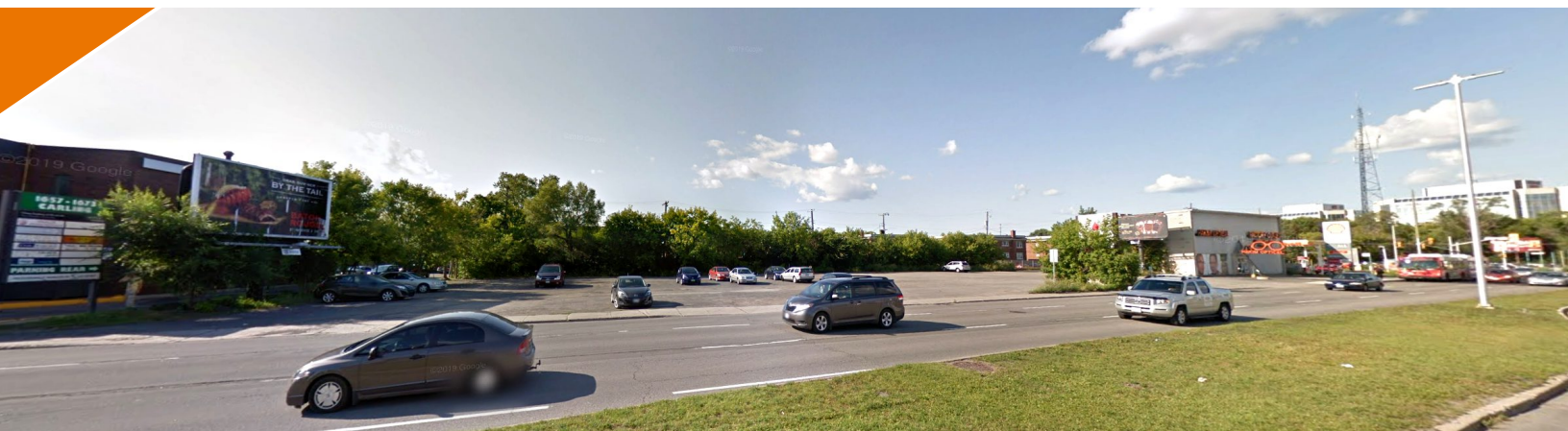


TIA Report
**Residential Building
Development
1655 Carling Avenue**

PARSONS



**Residential Building Development
1619-1655 Carling Avenue**

TIA Report

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November 4, 2020

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PROJECT NAME:	Transportation Impact Assessment – 1619-1655 Carling Ave
REPORT TITLE:	1619-1655 Carling Ave – TIA Report
PARSONS PROJECT NO.:	477272 - 01000
IN SUPPORT OF:	Zoning By-Law Amendment (ZBLA) and Site Plan Application (SPA)
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TIA Plan Reports

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

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

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

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check appropriate field(s)] is either transportation engineering or transportation planning .

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

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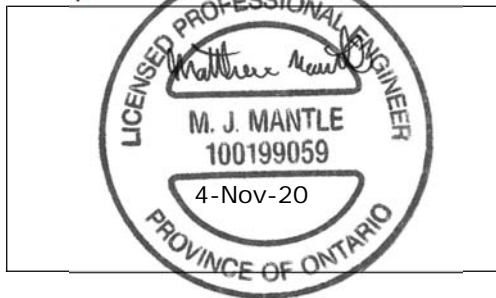


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- APPENDIX F – Vehicle Maneuvering Templates
- APPENDIX G – TDM Checklist
- APPENDIX H – MMLoS Analysis Results
- APPENDIX I – Synchro Analysis Reports

Parsons has been retained by Surface Developments to prepare a TIA in support of a Zoning Bylaw Amendment (ZBLA) and a Site Plan Application (SPA) for a proposed residential building development in Ward 15: Kitchissippi. The following report represents Step 5 of the TIA process. Note that the previous TIA submissions reflected a development plan within 1655 Carling Ave., whereas this updated TIA includes the additional development within the neighbouring property at 1619 Carling Ave.

1. SCREENING FORM

The Screening Form was submitted to the City of Ottawa for review and verification of the need to complete a Transportation Impact Assessment (TIA). The Trip Generation, Location and Safety triggers of the Screening Form were all met based on the checklist provided by the TIA Guidelines. As such, a TIA Report was deemed required. The Screening Form and responses to City comments are provided in **Appendix A**.

2. SCOPING REPORT

2.1. EXISTING AND PLANNED CONDITIONS

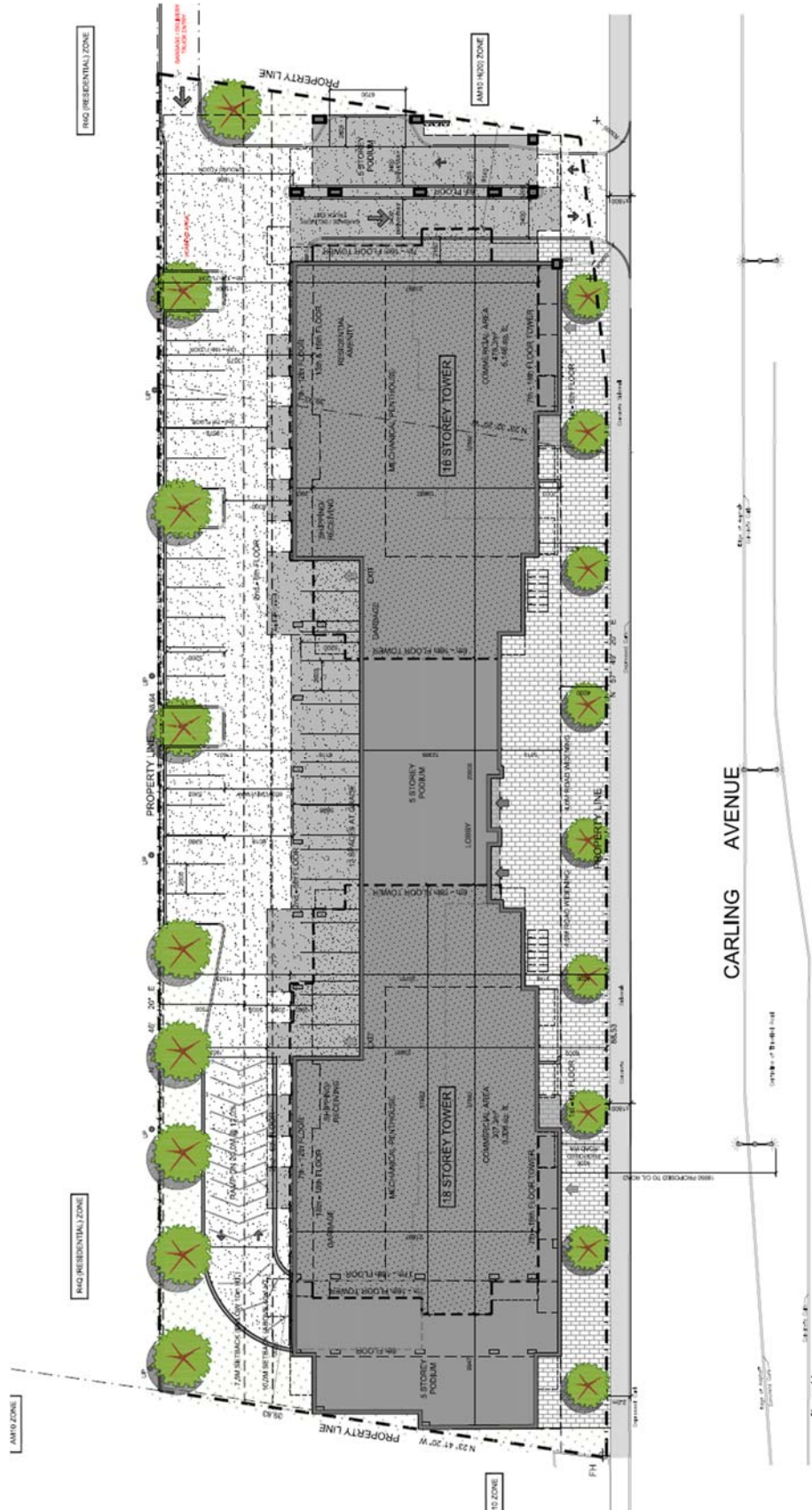
2.1.1. PROPOSED DEVELOPMENT

The proposed development is located at 1619 and 1655 Carling Ave and will consist of a total of 370 residential units and approximately 8,811 ft² (819 m²) within a 16 and 18-storey two-tower building. The site at 1655 Carling is currently occupied by an unpaved parking lot with an estimated maximum occupancy of 80 vehicles, which is being used by Carling Motors (1622 Carling Ave) and the Canadian Blood Services (1575 Carling Ave). The site at 1619 Carling is currently occupied by a furniture store and a sports bar, which are assumed to also utilize the existing parking lot on 1655 Carling. The proposed residential development will be constructed in a single phase, with an anticipated full-buildout date of 2022. **Figure 1** below provides the local context of the development site, while **Figure 2** provides the current Site Plan. The site is currently zoned as an Arterial Mainstreet (AM) zone.

Figure 1: Local Context



Figure 2: 1655 Carling Site Plan



Source: RLA

As shown in **Figure 2**, two driveways are proposed to serve the future development. The main driveway will be located on the east end of the site along the north side of Carling Ave, and function as a right-in/right-out only. The second driveway is located along the northeast corner of the site, which connects via an easement through the adjacent property (Shell gas station at 1607 Carling Ave) to Churchill Avenue N, as shown in Figure 3. This driveway is proposed to function primarily as an in-only and is understood to be restricted to authorized vehicles only, providing access to emergency vehicles, moving trucks and garbage trucks.

Figure 3: Proposed Driveways



To access the parking garage, residents will have to loop around the back of the site towards the west end of the building. Furthermore, the proposed development is anticipated to have 224 underground parking spaces and 34 surface parking spaces.

Given the centre median on Carling Ave along the site's frontage, vehicles destined to the site from the west would be expected to complete a U-turn at the Carling/Churchill and vehicles leaving to the site to the east would be required to complete a U-turn at the intersection Carling/Clyde/Cole intersection. Alternatively, there is a possibility that drivers elect to use Tillbury Ave. (local street situated north of the site) to avoid the U-turn manoeuvres on Carling Ave; however, this routing is considered more circuitous.

2.1.2. EXISTING CONDITIONS

Area Road Network

Carling Ave is an east-west municipal arterial roadway within the City of Ottawa, that runs from Bronson Ave in the east to March Rd in the west. Within the study area, Carling Ave has a six-lane divided cross-section, with a posted speed limit of 60 km/h and auxiliary turn lanes at major intersections.

Churchill Ave N is a north-south municipal roadway within the City of Ottawa, classified as a local roadway both south of Carling Ave and north of Lanark Ave, a major collector roadway between Carling Ave and Richmond Rd, an arterial roadway between Richmond Rd and Scott St and a collector roadway between Scott St and Lanark Ave. Churchill Ave N has a two-lane cross-section, with a posted speed limit of 50 km/h and auxiliary turn-lanes at major intersections.

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Cole Ave is a north-south municipal local roadway within the City of Ottawa, that extends from Dovercourt Ave in the north to connect to the north leg of Carling Ave in the south. Cole Ave has a two-lane cross-section and a posted speed limit of 40 km/h.

Clyde Ave is a north-south municipal local roadway within the City of Ottawa, that extends from the south leg of Carling Ave and terminates at 951 Clyde Ave. The roadway then continues at Castle Hill Crescent intersection down to Merivale Rd/Lotta Ave. Within the study area, Clyde Ave, with an assumed speed limit of 50 km/h and auxiliary turn lanes at major intersections.

Existing Study Area Intersections

Carling/Churchill

The Carling/Churchill intersection is a four-legged full-movement signalized intersection. The east and west legs of the intersection consist of two exclusive through lanes, 1 shared through/right-turn lane and one auxiliary left-turn lane. While the north and south legs of the intersection consist of one shared through/right-turn lane and one auxiliary left-turn lane. There are no restricted movements at this intersection.



Carling/Clyde/Cole

The Carling/Clyde/Cole intersection is a four-legged full-movement signalized intersection. The east and west legs of the intersection consist of two exclusive through lanes, 1 shared through/right-turn lane and one auxiliary left-turn lane. The north leg of the intersection consists of one shared through/right-turn lane and one auxiliary left-turn lane. The south leg of the intersection consists of one exclusive through lane, one auxiliary left-turn lane and one auxiliary right-turn lane. There are no restricted movements at this intersection. However, trucks are not permitted to enter the north leg of the intersection.



Existing Driveways to Adjacent Developments

The following driveways are currently on the north side of Carling Ave, within 200 m of the proposed development driveway at 1655 Carling Ave:

- Two accesses to Shell Gas Station, less than 10m east of the proposed development;
- One access to a small mixed-use commercial and office building, approximately 85 m west of the proposed development; and,
- One access to commercial and office units, approximately 160 m west of the proposed development.

Pedestrian/Cycling Network

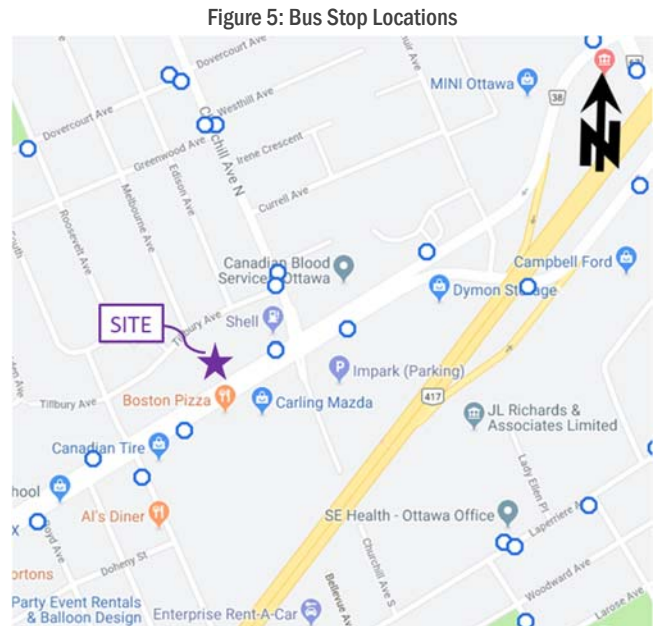
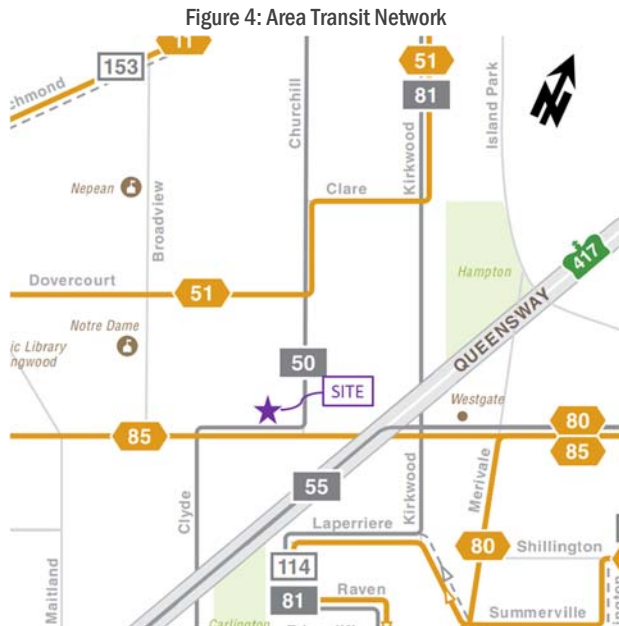
Pedestrian sidewalk facilities are provided throughout the study area, including both sides of Carling Ave, both sides of Churchill Ave, both sides of Cole Ave and the east side of Clyde Ave. With regards to cycling facilities, unidirectional cycle tracks are provided on both sides of Churchill Ave N, between Carling Ave and Byron Ave. There are no dedicated cycling facilities on Carling Ave, although it is identified as a spine route in the TMP.

Transit Network

The following OC Transpo routes currently operate along Carling Ave, at the frontage of the site:

- **Route #50 (Tunney's Pasture <-> Lincoln Fields):** identified by OC Transpo as a "Local Route", this route operates on customized routing and schedules, to serve local destinations. Route #50 operates at an average rate of every 30 minutes during weekdays. The nearest bus stops to the site are the Carling/Churchill stop, for the Lincoln Fields destination and the Carling/Clyde North stop, for the Tunney's Pasture destination.
- **Route #85 (Gatineau <-> Bayshore):** identified by OC Transpo as a "Frequent Route", this route operates at a high frequency along Carling Ave. Route #85 operates 7 days a week, at an average rate of every 15 minutes or less during weekday peak hours. The nearest bus stops to the site are the Carling/Churchill stop, for the Bayshore destination and the Carling/Clyde North stop, for the Lees destination.

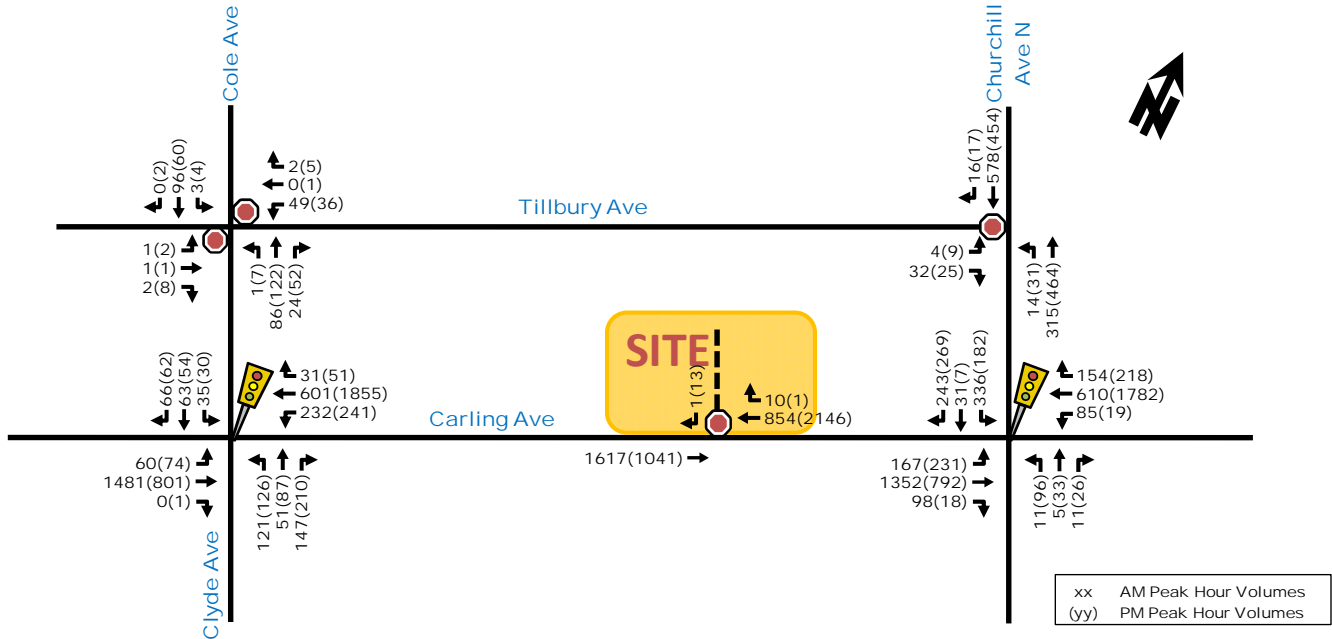
OC Transpo route maps for routes #50 and #85 have been provided in **Appendix B. Figure 4** below illustrates the area transit network surrounding the subject site, while **Figure 5** provides the nearest bus stop locations to the development site in the form of blue dots. The Carling/Churchill bus stop is approximately 40 m east of the site, while the Carling/Clyde North bus stop is within approximately a 300 m walking distance of the site.



Peak Hour Travel Demand

The existing peak hour traffic volumes, which were obtained from the City of Ottawa for the intersections of Carling/Churchill and Carling/Clyde/Cole, are illustrated in **Figure 6** below. Note that the east and west traffic volumes approaching to/from the Carling/Clyde/Cole intersection were balanced according to the traffic volumes at the Carling/Churchill intersection. Similarly, the SB traffic approaching from the Tillbury/Churchill intersection was balanced based on the SB traffic volumes at the Carling/Churchill intersection. With regards to the counts conducted at the existing site, the three existing parking lot accesses were combined to assume one large access. The raw traffic count data has been provided in **Appendix C**.

Figure 6: Existing Peak Hour Traffic Volumes



Existing Road Safety Conditions

A five-year collision history data (2014-2018, inclusive) was requested and obtained from the City of Ottawa for all intersections and road segments within the study area. Upon analyzing the collision data, the total number of collisions observed within the study area was determined to be 84 collisions within the past five-years. The majority of the collisions (83%) resulted in property damage only, while the remaining collisions resulted in a non-fatal injury. Furthermore, the type of impacts that resulted in 84 collisions were broken down into the following: 32 turning movement, 24 rear end, 24 sideswipe and 4 angle.

A standard unit of measure for assessing collisions at an intersection is based on the number of collisions per million entering vehicles (MEV). At signalized intersections within the study area, reported collisions have historically taken place at a rate of:

- 0.31 Collisions/MEV at the intersection of Carling/Churchill. A total of 22 collisions took place at this intersection within the past five-years. However, breakdown of collision data shows that there are no particular collision patterns taking place at this intersection.
- 0.77 Collisions/MEV at the intersection of Carling/Clyde/Cole. A total of 50 collisions took place at this intersection within the past five-years. Of these, 29 collisions occurred as a result of turning movements, the majority of which were between the WB/EB left-turns and the opposing EB/WB through movements, respectively. The turning movement collisions along Carling Ave are assumed to be due to the following:
 - Left-turning vehicles must cross 4 lanes of traffic (3 through and 1 left-turn lanes) to complete their left-turn movement.
 - Left-turn types along Carling Ave are protected-permitted during peak hours. Hence, the collisions occur during the EB/WB through/permitted left-turns phase.
 - A high volume of traffic performs a WBLT during peak hours to access the Canadian Tire store.

As such, turning movement collisions at the Carling/Clyde/Cole intersection can potentially be reduced by replacing the existing permissive-protected left-turn phase of the EB and WB movements with a fully protected left-turn phase.

Lastly, 6 collisions were observed along Carling Ave, between Churchill Ave and Clyde Ave/Cole Ave. However, no particular collision patterns were observed.

Collision data obtained from the City of Ottawa is provided in **Appendix D**, along with the analysis conducted by Parsons.

2.1.3. PLANNED CONDITIONS

Planned Study Area Transportation Network Changes

Based on the City of Ottawa's TMP, the 2031 Affordable Network for Rapid Transit and Transit Priority illustrates Carling Ave as a Transit Priority Corridor (Continuous Measures) at the frontage of the site. There are no other anticipated changes to the road network surrounding the subject development's site.

Other Area Developments

A summary of other area developments is provided below based on the latest available information from the City regarding adjacent site development applications.

689 Churchill Ave

A 3-storey low-rise apartment building is proposed at 689 Churchill Ave. The building will consist of 15 residential units, which are expected to generate minimal traffic. As such, traffic generated by this development will be accounted for in the background growth rate in the forecasting section of the report.

701 Churchill Ave

A 3-storey low-rise apartment building is proposed at 701 Churchill Ave. The building will consist of 12 residential units, which are expected to generate minimal traffic. As such, traffic generated by this development will be accounted for in the background growth rate in the forecasting section of the report.

1705 Carling Ave

A TIA was submitted by Novatech in May 2018 for a 9-storey mixed-use building development, containing 68 senior's apartments and 130 residential care units at 1705 Carling Ave. As the site is currently occupied by an 80-unit motel and a 3500 ft² restaurant, the number of trips forecasted for the future development are expected to be lower than the trips generated by the existing developments at this site. Thus, trips for this development will not be added to the background traffic volumes forecasted in this report.

2.2. STUDY AREA AND TIME PERIODS

Since the proposed development consists of a residential building, the peak time periods to be assessed are the weekday morning and afternoon peak hour periods. Furthermore, the horizon years to be analyzed are the year of full-buildout of the development (2022) and five years after full-buildout (2027), as per the requirements of the TIA Guidelines. The proposed study area is shown below in **Figure 7**.

Figure 7: Study Area



Study area intersections include:

- Carling Ave/Clyde Ave/Cole Ave
- Carling Ave/Churchill Ave N

A justification letter was provided to the City of Ottawa on August 28th, 2019, explaining the rationale for using a reduced study area limit instead of the 1 km radius recommended by the TIA Guidelines. The justification letter is provided in **Appendix E**.

2.3. EXEMPTION REVIEW

Based on the City's TIA guidelines and the subject site, the following modules/elements of the TIA process, summarized in **Table 1**, are recommended to be exempt in the subsequent steps of the TIA process:

Table 1: Exemptions Review Summary

Module	Element	Exemption Consideration
4.1 Development Design	4.1.3 New Street Networks	This element is not required for Site Plans.
4.2 Parking	4.2.2 Spillover Parking	Parking supply is anticipated to meet the City of Ottawa Parking Provision requirements.
4.8 Review of Network Concept	All elements	The site is not expected to generate 200 trips more than the established zoning.

3. FORECASTING

3.1. DEVELOPMENT GENERATED TRAVEL DEMAND

3.1.1. TRIP GENERATION AND MODE SHARES

The proposed development will consist of a two-tower apartment building containing 370 residential units and 8,811 ft² of commercial space. Appropriate trip generation rates were obtained from the "2009 TRANS Trip Generation Residential Trip Rates" report for the apartment units and from the ITE Trip Generation Manual for the commercial space, which are summarized in **Table 2**.

Table 2: Proposed Development Trip Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
High-Rise Apartments	TRANS	T = 0.24(du);	T = 0.27(du);
First Floor Commercial Space ("Shopping Centre")	ITE 820	T = 0.94(x);	T = 3.81(x);
Notes: T = Average Vehicle Trip Ends du = Dwelling unit x = Gross Floor Area (GFA) (1,000 ft ²)			

Using the trip rates shown in **Table 2**, along with the planned number of residential units, the number of vehicles per hour generated by the apartment units are provided in **Table 3** below.

Table 3: Apartment Units Vehicle Trip Generation

Land Use	Dwelling Units	AM Peak (Vehicles/h)			PM Peak (Vehicles/h)		
		In (24%)	Out (76%)	Total	In (62%)	Out (38%)	Total
High-Rise Apartments	370	21	68	89	62	38	100

The total vehicle trips of the apartment units, provided in **Table 3**, are then converted to total person trips using mode share percentages found in the 2009 TRANS Report. The total person trips are then used to determine person trips/h for each travel mode, based on their respective mode share percentages. **Table 4** summarizes the number of person trips generated for each of the respective travel modes of the proposed development.

Table 4: Mode Shares for the Apartment Units

Travel Mode	Mode Share	AM Peak (Person Trips/h)			Mode Share	PM Peak (Person Trips/h)		
		In (24%)	Out (76%)	Total		In (62%)	Out (38%)	Total
Auto Driver	37%	21	68	89	40%	62	38	100
Auto Passenger	8%	4	16	20	9%	14	8	22
Transit	41%	23	75	98	37%	57	36	93
Non-motorized	14%	8	26	34	14%	21	14	35
Total Person Trips	100%	56	185	241	100%	154	96	250

As shown in **Table 4**, the resulting number of total person trips expected to be generated by the apartment units are approximately 241 and 250 person trips/h in the morning and afternoon peak hours respectively.

With regards to the commercial use, the total number of person trips can be calculate directly using the trip rates provided in **Table 2** and multiplied by a factor of 1.28, as per TIA standards, to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. The resulting total person trips/hour for the commercial land use are provided in **Table 5**.

Table 5: Commercial Space Person Trip Generation

Land Use	Area (ft ²)	AM Peak (Vehicles/h)			PM Peak (Vehicles/h)		
		In (62%)	Out (38%)	Total	In (48%)	Out (52%)	Total
Commercial Space	8,811	6	5	11	20	23	43

Furthermore, the 2011 NCR Household Origin-Destination Survey provides mode share percentages based on the district where the proposed development site is located. Based on the Ottawa West District, new mode share percentages were used in conjunction with the total person trips of the apartment units in **Table 4** and the total person trips of the commercial space in **Table 5**, thereby providing new trip generation results as shown in **Table 6**.

Table 6: OD Survey Mode Shares - Ottawa West District

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	50%	31	95	126	87	60	147
Auto Passenger	15%	10	28	38	25	19	44
Transit	20%	13	38	51	35	23	58
Bike	5%	3	10	13	9	6	15
Walk	10%	5	19	24	17	12	29
Total Person Trips	100%	62	190	252	173	120	293
Total Auto Trips		31	95	126	87	60	147

The auto trips expected to be generated by the future residential development are 126 and 147 veh/h during the morning and afternoon peak hour periods, respectively. However, considering that proposed transit movements along Carling Ave (see **Section 3.2.1**), the mode shares were adjusted as shown in **Table 7** below to reflect a higher transit usage.

Table 7: OD Survey Mode Shares with Increased Transit

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	40%	26	75	101	70	48	118
Auto Passenger	10%	7	19	26	17	12	29
Transit	35%	22	66	88	60	42	102
Bike	5%	3	10	13	5	3	8
Walk	10%	5	19	24	10	7	17
Total Person Trips	100%	63	189	252	173	120	293
Total Auto Trips		26	75	101	70	48	118

As such, the proposed development is forecasted to generate approximately 101 and 118 veh/h during the morning and afternoon peak hour periods respectively. However, the proposed development site is currently occupied by an unpaved

parking lot with an assumed maximum occupancy of 80 vehicles. Morning and afternoon peak hour traffic counts were conducted at the three access points of the existing parking lot. **Table 8** provides the vehicle trips to/from the existing parking lot (as shown in **Figure 6**).

Table 8: Vehicle Trips to/from the Existing Unpaved Parking Lot

Land Use	Capacity	AM Peak (Vehicles/h)			PM Peak (Vehicles/h)		
		In	Out	Total	In	Out	Total
Existing Unpaved Parking Lot	80 Vehicles	10	1	11	1	13	14

Therefore, the net differences in vehicle trips between future and existing development conditions are provided in **Table 9**.

Table 9: Forecasted Net Change in Site Traffic

Land Use	AM Peak (Vehicles/h)			PM Peak (Vehicles/h)		
	In	Out	Total	In	Out	Total
<i>New Trips</i> High-Rise Apartments	26	75	101	70	48	118
<i>Minus Existing Trips</i> Unpaved Parking Lot	10	1	11	1	13	14
<i>Net Change</i>	16	74	90	69	35	104

As shown in **Table 9**, the planned residential building development is expected to result in a net increase of approximately 90 and 104 veh/h within the study area, during the morning and afternoon peak hour periods.

3.1.2. TRIP DISTRIBUTION AND ASSIGNMENT

Based on the 2011 OD Survey (Ottawa West district) and the location of adjacent arterial roadways and neighbourhoods, the distribution of site-generated traffic volumes was estimated as follows:

- 20% to/from the north;
- 10% to/from the south;
- 65% to/from the east; and,
- 5% to/from the west.

The expected site-generated auto trips in **Table 7** were then assigned to the surrounding road network as shown in **Figure 8** below. Furthermore, traffic volumes generated by the existing parking lot (see **Table 8**) are shown in **Figure 9** and the net difference in traffic (see **Table 9**) is illustrated in **Figure 10**. With regards to inbound traffic, vehicles were assumed to approach as follows:

- 65% from east Carling Ave
- 20% from north Churchill Ave N, and
- 15% from west Carling Ave (2/3 of which complete the U-turn at Carling/Churchill and 1/3 use Tillbury Ave),

Outbound vehicles were assumed to leave the site as follows:

- 15% to west Carling Ave
- 20% to north Churchill Ave N through Tillbury Ave and
- 65% to east Carling Ave (3/4 of which complete the U-turn at Carling/Clyde/Cole and 1/4 use Tillbury Ave).

Figure 8: Planned Residential Development Site-Generated Traffic

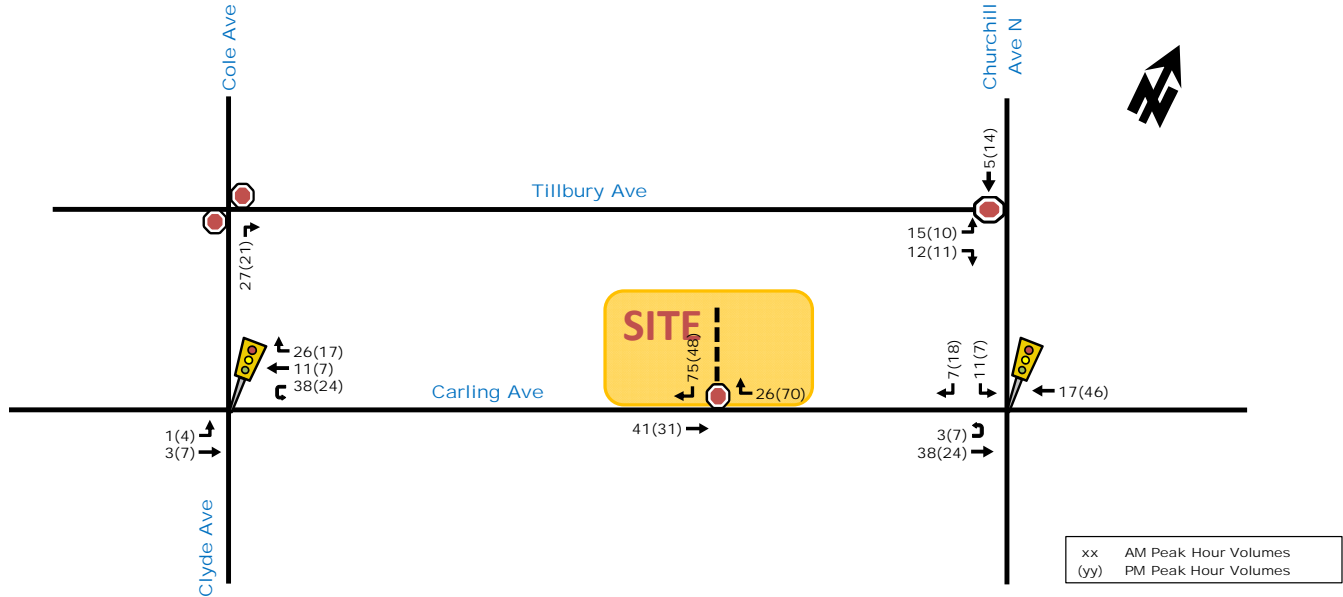


Figure 9: Existing Parking Lot Traffic Volumes

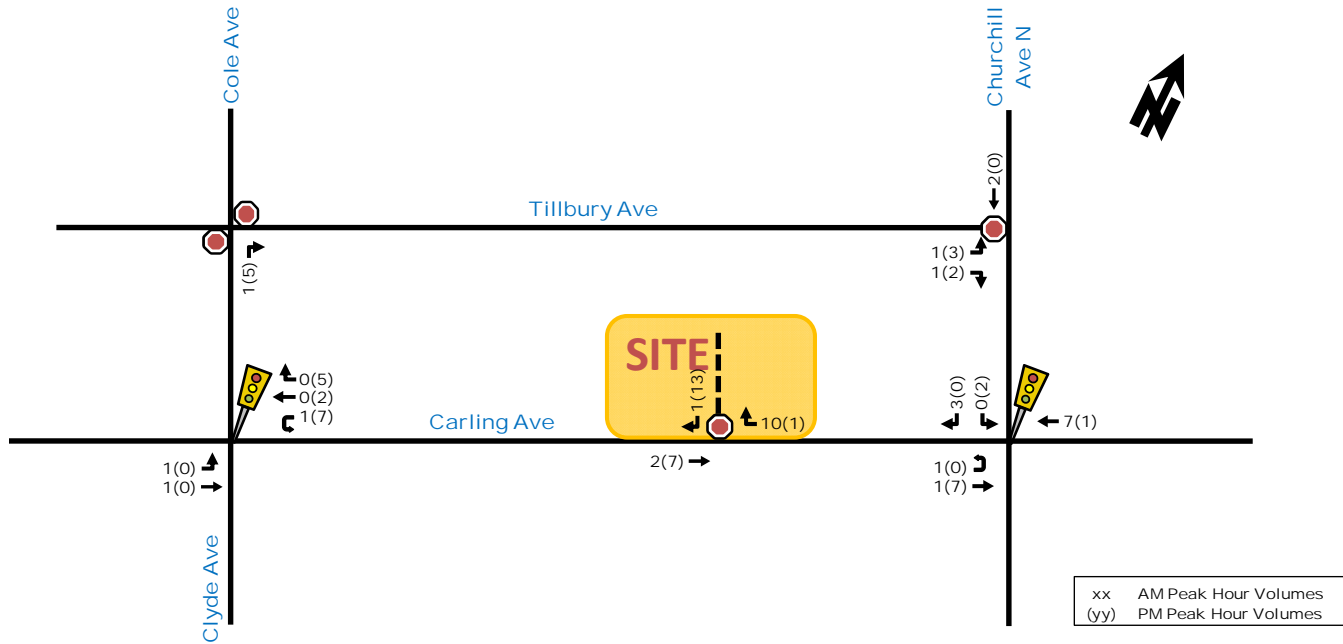
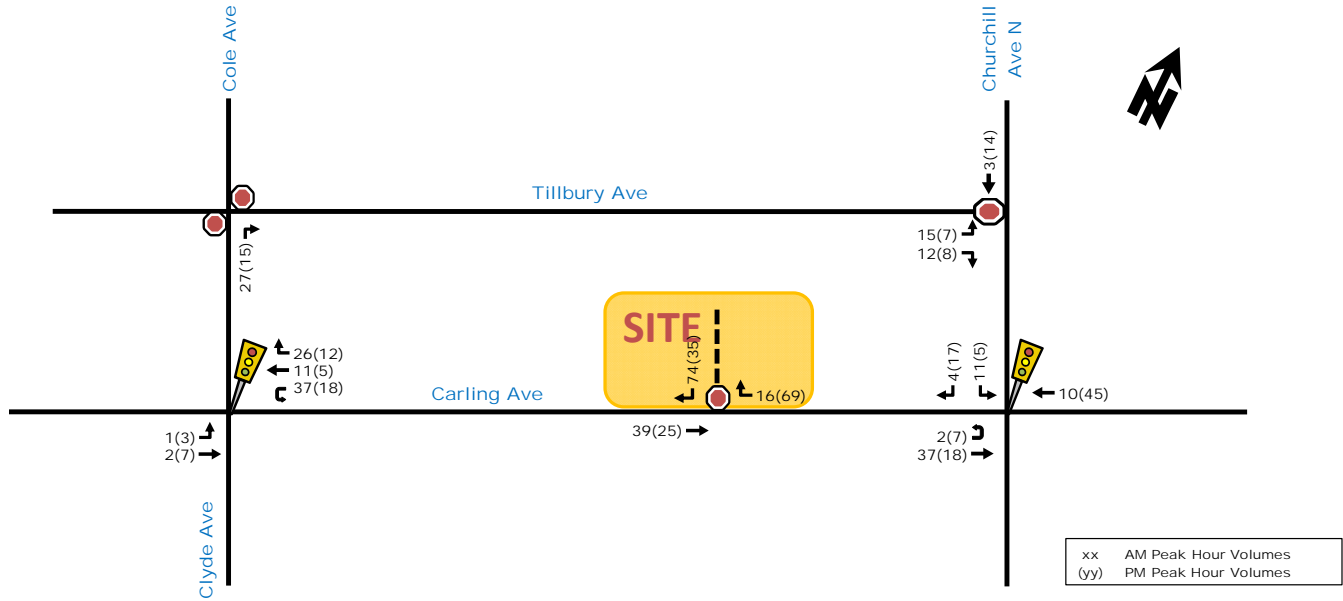


Figure 10: Net Traffic Difference



3.2. BACKGROUND NETWORK TRAFFIC

3.2.1. TRANSPORTATION NETWORK PLANS

Refer to **Section 2.1.3: Planned Study Area Transportation Network Changes**. A functional design project initiated by the City of Ottawa is currently underway to provide transit priority measures along Carling Ave, from Lincoln Fields to Bronson Ave. Between Lincoln Fields and Sherwood Dr, the plan is to provide a single designated bus lane for transit by reducing the three general purpose lanes to two general purpose lanes along both sides of Carling Ave. According to the TMP, this plan is anticipated to be implemented by 2031 as part of the Affordable Network. **Figure 11** below shows the functional plan at the frontage of the site, where red lines represent the designated transit bus lanes.

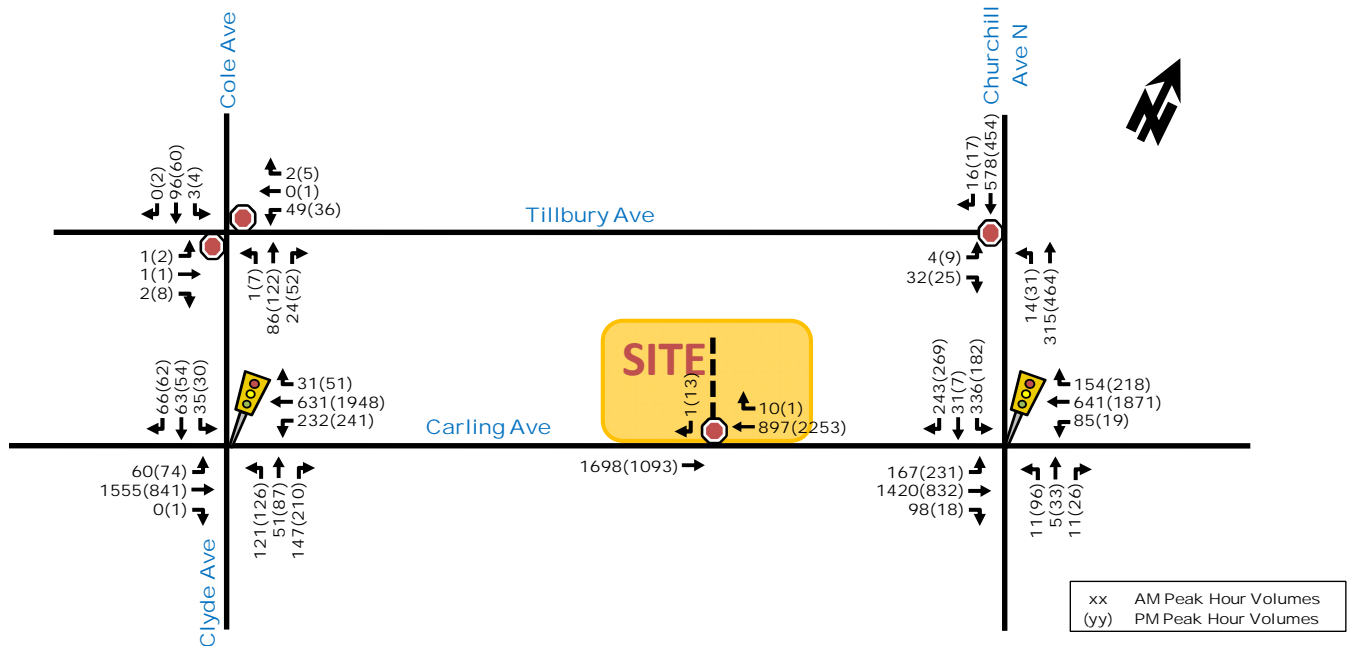
Figure 11: Carling Ave Transit Priority Measure



3.2.2. BACKGROUND GROWTH

The introduction of designated transit bus lanes along Carling Ave is expected to help reduce future background traffic through increasing the reliability and performance of transit services. Furthermore, since the area is well developed and there are no major other area developments planned near the subject site, traffic along Carling Ave is not anticipated to increase significantly in the next few years. As such, traffic growth is assumed to be 0% per year for the future horizon year 2022 and 1% per year thereafter for future horizon year 2027. Traffic volumes anticipated for the future background horizon year 2027 is illustrated in **Figure 12**.

Figure 12: Future Background 2027 Traffic Volumes



3.2.3. OTHER DEVELOPMENTS

Description of other area developments taking place within the study area was provided in **Section 2.1.3 - Other Area Developments**. For the purposes of this report, there are no additional traffic volumes associated with adjacent area developments that will be included in the analysis.

3.3. DEMAND RATIONALIZATION

Given that the number of lanes along Carling Ave is anticipated to be reduced to two general-purpose lanes in each direction, capacity of the study area intersections in future horizon years will be significantly lower than the capacity of Carling Ave in existing conditions. However, based on the *Carling Avenue Transit Priority Measures and Functional Design Report (WSP, June 2017)*, east-west traffic along Carling Ave is forecasted to decrease by up to 20% due to the implementation of the continuous dedicated bus lanes. The resulting anticipated traffic volumes for future background horizon years 2022 and 2027 are illustrated in **Figure 13** and **Figure 14**. Note that, as per **Section 3.2.2**, a 1% per year background growth rate was applied to traffic volumes between horizon year 2022 and 2027.

Figure 13: Future Background 2022 Traffic Volumes, with 20% East-West Reduction

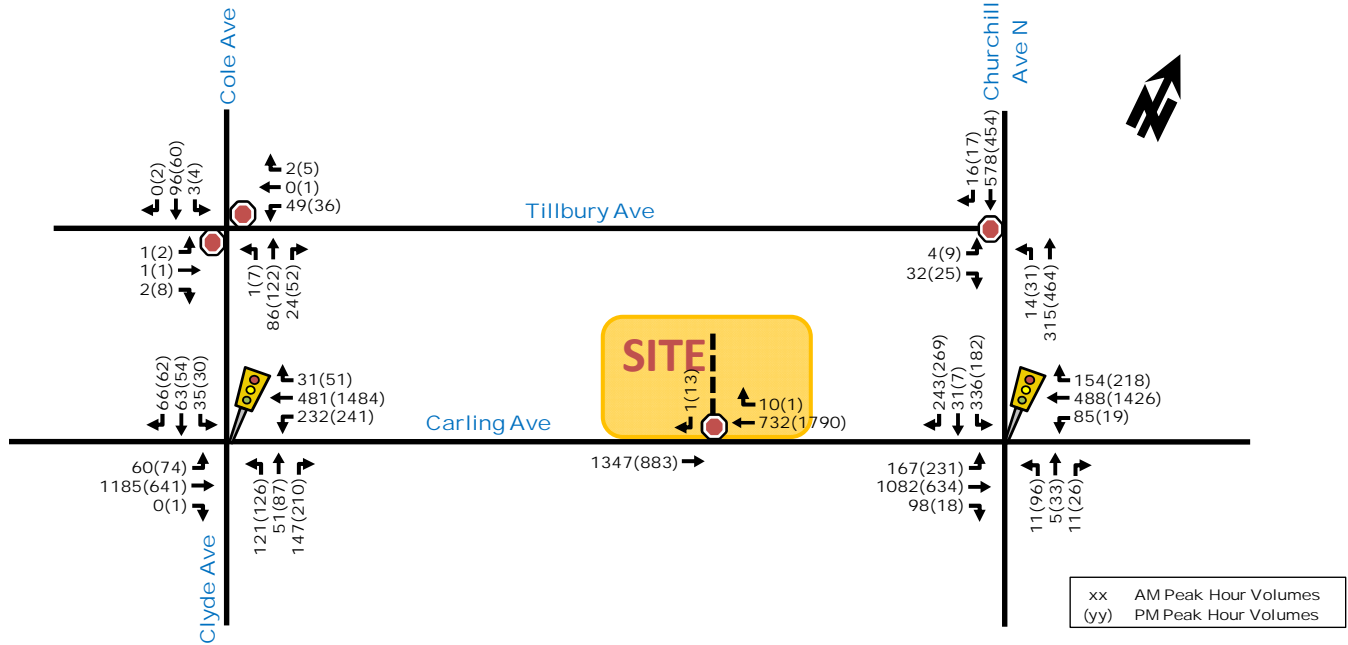
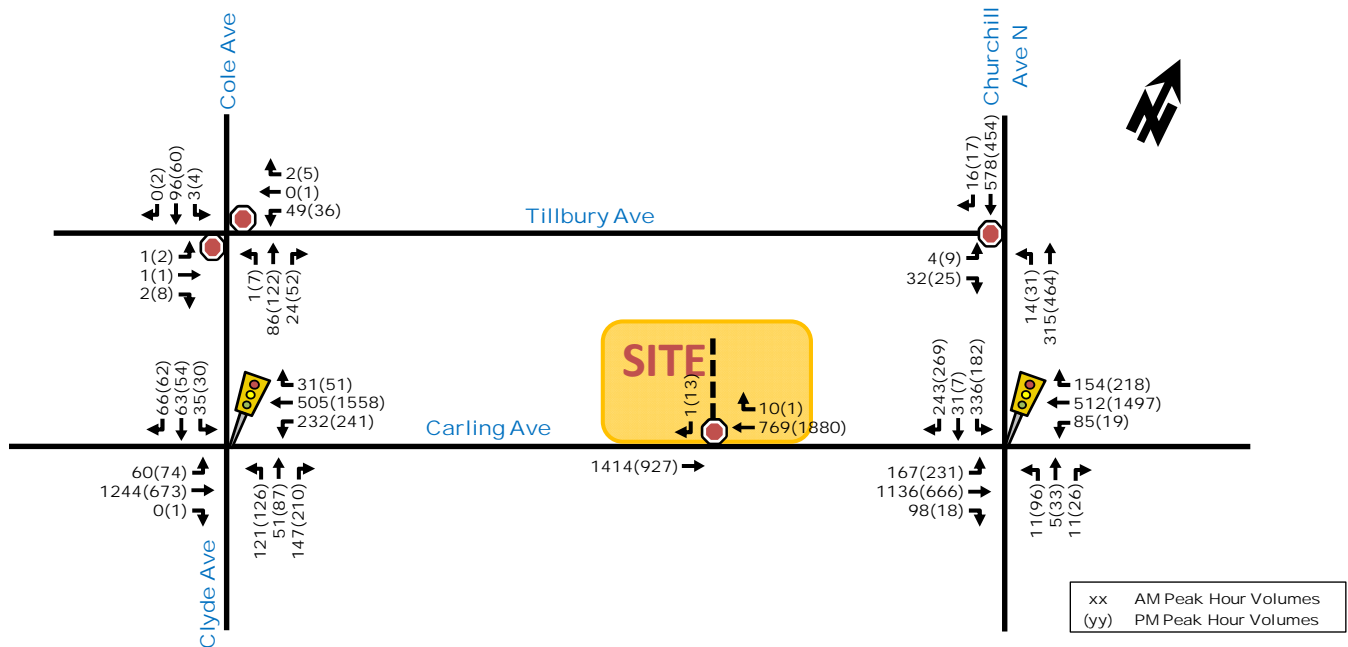


Figure 14: Future Background 2027 Traffic Volumes, with 20% East-West Reduction



4. ANALYSIS

4.1. DEVELOPMENT DESIGN

Surface parking spaces are proposed to be located along the site’s internal driveway on the north end of the site, while access to the underground parking is proposed on the northwest end of the site. Bicycle parking will be provided on the first floor of the underground parking garage.

Pedestrian sidewalk facilities will be provided at the frontage of the proposed development building and will continue to exist as described in **Section 2.1.2: Pedestrian/Cycling Network**. Similarly, bus routes will continue to operate throughout the study area as described in **Section 2.1.2: Transit Network**.

As described previously, the development proposes two driveway connections, the main driveway connects to Carling Ave. that will provide day-to-day access for the residents. The second driveway located at the northeast corner of the property connects to Churchill Ave. N. via an easement. The purpose of this driveway is to provide a service route for garbage trucks, moving vehicles and emergency vehicles. Vehicle movement templates can be found in Appendix F.

Upon review of the on-site vehicle maneuvering, the following was noted:

- HSU (emergency vehicles) sized vehicles may be required to reverse out the north east driveway.
- When exiting, MSU sized vehicles partially mount the pedestrian path along the west side of Carling Ave. driveway as it passes through the building.
- Vehicles entering and exiting the parking garage have overlapping paths at the 90 degree turn near the building entrance, it is recommended that a convex mirror is provided on the northwest corner of the ramp as shown in Figure 15 to improve sight lines

Figure 15: Parking Garage Access



The City of Ottawa’s TDM-supportive Development Design and Infrastructure Checklist is provided in **Appendix G**.

4.2. PARKING

Based on the Site Plan, a total of 258 (224 underground and 34 surface) parking spaces are proposed for the development. The City of Ottawa Parking Provisions requires 0.5 parking spaces per unit and 0.1 visitor spaces per unit based on the location and land use of the development, which equates to approximately 222 parking spaces required. As such, the proposed number of vehicle parking spaces meets the requirement.

A total of 197 bicycle storage spaces are proposed in the first level of the underground parking garage. The City of Ottawa Parking Provisions requires 0.5 spaces per unit based on the location and land use of the proposed development, which equates to approximately 185 spaces required. As such, the proposed number of bicycle parking spaces meets the requirement.

4.3. BOUNDARY STREET DESIGN

Multi-Modal Level of Service (MMLoS) analysis was conducted for existing and future conditions along the boundary road, Carling Ave, between Cole/Clyde and Churchill. Detailed analysis results are provided in **Appendix H**. The anticipated future design of Carling Ave includes the reprogramming of the existing shoulder travel lanes to transit lanes on both sides of the roadway as part of the transit priority measures that will be implemented. The existing and future features of Carling Ave are described as follows:

- 3 travel lanes in each direction.
- 1.8m sidewalks on both sides of the roadway.
- Posted speed of 60km/h along Carling Ave.
- More than 3000 avg daily curb lane traffic volumes (existing general-purpose lane); less than 3000 avg daily curb lane traffic volumes (future transit lane).
- No bike lanes.
- Transit travels in mixed traffic (existing); Transit travels in dedicated lanes (future).
- Lane widths of approximately 3.5m.

Table 10 below summarizes the MMLoS analysis results for the pedestrian, bicycle, transit and truck travel modes. The minimum desirable LOS target for each of the travel modes is also provided in **Table 10** and were obtained from the City of Ottawa’s MMLoS Guidelines. The targets are based on the designation of Carling Ave as an “Arterial Main Street”, that is classified by the City of Ottawa TMP as a bicycle spine route, is a part of the City of Ottawa Truck Route and is expected to provide transit priority measures in the future.

Table 10: MMLoS - Boundary Road Analysis

Road Segment	Level of Service							
	Pedestrian (PLOS)		Bicycle (BLOS)		Transit (TLOS)		Truck (TkLOS)	
	PLOS	Target	BLOS	Target	TLOS	Target	TkLOS	Target
Carling Ave (Existing)	F	C	F	C	D	No target	D	D
Carling Ave (Future)	C	C	F	C	B	C	D	D

Red font in **Table 10** indicates that the respective target has not been met. The pedestrian LOS minimum desirable target is not met in existing conditions due to the high volume of the average daily curb lane traffic (more than 3000), as it is currently a general-purpose lane. The future pedestrian LOS improves on the premise that the shoulder lanes are converted from general purpose to transit, reducing the curb lane traffic significantly. The bicycle LOS is not met in both existing and future conditions, due to the lack of bike lane facilities along this section of Carling Ave, the high operating speeds and the number of lanes that cyclists perform while turning left at the next intersection. Although it is not reflected by the MMLoS analysis, bikes are permitted to use the transit lanes, which may provide slightly better operations for cyclists than anticipated. No target is available for the transit LOS in existing conditions, as the MMLoS Guidelines do not provide targets for locations where there are no transit priority measures.

4.4. ACCESS INTERSECTION DESIGN

As mentioned previously, the main driveway is located on the east end of the site connecting to Carling Ave. and can be used to access the surface and underground parking entrance at the back end of the building. This access will permit right-in/right-out movements only, with STOP control for vehicles exiting the development site. The access will be located approximately 45m west of the Carling/Churchill intersection. A second driveway will have restricted access and will be primarily used as a service access between the site and Churchill Ave N.

The proposed driveway is approximately 5m west of the adjacent existing driveway servicing the gas station to the east and less than 2m from the east property line.

MMLoS analysis was conducted for the two signalized intersections along Carling Ave, within the study area. **Table 11** below summarizes the analysis results, with detailed results provided in **Appendix H**. While one lane in each direction of Carling Ave is expected to be converted to a transit lane, the overall design of these particular intersections is not expected to be modified in the future. As such, the analysis results of future and existing conditions are mostly the same, with the exception of transit. The minimum desirable LOS targets are the same as those obtained in **Table 10**.

Table 11: MMLoS - Signalized Intersections

Intersection	Level of Service							
	Pedestrian (PLOS)		Bicycle (BLOS)		Transit (TLOS)		Truck (TkLOS)	
	PLOS	Target	BLOS	Target	TLOS	Target	TkLOS	Target
Carling/Clyde/Cole (Existing)	F	C	F	C	E	No target	D	D
Carling/Clyde/Cole (Future)	F	C	F	C	B (Carling) E (NB on Clyde)	C	D	D
Carling/Churchill (Existing)	F	C	F	C	F	No target	C	D
Carling/Churchill (Future)	F	C	F	C	B (Carling) E (SB on Churchill)	C	C	D

Red font in **Table 11** indicates that the respective target has not been met. All pedestrian and bicycle LOS results do not meet the minimum desirable LOS targets. With regards to pedestrians, this is caused primarily by the number of lanes that pedestrians have to cross on the east and west crosswalks (7 lanes). A PLOS ‘C’ can only be achieved by reducing the number of lanes to three total, which would not be feasible, given the function of Carling Ave as a primary arterial roadway in the City of Ottawa.

With regards to cyclists, the minimum desirable LOS targets are not met due to the lack of bicycle facilities on all legs of the intersection, as well as the number of lanes that cyclists must cross on Carling Ave to complete a left turn at the intersection. Achieving a BLOS ‘C’ would require bike crossings at all legs of the intersections, as well as bike lanes or cycle tracks for the approaching movements of the intersection. Furthermore, as mentioned previously, bikes will be permitted to use the transit lanes in the future, which may provide cyclists with better operations than anticipated.

With regards to transit, two results have been provided for the future conditions, which are reflective of transit traffic on north/southbound streets as well as movements along the future Carling Ave transit lanes. It was assumed that the delay that bus routes travelling along the future transit lanes would incur is 10 seconds or less, which is equivalent to a TLOS ‘B’ as provided in **Table 11**. However, the existing bus routes at the northbound approach of Cole/Clyde and the southbound approach of Churchill are expected to result in delays equivalent to TLOS ‘E’ in future conditions.

4.5. TRANSPORTATION DEMAND MANAGEMENT

The TDM Measures Checklist is attached in **Appendix G**.

4.6. NEIGHBOURHOOD TRAFFIC MANAGEMENT

Within the study area, some drivers may elect to use Cole Ave and Tillbury Ave (local roads) in combination with Churchill Ave N (major collector) as part of their route to/from the proposed development. Based on the City of Ottawa’s TIA Guidelines, the threshold for future traffic volumes in the peak direction is 120 veh/h for local roads and 600 veh/h for

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major collector roads. Based on the projected future background 2027 traffic volumes (**Figure 14**) and the net site-generated traffic (**Figure 10**):

- Along Tillbury Ave, the maximum number of traffic anticipated in the peak direction is 72 veh/h in the afternoon eastbound direction, which does not exceed the 120 veh/h threshold.
- Along Cole Ave, traffic volumes between Carling Ave and Tillbury Ave exceed the 120 veh/h threshold in peak directions for both existing and future conditions. However, there are no anticipated operational issues along Cole Ave as the threshold is exceeded over a short road segment (60m) as vehicles turn to/from Tillbury Ave.
- Along Churchill Ave N, the maximum number of traffic anticipated in the peak direction is 581 veh/h in the morning southbound direction, which does not exceed the 600 veh/h threshold.

Therefore, changes to the existing classification of the study area roadways is not required.

4.7. TRANSIT

As previously mentioned in **Section 3.2.1**, Carling Ave is planned to be a transit priority corridor (continuous measures). In order to account for the anticipated addition of a designated bus lane along Carling Ave, the number of general purpose lanes was reduced to two lanes for the future background and future projected conditions analyzed in **Section 4.9**.

Due to the placement of the proposed driveway off Carling Ave., the existing bus stop located at the east end of the property will be relocated west of the current position. It is recommended that the bus stop be located a minimum of 15m west of the proposed driveway to provide enough space for a bus to stop without blocking vehicle movements to/from Carling Ave.

4.8. REVIEW OF NETWORK CONCEPT

Exempt – see **Section 2.3**. As shown in **Table 7**, the number of person trips anticipated to be generated by the proposed development are 252 and 293 person trips per hour during the morning and afternoon peak hours. Based on the established zoning, a building height of 15m is permitted at this location. The proposed development building illustrates 3.0m per storey. Therefore, 5 storeys are permitted under the existing zoning. Above the 5th storey, the number of proposed units is 230 apartment units.

Using the average vehicle trip rates of a high-rise building provided in **Table 2** and multiplying by the 230 units, this equates to approximately 55 and 62 veh/h during the morning and afternoon peak hours, respectively. Based on the TRANS 2009 report, 37% of mode shares are auto driver during the morning peak hour, while 40% are auto driver during the afternoon peak hour. Dividing the vehicle trips generated from the 230 units by these mode shares, it is determined that the total person trips are 149 and 155 person trips per hour during the morning and afternoon peak hours. As such, the proposed development is not expected to generate 200 person trips in excess of the current zoning.

4.9. INTERSECTION DESIGN

4.9.1. INTERSECTION CONTROL

STOP control will be provided for the proposed development access, which will be sufficient given the low site-generated traffic volumes.

4.9.2. INTERSECTION DESIGN

The Synchro 10 Trafficware was used to analyze intersection performance of intersections within the study area. Critical movements at each of the intersections were assessed based on either the movement with the highest volume-to-capacity ratio (for signalized intersections), or the movement experiencing the highest average delay (for unsignalized intersections). It should be noted that, as per the TIA Guidelines, the Peak Hour Factor (PHF) used for analysis was 0.9 in existing conditions and 1.0 in all future scenario conditions. Furthermore, the number of lanes along Carling Ave were reduced to two general purpose lanes in all future background and total projected scenarios. All Synchro report outputs for existing and future conditions have been provided in **Appendix I**.

Existing Conditions

Table 12 below summarizes the intersection performance of study area intersections, based on the existing conditions traffic volumes provided in **Figure 6**.

Table 12: Existing Conditions Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LOS	max. v/c or avg. delay (s)	Movement	Delay (s)	LOS	v/c
Churchill Ave N/Carling Ave (S)	D(F)	0.90(1.14)	SBL(WBT)	28.5(69.9)	C(F)	0.79(1.04)
Clyde Ave/Cole Ave/Carling Ave (S)	C(C)	0.78(0.75)	NBL(NBL)	23.7(20.1)	B(B)	0.64(0.66)
Carling Ave/Site Access (U)	A(B)	8.7(10.6)	SB(SB)	0.0(0.0)	-	-
Cole Ave/Tillbury Ave (U)	B(B)	10.3(10.4)	WB(WB)	2.2(2.1)	-	-
Tillbury Ave/Churchill Ave N (U)	B(B)	14.2(14.8)	EB(EB)	0.7(1.0)	-	-

Note: Analysis of signalized intersections assumes a PHF of 0.90 and a saturation flow rate of 1800 veh/h/lane.
(S) - Signalized intersection.
(U) - Unsignalized intersection.

As shown in **Table 12**, the critical southbound left-turn movement at Churchill Ave N/Carling Ave operates at a LOS 'D' during the morning peak hour, while the critical westbound through movement operates at capacity with LOS 'F' during the afternoon peak hour. The critical northbound left-turn movement at Clyde Ave/Cole Ave/Carling Ave operates at a LOS 'C' during both morning and afternoon peak hour periods. Critical movements at the unsignalized intersections operate at a LOS 'B' or better during the morning and afternoon peak hour periods.

Future Background 2022 Conditions

Table 13 below summarizes the intersection performance of study area intersections, based on the future background 2022 conditions traffic volumes provided in **Figure 13**.

Table 13: Future Background 2022 Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LOS	max. v/c or avg. delay (s)	Movement	Delay (s)	LOS	v/c
Churchill Ave N/Carling Ave (S)	D(E)	0.86(0.97)	SBL(WBT)	27.7(39.4)	A(D)	0.58(0.87)
Clyde Ave/Cole Ave/Carling Ave (S)	C(B)	0.74(0.70)	NBL(NBL)	21.8(17.9)	B(B)	0.61(0.64)
Carling Ave/Site Access (U)	A(B)	9.2(10.8)	SB(SB)	0.0(0.1)	-	-
Cole Ave/Tillbury Ave (U)	B(B)	10.1(10.2)	WB(WB)	2.2(2.1)	-	-
Tillbury Ave/Churchill Ave N (U)	B(B)	13.3(13.7)	EB(EB)	0.7(0.9)	-	-

Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane.
(S) - Signalized intersection.
(U) - Unsignalized intersection.

As shown in **Table 13**, the critical SBL movement at Churchill Ave N/Carling Ave shows slight improvement in the morning and afternoon peak hour analysis compared to the existing conditions, which is due to the change of the peak hour factor used to assess the intersection performance. Likewise, the critical movements at the Clyde Ave/Cole Ave/Carling Ave intersection show decrease in v/c ratios and operate at a LOS 'C' or better during morning and afternoon peak hour periods. Critical movements at the unsignalized intersections continue to operate at a LOS 'B' or better during the morning and afternoon peak hour periods.

Future Background 2027 Conditions

Table 14 below summarizes the intersection performance of study area intersections, based on the future background 2027 conditions traffic volumes provided in **Figure 14**.

Table 14: Future Background 2027 Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LOS	max. v/c or avg. delay (s)	Movement	Delay (s)	LOS	v/c
Churchill Ave N/Carling Ave (S)	D(F)	0.86(1.02)	SBL(WBT)	28.0(44.3)	A(E)	0.58(0.91)
Clyde Ave/Cole Ave/Carling Ave (S)	C(B)	0.74(0.70)	NBL(WBT)	22.5(18.6)	B(B)	0.63(0.67)
Carling Ave/Site Access (U)	A(B)	9.3(10.9)	SB(SB)	0.0(0.1)	-	-
Cole Ave/Tillbury Ave (U)	B(B)	10.1(10.2)	WB(WB)	2.2(2.1)	-	-
Tillbury Ave/Churchill Ave N (U)	B(B)	13.3(13.7)	EB(EB)	0.7(0.9)	-	-

Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane.
 (S) - Signalized intersection.
 (U) - Unsignalized intersection.

As shown in **Table 14**, the analysis results show slight increase in v/c ratios and intersection delays compared to the future background 2022 conditions. However, the WBT movement at the intersection of Churchill Ave N/Carling Ave is projected to operate at capacity during the afternoon peak hour.

Total Projected 2022 Conditions – Full Build-Out

The total projected 2022 traffic volumes were derived by superimposing the net site-generated traffic (**Figure 10**) onto future background 2022 traffic volumes (**Figure 13**). The resulting total projected 2022 traffic volumes are illustrated in **Figure 16**.

Figure 16: Total Projected 2022 Traffic Volumes

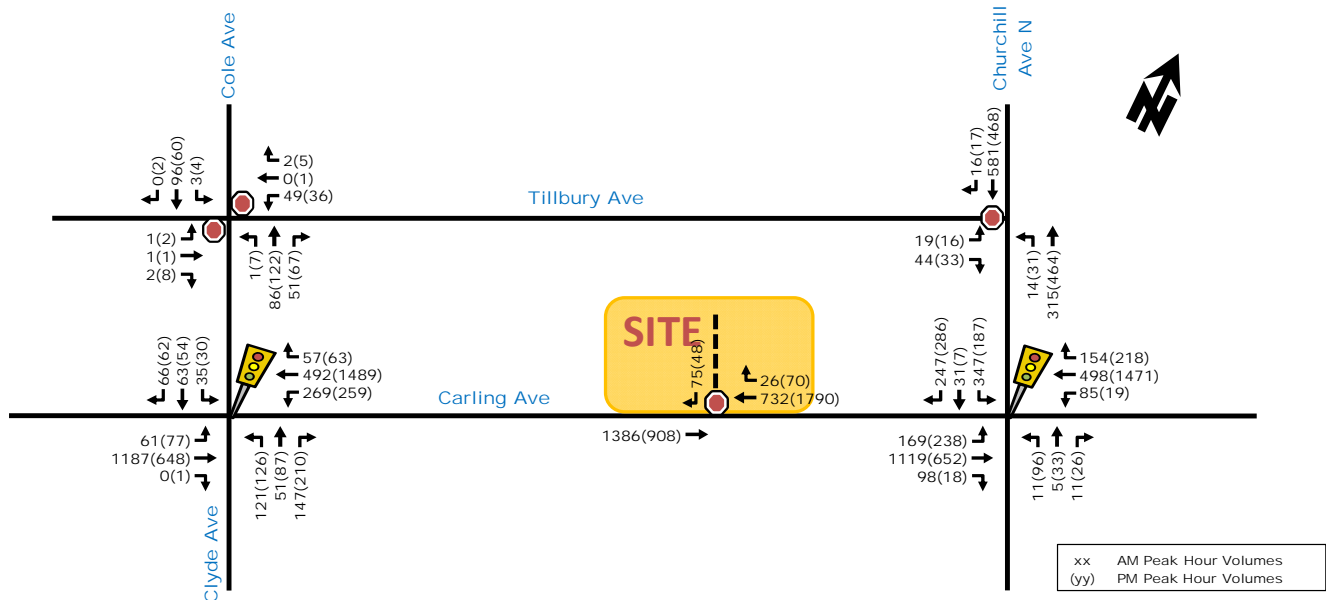


Table 15 below summarizes the intersection performance of study area intersections, based on the total projected 2022 conditions.

Table 15: Total Projected 2022 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LOS	max. v/c or avg. delay (s)	Movement	Delay (s)	LOS	v/c
Churchill Ave N/Carling Ave (S)	D(F)	0.86(1.02)	SBL(WBT)	28.1(46.0)	A(E)	0.59(0.91)
Clyde Ave/Cole Ave/Carling Ave (S)	C(B)	0.74(0.70)	NBL(NBL)	22.8(18.2)	B(B)	0.63(0.64)
Carling Ave/Proposed Access (U)	A(B)	9.6(11.2)	SB(SB)	0.3(0.2)	-	-
Cole Ave/Tillbury Ave (U)	B(B)	10.2(10.2)	WB(WB)	2.0(2.0)	-	-
Tillbury Ave/Churchill Ave N (U)	C(B)	15.2(14.8)	EB(EB)	1.1(1.1)	-	-

Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane.
 (S) - Signalized intersection.
 (U) - Unsignalized intersection.

Note that U-turn movements are analyzed in Synchro as left-turn movements. As such, U-turn traffic volumes generated by the future development were added to the left-turn traffic volumes in both the Synchro model and its corresponding traffic volumes figure (Figure 16). Overall, the analysis results in Table 15 show slight increase in v/c ratios and intersection delays compared to the future background 2022 conditions. The WBT movement at the intersection of Churchill Ave N/Carling Ave is projected to operate at capacity during the afternoon peak hour.

Total Projected 2027 Conditions – Build-Out Plus Five Years

The total projected 2027 traffic volumes, shown in Figure 17, were derived by superimposing the net site-generated traffic (Figure 10) onto future background 2027 traffic volumes (Figure 14).

Figure 17: Total Projected 2027 Traffic Volumes

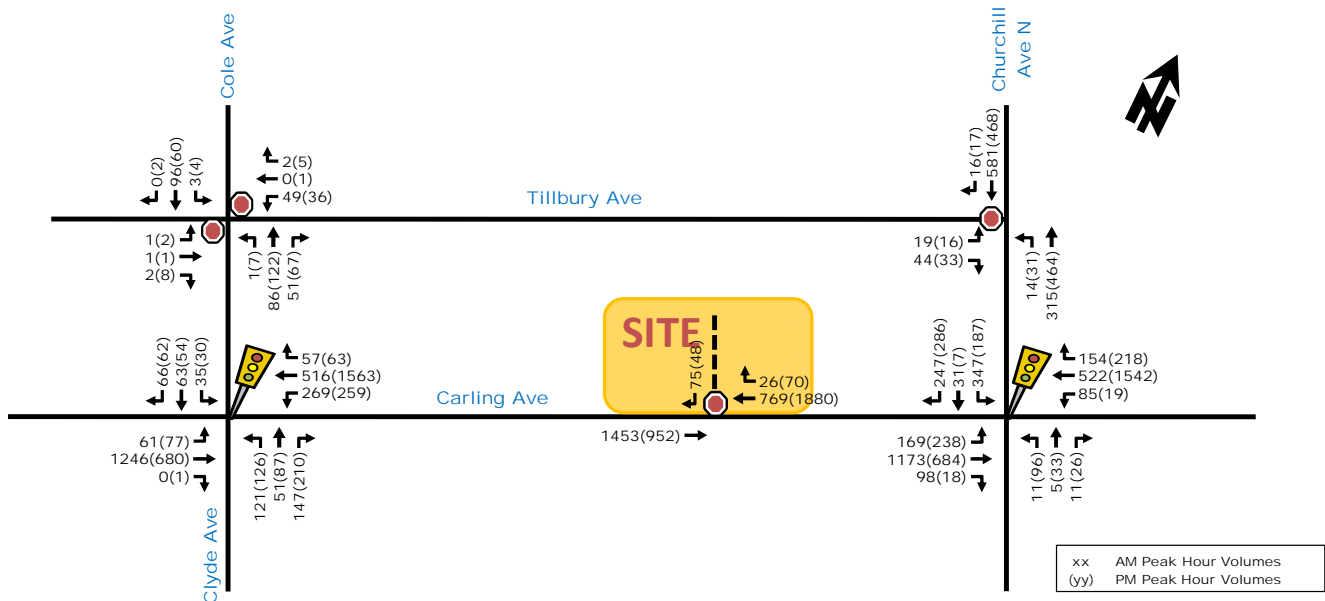


Table 16 below summarizes the intersection performance of study area intersections, based on the total projected 2027 conditions.

Table 16: Total Projected 2027 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LOS	max. v/c or avg. delay (s)	Movement	Delay (s)	LOS	v/c
Churchill Ave N/Carling Ave (S)	D(F)	0.86(1.07)	SBL(WBT)	28.3(53.2)	A(E)	0.59(0.95)
Clyde Ave/Cole Ave/Carling Ave (S)	C(B)	0.74(0.70)	NBL(WBT)	23.6(18.9)	B(B)	0.66(0.67)
Carling Ave/Proposed Access (U)	A(B)	9.7(11.0)	SB(SB)	0.3(0.1)	-	-
Cole Ave/Tillbury Ave (U)	B(B)	10.2(10.2)	WB(WB)	2.0(2.0)	-	-
Tillbury Ave/Churchill Ave N (U)	C(B)	15.2(14.8)	EB(EB)	1.1(1.1)	-	-

Note: Analysis of signalized intersections assumes a PHF of 1.00 and a saturation flow rate of 1800 veh/h/lane.
 (S) - Signalized intersection.
 (U) - Unsignalized intersection.

As shown in **Table 16**, there is a slight increase in v/c ratios compared to future background 2027 conditions. The WBT movement at the Churchill Ave N/Carling Ave intersection continues to operate at capacity during the afternoon peak hour period. However, note that the v/c ratio only slightly exceed the 1.00 threshold. As such, a simple potential mitigation measure to reduce the v/c ratio to an acceptable level is to adjust the phase timings of the intersection of Churchill Ave N/Carling Ave.

It is acknowledged that queuing and congestion may occur at various intersections along Carling Ave as a result of City's plan to reduce the number of through lanes to two for general purpose vehicles. However, the Synchro analysis completed in support of the subject TIA does not take into account the influence of those intersections located outside of the agreed upon study area (i.e., east of Churchill N/Carling and west of Clyde/Cole/Carling).

Total Projected 2027, without 20% Reduction

To account for a worst-case scenario, analysis was conducted assuming that a 20% east-west reduction in traffic volumes is not achieved in the future. The total projected 2027 traffic volumes, shown in **Figure 18**, were derived by superimposing the net site-generated traffic (**Figure 10**) onto future background 2027 traffic volumes, without the 20% east-west reduction (**Figure 12**). For comparison purposes, the difference in traffic volumes along Carling Ave, between the 20% reduction scenario (**Figure 17**) and the no reduction scenario, is shown in **Figure 19**.

Figure 18: Total Projected 2027 Traffic Volumes, WITHOUT 20% East-West Reduction

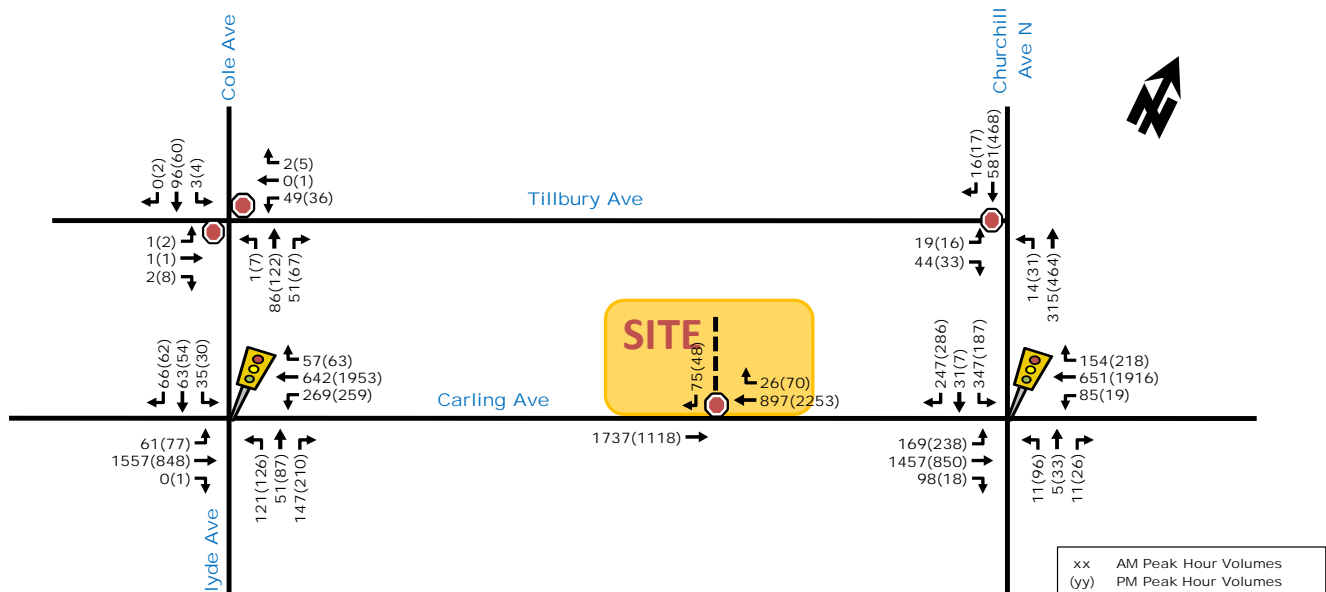
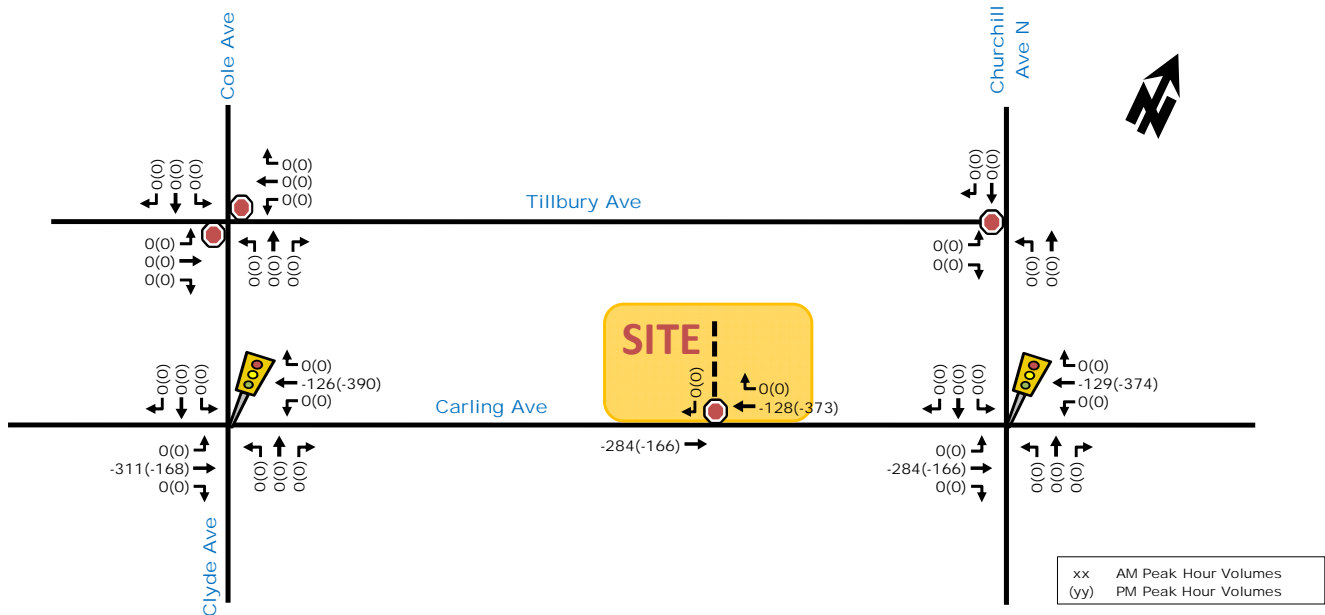


Figure 19: Total Projected 2027 Traffic Volumes Difference



As a result, **Table 17** below summarizes the intersection performance of study area intersections, based on the **Figure 18** traffic volumes.

Table 17: Total Projected 2027 (WITHOUT 20% East-West Reduction) Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LOS	max. v/c or avg. delay (s)	Movement	Delay (s)	LOS	v/c
Churchill Ave N/Carling Ave (S)	E(F)	0.93(1.33)	EBT(WBT)	31.3(105.8)	D(F)	0.89(1.16)
Clyde Ave/Cole Ave/Carling Ave (S)	D(D)	0.86(0.88)	EBT(WBT)	28.5(23.5)	D(D)	0.82(0.83)
Carling Ave/Proposed Access (U)	A(B)	9.6(11.2)	SB(SB)	0.3(0.2)	-	-
Cole Ave/Tillbury Ave (U)	B(B)	10.2(10.2)	WB(WB)	2.0(2.0)	-	-
Tillbury Ave/Churchill Ave N (U)	C(B)	15.2(14.8)	EB(EB)	1.1(1.1)	-	-

Note: Analysis of signalized intersections assumes a PHF of 1.00 and a saturation flow rate of 1800 veh/h/lane.
 (S) - Signalized intersection.
 (U) - Unsignalized intersection.

As shown in **Table 17**, the two signalized intersections show a significant increase in delays of the intersections 'as a whole' and in the v/c ratios of their critical movements, should the 20% reduction in east-west traffic not be met. The intersection of Churchill Ave N/Carling Ave in particular operates significantly above capacity during the PM peak hour. Optimization of cycle length or the split times does not reduce its LOS to an acceptable standard.

Auxiliary Left-Turn Lane Analysis

As illustrated by the site-generated traffic in **Figure 10**, auxiliary left-turn lanes along Carling Ave within the study area may be used as part of the access routes to/from the proposed development site. In particular, the EBLT and WBLT at the intersection of Clyde Ave/Cole Ave/Carling Ave, as well as the EBLT at the intersection of Churchill Ave N/Carling Ave require review to determine if adequate storage length is available. However, the EBLT traffic anticipated to be generated by the site at both intersections was projected to be minimal. As such, the adequacy of their respective storage length is dependent on existing traffic volumes and signal timing plans. Note that both existing conditions and total projected 2027 (with 20% east-west reduction) conditions have been reviewed.

At the intersection of Clyde Ave/Cole Ave/Carling Ave, the 95th percentile queue length in Synchro indicates that traffic slightly exceeds available storage length in existing conditions during the afternoon peak hour period. On the other hand,

the WBLT lane provides adequate storage length in both existing and total projected 2027 conditions. The intersection of Clyde Ave/Cole Ave/Carling Ave was also reviewed assuming fully protected EBLT and WBLT scenarios in total projected 2027 conditions, to account for safety concerns previously discussed in **Section 2.1.2**. In this scenario, EBLT storage length is inadequate to accommodate the projected 95th percentile queue during both morning and afternoon peak hour periods. The 95th percentile queue exceeds the available storage length (20m) by approximately 10m (although the existing taper length is 20m), however, the projected average queue of approximately 18m can be accommodated. There is opportunity to extend the EBLT storage length by converting the existing centre median, however additional storage is not required if the existing protected/permissive phasing is maintained. The WBLT lane continues to provide adequate storage length. On this basis, the City should consider extending EBLT storage at this location as part of their work on Carling Avenue Transit Priority Project.

At the intersection of Churchill Ave N/Carling Ave, the analysis indicates that the existing 95th percentile queue length for the EBLT is not accommodated within the available storage length of 70m. The storage is exceeded by an estimated 55m during the critical afternoon peak hour, thereby blocking the eastbound through movement. Note that the additional site traffic to this movement is less than 10 veh/h compared to the existing left-turn volume of up to 230 veh/h. On this basis, the City should consider extending EBLT storage at this location as part of their work on Carling Avenue Transit Priority Project.

5. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on the results summarized herein the following transportation related conclusions are offered:

Proposed Development

- The proposed single-phase development will consist of 370 apartment units and 8,811 ft² commercial space within a 16 and 18-storey two-tower residential building that is expected to reach full build-out by 2022.
- The proposed development is anticipated to generate approximately 101 and 118 vehicles/hour during the morning and afternoon peak hour periods. However, due to the existing vehicle trips generated by the unpaved parking lot, the proposed development vehicle trips result in a net increase of approximately 90 and 104 veh/h during the morning and afternoon peak hour periods.

Existing and Background Conditions

- In existing conditions, the SBL operates at a LOS 'D', while the WBT operates at capacity at the intersection of Churchill Ave N/Carling Ave, during the morning and afternoon peak hour periods, respectively. The NBL at the intersection of Clyde Ave/Cole Ave/Carling Ave operates at a LOS 'C' during both morning and afternoon peak hour periods. Critical movements at unsignalized intersections operate at a LOS 'B' or better during both morning and afternoon peak hours.
- The Synchro operational analysis of existing conditions indicates inadequate storage length for the EBLT movement at Churchill Ave N/Carling Ave, and the City should consider extending EBLT storage at this location as part of their work on Carling Avenue Transit Priority Project.
- Due to the absence of major other area developments near the subject site, traffic is not anticipated to grow significantly within the study area. Nonetheless, a 1% per year background growth rate was applied along Carling Ave, between horizon years 2022 and 2027.
- A designated bus lane is anticipated to be implemented along Carling Ave as part of the 2031 affordable network, which will reduce the vehicle capacity significantly along Carling Ave, since a general-purpose lane in each travel direction will be replaced with a transit lane. However, the *Carling Avenue Transit Priority Measures and Functional Design Report* indicates that vehicle traffic along Carling Ave is expected to reduce by up to 20% once the transit lanes are implemented. These changes are reflected in the Synchro analysis conducted for all future scenarios.

- The Synchro operational analysis of Future Background 2022 and 2027 conditions indicated the following:
 - The SBL movement at the intersection of Churchill Ave N/Carling Ave operates at a LOS 'D' during the morning peak hour. While the WBT movement operates at a LOS 'E' for future background 2022 conditions and LOS 'F' for future background 2027 conditions during the afternoon peak hour.
 - The critical movements at the intersection of Clyde Ave/Cole Ave/Carling Ave operate at a LOS 'C' or better during the morning and afternoon peak hour periods.
 - Critical movements at all unsignalized intersections operate at a LOS 'B' or better during morning and afternoon peak hour periods.

Projected Conditions

- Analysis of Total Projected 2022 and 2027 conditions indicated results similar to Future Background 2022 and 2027 conditions, with slight increase in v/c ratios and intersection delays.
- Although critical movements at the intersection of Churchill Ave N/Carling Ave operate at capacity during the afternoon peak hour, the volume-to-capacity ratio exceeds the threshold only slightly. As such, the v/c ratios may be reduced to acceptable levels by adjusting the intersection's phase timings.
- Should the 20% east-west reduction in traffic volumes not be achieved for Total Projected 2027 conditions, the intersection of Churchill Ave N/Carling Ave would operate above capacity during the afternoon peak hour.
- Since site-generated traffic may use local roads (Cole Ave and Tillbury Ave) and a major collector road (Churchill Ave N) as part of their access route to/from the future development, anticipated future traffic volumes along these roadways was compared against the thresholds set by the TIA Guidelines. It was determined that changes to the existing classification of the existing study area roadways was not required given the very modest volume increases of 27 veh/h.
- Should the City elect to modify the eastbound left-turn phase at the intersection of Clyde Ave/Cole Ave/Carling Ave (from the existing protected/permissive to fully protected) due to the existing safety concerns, consideration should be given to extending the storage length for this movement. The proposed development adds minimal traffic to this movement (less than 5 veh/h).
- Based on the MMLOS analysis for boundary roads (Carling Ave) and signalized intersections:
 - At the frontage of the site, Carling Ave does not currently meet the pedestrian LOS minimum desirable target due to the high volume of curb lane traffic, which will decrease significantly once the lanes are converted to transit lanes. As such, the PLOS target is anticipated to be met in the future. Bicycle LOS is not met in existing or future conditions due to the lack of bike lane facilities along Carling Ave. Although not reflected in the MMLOS analysis, bikes will be permitted to use transit lanes in the future.
 - The two signalized intersections do not meet the minimum desirable target LOS for pedestrians and cyclists in existing or future conditions. This is primarily due to the number of lanes that pedestrians must cross on Carling Ave and the lack of bike facilities at the intersections. The transit LOS is expected to improve significantly along Carling Ave due to reduction of delay to EB and WB, thereby meeting the target LOS.

Site Plan Review

- A total of 224 underground parking spaces and 34 surface parking spaces are anticipated to be provided for vehicles, with 197 bicycle storage spaces provided in the first level of underground parking.
- A right-in/right-out driveway is proposed as the site's main driveway at the east end of the property that connects to Carling Ave. A second driveway that connects to/from Churchill Ave N via an existing easement through the eastern adjacent property is proposed as a restricted access to be used primarily by garbage trucks, emergency vehicles and moving trucks.

PARSONS

- It is recommended that a convex mirror be installed at the northwest corner of the garage ramp to improve sight lines for vehicles entering/exiting the building.

Based on the foregoing, the proposed residential development causes a slight variation to the performance of the nearby study area intersections and is recommended to proceed from a transportation perspective.

Prepared By:

Reviewed By:



Basel Ansari, EIT.
Transportation Planner

Matthew Mantle, P.Eng.
Transportation Engineer

Appendix A

Screening Form and City Comments

City of Ottawa 2017 TIA Guidelines

Date

27-Aug-19

TIA Screening Form

Project

1655 Carling Avenue

Project Number

477272 - 01000

Results of Screening	Yes/No
Development Satisfies the Trip Generation Trigger	Yes
Development Satisfies the Location Trigger	Yes
Development Satisfies the Safety Trigger	Yes

Module 1.1 - Description of Proposed Development	
Municipal Address	1655 Carling Avenue (Ottawa, ON)
Description of location	To replace the unpaved parking lot west of Hakim Optical
Land Use	Residential apartments tower
Development Size	260 residential units
Number of Accesses and Locations	1 Existing Access, 65 m west of Carling/Churchill intersection
Development Phasing	1 Phase
Buildout Year	2021
Sketch Plan / Site Plan	See attached

Module 1.2 - Trip Generation Trigger		
Land Use Type	Townhomes or Apartments	
Development Size	260	Units
Trip Generation Trigger Met?	Yes	

Module 1.3 - Location Triggers		
Development Proposes a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit, or Spine Bicycle Networks (See Sheet 3)	No	Development to continue using existing driveway
Development is in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone. (See Sheet 3)	Yes	Carling Avenue is designated as an Arterial Mainstreet
Location Trigger Met?	Yes	

Module 1.4 - Safety Triggers		
Posted Speed Limit on any boundary road	<80	km/h
Horizontal / Vertical Curvature on a boundary street limits sight lines at a proposed driveway	No	
A proposed driveway is 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) or within auxiliary lanes of an intersection;	Yes	Within 150 m of the Carling Ave/Churchill Ave N signalized intersection
A proposed driveway makes use of an existing median break that serves an existing site	No	
There is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development	No	
The development includes a drive-thru facility	No	
Safety Trigger Met?	Yes	

Responses can be found in green following the comments below.

Please review the following comments;

Project No.: 477272 - 01000	Project Address: 1619-1655 Carling Ave
Applicant/Consultants/Developer: Parsons	Ward/Councillor: 15/Jeff Leiper

TIA Step 5 Comments:

Transportation

- Indicate how many car-share spaces will be provided in the site plan agreement.

There is no specific direction in the Zoning By-law regarding the number of car-share spaces permitted within an AM zone. At this time, one car-space is being considered, and will be confirmed at SPA.

Car Sharing Services (Section 94)

- 94.** (1) Car-sharing services are permitted in any commercial, industrial, institutional or transportation zone. For the purposes of this Section, commercial zone means the AM, GM, LC, MC, MD and TM zones. (By-law 2009-164)
- (2) Car-sharing spaces are permitted in any principal use or accessory use parking lot or parking garage in any zone in which car-sharing services are permitted, and may occupy either required or provided parking spaces.

Traffic Signal Operations

- If transit targets are not achieved, analysis/review the potential impacts of the site generated traffic on the adjacent signals using background traffic volumes without 20% reductions?

Additional analysis has been conducted by Parsons, to reflect a scenario without the 20% reduction. The analysis results have been provided in the report, in Section 4.9.2, under the Total Projected 2027 conditions subsection. In short, the intersection of Churchill Ave N/Carling Ave will continue to operate at capacity during the afternoon peak hour.

- Since there are known left turn storage capacity constraints with existing vehicle volumes at the signals adjacent to the proposed site, it is recommended that eastbound left turn lane storage lengths be increased at Carling Avenue and Churchill Avenue as well as Carling Avenue and Clyde Avenue/Cole Avenue to accommodate any additional vehicles. As a result an RMA may be required to implement this network change.

If required, RMA to be completed as part of SPA.

- Given that the report indicates site generated traffic will complete U-turn movements at the adjacent signals, additional left turn storage at Carling Avenue and Clyde Avenue/Cole Avenue would improve signal operations if fully protected left turns were to be implemented; which would also accommodate safer U-turn movements. As a result an RMA may be required to implement this network change.

If required, RMA to be completed as part of SPA.

- Consideration to be given to a possible scenario where the U-turn movement(s) could be prohibited at the adjacent signals and how this may affect site traffic?

Prohibiting U-turn movements at adjacent signalized intersection is not recommended as it would likely result in more site traffic on local streets (i.e., Tillbury).

Appendix B

Transit Route Maps



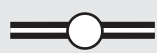
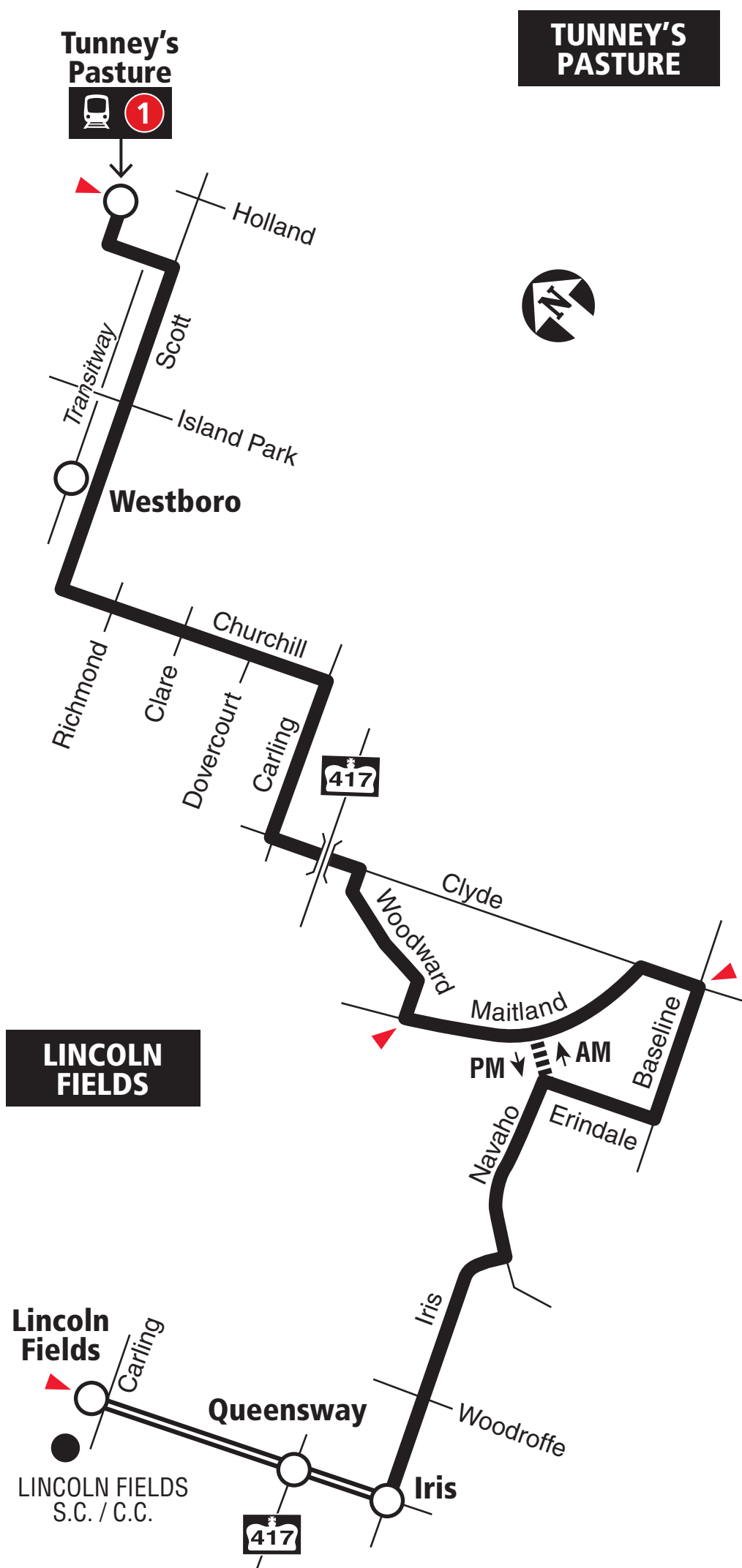
50

LINCOLN FIELDS TUNNEY'S PASTURE

Local

Monday to Saturday / Lundi au samedi

No service Sat. eve. or all day Sunday / Aucun service le soir le sam. ou toute la journée dimanche



Transitway & Station



Peak Periods only /
Périodes de pointe seulement



Timepoint / Heures de passage

2019.06

Schedule / Horaire 613-560-1000

Text / Texto 560560

plus your four digit bus stop number / plus votre numéro d'arrêt à quatre chiffres

Customer Service

Service à la clientèle **613-842-3600**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective April 24, 2017

En vigueur 24 avril 2017



INFO 613-741-4390
octranspo.com



85

GATINEAU BAYSHORE

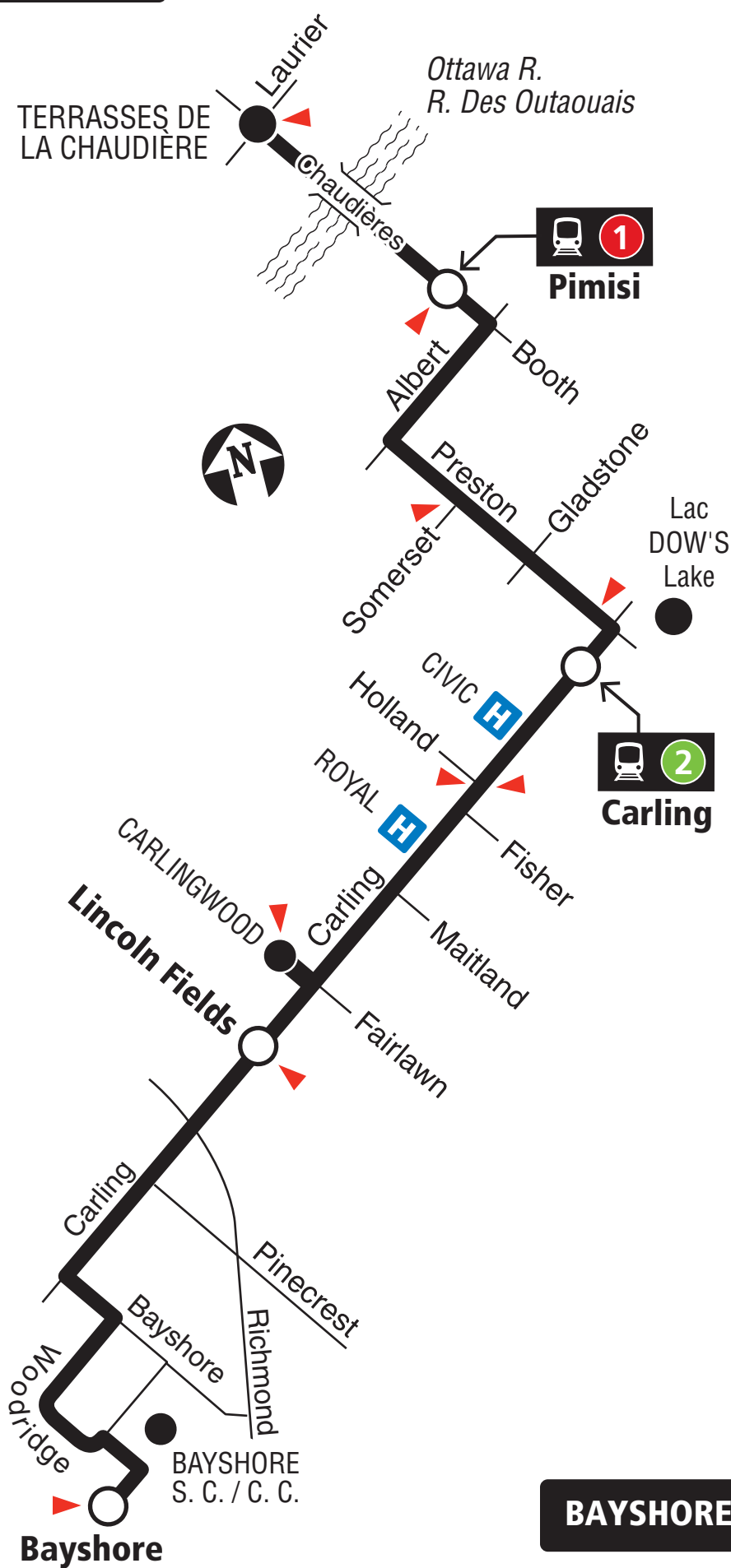
Fréquent

7 days a week / 7 jours par semaine

All day service

Service toute la journée

GATINEAU



BAYSHORE



Station



Timepoint / Heures de passage

2019.07



1



Future route after O-Train Line 1 is open
Trajet du circuit après l'ouverture de la Ligne 1 de l'O-Train

Lost and Found / Objets perdus..... 613-563-4011

Security / Sécurité 613-741-2478



INFO 613-741-4390
octranspo.com

Appendix C

Traffic Data

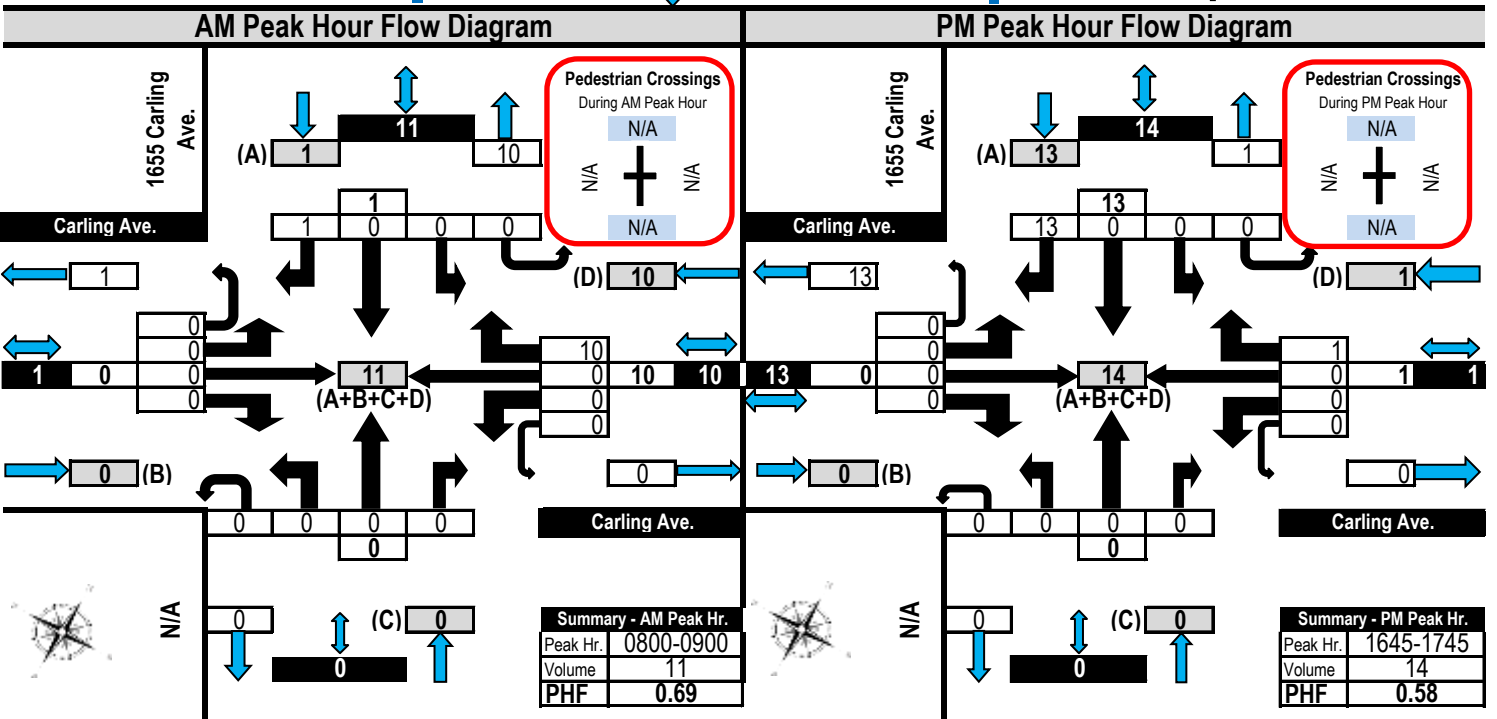
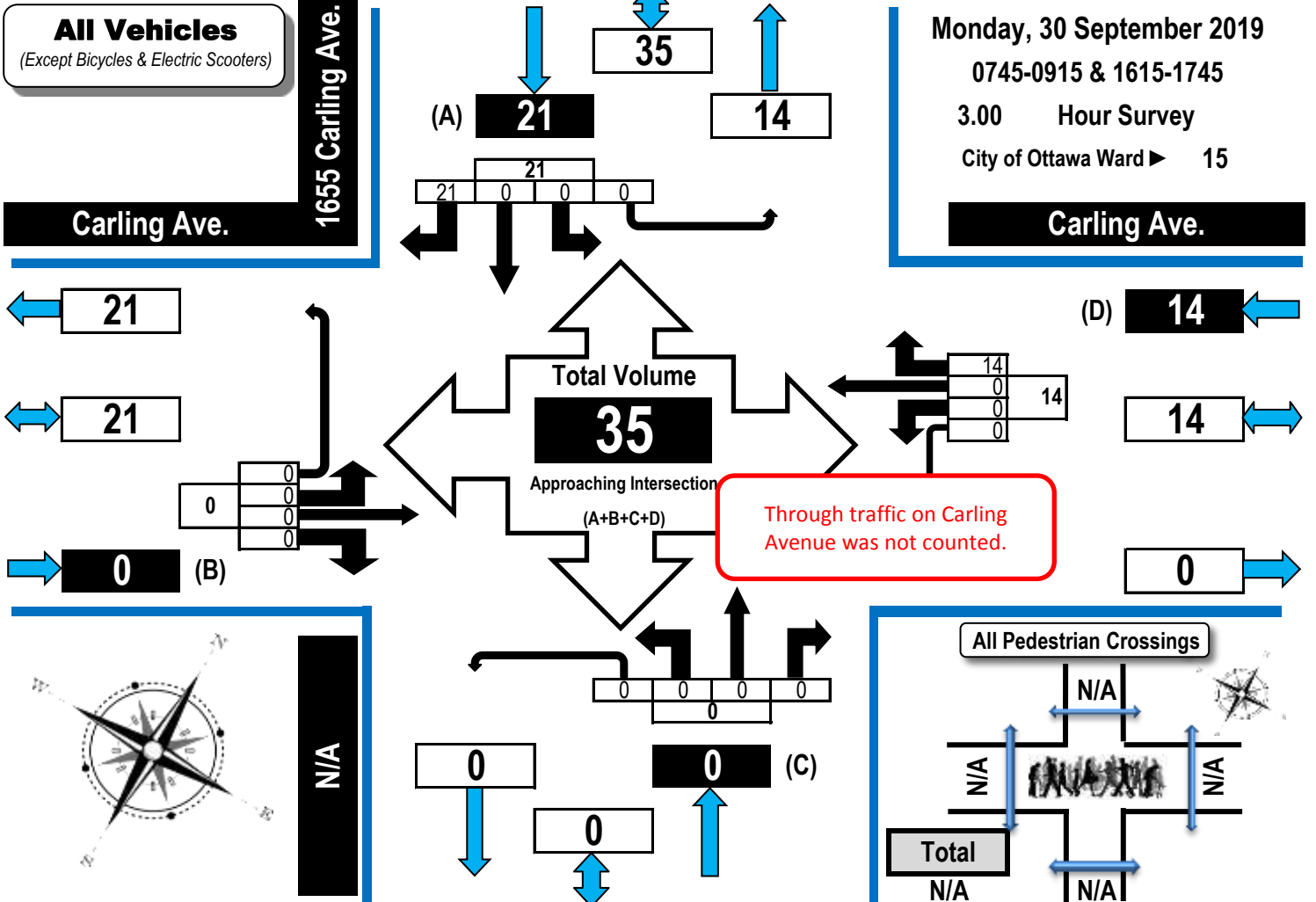


Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Carling Avenue & 1655 Carling Avenue

Ottawa, ON

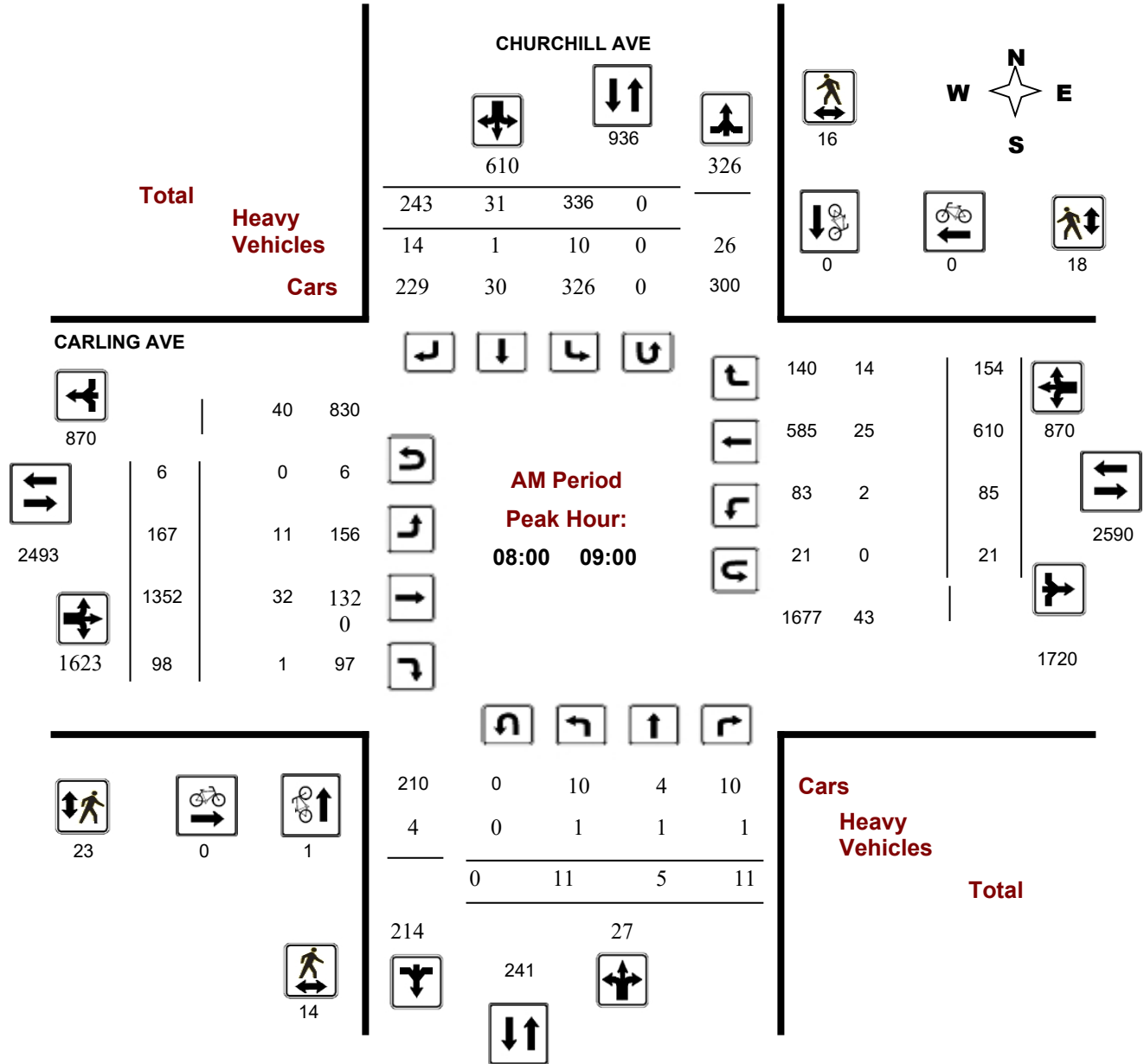


Survey Date: Tuesday, April 25, 2017

Start Time: 07:00

WO No: 36955

Device: Miovision

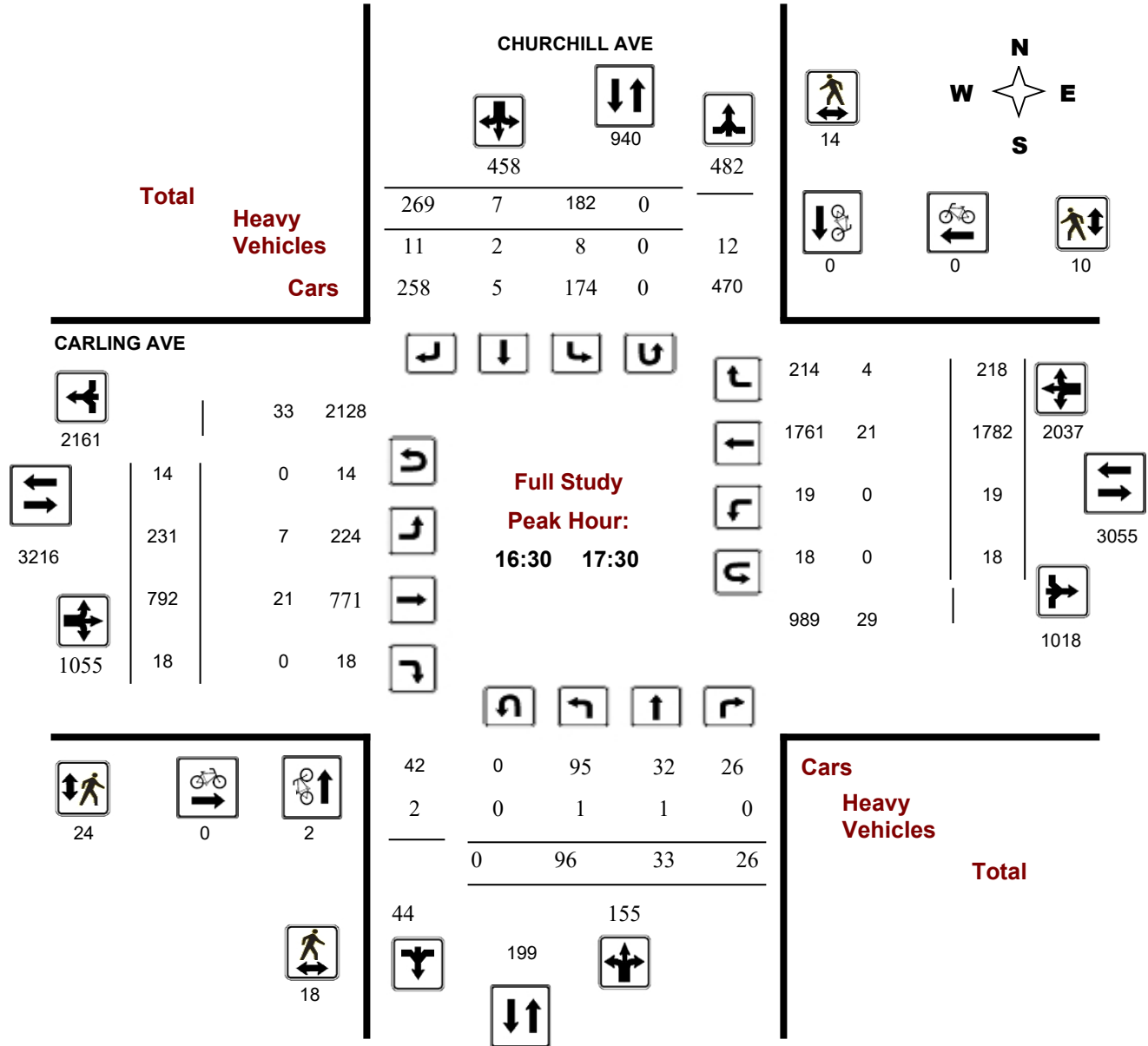


Survey Date: Tuesday, April 25, 2017

Start Time: 07:00

WO No: 36955

Device: Miovision

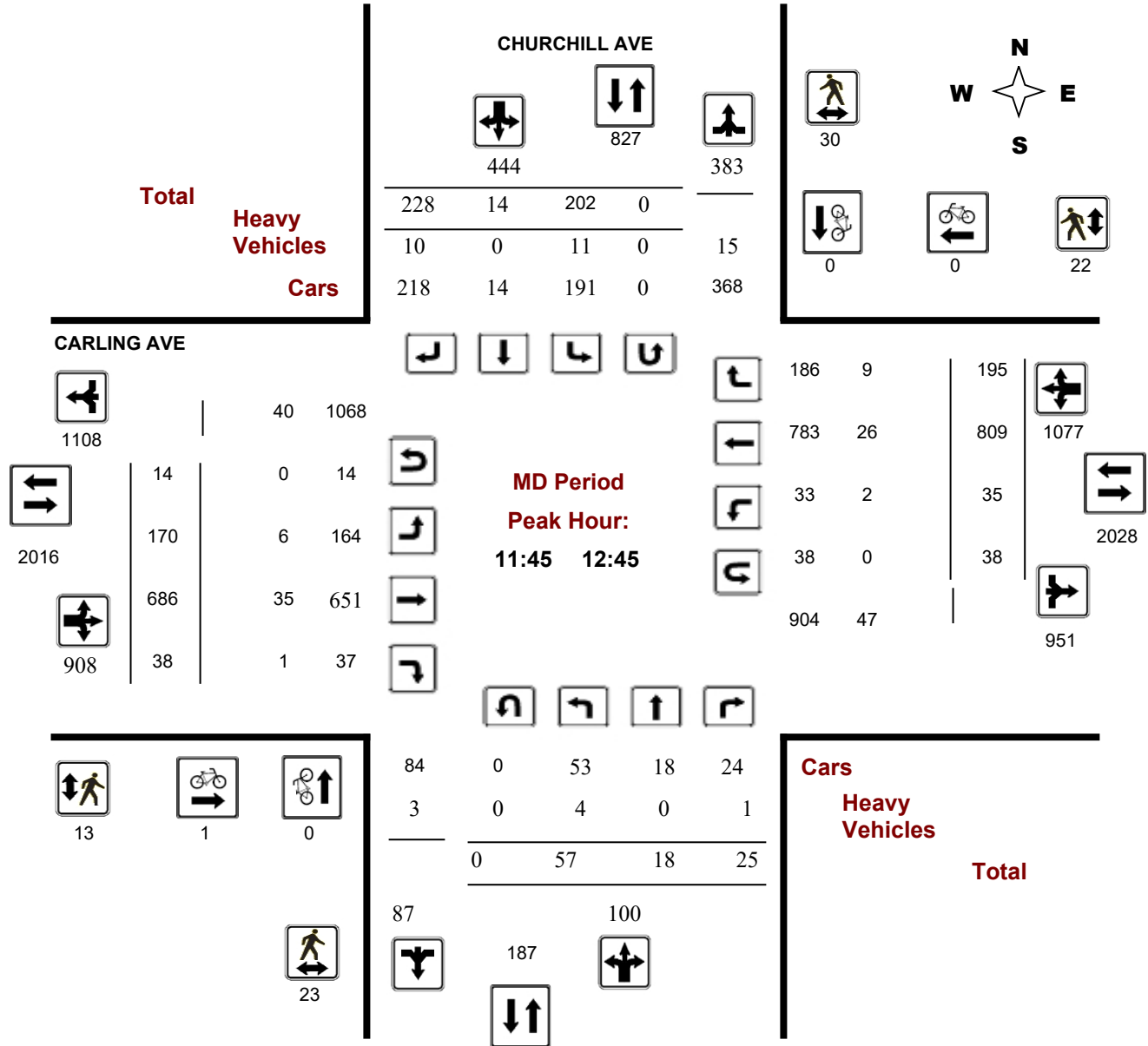


Survey Date: Tuesday, April 25, 2017

Start Time: 07:00

WO No: 36955

Device: Miovision





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

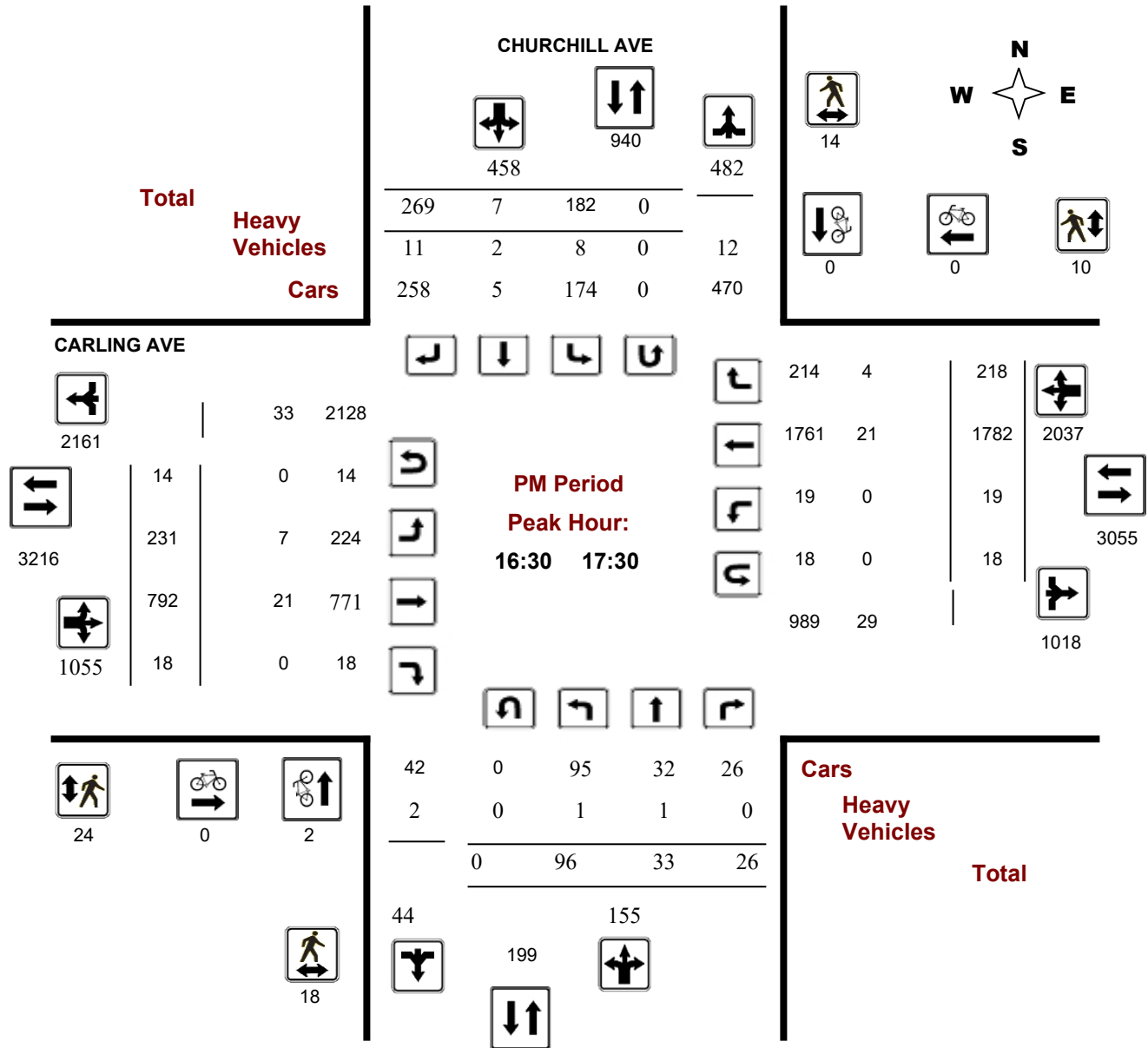
CARLING AVE @ CHURCHILL AVE

Survey Date: Tuesday, April 25, 2017

Start Time: 07:00

WO No: 36955

Device: Miovision



Transportation Services - Traffic Services

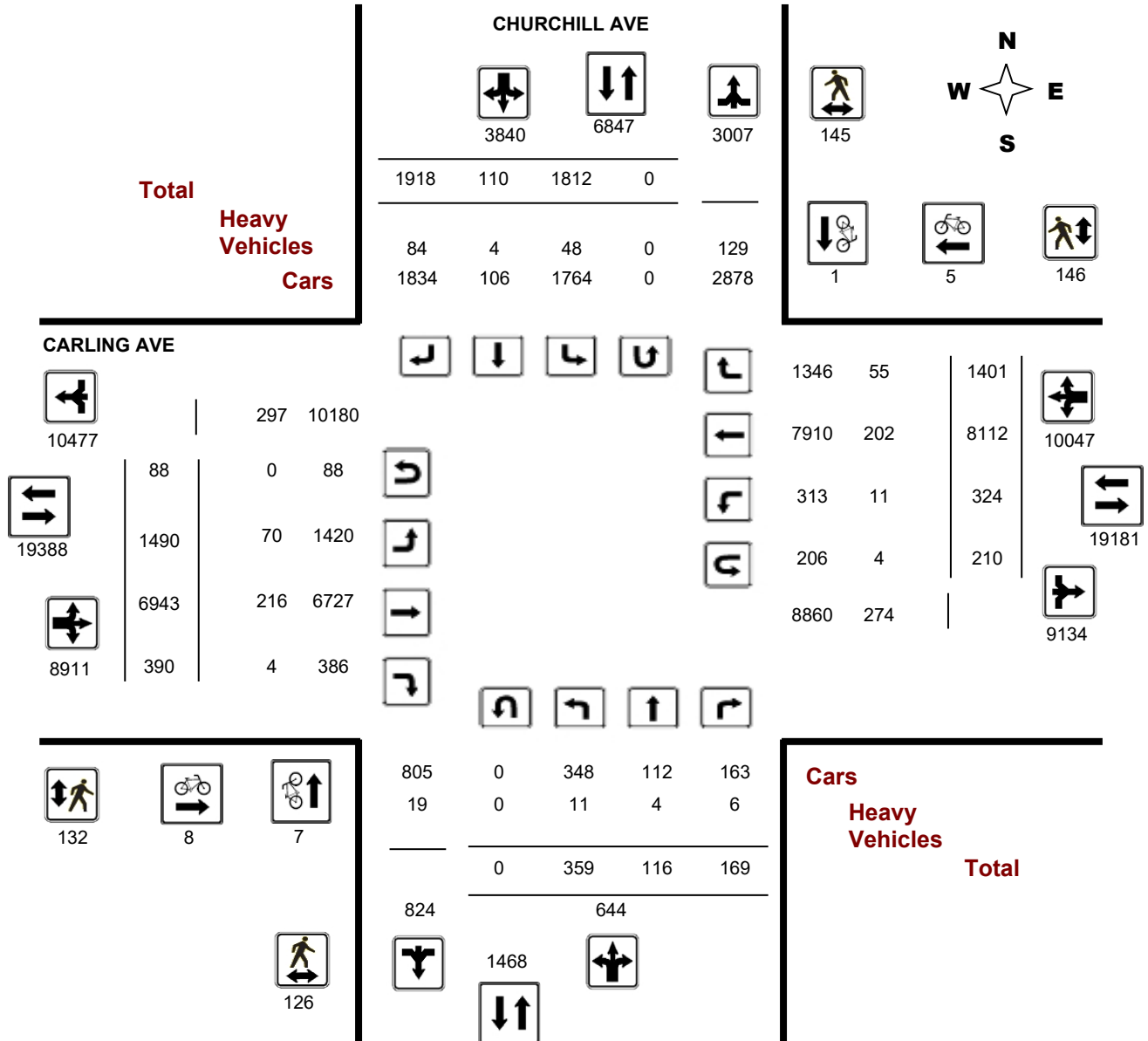
Turning Movement Count - Full Study Diagram

CARLING AVE @ CHURCHILL AVE

Survey Date: Tuesday, April 25, 2017

WO#: 36955

Device: Miovision



Comments

Turning Movement Count - Full Study Summary Report

CARLING AVE @ CHURCHILL AVE

Survey Date: Tuesday, April 25, 2017

Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 88 Westbound: 210

AADT Factor

.90

Full Study

Period	CHURCHILL AVE								CARLING AVE								STR TOT	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	14	6	9	29	252	11	180	443	472	144	1213	76	1433	55	416	118	589	2022	2494
08:00 09:00	11	5	11	27	336	31	243	610	637	167	1352	98	1617	85	610	154	849	2466	3103
09:00 10:00	24	5	25	54	224	19	212	455	509	171	790	77	1038	47	618	151	816	1854	2363
11:30 12:30	54	16	23	93	204	10	237	451	544	164	637	34	835	35	823	188	1046	1881	2425
12:30 13:30	46	11	30	87	188	13	241	442	529	192	749	51	992	45	713	185	943	1935	2464
15:00 16:00	38	18	21	77	220	12	259	491	568	203	709	22	934	24	1403	174	1601	2535	3103
16:00 17:00	87	24	31	142	175	11	276	462	604	239	740	17	996	22	1762	208	1992	2988	3592
17:00 18:00	85	31	19	135	213	3	270	486	621	210	753	15	978	11	1767	223	2001	2979	3600
Sub Total	359	116	169	644	1812	110	1918	3840	4484	1490	6943	390	8823	324	8112	1401	9837	18660	23144
U Turns				0				0	0				88				210	298	298
Total	359	116	169	644	1812	110	1918	3840	4484	1490	6943	390	8911	324	8112	1401	10047	18958	23442
EQ 12Hr	499	161	235	895	2519	153	2666	5338	6233	2071	9651	542	12386	450	11276	1947	13965	26351	32584
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													1.39						
AVG 12Hr	449	145	211	806	2267	138	2399	4804	5610	1864	8686	488	11148	405	10148	1753	12569	23717	29327
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													.90						
AVG 24Hr	588	190	277	1055	2970	180	3143	6293	7348	2442	11378	639	14603	531	13294	2296	16465	31068	38416
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													1.31						

Comments:

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



Turning Movement Count - 15 Minute Summary Report

CARLING AVE @ CHURCHILL AVE

Survey Date: Tuesday, April 25, 2017

Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 88 Westbound: 210

CHURCHILL AVE

CARLING AVE

Table with columns for Time Period, Northbound (LT, ST, RT, N 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.

Note: U-Turns are included in Totals.

Comment:



Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order
36955

CARLING AVE @ CHURCHILL AVE

Count Date: Tuesday, April 25, 2017

Start Time: 07:00

Time Period	CHURCHILL AVE			CARLING AVE			Grand Total
	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	
07:00 08:00	0	0	0	2	1	3	3
08:00 09:00	1	0	1	0	0	0	1
09:00 10:00	2	1	3	2	0	2	5
11:30 12:30	0	0	0	0	1	1	1
12:30 13:30	0	0	0	3	1	4	4
15:00 16:00	2	0	2	1	1	2	4
16:00 17:00	0	0	0	0	1	1	1
17:00 18:00	2	0	2	0	0	0	2
Total	7	1	8	8	5	13	21

Comment:

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



Transportation Services - Traffic Services

W.O.
36955

Turning Movement Count - Heavy Vehicle Report

CARLING AVE @ CHURCHILL AVE

Survey Date: Tuesday, April 25, 2017

Time Period	CHURCHILL AVE									CARLING AVE									Grand Total
	Northbound			Southbound			S TOT	STR TOT	Eastbound			Westbound			W TOT	STR TOT			
	LT	ST	RT	N TOT	LT	ST			RT	LT	ST	RT	E TOT	LT			ST	RT	
07:00 08:00	0	0	0	0	6	0	8	14	14	16	22	0	38	1	22	9	33	71	85
08:00 09:00	1	1	1	3	10	1	14	25	28	11	32	1	44	2	25	14	41	85	113
09:00 10:00	2	1	3	6	7	0	9	16	22	9	34	2	45	6	25	5	38	83	105
11:30 12:30	5	0	0	5	10	0	10	20	25	10	29	1	40	2	34	13	49	89	114
12:30 13:30	1	0	1	2	2	0	13	15	17	6	35	0	41	0	31	3	35	76	93
15:00 16:00	0	1	1	2	4	0	11	15	17	7	24	0	31	0	26	5	31	62	79
16:00 17:00	1	0	0	1	2	3	9	14	15	7	23	0	30	0	23	3	26	56	71
17:00 18:00	1	1	0	2	7	0	10	17	19	4	17	0	21	0	16	3	19	40	59
Sub Total	11	4	6	21	48	4	84	136	157	70	216	4	290	11	202	55	272	562	719
U-Turns (Heavy Vehicles)				0				0	0				0				4	4	4
Total	11	4	6	0	48	4	84	136	157	70	216	4	290	11	202	55	276	566	723

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



Transportation Services - Traffic Services

Work Order

36955

Turning Movement Count - Pedestrian Volume Report

CARLING AVE @ CHURCHILL AVE

Count Date: Tuesday, April 25, 2017

Start Time: 07:00

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	3	3	6	1	4	5	11
07:15 07:30	3	5	8	6	7	13	21
07:30 07:45	4	2	6	2	5	7	13
07:45 08:00	1	2	3	5	5	10	13
07:00 08:00	11	12	23	14	21	35	58
08:00 08:15	1	2	3	5	3	8	11
08:15 08:30	5	3	8	6	4	10	18
08:30 08:45	4	3	7	8	4	12	19
08:45 09:00	4	8	12	4	7	11	23
08:00 09:00	14	16	30	23	18	41	71
09:00 09:15	3	4	7	7	2	9	16
09:15 09:30	1	5	6	2	7	9	15
09:30 09:45	5	5	10	3	7	10	20
09:45 10:00	1	3	4	0	3	3	7
09:00 10:00	10	17	27	12	19	31	58
11:30 11:45	4	5	9	5	6	11	20
11:45 12:00	2	9	11	1	5	6	17
12:00 12:15	4	7	11	2	6	8	19
12:15 12:30	9	9	18	5	2	7	25
11:30 12:30	19	30	49	13	19	32	81
12:30 12:45	8	5	13	5	9	14	27
12:45 13:00	8	6	14	6	9	15	29
13:00 13:15	9	3	12	6	6	12	24
13:15 13:30	3	4	7	2	6	8	15
12:30 13:30	28	18	46	19	30	49	95
15:00 15:15	2	5	7	2	4	6	13
15:15 15:30	5	6	11	8	4	12	23
15:30 15:45	10	2	12	3	4	7	19
15:45 16:00	1	3	4	3	2	5	9
15:00 16:00	18	16	34	16	14	30	64
16:00 16:15	2	4	6	3	3	6	12
16:15 16:30	5	6	11	3	6	9	20
16:30 16:45	1	7	8	5	3	8	16
16:45 17:00	3	1	4	3	1	4	8
16:00 17:00	11	18	29	14	13	27	56
17:00 17:15	6	4	10	9	4	13	23
17:15 17:30	8	2	10	7	2	9	19
17:30 17:45	1	7	8	4	4	8	16
17:45 18:00	0	5	5	1	2	3	8
17:00 18:00	15	18	33	21	12	33	66
Total	126	145	271	132	146	278	549

Comment:

Turning Movement Count - 15 Min U-Turn Total Report

CARLING AVE @ CHURCHILL AVE

Survey Date: Tuesday, April 25, 2017

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	1	3	4
07:15	07:30	0	0	2	2	4
07:30	07:45	0	0	1	9	10
07:45	08:00	0	0	1	5	6
08:00	08:15	0	0	1	4	5
08:15	08:30	0	0	2	7	9
08:30	08:45	0	0	2	7	9
08:45	09:00	0	0	1	3	4
09:00	09:15	0	0	2	9	11
09:15	09:30	0	0	2	6	8
09:30	09:45	0	0	4	7	11
09:45	10:00	0	0	3	10	13
11:30	11:45	0	0	1	13	14
11:45	12:00	0	0	5	15	20
12:00	12:15	0	0	4	7	11
12:15	12:30	0	0	4	9	13
12:30	12:45	0	0	1	7	8
12:45	13:00	0	0	4	7	11
13:00	13:15	0	0	2	9	11
13:15	13:30	0	0	3	14	17
15:00	15:15	0	0	4	7	11
15:15	15:30	0	0	5	7	12
15:30	15:45	0	0	4	7	11
15:45	16:00	0	0	3	3	6
16:00	16:15	0	0	3	3	6
16:15	16:30	0	0	1	3	4
16:30	16:45	0	0	7	8	15
16:45	17:00	0	0	2	4	6
17:00	17:15	0	0	2	3	5
17:15	17:30	0	0	3	3	6
17:30	17:45	0	0	6	2	8
17:45	18:00	0	0	2	7	9
Total		0	0	88	210	298



Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

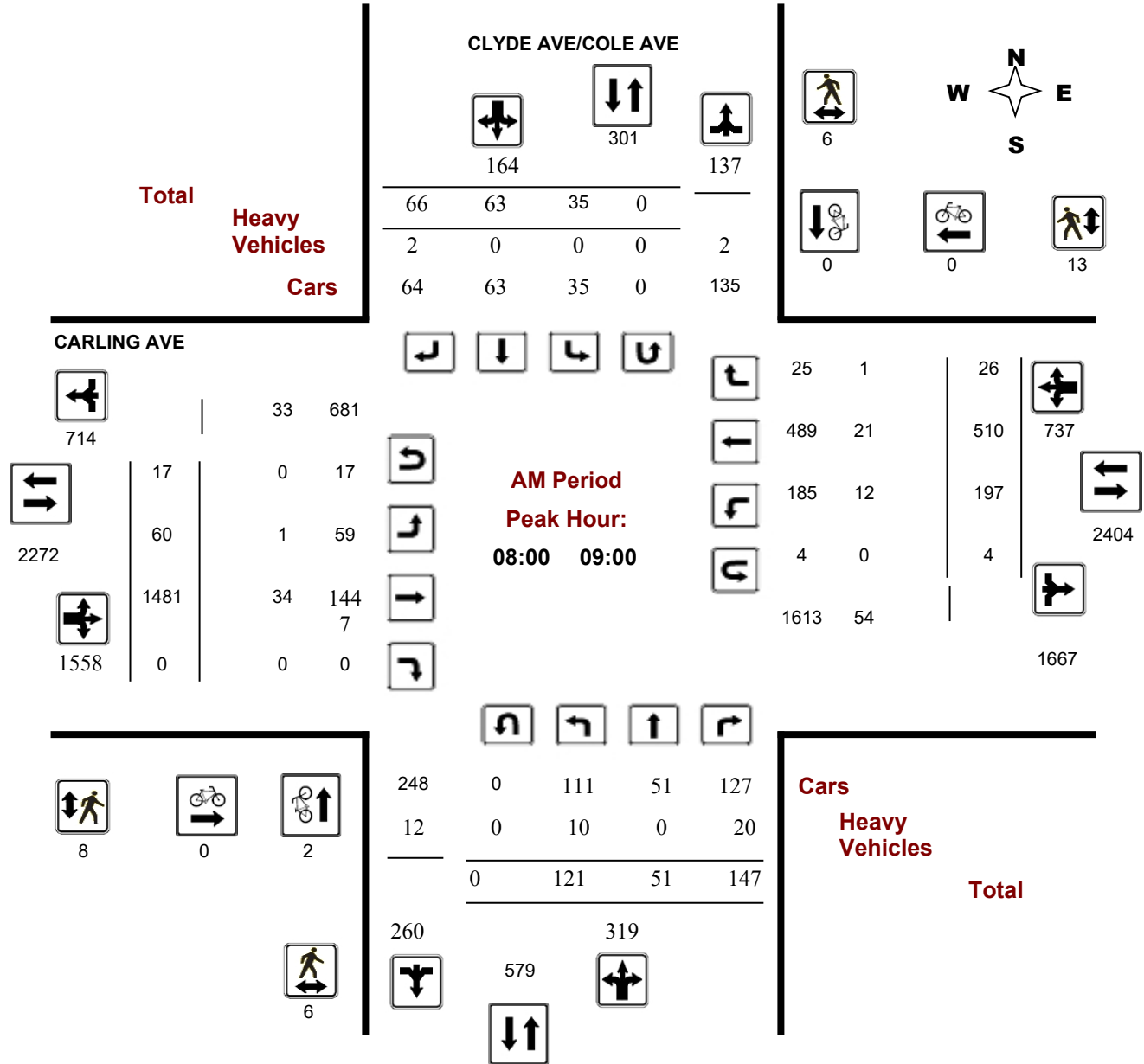
CARLING AVE @ CLYDE AVE/COLE AVE

Survey Date: Wednesday, January 27, 2016

Start Time: 07:00

WO No: 35669

Device: Miovision

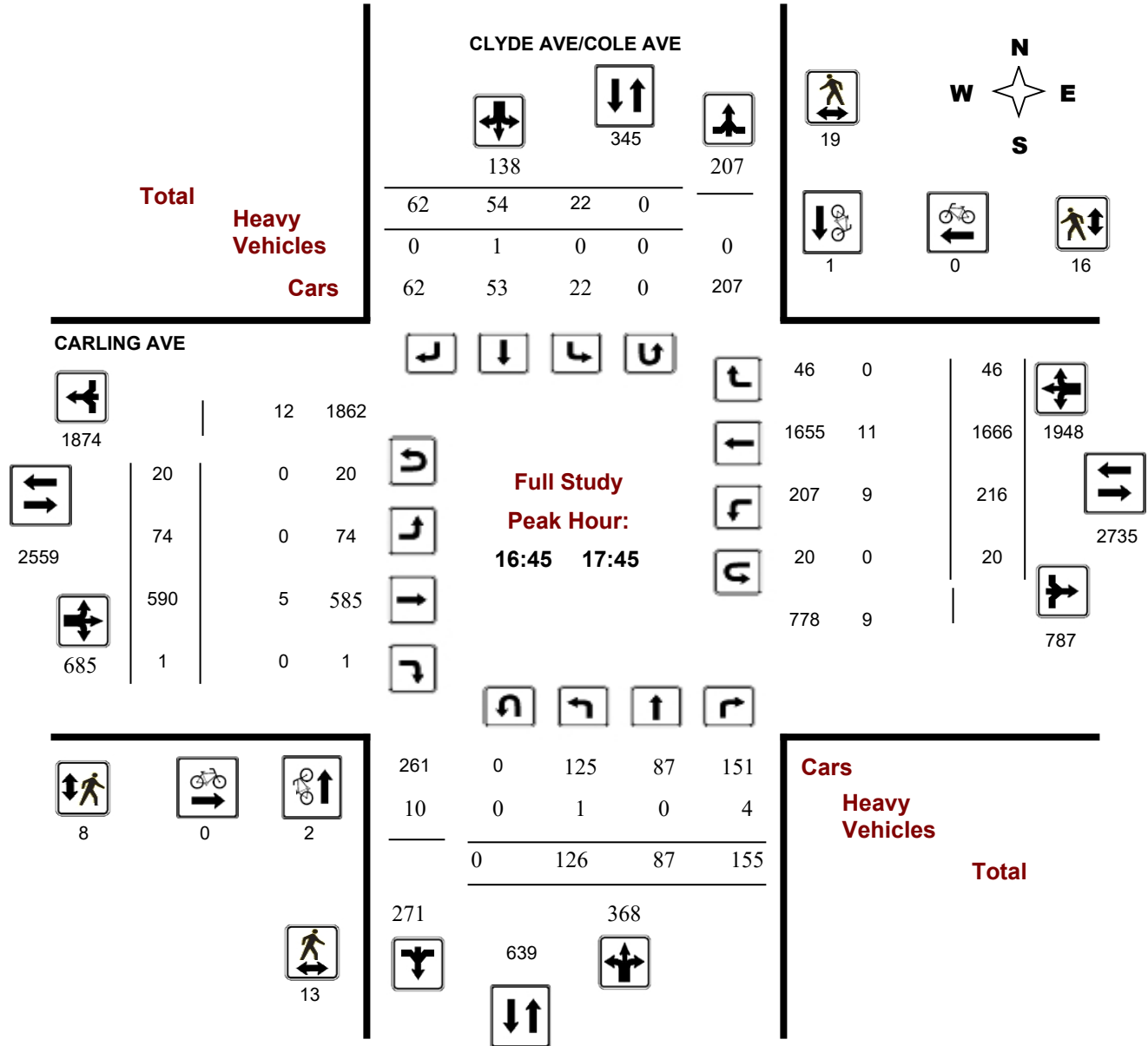


Survey Date: Wednesday, January 27, 2016

Start Time: 07:00

WO No: 35669

Device: Miovision

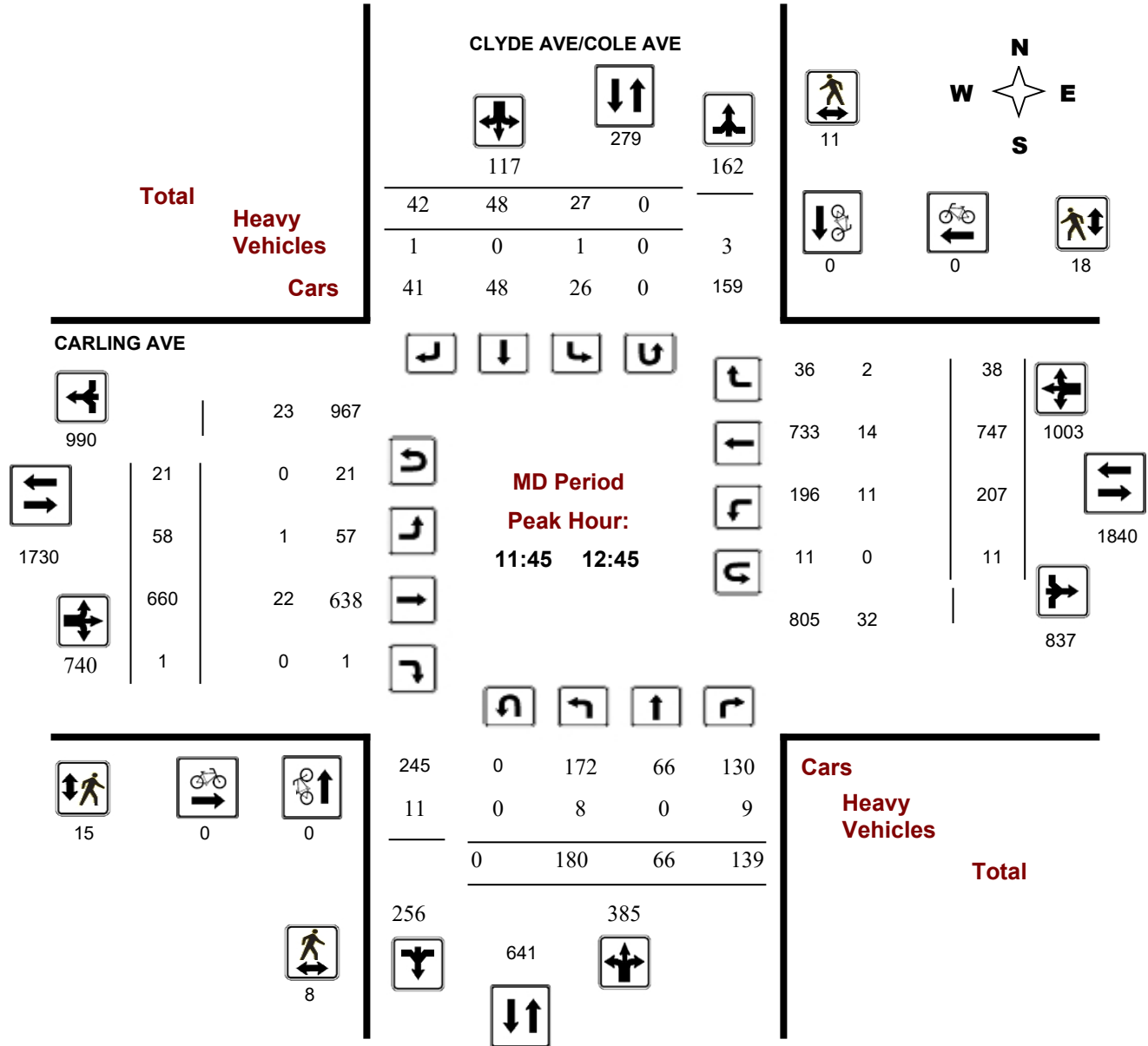


Survey Date: Wednesday, January 27, 2016

Start Time: 07:00

WO No: 35669

Device: Miovision

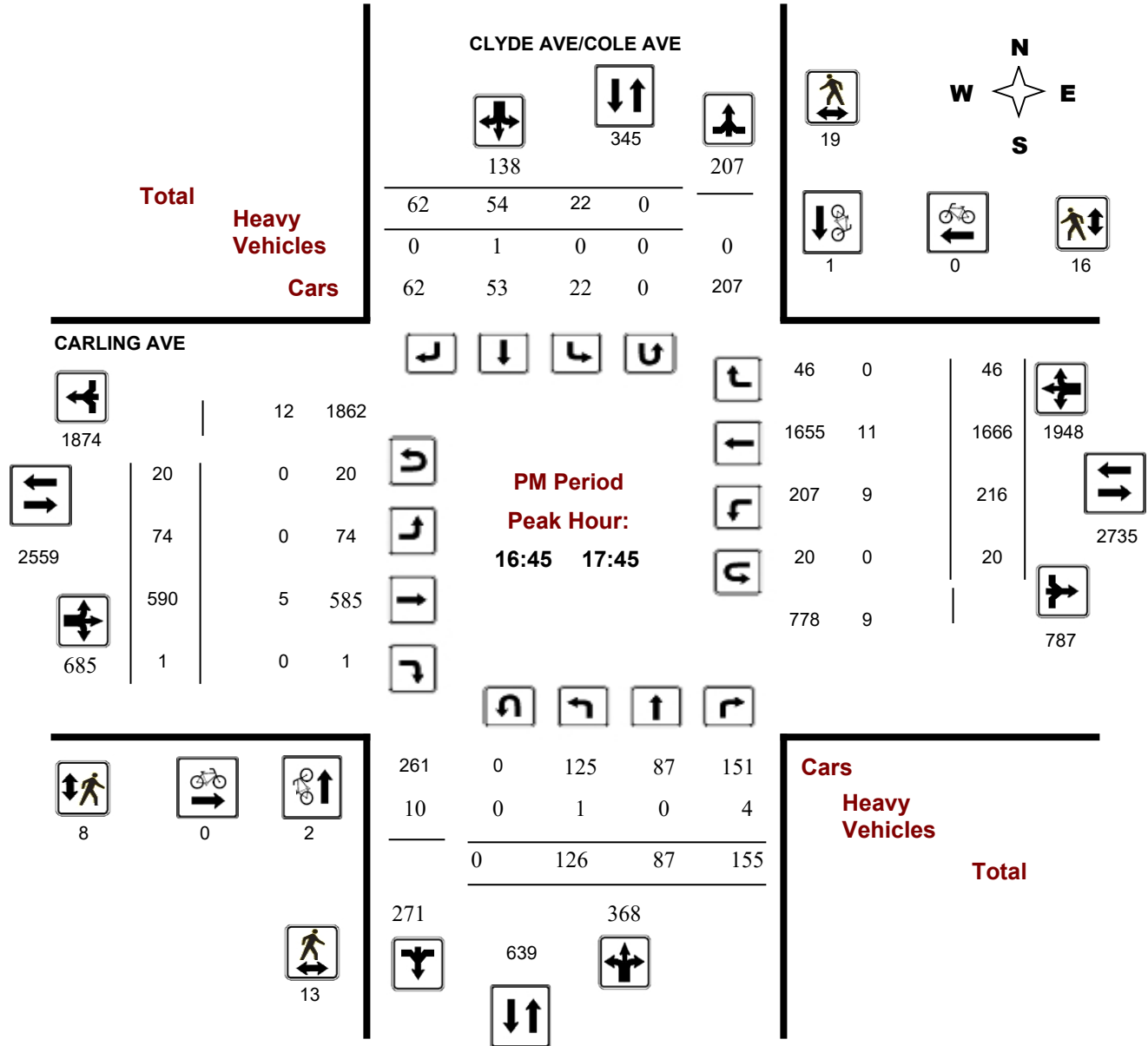


Survey Date: Wednesday, January 27, 2016

Start Time: 07:00

WO No: 35669

Device: Miovision



Transportation Services - Traffic Services

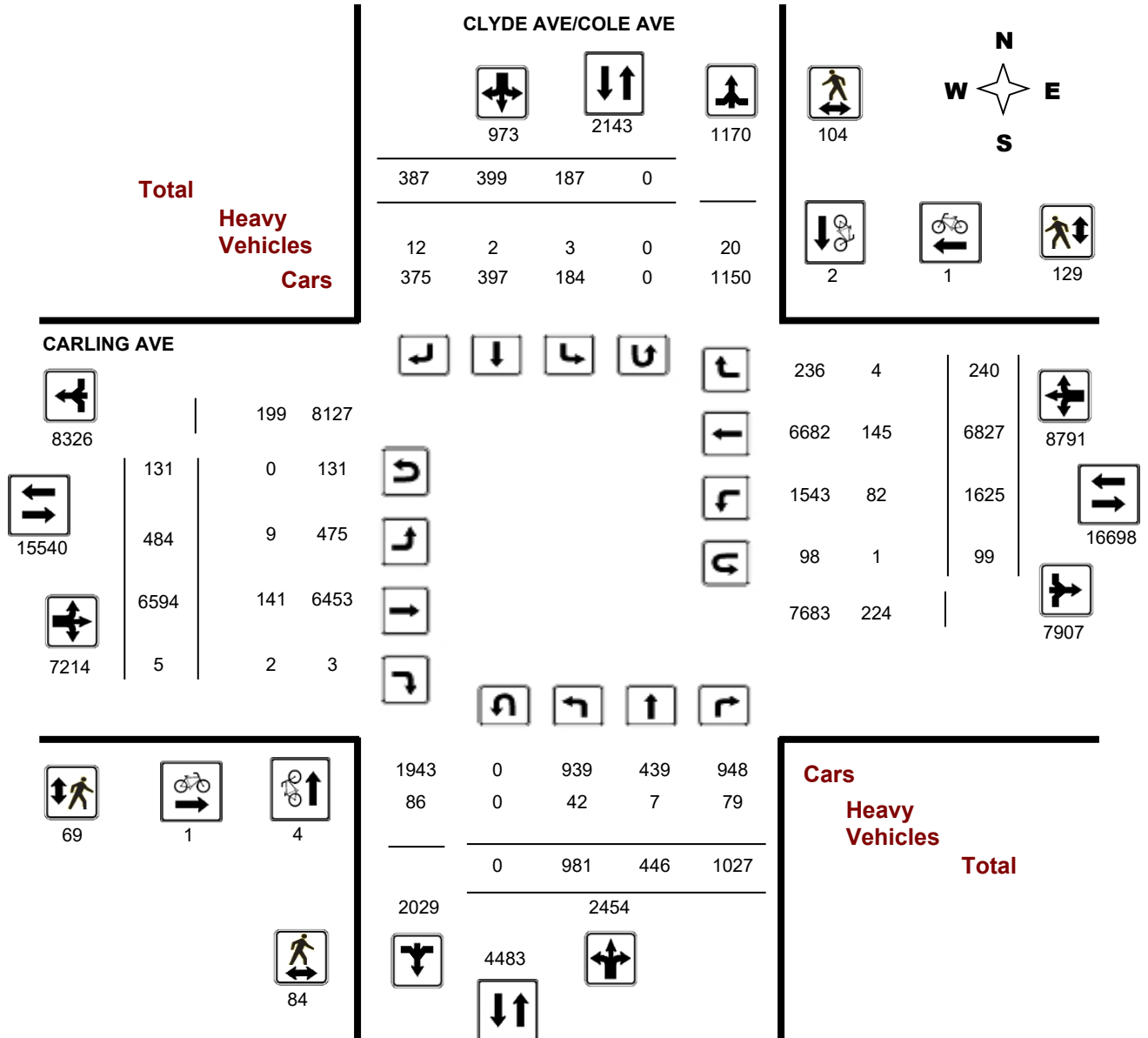
Turning Movement Count - Full Study Diagram

CARLING AVE @ CLYDE AVE/COLE AVE

Survey Date: Wednesday, January 27, 2016

WO#: 35669

Device: Miovision





Turning Movement Count - Full Study Summary Report

CARLING AVE @ CLYDE AVE/COLE AVE

Survey Date: Wednesday, January 27, 201

Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 131 Westbound: 99

AADT Factor

1.00

Full Study

Period	CLYDE AVE/COLE AVE									CARLING AVE									Grand Total
	Northbound				Southbound					Eastbound			Westbound						
	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	
07:00 08:00	47	19	80	146	23	27	31	81	227	38	1209	0	1247	180	319	13	512	1759	1986
08:00 09:00	121	51	147	319	35	63	66	164	483	60	1481	0	1541	197	510	26	733	2274	2757
09:00 10:00	108	31	97	236	16	40	39	95	331	61	784	0	845	191	540	12	743	1588	1919
11:30 12:30	159	69	137	365	22	50	47	119	484	54	642	2	698	214	743	33	990	1688	2172
12:30 13:30	129	52	133	314	29	47	50	126	440	77	689	0	766	187	672	27	886	1652	2092
15:00 16:00	165	56	139	360	16	43	44	103	463	41	657	2	700	221	1117	34	1372	2072	2535
16:00 17:00	120	68	147	335	20	73	41	134	469	75	540	0	615	228	1381	51	1660	2275	2744
17:00 18:00	132	100	147	379	26	56	69	151	530	78	592	1	671	207	1545	44	1796	2467	2997
Sub Total	981	446	1027	2454	187	399	387	973	3427	484	6594	5	7083	1625	6827	240	8692	15775	19202
U Turns				0				0	0				131				99	230	230
Total	981	446	1027	2454	187	399	387	973	3427	484	6594	5	7214	1625	6827	240	8791	16005	19432
EQ 12Hr	1364	620	1428	3411	260	555	538	1352	4763	673	9166	7	10027	2259	9490	334	12219	22246	27009
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													1.39						
AVG 12Hr	1364	620	1428	3411	260	555	538	1352	4763	673	9166	7	10027	2259	9490	334	12219	22246	27009
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													1.00						
AVG 24Hr	1786	812	1870	4468	341	727	705	1772	6240	881	12007	9	13136	2959	12431	437	16008	29144	35384
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													1.31						

Comments:

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



Turning Movement Count - 15 Minute Summary Report

CARLING AVE @ CLYDE AVE/COLE AVE

Survey Date: Wednesday, January 27, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 131 Westbound: 99

Table with columns for Time Period, Northbound (LT, ST, RT, N 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.

Note: U-Turns are included in Totals.

Comment:



Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order
35669

CARLING AVE @ CLYDE AVE/COLE AVE

Count Date: Wednesday, January 27, 2016

Start Time: 07:00

Time Period	CLYDE AVE/COLE AVE			CARLING AVE			Grand Total
	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	
07:00 08:00	0	1	1	0	0	0	1
08:00 09:00	2	0	2	0	0	0	2
09:00 10:00	0	0	0	0	0	0	0
11:30 12:30	0	0	0	0	0	0	0
12:30 13:30	0	0	0	1	1	2	2
15:00 16:00	0	0	0	0	0	0	0
16:00 17:00	1	0	1	0	0	0	1
17:00 18:00	1	1	2	0	0	0	2
Total	4	2	6	1	1	2	8

Comment:

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



Transportation Services - Traffic Services

W.O.
35669

Turning Movement Count - Heavy Vehicle Report

CARLING AVE @ CLYDE AVE/COLE AVE

Survey Date: Wednesday, January 27, 2016

Time Period	CLYDE AVE/COLE AVE									CARLING AVE									Grand Total
	Northbound			Southbound			S TOT	STR TOT	Eastbound			Westbound			W TOT	STR TOT			
	LT	ST	RT	N TOT	LT	ST			RT	LT	ST	RT	E TOT	LT			ST	RT	
07:00 08:00	6	1	13	20	0	0	4	4	24	3	12	0	15	6	14	0	20	35	59
08:00 09:00	10	0	20	30	0	0	2	2	32	1	34	0	35	12	21	1	34	69	101
09:00 10:00	6	1	14	21	1	0	1	2	23	1	27	0	28	12	26	0	38	66	89
11:30 12:30	6	0	10	16	1	0	0	1	17	1	25	0	26	15	18	2	35	61	78
12:30 13:30	5	3	9	17	0	1	2	3	20	0	16	0	16	12	15	0	28	44	64
15:00 16:00	5	2	6	13	0	0	3	3	16	1	13	2	16	7	21	1	29	45	61
16:00 17:00	4	0	2	6	1	1	0	2	8	2	8	0	10	8	17	0	25	35	43
17:00 18:00	0	0	5	5	0	0	0	0	5	0	6	0	6	10	13	0	23	29	34
Sub Total	42	7	79	128	3	2	12	17	145	9	141	2	152	82	145	4	232	384	529
U-Turns (Heavy Vehicles)				0				0	0				0				1	1	1
Total	42	7	79	0	3	2	12	17	145	9	141	2	152	82	145	4	233	385	530

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



Transportation Services - Traffic Services

Work Order

35669

Turning Movement Count - Pedestrian Volume Report

CARLING AVE @ CLYDE AVE/COLE AVE

Count Date: Wednesday, January 27, 2016

Start Time: 07:00

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	1	4	5	2	1	3	8
07:15 07:30	1	2	3	1	4	5	8
07:30 07:45	2	4	6	0	2	2	8
07:45 08:00	7	3	10	2	10	12	22
07:00 08:00	11	13	24	5	17	22	46
08:00 08:15	1	2	3	2	5	7	10
08:15 08:30	2	1	3	4	4	8	11
08:30 08:45	2	2	4	2	4	6	10
08:45 09:00	1	1	2	0	0	0	2
08:00 09:00	6	6	12	8	13	21	33
09:00 09:15	5	6	11	1	3	4	15
09:15 09:30	1	2	3	1	2	3	6
09:30 09:45	0	0	0	1	1	2	2
09:45 10:00	2	2	4	4	3	7	11
09:00 10:00	8	10	18	7	9	16	34
11:30 11:45	2	7	9	1	6	7	16
11:45 12:00	3	2	5	3	1	4	9
12:00 12:15	0	4	4	5	8	13	17
12:15 12:30	1	2	3	2	0	2	5
11:30 12:30	6	15	21	11	15	26	47
12:30 12:45	4	3	7	5	9	14	21
12:45 13:00	3	1	4	1	6	7	11
13:00 13:15	5	6	11	5	8	13	24
13:15 13:30	2	2	4	2	0	2	6
12:30 13:30	14	12	26	13	23	36	62
15:00 15:15	3	4	7	1	6	7	14
15:15 15:30	2	10	12	2	5	7	19
15:30 15:45	1	1	2	4	3	7	9
15:45 16:00	5	3	8	0	4	4	12
15:00 16:00	11	18	29	7	18	25	54
16:00 16:15	7	2	9	4	3	7	16
16:15 16:30	1	3	4	1	6	7	11
16:30 16:45	5	5	10	4	5	9	19
16:45 17:00	3	3	6	0	6	6	12
16:00 17:00	16	13	29	9	20	29	58
17:00 17:15	1	3	4	1	5	6	10
17:15 17:30	5	5	10	2	2	4	14
17:30 17:45	4	8	12	5	3	8	20
17:45 18:00	2	1	3	1	4	5	8
17:00 18:00	12	17	29	9	14	23	52
Total	84	104	188	69	129	198	386

Comment:

Turning Movement Count - 15 Min U-Turn Total Report

CARLING AVE @ CLYDE AVE/COLE AVE

Survey Date: Wednesday, January 27, 2016

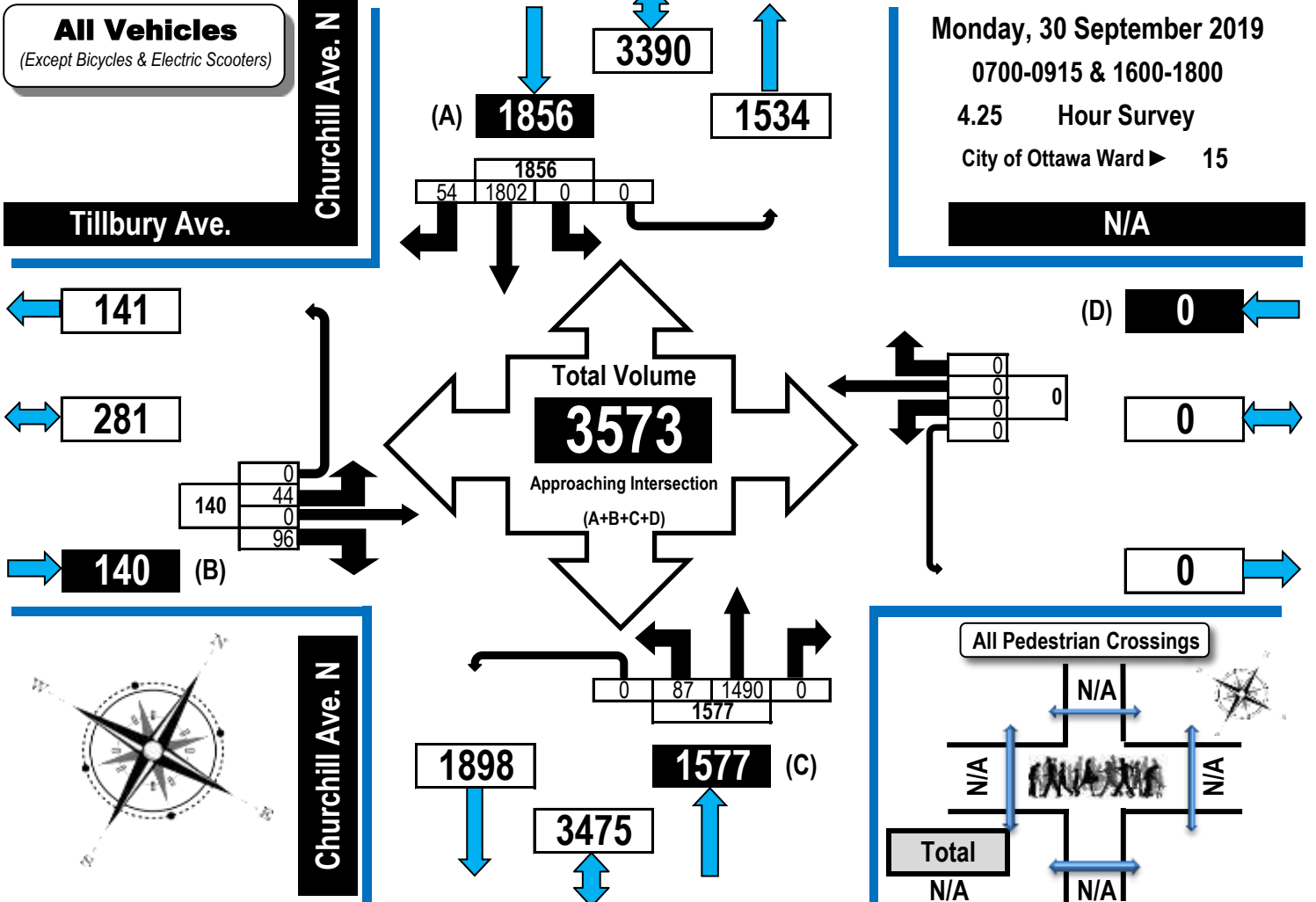
Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	2	2
07:15	07:30	0	0	3	2	5
07:30	07:45	0	0	4	4	8
07:45	08:00	0	0	4	1	5
08:00	08:15	0	0	1	1	2
08:15	08:30	0	0	3	0	3
08:30	08:45	0	0	6	2	8
08:45	09:00	0	0	7	1	8
09:00	09:15	0	0	4	1	5
09:15	09:30	0	0	2	2	4
09:30	09:45	0	0	6	1	7
09:45	10:00	0	0	4	2	6
11:30	11:45	0	0	7	3	10
11:45	12:00	0	0	7	2	9
12:00	12:15	0	0	7	4	11
12:15	12:30	0	0	2	2	4
12:30	12:45	0	0	5	3	8
12:45	13:00	0	0	6	6	12
13:00	13:15	0	0	2	4	6
13:15	13:30	0	0	5	2	7
15:00	15:15	0	0	4	3	7
15:15	15:30	0	0	5	4	9
15:30	15:45	0	0	3	5	8
15:45	16:00	0	0	5	4	9
16:00	16:15	0	0	3	5	8
16:15	16:30	0	0	1	4	5
16:30	16:45	0	0	3	3	6
16:45	17:00	0	0	3	0	3
17:00	17:15	0	0	11	5	16
17:15	17:30	0	0	1	4	5
17:30	17:45	0	0	5	11	16
17:45	18:00	0	0	2	6	8
Total		0	0	131	99	230



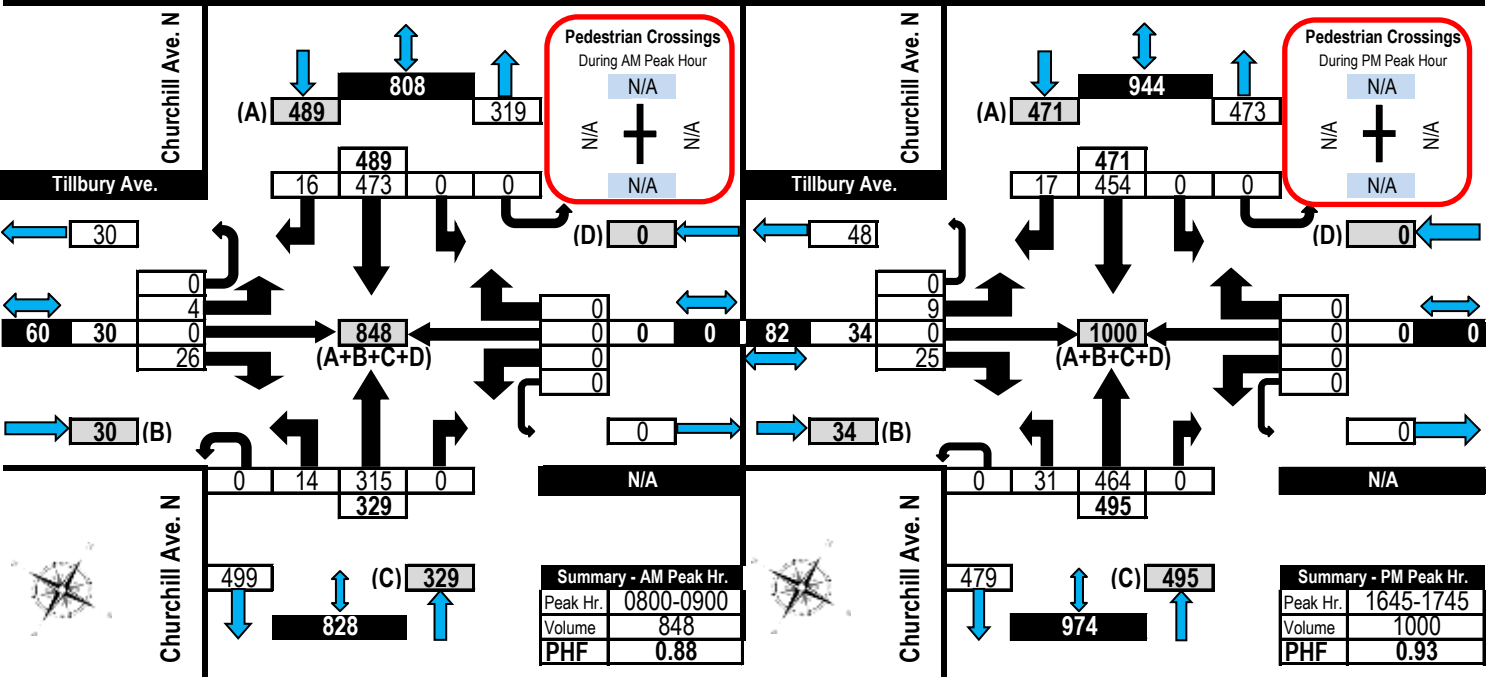
Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Churchill Avenue North & Tillbury Avenue Ottawa, ON



AM Peak Hour Flow Diagram PM Peak Hour Flow Diagram

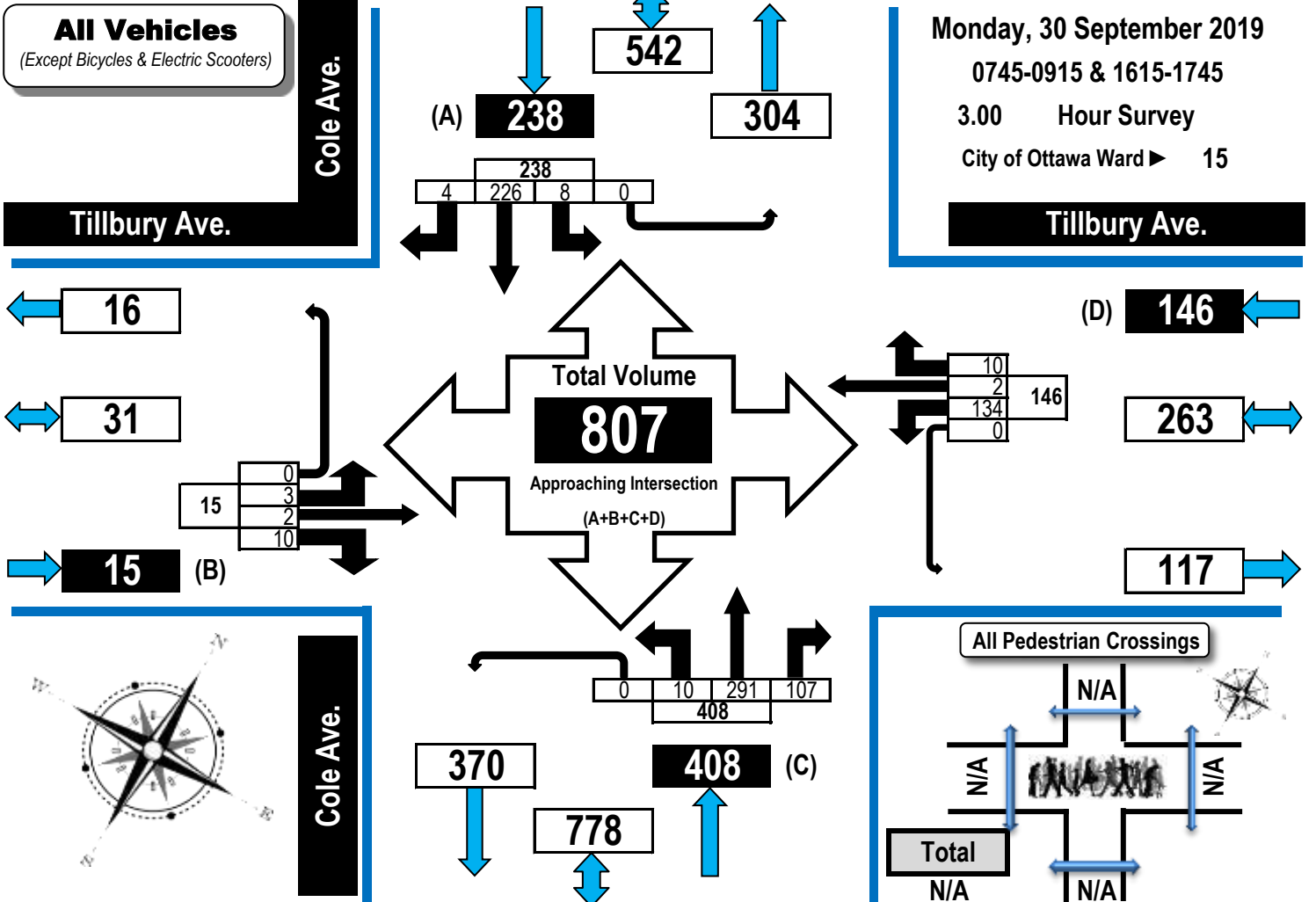




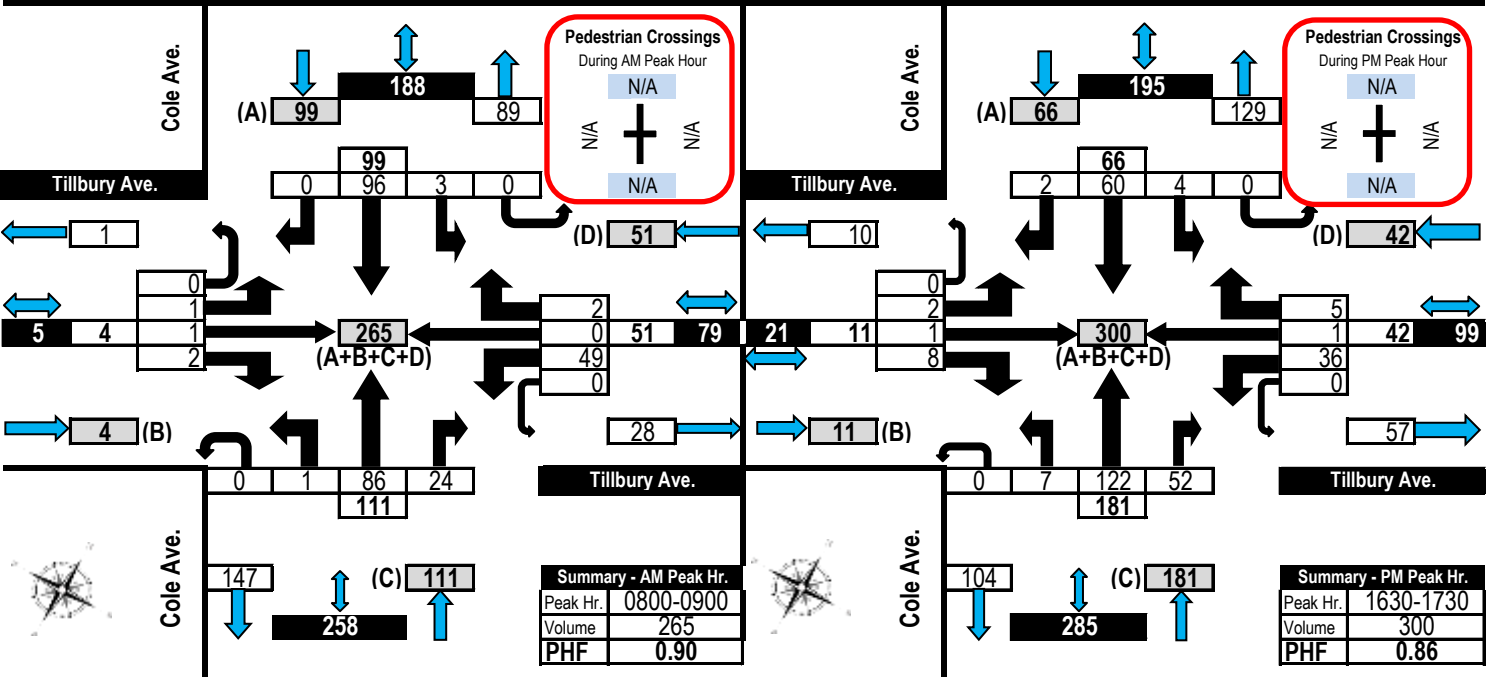
Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

Cole Avenue & Tillbury Avenue Ottawa, ON



AM Peak Hour Flow Diagram PM Peak Hour Flow Diagram



Appendix D

City of Ottawa Collision Data

Total Area

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total
P.D. only	19	24	20	2	0	0	0	0	65
Non-fatal injury	3	7	1	2	0	0	0	0	13
Non reportable	0	0	0	0	0	0	0	0	0
Total	22	31	21	4	0	0	0	0	78
	#2 or 28%	#1 or 40%	#3 or 27%	#4 or 5%	#5 or 0%	#5 or 0%	#5 or 0%	#5 or 0%	

83%
17%
0%
100%

Carling Ave/Churchill Ave

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2014-2018	22	38,416	1825	0.31

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total
P.D. only	11	1	6	1	0	0	0	0	19
Non-fatal injury	2	0	1	0	0	0	0	0	3
Non reportable	0	0	0	0	0	0	0	0	0
Total	13	1	7	1	0	0	0	0	22
	59%	5%	32%	5%	0%	0%	0%	0%	

86%
14%
0%
100%

Carling Ave/Clyde Ave/Cole Ave

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2014-2018	50	35,384	1825	0.77

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total
P.D. only	6	22	11	1	0	0	0	0	40
Non-fatal injury	1	7	0	2	0	0	0	0	10
Non reportable	0	0	0	0	0	0	0	0	0
Total	7	29	11	3	0	0	0	0	50
	14%	58%	22%	6%	0%	0%	0%	0%	

80%
20%
0%
100%

Carling Ave EB, Clyde Ave to Churchill Ave N

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2014-2018	1	n/a	1825	n/a

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total
P.D. only	0	0	1	0	0	0	0	0	1
Non-fatal injury	0	0	0	0	0	0	0	0	0
Non reportable	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	0	0	0	1
	0%	0%	100%	0%	0%	0%	0%	0%	

100%
0%
0%
100%

Carling Ave WB, Cole Ave to Churchill Ave N

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2014-2018	5	n/a	1825	n/a

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total
P.D. only	2	1	2	0	0	0	0	0	5
Non-fatal injury	0	0	0	0	0	0	0	0	0
Non reportable	0	0	0	0	0	0	0	0	0
Total	2	1	2	0	0	0	0	0	5
	40%	20%	40%	0%	0%	0%	0%	0%	

100%
0%
0%
100%



City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

Location: CARLING AVE @ CHURCHILL AVE

Traffic Control: Traffic signal

Total Collisions: 23

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2014-Mar-04, Tue,14:04	Clear	Rear end	P.D. only	Dry	East	Going ahead	Truck and trailer	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Jun-09, Mon,08:55	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Sep-15, Mon,16:25	Clear	Sideswipe	Non-fatal injury	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Mar-28, Sat,13:18	Clear	Rear end	P.D. only	Dry	East	Turning left	Municipal transit bus	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2015-May-01, Fri,13:22	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle	
					South	Turning right	Pick-up truck	Other motor vehicle	
2015-Nov-04, Wed,16:04	Clear	Rear end	P.D. only	Dry	West	Slowing or stopping	Pick-up truck	Other motor vehicle	

					West	Stopped	Automobile, station wagon	Other motor vehicle
2015-Jul-08, Wed, 13:40	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Pick-up truck	Other motor vehicle
					West	Turning left	Automobile, station wagon	Other motor vehicle
2016-May-19, Thu, 13:41	Clear	Rear end	P.D. only	Dry	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2016-Mar-04, Fri, 11:19	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-Jul-08, Fri, 14:38	Clear	Sideswipe	P.D. only	Dry	East	Turning right	Truck - open	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-Aug-16, Wed, 15:00	Clear	Turning movement	P.D. only	Dry	East	Going ahead	Delivery van	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2017-Feb-10, Fri, 09:52	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-Jul-19, Wed, 16:45	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle

					North	Turning left	Automobile, station wagon	Other motor vehicle
2017-Sep-20, Wed,19:20	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Jan-16, Tue,18:18	Clear	Rear end	P.D. only	Slush	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2018-Feb-27, Tue,11:26	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Truck - closed	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Mar-27, Tue,10:50	Clear	SMV other	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Curb
2018-Oct-12, Fri,10:20	Clear	Rear end	P.D. only	Dry	East	Turning left	Truck - dump	Other motor vehicle
					East	Turning left	Delivery van	Other motor vehicle
2018-Sep-05, Wed,08:46	Clear	Rear end	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2018-Sep-04, Tue,08:30	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Truck - dump	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle

2018-Jul-23, Mon, 18:59	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle

2018-Dec-25, Tue, 12:19	Clear	Rear end	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle

2018-Aug-27, Mon, 12:02	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Pick-up truck	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle

Location: CARLING AVE @ CLYDE AVE/COLE AVE

Traffic Control: Traffic signal

Total Collisions: 55

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2014-Jan-29, Wed, 15:37	Clear	Turning movement	P.D. only	Slush	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Delivery van	Other motor vehicle	
2014-Mar-12, Wed, 17:04	Drifting Snow	Turning movement	P.D. only	Packed snow	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Apr-16, Wed, 10:05	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Delivery van	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Mar-25, Tue, 15:40	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle	

					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jan-30, Thu,13:05	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Pedestrian	1
2014-Jul-19, Sat,12:01	Clear	Turning movement	P.D. only	Dry	East	Making "U" turn	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Dec-05, Fri,14:15	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Passenger van	Other motor vehicle	
2014-Nov-14, Fri,16:14	Snow	Turning movement	P.D. only	Wet	East	Making "U" turn	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Nov-06, Thu,11:59	Clear	Sideswipe	P.D. only	Dry	East	Turning left	Truck - dump	Other motor vehicle	
					East	Stopped	Truck - dump	Other motor vehicle	
2015-Feb-10, Tue,17:34	Clear	Turning movement	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Making "U" turn	Pick-up truck	Other motor vehicle	
2014-Sep-25, Thu,12:15	Clear	Sideswipe	P.D. only	Dry	West	Unknown	Unknown	Other motor vehicle	
					West	Turning right	Automobile, station wagon	Other motor vehicle	

2014-Oct-29, Wed,15:31	Clear	Turning movement	P.D. only	Dry	West	Turning left	Unknown	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Dec-11, Thu,03:15	Snow	SMV other	P.D. only	Loose snow	East	Going ahead	Automobile, station wagon	Curb
2014-Sep-04, Thu,08:20	Clear	Angle	P.D. only	Dry	East	Making "U" turn	Passenger van	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2014-Nov-27, Thu,11:34	Clear	Turning movement	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jan-05, Mon,17:51	Clear	Sideswipe	P.D. only	Wet	West	Changing lanes	Passenger van	Other motor vehicle
					West	Going ahead	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Feb-19, Thu,16:10	Snow	Rear end	P.D. only	Loose snow	West	Going ahead	Unknown	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2015-Mar-27, Fri,08:15	Snow	Rear end	P.D. only	Wet	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle

					West	Stopped	Pick-up truck	Other motor vehicle
2015-Sep-15, Tue,14:46	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Feb-12, Fri,09:41	Clear	Turning movement	Non-fatal injury	Wet	West	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Aug-02, Tue,10:00	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Passenger van	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Aug-05, Wed,18:30	Clear	Turning movement	P.D. only	Dry	South	Turning left	Passenger van	Other motor vehicle
					North	Going ahead	Passenger van	Other motor vehicle
2015-Jul-23, Thu,19:14	Clear	Turning movement	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Dec-08, Tue,09:09	Clear	Turning movement	P.D. only	Dry	East	Making "U" turn	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Municipal transit bus	Other motor vehicle
2016-Oct-08, Sat,15:20	Clear	SMV other	P.D. only	Dry	East	Turning right	Truck and trailer	Pole (utility, power)

2017-Jun-28, Wed,17:55	Clear	Sideswipe	P.D. only	Dry	East	Unknown	Unknown	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Nov-28, Mon,08:41	Clear	SMV other	Non-fatal injury	Dry	North	Turning right	Automobile, station wagon	Pedestrian	1
2017-May-18, Thu,08:36	Clear	Turning movement	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2017-Jun-27, Tue,14:30	Clear	Turning movement	P.D. only	Dry	West	Turning left	Unknown	Other motor vehicle	
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2017-Jul-07, Fri,15:43	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Motorcycle	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Nov-30, Thu,14:31	Clear	Rear end	P.D. only	Wet	North	Turning right	Automobile, station wagon	Other motor vehicle	
					North	Turning right	Pick-up truck	Other motor vehicle	
2017-Jul-26, Wed,08:34	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Jul-20, Thu,15:48	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Passenger van	Other motor vehicle	
					South	Turning left	Municipal transit bus	Other motor vehicle	

2017-Oct-14, Sat,13:15	Clear	Turning movement	P.D. only	Dry	North	Turning right	Delivery van	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2017-Sep-22, Fri,15:43	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Truck - dump	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Oct-26, Thu,16:59	Clear	Turning movement	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Sep-21, Thu,16:00	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2018-Jan-13, Sat,10:12	Drifting Snow	Sideswipe	P.D. only	Ice	West	Slowing or stopping	Automobile, station wagon	Skidding/sliding
					West	Turning left	Automobile, station wagon	Other motor vehicle
2018-Jan-09, Tue,21:41	Clear	Sideswipe	P.D. only	Slush	South	Unknown	Unknown	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2018-Jan-10, Wed,21:16	Clear	Turning movement	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle

2018-Feb-09, Fri,12:58	Clear	Rear end	P.D. only	Wet	West	Slowing or stopping	Truck - dump	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle
2018-Feb-06, Tue,18:13	Clear	Turning movement	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Turning left	Pick-up truck	Other motor vehicle
2018-Feb-01, Thu,07:07	Snow	Sideswipe	P.D. only	Loose snow	West	Turning left	School bus	Other motor vehicle
					West	Changing lanes	Pick-up truck	Other motor vehicle
2018-May-31, Thu,08:11	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2018-May-18, Fri,11:37	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Truck - closed	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2018-May-12, Sat,14:30	Clear	Turning movement	P.D. only	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Jun-29, Fri,15:48	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2018-Oct-19, Fri,09:19	Clear	Turning movement	P.D. only	Dry	West	Turning left	Pick-up truck	Other motor vehicle

					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Nov-23, Fri,13:08	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Pedestrian	1
2018-Oct-24, Wed,12:43	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-13, Mon,16:20	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-11, Sat,12:51	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Oct-27, Sat,22:36	Snow	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-17, Fri,10:38	Clear	Turning movement	P.D. only	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Truck - closed	Other motor vehicle	
2018-Nov-16, Fri,07:23	Snow	Angle	Non-fatal injury	Loose snow	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	

South Going ahead Pick-up truck Other motor vehicle

Location: CARLING AVE EB btwn CLYDE AVE & CHURCHILL AVE N

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Mar-27, Mon,15:30	Clear	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Passenger van	Other motor vehicle	

Location: CARLING AVE WB btwn COLE AVE & CHURCHILL AVE N

Traffic Control: No control

Total Collisions: 5

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Feb-15, Sat,20:28	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2015-Mar-31, Tue,10:04	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Truck and trailer	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Oct-07, Fri,14:55	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2017-May-04, Thu,16:47	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

2018-Aug-02, Thu, 17:43	Clear	Turning movement	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle

Appendix E

Study Area Justification

Technical Memo

To: Wally Dubyk (City of Ottawa)
 Copy: Mark Baker, P.Eng.
 From: Basel Ansari, EIT

Date: 28 August 2019
 Project: 477272 - 01000

Re: TIA 1655 Carling Avenue - Proposed Study Area

This letter is prepared with the purpose of providing justification for using a smaller study area than the 1km radius noted in the City’s current TIA Guidelines for a suburban context.

The proposed development is located at 1655 Carling Avenue and is anticipated to consist of a 22-storey building containing 260 residential units, which is forecasted to generate person trips as summarized in Table 1 below. The number of vehicle trips forecasted in in the order of approximately 90 vehicles/hr during each of the morning and afternoon peak hour periods.

Table 1: Forecasted Trips

Travel Mode	AM Mode Share	AM Peak (persons/h)			PM Mode Share	PM Peak (persons/h)		
		In	Out	Total		In	Out	Total
Auto Driver	50%	20	64	84	50%	53	34	87
Auto Passenger	15%	6	19	25	15%	16	10	26
Transit	20%	7	26	33	20%	21	14	35
Non-motorized	15%	6	20	26	15%	16	11	27
Total People Trips	100%	39	129	168	100%	106	69	175
Total 'New' Residential Apartment Building Auto Trips		20	64	84		53	34	87

The subject site currently consists of an unpaved parking lot with an estimated maximum occupancy of 80 vehicles. Although a driveway count has not been conducted, it is estimated that half of the parking lot’s capacity is generated during the commuter peak hour. On this basis, the existing parking lot generates in the order of 40 vehicles during each peak hour, thereby resulting in a net potential increase in vehicle trips of approximately 50 veh/h two-way associated with the proposed residential development.

Parsons is recommending that the TIA limit the study area for analysis to the adjacent two signalized intersections on Carling Avenue located within approximately 400m of the site, namely Carling/Clyde (to the west) and Carling/Churchill (to the east). This is consistent with an urban context according to the TIA Guidelines. **Figure 1** below provides an illustration of the site location, with a 1 km radius from the site shown. Red circles within the radius indicate major intersections near the subject site that are proposed as part of the reduced study area, whereas the orange circles and rectangles represent intersections and highway ramps that would need to be included in the analysis based on the 1 km radius noted in the TIA Guidelines for a suburban context.

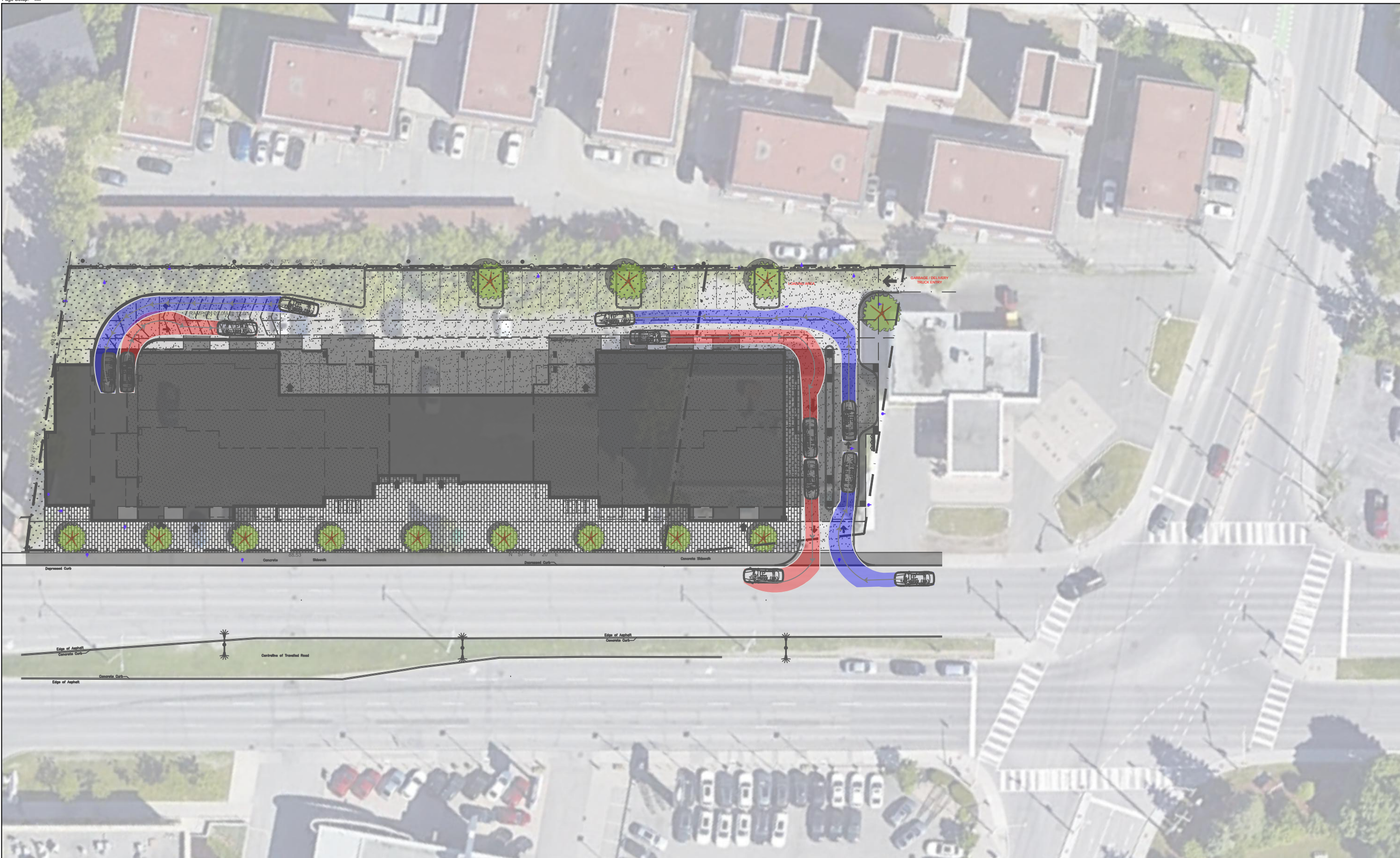
Given the relatively low volume of net forecasted site-generated traffic, an appropriate study area is considered to be the two signalized intersections on either side of the subject site. An evaluation of all eight signalized intersections and two highway ramps within a 1km radius is not considered of benefit to the approvals process.

Figure 1: Study Area



Appendix F

Vehicle Maneuvering Templates



PARSONS

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

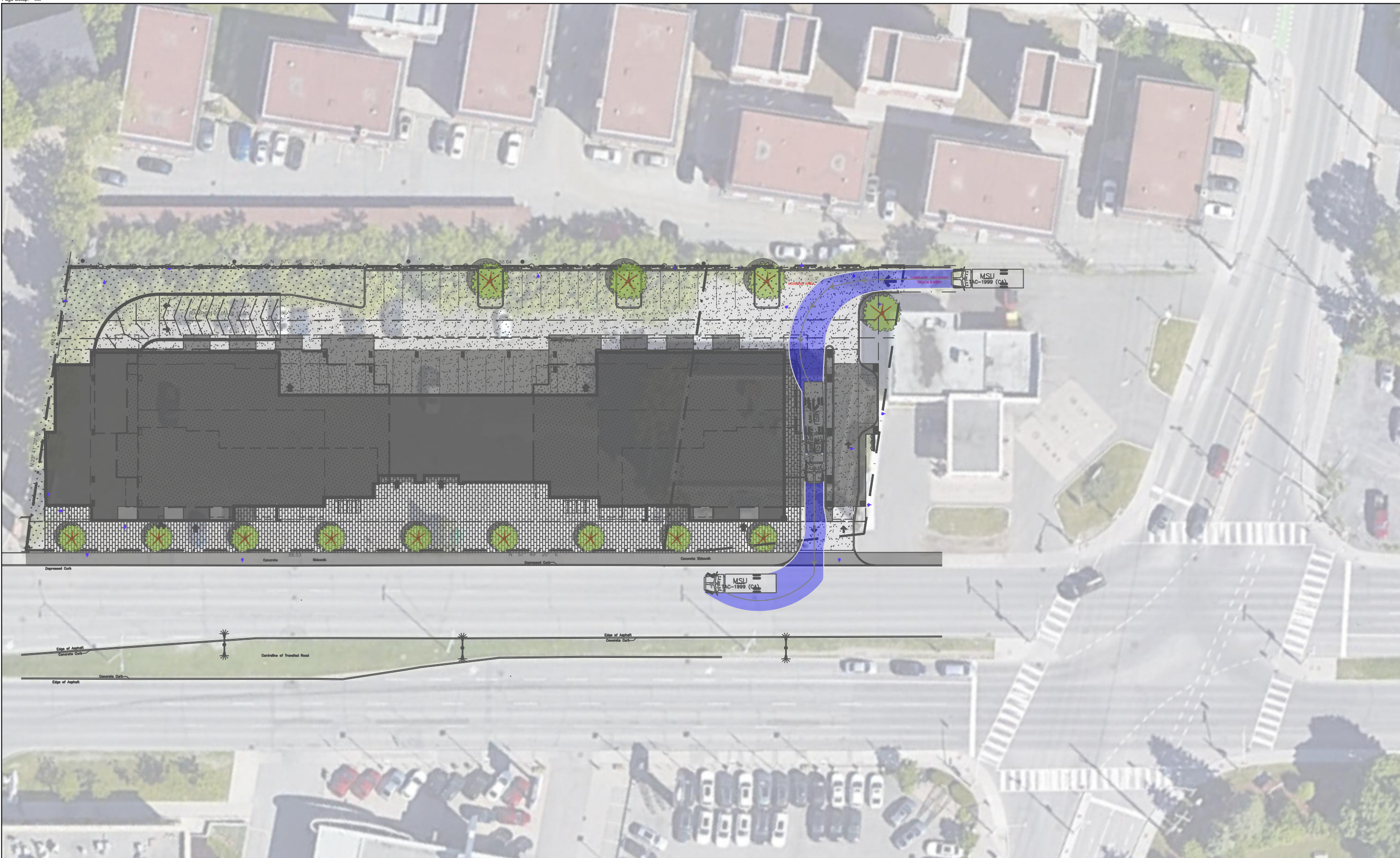


Legend

Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 4.0
Steering Angle	: 35.9

Not to Scale

Drawing Description Site Vehicle Maneuvering - Passenger Vehicle			
Client	Surface Developments	Date	Nov. 3, 2020
Project Number	477272	Figure Number	001
Project Description		1655 Carling Avenue Development	



PARSONS



Legend

MSU

Width	2.60
Track	2.50
Lock to Lock Time	6.0
Steering Angle	45.2

meters

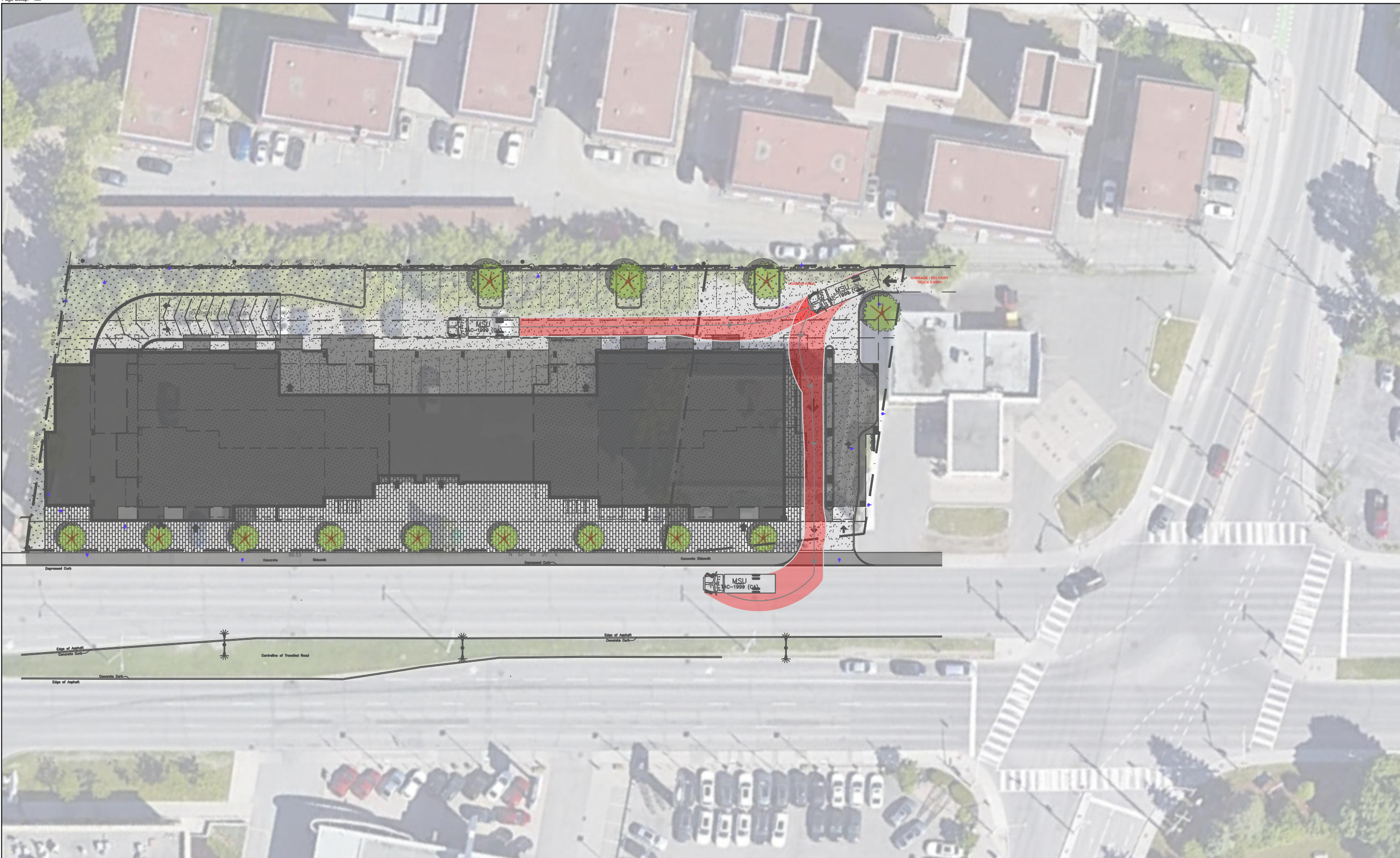
NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Not to Scale

Drawing Description		Site Vehicle Maneuvering - Passenger Vehicle	
Client	Surface Developments	Date	Nov. 3, 2020
Project Number	477272	Figure Number	002
		Project Description	
		1655 Carling Avenue Development	

Last Saved: Wednesday, November 04, 2020 12:28:22
 Plot Date: Wednesday, November 04, 2020 12:38:38

Consultant: \\GCCAN67FSU\ID\mail\SGM47272\1000\DWG\GS1655 Carling Ave - TT - 20201103.dwg



PARSONS

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.



Legend

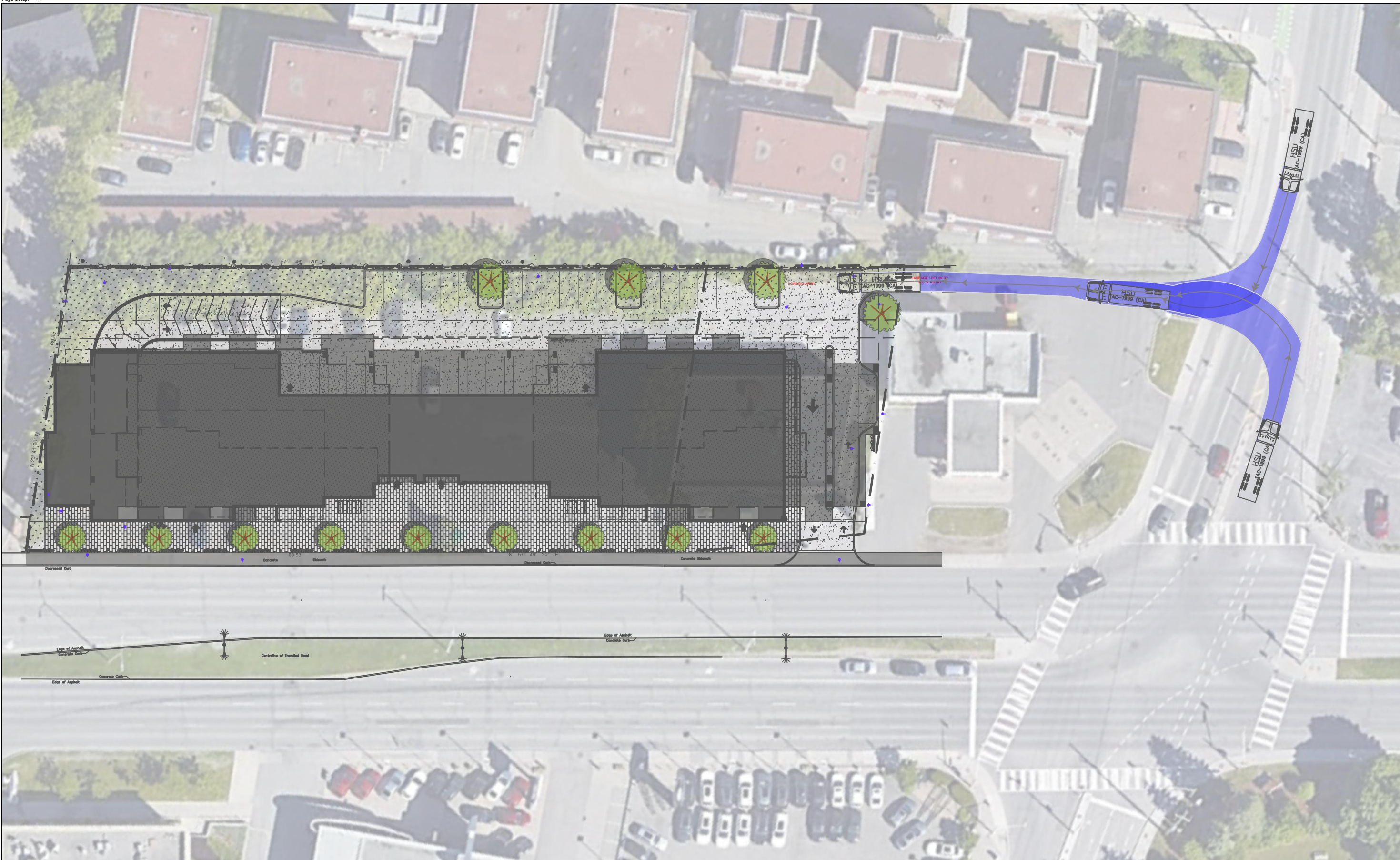
MSU

meters

- Width : 2.60
- Track : 2.50
- Lock to Lock Time : 6.0
- Steering Angle : 45.2

Not to Scale

Drawing Description		Site Vehicle Maneuvering - MSU Exiting from Mid-Building	
Client	Surface Developments	Date	Nov. 3, 2020
Project Number	477272	Figure Number	003
Project Description		1655 Carling Avenue Development	



PARSONS



Legend

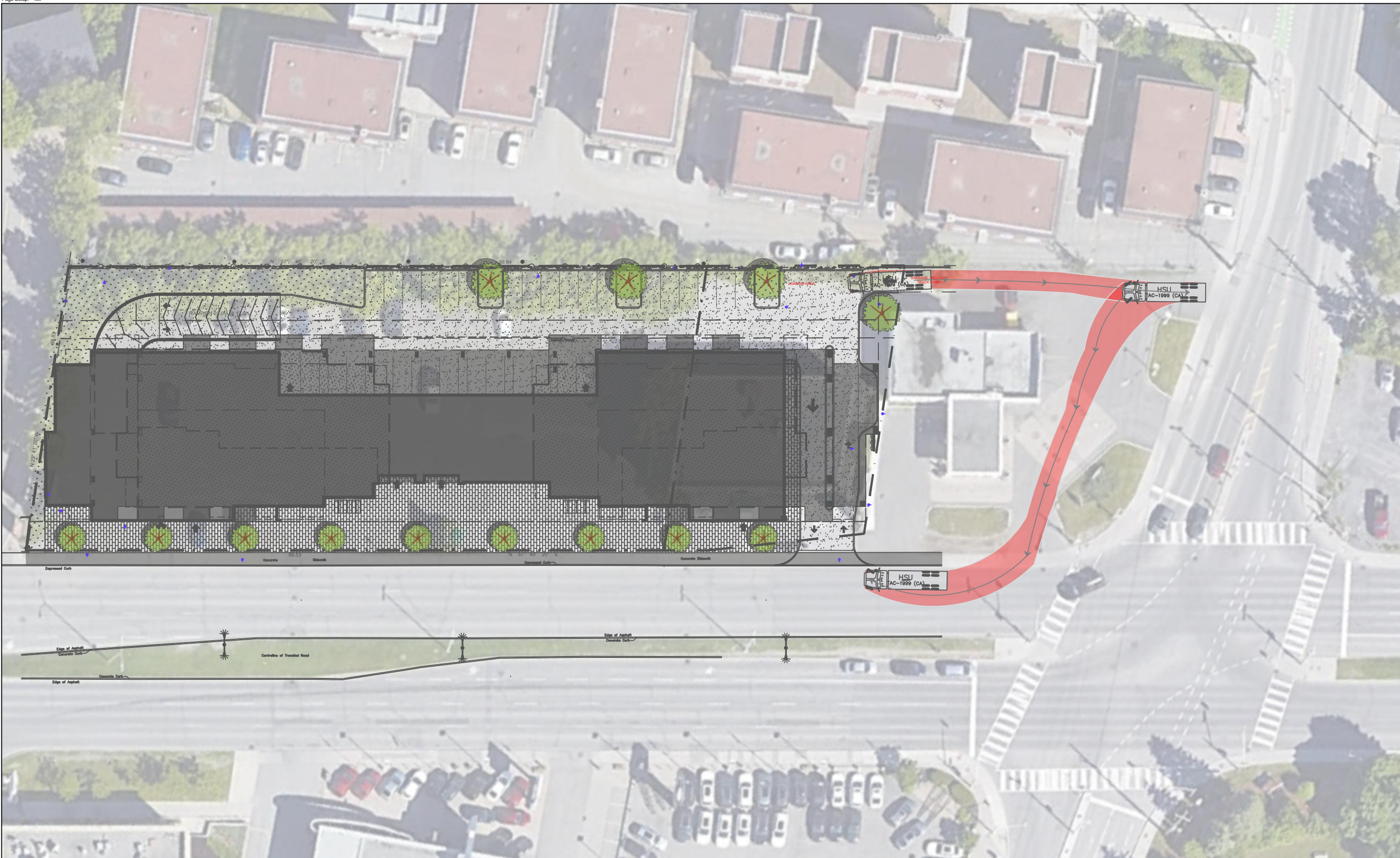
HSU

Width : 2.40
Track : 2.60
Lock to Lock Time : 8.0
Steering Angle : 40.0

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Not to Scale

Drawing Description		Site Vehicle Maneuvering - HSU Enter	
Client	Surface Developments	Date	Nov. 3, 2020
Project Number	477272	Figure Number	004
Project Description		1655 Carling Avenue Development	



PARSONS



Legend

HSU
 meters
 Width : 2.40
 Track : 2.60
 Lock to Lock Time : 0.0
 Steering Angle : 40.0

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

Not to Scale

Drawing Description				Site Vehicle Maneuvering - HSU Exit	
Client		Date		Figure Number	
Surface Developments		Nov. 3, 2020		005	
Project Number		Project Description			
477272		1655 Carling Avenue Development			

Appendix G

TDM Checklist

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

Completed By: Parsons Corporation
1223 Michael Street, Gloucester, ON, K1J 7T2

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

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
1. WALKING & CYCLING: ROUTES		
1.1 Building location & access points		
BASIC	1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances	<input checked="" type="checkbox"/>
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	<input 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 type="checkbox"/>
1.2 Facilities for walking & cycling		
REQUIRED	1.2.1 Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations (<i>see Official Plan policy 4.3.3</i>)	<input type="checkbox"/> <i>No rapid transit routes within 600 meters.</i>
REQUIRED	1.2.2 Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible (<i>see Official Plan policy 4.3.12</i>)	<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 checked="" type="checkbox"/>
BASIC	1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	<input type="checkbox"/>
BASIC	1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	<input type="checkbox"/>
BASIC	1.2.8 Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	<input type="checkbox"/>
1.3 Amenities for walking & cycling		
BASIC	1.3.1 Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	<input type="checkbox"/>
BASIC	1.3.2 Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	<input type="checkbox"/>

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

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

TDM Measures Checklist:

Residential Developments (multi-family, condominium or subdivision)

Completed By: Jakub Ulak, M.Arch, RIAC

Surface Condos

88 Spadina Avenue, Ottawa, ON, K1Y 2C1

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

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

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

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

Appendix H

MMLOS Analysis Results

Multi-Modal Level of Service - Segments Form

Consultant Scenario Comments	Parsons	Project Date	477272-01000
	Future		10.27.20

SEGMENTS		Carling	Cole/Clyde to Churchill			
			Existing	Future		
Pedestrian	Sidewalk Width Boulevard Width	F	1.8 m < 0.5 m	1.8 m < 0.5 m		
	Avg Daily Curb Lane Traffic Volume		> 3000	≤ 3000		
	Operating Speed On-Street Parking		> 50 to 60 km/h no	> 50 to 60 km/h no		
	Exposure to Traffic PLoS		F	C		
	Effective Sidewalk Width Pedestrian Volume		2.0 m 250 ped/hr	2.0 m 250 ped/hr		
	Crowding PLoS		B	B		
	Level of Service		F	C		
	Bicycle		Type of Cycling Facility	F	Mixed Traffic	Mixed Traffic
Number of Travel Lanes		2-3 lanes total	2-3 lanes total			
Operating Speed # of Lanes & Operating Speed LoS		≥ 60 km/h F	≥ 60 km/h F			
Bike Lane (+ Parking Lane) Width Bike Lane Width LoS		- -	- -			
Bike Lane Blockages Blockage LoS		- -	- -			
Median Refuge Width (no median = < 1.8 m) No. of Lanes at Unsignalized Crossing Sidestreet Operating Speed Unsignalized Crossing - Lowest LoS		≥ 1.8 m refuge ≤ 3 lanes ≤ 40 km/h A	≥ 1.8 m refuge ≤ 3 lanes ≤ 40 km/h A			
Level of Service		F	F			
Transit		Facility Type Friction or Ratio Transit:Posted Speed	D		Mixed Traffic Vt/Vp ≥ 0.8	Bus lane Cf ≤ 60
		Level of Service			D	B
		Truck			Truck Lane Width Travel Lanes per Direction	A
Level of Service	A		A			

Multi-Modal Level of Service - Intersections Form

Consultant Scenario Comments
 Parsons Existing

Project Date
 477272-01000
 10.27.20

INTERSECTIONS									
Crossing Side		Carling/Cole/Clyde				Carling/Churchill			
		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	3	5	7	7	3	3	7	7
	Median	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	Median > 2.4 m
	Conflicting Left Turns	Protected/ Permissive	Protected/ Permissive	Permissive	Permissive	Protected	Protected	Permissive	Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RTOR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	Yes	Yes
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	5-10m	5-10m	5-10m	5-10m	15-25m	15-25m	10-15m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings
	PETSI Score		71	38	11	11	79	79	15
Ped. Exposure to Traffic LoS		C	E	F	F	B	B	F	F
Cycle Length									
Effective Walk Time									
Average Pedestrian Delay									
Pedestrian Delay LoS		-	-	-	-	-	-	-	-
Level of Service		C	E	F	F	B	B	F	F
		F				F			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic
	Right Turn Lane Configuration	≤ 50 m	≤ 50 m	≤ 50 m	≤ 50 m	Not Applicable	Not Applicable	≤ 50 m	≤ 50 m
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	Not Applicable	≤ 25 km/h	≤ 25 km/h
	Cyclist relative to RT motorists	D	D	D	D	Not Applicable	Not Applicable	D	D
	Separated or Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Separated	Separated	Mixed Traffic	Mixed Traffic
	Left Turn Approach	One lane crossed	One lane crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	1 lane crossed	1 lane crossed	≥ 2 lanes crossed	≥ 2 lanes crossed
	Operating Speed	≤ 40 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	B	D	F	F	C	C	F	F
Level of Service	D	D	F	F	C	C	F	F	
		F				F			
Transit	Average Signal Delay		≤ 40 sec	≤ 20 sec	≤ 30 sec	≤ 40 sec		> 40 sec	≤ 30 sec
	Level of Service	-	E	C	D	E	-	F	D
		E				F			
Truck	Effective Corner Radius		< 10 m		< 10 m	> 15 m	> 15 m	> 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection		≥ 2		≥ 2	≥ 2	≥ 2	1	≥ 2
	Level of Service	-	D	-	D	A	A	C	B
		D				C			
Auto	Volume to Capacity Ratio		0.61 - 0.70				0.91 - 1.00		
	Level of Service		B				E		

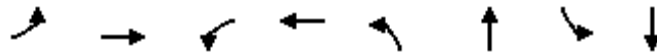
Appendix I

Synchro Analysis Reports

Existing Conditions

Existing AM
1: Churchill Ave N & Carling Ave

02/03/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø9	Ø13
Lane Configurations										
Traffic Volume (vph)	167	1352	85	610	11	5	336	31		
Future Volume (vph)	167	1352	85	610	11	5	336	31		
Lane Group Flow (vph)	186	1611	94	849	12	18	373	304		
Turn Type	Prot	NA	Prot	NA	Perm	NA	Perm	NA		
Protected Phases	7	4	3	8		2		6	9	13
Permitted Phases					2		6			
Detector Phase	7	4	3	8	2	2	6	6		
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	11.1	34.1	11.1	34.1	40.0	40.0	40.0	40.0	5.0	5.0
Total Split (s)	25.0	50.0	25.0	50.0	40.0	40.0	40.0	40.0	5.0	5.0
Total Split (%)	20.8%	41.7%	20.8%	41.7%	33.3%	33.3%	33.3%	33.3%	4%	4%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	2.0	2.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.5	3.5	3.5	3.5	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.8	6.8	6.8	6.8		
Lead/Lag	Lead	Lag	Lead	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None	None
Act Effct Green (s)	16.9	50.8	12.0	45.9	38.2	38.2	38.2	38.2		
Actuated g/C Ratio	0.14	0.42	0.10	0.38	0.32	0.32	0.32	0.32		
v/c Ratio	0.78	0.79	0.56	0.47	0.05	0.04	0.90	0.46		
Control Delay	92.6	15.4	63.4	27.1	29.3	16.8	64.9	7.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	92.6	15.4	63.4	27.1	29.3	16.8	64.9	7.9		
LOS	F	B	E	C	C	B	E	A		
Approach Delay		23.4		30.7		21.8		39.3		
Approach LOS		C		C		C		D		
Queue Length 50th (m)	45.8	41.9	21.5	51.8	2.0	1.0	83.6	5.6		
Queue Length 95th (m)	#73.7	28.3	37.1	64.7	6.6	6.2	#139.2	27.4		
Internal Link Dist (m)		99.0		113.3		62.0		67.5		
Turn Bay Length (m)	65.0		60.0		20.0		20.0			
Base Capacity (vph)	266	2042	266	1825	239	508	415	660		
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	0.70	0.79	0.35	0.47	0.05	0.04	0.90	0.46		

Intersection Summary

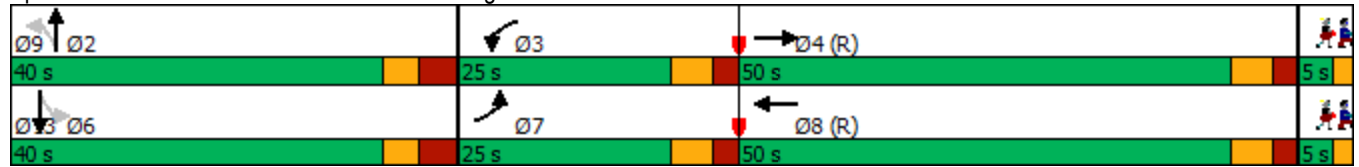
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 101 (84%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 28.5	Intersection LOS: C
Intersection Capacity Utilization 77.7%	ICU Level of Service D
Analysis Period (min) 15	

Existing AM
 1: Churchill Ave N & Carling Ave

02/03/2020

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Existing AM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	60	1481	232	601	121	51	147	35	63
Future Volume (vph)	60	1481	232	601	121	51	147	35	63
Lane Group Flow (vph)	67	1646	258	702	134	57	163	39	143
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases	7	4	3	8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	7	4	3	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	10.4	35.5	37.0	37.0	37.0	37.0	37.0
Total Split (s)	23.0	60.0	23.0	60.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	19.2%	50.0%	19.2%	50.0%	30.8%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	1.7	2.1	3.3	3.3	3.3	3.3	3.3
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)	5.4	5.8	5.4	5.8	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
Act Effct Green (s)	71.4	64.1	88.4	77.9	19.6	19.6	19.6	19.6	19.6
Actuated g/C Ratio	0.60	0.53	0.74	0.65	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.15	0.63	0.74	0.22	0.78	0.20	0.43	0.19	0.48
Control Delay	7.8	22.6	44.3	8.7	75.9	42.3	9.6	42.5	35.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	22.6	44.3	8.7	75.9	42.3	9.6	42.5	35.6
LOS	A	C	D	A	E	D	A	D	D
Approach Delay		22.0		18.3		39.9			37.1
Approach LOS		C		B		D			D
Queue Length 50th (m)	3.8	99.2	48.4	17.8	30.6	11.8	0.0	8.0	21.5
Queue Length 95th (m)	10.0	133.4	#81.0	29.5	48.5	21.8	16.7	16.7	38.0
Internal Link Dist (m)		94.2		153.1		79.0			73.1
Turn Bay Length (m)	20.0		120.0				5.0	20.0	
Base Capacity (vph)	604	2601	361	3138	267	451	495	320	444
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	0.11	0.63	0.71	0.22	0.50	0.13	0.33	0.12	0.32

Intersection Summary

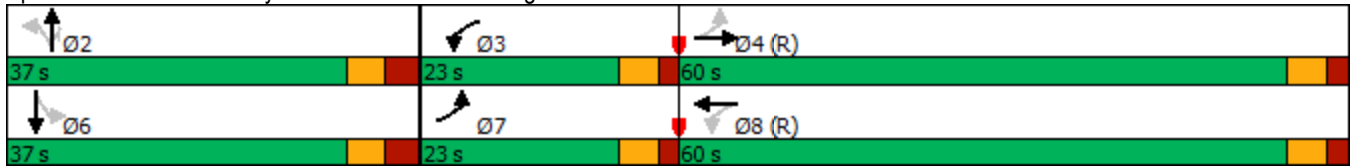
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 23.7	Intersection LOS: C
Intersection Capacity Utilization 86.6%	ICU Level of Service E
Analysis Period (min) 15	

Existing AM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020

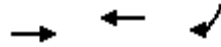
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Clyde Ave/Cole Ave & Carling Ave



Existing AM
 3: Carling Ave & Site Access

02/03/2020



Lane Group	EBT	WBT	SBR
Lane Configurations	↑↑↑	↑↑↑	↑
Traffic Volume (vph)	1617	854	1
Future Volume (vph)	1617	854	1
Lane Group Flow (vph)	1797	960	1
Sign Control	Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 36.3% ICU Level of Service A

Analysis Period (min) 15

Existing AM
3: Carling Ave & Site Access

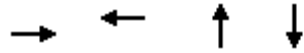
02/03/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↑↑↑	↑↑↑			↗	
Traffic Volume (veh/h)	0	1617	854	10	0	1	
Future Volume (Veh/h)	0	1617	854	10	0	1	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	0	1797	949	11	0	1	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (m)		177	123				
pX, platoon unblocked	0.89				0.82	0.89	
vC, conflicting volume	960				1554	322	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	522				14	0	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	100				100	100	
cM capacity (veh/h)	926				825	965	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	599	599	599	380	380	201	1
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	11	1
cSH	1700	1700	1700	1700	1700	1700	965
Volume to Capacity	0.35	0.35	0.35	0.22	0.22	0.12	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	8.7
Lane LOS							A
Approach Delay (s)	0.0			0.0			8.7
Approach LOS							A
Intersection Summary							
Average Delay			0.0				
Intersection Capacity Utilization			36.3%	ICU Level of Service		A	
Analysis Period (min)			15				

Existing AM
4: Cole Ave & Tillbury Ave

02/03/2020



Lane Group	EBT	WBT	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	1	0	86	96
Future Volume (vph)	1	0	86	96
Lane Group Flow (vph)	4	56	124	110
Sign Control	Stop	Stop	Free	Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 23.2% ICU Level of Service A

Analysis Period (min) 15

Existing AM
4: Cole Ave & Tillbury Ave

02/03/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	1	2	49	0	2	1	86	24	3	96	0
Future Volume (Veh/h)	1	1	2	49	0	2	1	86	24	3	96	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	1	2	54	0	2	1	96	27	3	107	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	226	238	107	227	224	110	107			123		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	226	238	107	227	224	110	107			123		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	100	100			100		
cM capacity (veh/h)	726	661	947	724	673	944	1484			1464		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	4	56	124	110								
Volume Left	1	54	1	3								
Volume Right	2	2	27	0								
cSH	800	730	1484	1464								
Volume to Capacity	0.01	0.08	0.00	0.00								
Queue Length 95th (m)	0.1	1.9	0.0	0.0								
Control Delay (s)	9.5	10.3	0.1	0.2								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.5	10.3	0.1	0.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			23.2%		ICU Level of Service					A		
Analysis Period (min)			15									

Existing AM
 5: Churchill Ave N & Tillbury Ave

02/03/2020



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	4	315	578
Future Volume (vph)	4	315	578
Lane Group Flow (vph)	40	366	660
Sign Control	Stop	Free	Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 43.1% ICU Level of Service A

Analysis Period (min) 15

Existing AM
5: Churchill Ave N & Tillbury Ave

02/03/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	32	14	315	578	16
Future Volume (Veh/h)	4	32	14	315	578	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	4	36	16	350	642	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	91					
pX, platoon unblocked						
vC, conflicting volume	1033	651	660			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1033	651	660			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	92	98			
cM capacity (veh/h)	253	469	928			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	40	366	660			
Volume Left	4	16	0			
Volume Right	36	0	18			
cSH	432	928	1700			
Volume to Capacity	0.09	0.02	0.39			
Queue Length 95th (m)	2.3	0.4	0.0			
Control Delay (s)	14.2	0.6	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.2	0.6	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			43.1%	ICU Level of Service	A	
Analysis Period (min)			15			

Existing PM
1: Churchill Ave N & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	231	792	18	19	1782	218	96	33	26	182	7	269
Future Volume (vph)	231	792	18	19	1782	218	96	33	26	182	7	269
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		0.0	60.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		108.4			137.3			86.0				87.9
Travel Time (s)		6.5			8.2			6.2				6.3
Lane Group Flow (vph)	257	900	0	21	2222	0	107	66	0	202	307	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1		11.1	34.1		40.0	40.0		40.0		40.0
Total Split (s)	20.0	55.0		20.0	55.0		40.0	40.0		40.0		40.0
Total Split (%)	16.7%	45.8%		16.7%	45.8%		33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4		2.4	2.4		3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None		None		None
Act Effct Green (s)	26.7	75.9		7.1	48.9		25.4	25.4		25.4		25.4
Actuated g/C Ratio	0.22	0.63		0.06	0.41		0.21	0.21		0.21		0.21
v/c Ratio	0.68	0.29		0.21	1.14		1.01	0.18		0.76		0.58
Control Delay	68.9	8.6		58.2	102.1		135.0	22.4		61.4		10.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0		0.0
Total Delay	68.9	8.6		58.2	102.1		135.0	22.4		61.4		10.2
LOS	E	A		E	F		F	C		E		B
Approach Delay		22.0			101.7			92.0				30.5
Approach LOS		C			F			F				C
Queue Length 50th (m)	64.0	20.8		4.8	~223.0		~25.5	7.1		45.1		5.0
Queue Length 95th (m)	#125.8	30.1		12.8	#252.2		#50.7	16.7		63.9		26.8
Internal Link Dist (m)		84.4			113.3			62.0				63.9
Turn Bay Length (m)	65.0			60.0			20.0			20.0		
Base Capacity (vph)	377	3069		196	1954		142	485		354		615
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	0.68	0.29		0.11	1.14		0.75	0.14		0.57		0.50

Intersection Summary

Area Type: Other

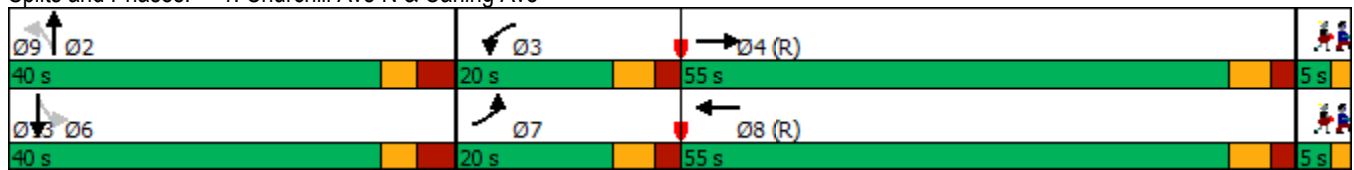
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Existing PM
 1: Churchill Ave N & Carling Ave

02/03/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 92 (77%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.14
 Intersection Signal Delay: 69.9 Intersection LOS: E
 Intersection Capacity Utilization 109.2% ICU Level of Service H
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Existing PM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	801	1	241	1855	51	126	87	210	30	54	62
Future Volume (vph)	74	801	1	241	1855	51	126	87	210	30	54	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		0.0	120.0		0.0	0.0		5.0	20.0		0.0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			191.8			103.0				96.3
Travel Time (s)		7.1			11.5			7.4				8.7
Lane Group Flow (vph)	82	891	0	268	2118	0	140	97	233	33	129	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	10.0		10.0
Minimum Split (s)	10.4	35.5		10.4	35.5		37.0	37.0	37.0	37.0		37.0
Total Split (s)	25.0	55.0		25.0	55.0		40.0	40.0	40.0	40.0		40.0
Total Split (%)	20.8%	45.8%		20.8%	45.8%		33.3%	33.3%	33.3%	33.3%		33.3%
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3	3.3	3.3		3.3
All-Red Time (s)	1.7	2.1		1.7	2.1		3.3	3.3	3.3	3.3		3.3
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)	5.4	5.8		5.4	5.8		6.6	6.6	6.6	6.6		6.6
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None	None	None		None
Act Effct Green (s)	77.8	69.8		87.4	76.9		19.9	19.9	19.9	19.9		19.9
Actuated g/C Ratio	0.65	0.58		0.73	0.64		0.17	0.17	0.17	0.17		0.17
v/c Ratio	0.49	0.31		0.57	0.68		0.75	0.33	0.61	0.16		0.42
Control Delay	27.6	14.8		18.3	16.8		70.5	45.1	20.5	41.5		30.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Delay	27.6	14.8		18.3	16.8		70.5	45.1	20.5	41.5		30.1
LOS	C	B		B	B		E	D	C	D		C
Approach Delay		15.9			16.9			40.5				32.4
Approach LOS		B			B			D				C
Queue Length 50th (m)	4.7	36.0		30.3	78.0		31.9	20.5	14.0	6.8		17.0
Queue Length 95th (m)	22.5	61.8		m30.0	m76.1		49.5	33.0	36.3	14.7		32.2
Internal Link Dist (m)		94.2			167.8			79.0				72.3
Turn Bay Length (m)	20.0			120.0					5.0	20.0		
Base Capacity (vph)	334	2831		543	3105		313	496	528	339		486
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	0.25	0.31		0.49	0.68		0.45	0.20	0.44	0.10		0.27

Intersection Summary

Area Type: Other

Existing PM
3: Carling Ave & Site Access

02/03/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑			↗
Traffic Volume (vph)	0	1041	2146	1	0	13
Future Volume (vph)	0	1041	2146	1	0	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		48	
Link Distance (m)		191.8	108.4		45.0	
Travel Time (s)		11.5	6.5		3.4	
Lane Group Flow (vph)	0	1157	2385	0	0	14
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	53.8%
ICU Level of Service	A
Analysis Period (min)	15

Existing PM
3: Carling Ave & Site Access

02/03/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↑↑↑	↑↑↑			↗	
Traffic Volume (veh/h)	0	1041	2146	1	0	13	
Future Volume (Veh/h)	0	1041	2146	1	0	13	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	0	1157	2384	1	0	14	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (m)		192	109				
pX, platoon unblocked	0.60				0.64	0.60	
vC, conflicting volume	2385				2770	795	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	987				942	0	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	100				100	98	
cM capacity (veh/h)	419				168	653	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	386	386	386	954	954	478	14
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	1	14
cSH	1700	1700	1700	1700	1700	1700	653
Volume to Capacity	0.23	0.23	0.23	0.56	0.56	0.28	0.02
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.6
Lane LOS							B
Approach Delay (s)	0.0			0.0			10.6
Approach LOS							B
Intersection Summary							
Average Delay			0.0				
Intersection Capacity Utilization			53.8%	ICU Level of Service		A	
Analysis Period (min)			15				

Existing PM
4: Cole Ave & Tillbury Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Future Volume (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		64.0			51.0			96.3			60.0	
Travel Time (s)		5.8			4.6			8.7			5.4	
Lane Group Flow (vph)	0	12	0	0	47	0	0	202	0	0	73	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 27.8% ICU Level of Service A

Analysis Period (min) 15

Existing PM
4: Cole Ave & Tillbury Ave

02/03/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	2	1	8	36	1	5	7	122	52	4	60	2
Future Volume (Veh/h)	2	1	8	36	1	5	7	122	52	4	60	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	1	9	40	1	6	8	136	58	4	67	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked	0.97	0.97		0.97	0.97	0.97					0.97	
vC, conflicting volume	264	286	68	266	258	165	69				194	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	227	250	68	230	221	125	69				155	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	99	94	100	99	99				100	
cM capacity (veh/h)	698	629	995	693	653	899	1532				1384	
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	12	47	202	73								
Volume Left	2	40	8	4								
Volume Right	9	6	58	2								
cSH	889	713	1532	1384								
Volume to Capacity	0.01	0.07	0.01	0.00								
Queue Length 95th (m)	0.3	1.6	0.1	0.1								
Control Delay (s)	9.1	10.4	0.3	0.4								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.1	10.4	0.3	0.4								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			27.8%	ICU Level of Service	A							
Analysis Period (min)			15									

Existing PM
5: Churchill Ave N & Tillbury Ave

02/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	9	25	31	464	454	17
Future Volume (vph)	9	25	31	464	454	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	66.9			87.9	45.3	
Travel Time (s)	6.0			6.3	3.3	
Lane Group Flow (vph)	38	0	0	550	523	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 62.6% ICU Level of Service B

Analysis Period (min) 15

Existing PM
5: Churchill Ave N & Tillbury Ave

02/03/2020

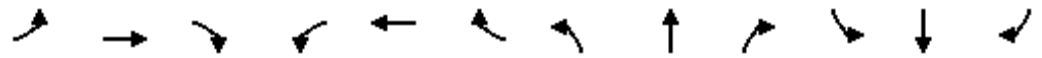


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	25	31	464	454	17
Future Volume (Veh/h)	9	25	31	464	454	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	10	28	34	516	504	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	88					
pX, platoon unblocked						
vC, conflicting volume	1098	514	523			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1098	514	523			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	95	97			
cM capacity (veh/h)	228	561	1043			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	550	523			
Volume Left	10	34	0			
Volume Right	28	0	19			
cSH	405	1043	1700			
Volume to Capacity	0.09	0.03	0.31			
Queue Length 95th (m)	2.3	0.8	0.0			
Control Delay (s)	14.8	0.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.8	0.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	1.0					
Intersection Capacity Utilization	62.6%			ICU Level of Service	B	
Analysis Period (min)	15					

Future Background 2022

Future Background 2022 AM
1: Churchill Ave N & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	1082	98	85	488	154	11	5	11	336	31	243
Future Volume (vph)	167	1082	98	85	488	154	11	5	11	336	31	243
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		111.5			137.3			86.0				94.3
Travel Time (s)		6.7			8.2			6.2				6.8
Lane Group Flow (vph)	167	1082	98	85	488	154	11	16	0	336	274	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	40.0	40.0		40.0		40.0
Total Split (%)	20.8%	41.7%	41.7%	20.8%	41.7%	41.7%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	16.0	56.3	56.3	11.3	49.0	49.0	36.0	36.0		36.0		36.0
Actuated g/C Ratio	0.13	0.47	0.47	0.09	0.41	0.41	0.30	0.30		0.30		0.30
v/c Ratio	0.74	0.68	0.13	0.53	0.35	0.24	0.05	0.03		0.86		0.44
Control Delay	87.5	16.0	1.1	63.2	26.6	9.9	29.2	17.1		60.8		8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	87.5	16.0	1.1	63.2	26.6	9.9	29.2	17.1		60.8		8.0
LOS	F	B	A	E	C	A	C	B		E		A
Approach Delay		23.8			27.4			22.0				37.1
Approach LOS		C			C			C				D
Queue Length 50th (m)	36.5	111.6	0.2	19.4	43.2	6.8	1.8	0.8		72.4		5.1
Queue Length 95th (m)	64.4	45.9	m2.6	34.4	58.8	21.6	6.2	5.9		#119.1		25.6
Internal Link Dist (m)		87.5			113.3			62.0				70.3
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	266	1589	733	266	1384	650	245	488		401		627
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.68	0.13	0.32	0.35	0.24	0.04	0.03		0.84		0.44

Intersection Summary

Area Type: Other

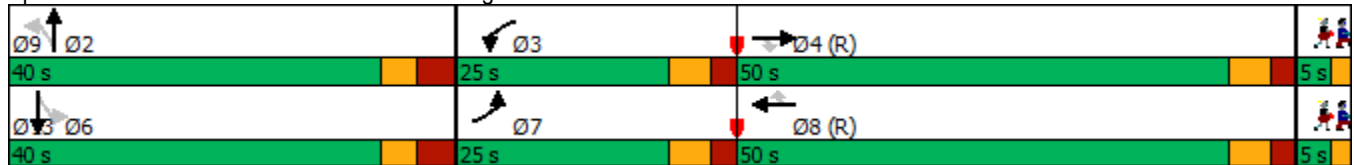
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Future Background 2022 AM
 1: Churchill Ave N & Carling Ave

02/03/2020

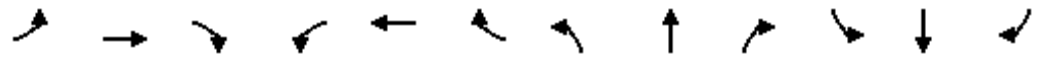
Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 101 (84%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 27.7 Intersection LOS: C
 Intersection Capacity Utilization 79.3% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Future Background 2022 AM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1185	0	232	481	31	121	51	147	35	63	66
Future Volume (vph)	60	1185	0	232	481	31	121	51	147	35	63	66
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			188.6			103.0				97.3
Travel Time (s)		7.1			11.3			7.4				8.8
Lane Group Flow (vph)	60	1185	0	232	481	31	121	51	147	35	129	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	23.0	60.0	60.0	23.0	60.0	60.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	19.2%	50.0%	50.0%	19.2%	50.0%	50.0%	30.8%	30.8%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	76.4	69.3		90.2	79.9	79.9	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.64	0.58		0.75	0.67	0.67	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.10	0.61		0.60	0.21	0.03	0.74	0.19	0.43	0.19	0.47	0.47
Control Delay	6.5	20.3		30.3	7.9	0.1	73.5	43.8	10.4	44.2	35.2	35.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	20.3		30.3	7.9	0.1	73.5	43.8	10.4	44.2	35.2	35.2
LOS	A	C		C	A	A	E	D	B	D	D	D
Approach Delay		19.6			14.5			39.7				37.2
Approach LOS		B			B			D				D
Queue Length 50th (m)	3.1	90.5		36.0	17.6	0.0	27.7	10.7	0.0	7.3	18.7	18.7
Queue Length 95th (m)	8.5	148.4		63.3	28.4	m0.3	44.8	20.5	16.3	15.6	34.7	34.7
Internal Link Dist (m)		94.2			164.6			79.0				73.3
Turn Bay Length (m)	20.0			120.0		20.0			5.0	20.0		
Base Capacity (vph)	733	1958		426	2257	1003	280	451	483	322	444	444
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.61		0.54	0.21	0.03	0.43	0.11	0.30	0.11	0.29	0.29

Intersection Summary

Area Type: Other

Future Background 2022 AM
 3: Carling Ave & Site Access

02/03/2020

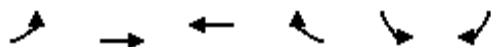


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	1347	732	10	0	1
Future Volume (vph)	0	1347	732	10	0	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		188.6	111.5		51.7	
Travel Time (s)		11.3	6.7		4.7	
Lane Group Flow (vph)	0	1347	742	0	0	1
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	42.6% ICU Level of Service A
Analysis Period (min)	15

Future Background 2022 AM
3: Carling Ave & Site Access

02/03/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	1347	732	10	0	1
Future Volume (Veh/h)	0	1347	732	10	0	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1347	732	10	0	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		189	112			
pX, platoon unblocked	0.90				0.82	0.90
vC, conflicting volume	742				1410	371
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	505				538	95
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	956				388	853
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	674	674	488	254	1	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	10	1	
cSH	1700	1700	1700	1700	853	
Volume to Capacity	0.40	0.40	0.29	0.15	0.00	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	
Control Delay (s)	0.0	0.0	0.0	0.0	9.2	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.2	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			42.6%		ICU Level of Service	A
Analysis Period (min)			15			

Future Background 2022 AM
 4: Cole Ave & Tillbury Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	1	1	2	49	0	2	1	86	24	3	96	0
Future Volume (vph)	1	1	2	49	0	2	1	86	24	3	96	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		50.6			53.4			97.3			63.2	
Travel Time (s)		4.6			4.8			8.8			5.7	
Lane Group Flow (vph)	0	4	0	0	51	0	0	111	0	0	99	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

















Control Type: Unsignalized

Intersection Capacity Utilization 23.2% ICU Level of Service A

Analysis Period (min) 15

Future Background 2022 AM
4: Cole Ave & Tillbury Ave

02/03/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	2	49	0	2	1	86	24	3	96	0
Future Volume (Veh/h)	1	1	2	49	0	2	1	86	24	3	96	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	1	2	49	0	2	1	86	24	3	96	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	204	214	96	204	202	98	96			110		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	204	214	96	204	202	98	96			110		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	100	100			100		
cM capacity (veh/h)	751	682	960	749	692	958	1498			1480		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	4	51	111	99								
Volume Left	1	49	1	3								
Volume Right	2	2	24	0								
cSH	819	756	1498	1480								
Volume to Capacity	0.00	0.07	0.00	0.00								
Queue Length 95th (m)	0.1	1.6	0.0	0.0								
Control Delay (s)	9.4	10.1	0.1	0.2								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.4	10.1	0.1	0.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			23.2%		ICU Level of Service					A		
Analysis Period (min)			15									

Future Background 2022 AM
 5: Churchill Ave N & Tillbury Ave

02/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	32	14	315	578	16
Future Volume (vph)	4	32	14	315	578	16
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	69.5			94.3	40.7	
Travel Time (s)	6.3			6.8	2.9	
Lane Group Flow (vph)	36	0	0	329	594	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	43.1%
Analysis Period (min)	15
	ICU Level of Service A

Future Background 2022 AM
5: Churchill Ave N & Tillbury Ave

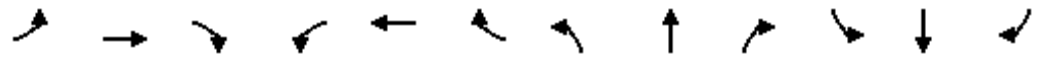
02/03/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	32	14	315	578	16
Future Volume (Veh/h)	4	32	14	315	578	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	4	32	14	315	578	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	94					
pX, platoon unblocked						
vC, conflicting volume	929	586	594			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	929	586	594			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	94	99			
cM capacity (veh/h)	293	510	982			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	36	329	594			
Volume Left	4	14	0			
Volume Right	32	0	16			
cSH	471	982	1700			
Volume to Capacity	0.08	0.01	0.35			
Queue Length 95th (m)	1.9	0.3	0.0			
Control Delay (s)	13.3	0.5	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.3	0.5	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	0.7					
Intersection Capacity Utilization	43.1%			ICU Level of Service	A	
Analysis Period (min)	15					

Future Background 2022 PM
1: Churchill Ave N & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	231	634	18	19	1426	218	96	33	26	182	7	269
Future Volume (vph)	231	634	18	19	1426	218	96	33	26	182	7	269
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		112.3			137.3			86.0				93.3
Travel Time (s)		6.7			8.2			6.2				6.7
Lane Group Flow (vph)	231	634	18	19	1426	218	96	59	0	182	276	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	20.0	55.0	55.0	20.0	55.0	55.0	40.0	40.0		40.0		40.0
Total Split (%)	16.7%	45.8%	45.8%	16.7%	45.8%	45.8%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	25.9	78.4	78.4	7.0	52.2	52.2	22.9	22.9		22.9		22.9
Actuated g/C Ratio	0.22	0.65	0.65	0.06	0.44	0.44	0.19	0.19		0.19		0.19
v/c Ratio	0.63	0.29	0.02	0.19	0.97	0.32	0.92	0.18		0.75		0.56
Control Delay	68.9	8.5	0.1	57.8	50.7	12.8	116.1	24.1		63.9		9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	68.9	8.5	0.1	57.8	50.7	12.8	116.1	24.1		63.9		9.3
LOS	E	A	A	E	D	B	F	C		E		A
Approach Delay		24.1			45.9			81.1				31.0
Approach LOS		C			D			F				C
Queue Length 50th (m)	57.3	21.2	0.0	4.4	169.1	15.5	22.5	6.5		41.1		1.4
Queue Length 95th (m)	#97.9	34.2	m0.0	11.9	#231.6	34.9	#44.9	16.2		60.1		21.9
Internal Link Dist (m)		88.3			113.3			62.0				69.3
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	366	2215	971	196	1474	688	151	475		351		600
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.29	0.02	0.10	0.97	0.32	0.64	0.12		0.52		0.46

Intersection Summary

Area Type: Other

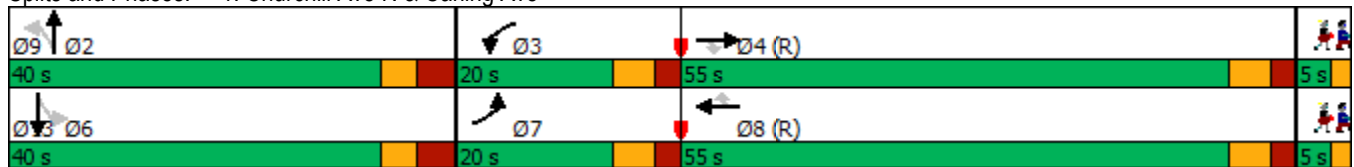
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Future Background 2022 PM
 1: Churchill Ave N & Carling Ave

02/03/2020

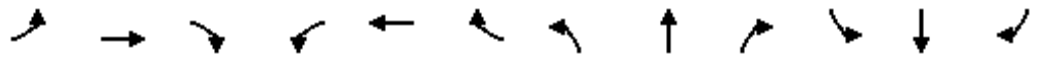
Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 92 (77%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 39.4 Intersection LOS: D
 Intersection Capacity Utilization 109.2% ICU Level of Service H
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Future Background 2022 PM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	641	1	241	1484	51	126	87	210	30	54	62
Future Volume (vph)	74	641	1	241	1484	51	126	87	210	30	54	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			187.7			103.0				97.5
Travel Time (s)		7.1			11.3			7.4				8.8
Lane Group Flow (vph)	74	641	1	241	1484	51	126	87	210	30	116	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	25.0	55.0	55.0	25.0	55.0	55.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	20.8%	45.8%	45.8%	20.8%	45.8%	45.8%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	80.5	72.9	72.9	88.6	78.9	78.9	18.4	18.4	18.4	18.4	18.4	18.4
Actuated g/C Ratio	0.67	0.61	0.61	0.74	0.66	0.66	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.31	0.31	0.00	0.43	0.67	0.05	0.70	0.32	0.58	0.16	0.40	
Control Delay	9.5	13.3	0.0	10.0	14.9	3.2	67.0	46.3	17.6	42.8	29.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	9.5	13.3	0.0	10.0	14.9	3.2	67.0	46.3	17.6	42.8	29.6	
LOS	A	B	A	B	B	A	E	D	B	D	C	
Approach Delay		12.9			13.9			38.2				32.3
Approach LOS		B			B			D				C
Queue Length 50th (m)	3.9	35.2	0.0	17.3	71.7	0.4	28.6	18.6	9.2	6.2	14.4	
Queue Length 95th (m)	10.5	61.8	0.0	m25.1	m90.6	m1.1	45.2	30.9	30.0	13.8	29.2	
Internal Link Dist (m)		94.2			163.7			79.0				73.5
Turn Bay Length (m)	20.0		20.0	120.0		20.0			5.0	20.0		
Base Capacity (vph)	405	2060	907	644	2228	960	328	496	528	342	486	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.31	0.00	0.37	0.67	0.05	0.38	0.18	0.40	0.09	0.24	

Intersection Summary

Area Type: Other

Future Background 2022 PM
 3: Carling Ave & Site Access

02/03/2020



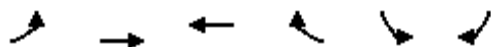
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (vph)	0	883	1790	1	0	13
Future Volume (vph)	0	883	1790	1	0	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		187.7	112.3		51.2	
Travel Time (s)		11.3	6.7		4.6	
Lane Group Flow (vph)	0	883	1791	0	0	13
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	62.3%
Analysis Period (min)	15
	ICU Level of Service B

Future Background 2022 PM
3: Carling Ave & Site Access

02/03/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	883	1790	1	0	13
Future Volume (Veh/h)	0	883	1790	1	0	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	883	1790	1	0	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		188	112			
pX, platoon unblocked	0.58				0.63	0.58
vC, conflicting volume	1791				2232	896
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	928				1164	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	427				118	633
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	442	442	1193	598	13	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	1	13	
cSH	1700	1700	1700	1700	633	
Volume to Capacity	0.26	0.26	0.70	0.35	0.02	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.5	
Control Delay (s)	0.0	0.0	0.0	0.0	10.8	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		10.8	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			62.3%		ICU Level of Service	B
Analysis Period (min)			15			

Future Background 2022 PM
 4: Cole Ave & Tillbury Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Future Volume (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		53.9			51.5			97.5			66.2	
Travel Time (s)		4.9			4.6			8.8			6.0	
Lane Group Flow (vph)	0	11	0	0	42	0	0	181	0	0	66	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

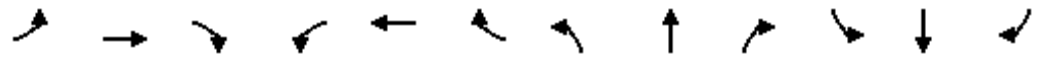
Control Type: Unsignalized

Intersection Capacity Utilization 27.8% ICU Level of Service A

Analysis Period (min) 15

Future Background 2022 PM
4: Cole Ave & Tillbury Ave

02/03/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	2	1	8	36	1	5	7	122	52	4	60	2
Future Volume (Veh/h)	2	1	8	36	1	5	7	122	52	4	60	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume												
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol												
tC, single (s)												
tC, 2 stage (s)												
tF (s)												
p0 queue free %												
cM capacity (veh/h)												
Direction, Lane #												
Volume Total												
Volume Left												
Volume Right												
cSH												
Volume to Capacity												
Queue Length 95th (m)												
Control Delay (s)												
Lane LOS												
Approach Delay (s)												
Approach LOS												
Intersection Summary												
Average Delay												
Intersection Capacity Utilization												
Analysis Period (min)												

Future Background 2022 PM
 5: Churchill Ave N & Tillbury Ave

02/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	9	25	31	464	454	17
Future Volume (vph)	9	25	31	464	454	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	65.8			93.3	43.5	
Travel Time (s)	5.9			6.7	3.1	
Lane Group Flow (vph)	34	0	0	495	471	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	62.6%
ICU Level of Service	B
Analysis Period (min)	15

Future Background 2022 PM
5: Churchill Ave N & Tillbury Ave

02/03/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	25	31	464	454	17
Future Volume (Veh/h)	9	25	31	464	454	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	25	31	464	454	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	988	462	471			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	988	462	471			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	96	97			
cM capacity (veh/h)	266	599	1091			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	34	495	471			
Volume Left	9	31	0			
Volume Right	25	0	17			
cSH	450	1091	1700			
Volume to Capacity	0.08	0.03	0.28			
Queue Length 95th (m)	1.9	0.7	0.0			
Control Delay (s)	13.7	0.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.7	0.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	0.9					
Intersection Capacity Utilization	62.6%			ICU Level of Service	B	
Analysis Period (min)	15					

Future Background 2027

Future Background 2027 AM
1: Churchill Ave N & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	1136	98	85	512	154	11	5	11	336	31	243
Future Volume (vph)	167	1136	98	85	512	154	11	5	11	336	31	243
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		113.4			137.3			90.4				92.0
Travel Time (s)		6.8			8.2			6.5				6.6
Lane Group Flow (vph)	167	1136	98	85	512	154	11	16	0	336	274	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	40.0	40.0		40.0		40.0
Total Split (%)	20.8%	41.7%	41.7%	20.8%	41.7%	41.7%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	16.0	56.3	56.3	11.3	49.0	49.0	36.0	36.0		36.0		36.0
Actuated g/C Ratio	0.13	0.47	0.47	0.09	0.41	0.41	0.30	0.30		0.30		0.30
v/c Ratio	0.74	0.71	0.13	0.53	0.37	0.24	0.05	0.03		0.86		0.44
Control Delay	88.5	16.9	1.5	63.2	26.9	9.9	29.2	17.1		60.8		8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	88.5	16.9	1.5	63.2	26.9	9.9	29.2	17.1		60.8		8.0
LOS	F	B	A	E	C	A	C	B		E		A
Approach Delay		24.4			27.5			22.0				37.1
Approach LOS		C			C			C				D
Queue Length 50th (m)	37.6	119.8	0.0	19.4	45.7	6.8	1.8	0.8		72.4		5.1
Queue Length 95th (m)	64.2	77.5	m2.7	34.4	61.9	21.6	6.2	5.9		#119.1		25.6
Internal Link Dist (m)		89.4			113.3			66.4				68.0
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	266	1589	733	266	1384	650	245	488		401		627
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.71	0.13	0.32	0.37	0.24	0.04	0.03		0.84		0.44

Intersection Summary

Area Type: Other

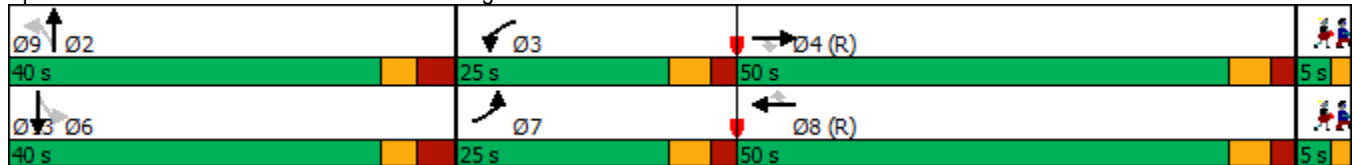
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Future Background 2027 AM
 1: Churchill Ave N & Carling Ave

02/03/2020

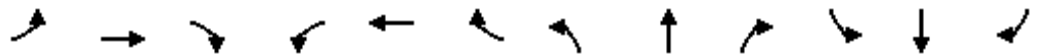
Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 101 (84%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 28.0 Intersection LOS: C
 Intersection Capacity Utilization 80.9% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Future Background 2027 AM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1244	0	232	505	31	121	51	147	35	63	66
Future Volume (vph)	60	1244	0	232	505	31	121	51	147	35	63	66
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			186.6			103.0				94.6
Travel Time (s)		7.1			11.2			7.4				8.5
Lane Group Flow (vph)	60	1244	0	232	505	31	121	51	147	35	129	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	23.0	60.0	60.0	23.0	60.0	60.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	19.2%	50.0%	50.0%	19.2%	50.0%	50.0%	30.8%	30.8%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	75.5	68.4		90.2	79.9	79.9	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.63	0.57		0.75	0.67	0.67	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.11	0.64		0.62	0.22	0.03	0.74	0.19	0.43	0.19	0.47	0.47
Control Delay	6.7	21.6		32.3	7.9	0.1	73.5	43.8	10.4	44.2	35.2	35.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.7	21.6		32.3	7.9	0.1	73.5	43.8	10.4	44.2	35.2	35.2
LOS	A	C		C	A	A	E	D	B	D	D	D
Approach Delay		20.9			14.9			39.7				37.2
Approach LOS		C			B			D				D
Queue Length 50th (m)	3.1	100.1		37.7	18.4	0.0	27.7	10.7	0.0	7.3	18.7	18.7
Queue Length 95th (m)	8.5	159.7		65.0	29.2	m0.3	44.8	20.5	16.3	15.6	34.7	34.7
Internal Link Dist (m)		94.2			162.6			79.0				70.6
Turn Bay Length (m)	20.0			120.0		20.0			5.0	20.0		
Base Capacity (vph)	717	1931		410	2257	1003	280	451	483	322	444	444
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.64		0.57	0.22	0.03	0.43	0.11	0.30	0.11	0.29	0.29

Intersection Summary

Area Type: Other

Future Background 2027 AM
 3: Carling Ave & Site Access

02/03/2020



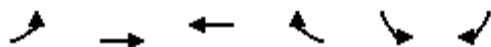
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	1414	769	10	0	1
Future Volume (vph)	0	1414	769	10	0	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		186.6	113.4		53.7	
Travel Time (s)		11.2	6.8		4.8	
Lane Group Flow (vph)	0	1414	779	0	0	1
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	44.6%
Analysis Period (min)	15
	ICU Level of Service A

Future Background 2027 AM
3: Carling Ave & Site Access

02/03/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	1414	769	10	0	1
Future Volume (Veh/h)	0	1414	769	10	0	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1414	769	10	0	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		187	113			
pX, platoon unblocked	0.90				0.80	0.90
vC, conflicting volume	779				1481	390
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	530				527	97
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	929				384	846
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	707	707	513	266	1	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	10	1	
cSH	1700	1700	1700	1700	846	
Volume to Capacity	0.42	0.42	0.30	0.16	0.00	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	
Control Delay (s)	0.0	0.0	0.0	0.0	9.3	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.3	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			44.6%		ICU Level of Service	A
Analysis Period (min)			15			

Future Background 2027 AM
 4: Cole Ave & Tillbury Ave

02/03/2020



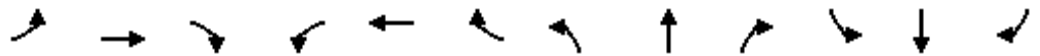
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	1	1	2	49	0	2	1	86	24	3	96	0
Future Volume (vph)	1	1	2	49	0	2	1	86	24	3	96	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		49.8			50.6			94.6			65.7	
Travel Time (s)		4.5			4.6			8.5			5.9	
Lane Group Flow (vph)	0	4	0	0	51	0	0	111	0	0	99	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	23.2%
ICU Level of Service	A
Analysis Period (min)	15

Future Background 2027 AM
4: Cole Ave & Tillbury Ave

02/03/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	1	2	49	0	2	1	86	24	3	96	0
Future Volume (Veh/h)	1	1	2	49	0	2	1	86	24	3	96	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	1	2	49	0	2	1	86	24	3	96	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	204	214	96	204	202	98	96			110		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	204	214	96	204	202	98	96			110		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	100	100			100		
cM capacity (veh/h)	751	682	960	749	692	958	1498			1480		
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	4	51	111	99								
Volume Left	1	49	1	3								
Volume Right	2	2	24	0								
cSH	819	756	1498	1480								
Volume to Capacity	0.00	0.07	0.00	0.00								
Queue Length 95th (m)	0.1	1.6	0.0	0.0								
Control Delay (s)	9.4	10.1	0.1	0.2								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.4	10.1	0.1	0.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			23.2%	ICU Level of Service	A							
Analysis Period (min)			15									

Future Background 2027 AM
 5: Churchill Ave N & Tillbury Ave

02/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	32	14	315	578	16
Future Volume (vph)	4	32	14	315	578	16
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	70.0			92.0	39.3	
Travel Time (s)	6.3			6.6	2.8	
Lane Group Flow (vph)	36	0	0	329	594	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	43.1%
Analysis Period (min)	15
	ICU Level of Service A

Future Background 2027 AM
5: Churchill Ave N & Tillbury Ave

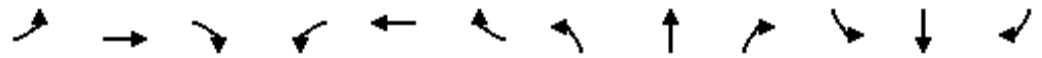
02/03/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	32	14	315	578	16
Future Volume (Veh/h)	4	32	14	315	578	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	4	32	14	315	578	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	92					
pX, platoon unblocked						
vC, conflicting volume	929	586	594			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	929	586	594			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	94	99			
cM capacity (veh/h)	293	510	982			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	36	329	594			
Volume Left	4	14	0			
Volume Right	32	0	16			
cSH	471	982	1700			
Volume to Capacity	0.08	0.01	0.35			
Queue Length 95th (m)	1.9	0.3	0.0			
Control Delay (s)	13.3	0.5	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.3	0.5	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			43.1%	ICU Level of Service	A	
Analysis Period (min)			15			

Future Background 2027 PM
1: Churchill Ave N & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	231	666	18	19	1497	218	96	33	26	182	7	269
Future Volume (vph)	231	666	18	19	1497	218	96	33	26	182	7	269
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		111.2			137.3			86.0				92.6
Travel Time (s)		6.7			8.2			6.2				6.7
Lane Group Flow (vph)	231	666	18	19	1497	218	96	59	0	182	276	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	20.0	55.0	55.0	20.0	55.0	55.0	40.0	40.0		40.0		40.0
Total Split (%)	16.7%	45.8%	45.8%	16.7%	45.8%	45.8%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	25.9	78.4	78.4	7.0	52.2	52.2	22.9	22.9		22.9		22.9
Actuated g/C Ratio	0.22	0.65	0.65	0.06	0.44	0.44	0.19	0.19		0.19		0.19
v/c Ratio	0.63	0.30	0.02	0.19	1.02	0.32	0.92	0.18		0.75		0.56
Control Delay	68.9	8.5	0.1	57.8	61.7	12.8	116.1	24.1		63.9		9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	68.9	8.5	0.1	57.8	61.7	12.8	116.1	24.1		63.9		9.3
LOS	E	A	A	E	E	B	F	C		E		A
Approach Delay		23.6			55.5			81.1				31.0
Approach LOS		C			E			F				C
Queue Length 50th (m)	57.1	22.1	0.0	4.4	~189.1	15.5	22.5	6.5		41.1		1.4
Queue Length 95th (m)	#97.8	35.3	m0.0	11.9	#250.2	34.9	#44.9	16.2		60.1		21.9
Internal Link Dist (m)		87.2			113.3			62.0				68.6
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	366	2215	971	196	1474	688	151	475		351		600
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.30	0.02	0.10	1.02	0.32	0.64	0.12		0.52		0.46

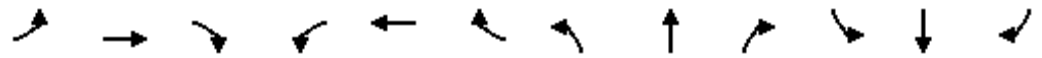
Intersection Summary

Area Type: Other

Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Future Background 2027 PM
2: Clyde Ave/Cole Ave & Carling Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	673	1	241	1558	51	126	87	210	30	54	62
Future Volume (vph)	74	673	1	241	1558	51	126	87	210	30	54	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			188.8			103.0				93.9
Travel Time (s)		7.1			11.3			7.4				8.5
Lane Group Flow (vph)	74	673	1	241	1558	51	126	87	210	30	116	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	25.0	55.0	55.0	25.0	55.0	55.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	20.8%	45.8%	45.8%	20.8%	45.8%	45.8%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	80.5	72.9	72.9	88.6	78.9	78.9	18.4	18.4	18.4	18.4	18.4	18.4
Actuated g/C Ratio	0.67	0.61	0.61	0.74	0.66	0.66	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.34	0.33	0.00	0.44	0.70	0.05	0.70	0.32	0.58	0.16	0.40	
Control Delay	10.4	13.5	0.0	10.6	16.3	3.1	67.0	46.3	17.6	42.8	29.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.4	13.5	0.0	10.6	16.3	3.1	67.0	46.3	17.6	42.8	29.6	
LOS	B	B	A	B	B	A	E	D	B	D	C	
Approach Delay		13.2			15.2			38.2				32.3
Approach LOS		B			B			D				C
Queue Length 50th (m)	3.9	37.4	0.0	18.5	79.3	0.4	28.6	18.6	9.2	6.2	14.4	
Queue Length 95th (m)	10.5	65.4	0.0	m24.2	m91.1	m1.0	45.2	30.9	30.0	13.8	29.2	
Internal Link Dist (m)		94.2			164.8			79.0				69.9
Turn Bay Length (m)	20.0		20.0	120.0		20.0			5.0	20.0		
Base Capacity (vph)	388	2060	907	629	2228	960	328	496	528	342	486	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.33	0.00	0.38	0.70	0.05	0.38	0.18	0.40	0.09	0.24	

Intersection Summary

Area Type: Other

Future Background 2027 PM
 3: Carling Ave & Site Access

02/03/2020



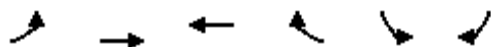
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (vph)	0	927	1880	1	0	13
Future Volume (vph)	0	927	1880	1	0	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		188.8	111.2		51.5	
Travel Time (s)		11.3	6.7		4.6	
Lane Group Flow (vph)	0	927	1881	0	0	13
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	64.9%
ICU Level of Service	C
Analysis Period (min)	15

Future Background 2027 PM
3: Carling Ave & Site Access

02/03/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (veh/h)	0	927	1880	1	0	13
Future Volume (Veh/h)	0	927	1880	1	0	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	927	1880	1	0	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		189	111			
pX, platoon unblocked	0.57				0.62	0.57
vC, conflicting volume	1881				2344	940
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1043				1273	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	379				98	620
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	464	464	1253	628	13	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	1	13	
cSH	1700	1700	1700	1700	620	
Volume to Capacity	0.27	0.27	0.74	0.37	0.02	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.5	
Control Delay (s)	0.0	0.0	0.0	0.0	10.9	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		10.9	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			64.9%		ICU Level of Service	C
Analysis Period (min)			15			

Future Background 2027 PM
 4: Cole Ave & Tillbury Ave

02/03/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Future Volume (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		45.1			46.3			93.9			62.0	
Travel Time (s)		4.1			4.2			8.5			5.6	
Lane Group Flow (vph)	0	11	0	0	42	0	0	181	0	0	66	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

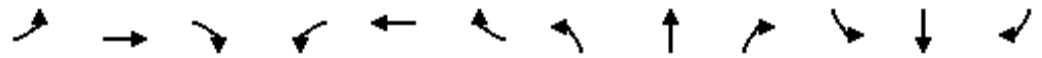
Control Type: Unsignalized

Intersection Capacity Utilization 27.8% ICU Level of Service A

Analysis Period (min) 15

Future Background 2027 PM
4: Cole Ave & Tillbury Ave

02/03/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	2	1	8	36	1	5	7	122	52	4	60	2
Future Volume (Veh/h)	2	1	8	36	1	5	7	122	52	4	60	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	1	8	36	1	5	7	122	52	4	60	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume												
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol												
tC, single (s)												
tC, 2 stage (s)												
tF (s)												
p0 queue free %												
cM capacity (veh/h)												
Direction, Lane #												
Volume Total												
Volume Left												
Volume Right												
cSH												
Volume to Capacity												
Queue Length 95th (m)												
Control Delay (s)												
Lane LOS												
Approach Delay (s)												
Approach LOS												
Intersection Summary												
Average Delay												
Intersection Capacity Utilization												
Analysis Period (min)												

Future Background 2027 PM
 5: Churchill Ave N & Tillbury Ave

02/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	9	25	31	464	454	17
Future Volume (vph)	9	25	31	464	454	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	69.2			92.6	40.9	
Travel Time (s)	6.2			6.7	2.9	
Lane Group Flow (vph)	34	0	0	495	471	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 62.6% ICU Level of Service B

Analysis Period (min) 15

Future Background 2027 PM
5: Churchill Ave N & Tillbury Ave

02/03/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	25	31	464	454	17
Future Volume (Veh/h)	9	25	31	464	454	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	25	31	464	454	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	988	462	471			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	988	462	471			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	96	97			
cM capacity (veh/h)	266	599	1091			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	34	495	471			
Volume Left	9	31	0			
Volume Right	25	0	17			
cSH	450	1091	1700			
Volume to Capacity	0.08	0.03	0.28			
Queue Length 95th (m)	1.9	0.7	0.0			
Control Delay (s)	13.7	0.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.7	0.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	0.9					
Intersection Capacity Utilization	62.6%			ICU Level of Service	B	
Analysis Period (min)	15					

Total Projected 2022

Total Projected 2022 AM
1: Churchill Ave N & Carling Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	1119	98	85	498	154	11	5	11	347	31	247
Future Volume (vph)	169	1119	98	85	498	154	11	5	11	347	31	247
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		115.1			137.3			90.4				90.1
Travel Time (s)		6.9			8.2			6.5				6.5
Lane Group Flow (vph)	169	1119	98	85	498	154	11	16	0	347	278	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	40.0	40.0		40.0		40.0
Total Split (%)	20.8%	41.7%	41.7%	20.8%	41.7%	41.7%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	16.1	55.4	55.4	11.3	48.0	48.0	36.9	36.9		36.9		36.9
Actuated g/C Ratio	0.13	0.46	0.46	0.09	0.40	0.40	0.31	0.31		0.31		0.31
v/c Ratio	0.75	0.72	0.14	0.53	0.37	0.24	0.04	0.03		0.86		0.44
Control Delay	89.6	16.3	1.1	63.2	27.2	10.0	29.2	17.1		60.8		7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	89.6	16.3	1.1	63.2	27.2	10.0	29.2	17.1		60.8		7.9
LOS	F	B	A	E	C	A	C	B		E		A
Approach Delay		24.2			27.8			22.0				37.3
Approach LOS		C			C			C				D
Queue Length 50th (m)	39.6	112.1	0.0	19.4	44.3	6.9	1.8	0.8		75.6		5.1
Queue Length 95th (m)	64.5	57.6	m2.5	34.4	60.1	21.6	6.2	5.9		#125.4		25.6
Internal Link Dist (m)		91.1			113.3			66.4				66.1
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	266	1563	723	266	1356	639	247	493		405		634
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.64	0.72	0.14	0.32	0.37	0.24	0.04	0.03		0.86		0.44

Intersection Summary

Area Type: Other

Total Projected 2022 AM
 1: Churchill Ave N & Carling Ave

10/20/2020

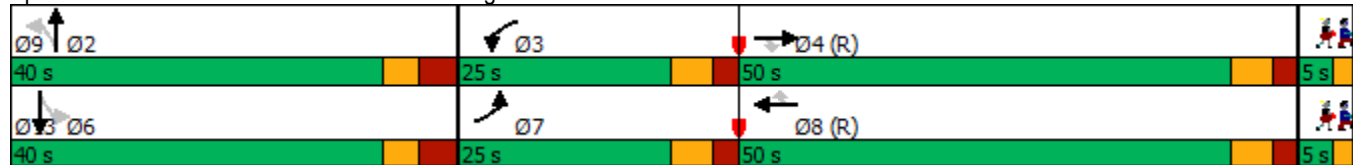
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Total Projected 2022 AM
 1: Churchill Ave N & Carling Ave

10/20/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 101 (84%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 28.1 Intersection LOS: C
 Intersection Capacity Utilization 80.7% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Total Projected 2022 AM
2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	1187	0	269	492	57	121	51	147	35	63	66
Future Volume (vph)	61	1187	0	269	492	57	121	51	147	35	63	66
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			185.0			103.0				95.8
Travel Time (s)		7.1			11.1			7.4				8.6
Lane Group Flow (vph)	61	1187	0	269	492	57	121	51	147	35	129	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	23.0	60.0	60.0	23.0	60.0	60.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	19.2%	50.0%	50.0%	19.2%	50.0%	50.0%	30.8%	30.8%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	73.9	66.8		90.2	79.9	79.9	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.62	0.56		0.75	0.67	0.67	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.11	0.63		0.66	0.22	0.06	0.74	0.19	0.43	0.19	0.47	0.47
Control Delay	6.9	22.0		32.5	8.0	0.6	73.5	43.8	10.4	44.2	35.2	35.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.9	22.0		32.5	8.0	0.6	73.5	43.8	10.4	44.2	35.2	35.2
LOS	A	C		C	A	A	E	D	B	D	D	D
Approach Delay		21.3			15.5			39.7				37.2
Approach LOS		C			B			D				D
Queue Length 50th (m)	3.2	97.2		42.4	18.4	0.2	27.7	10.7	0.0	7.3	18.7	18.7
Queue Length 95th (m)	8.6	148.5		71.3	29.7	1.1	44.8	20.5	16.3	15.6	34.7	34.7
Internal Link Dist (m)		94.2			161.0			79.0				71.8
Turn Bay Length (m)	20.0			120.0		20.0			5.0	20.0		
Base Capacity (vph)	715	1887		428	2257	1002	280	451	483	322	444	444
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.63		0.63	0.22	0.06	0.43	0.11	0.30	0.11	0.29	0.29

Intersection Summary

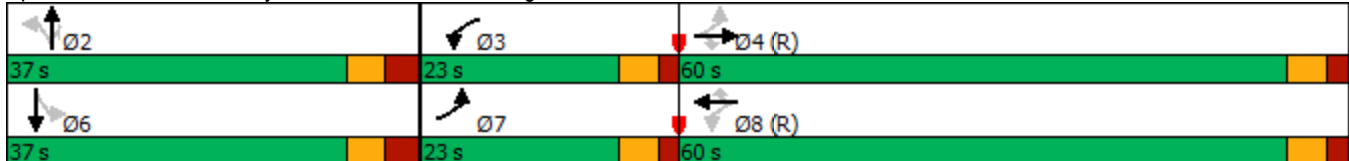
Area Type: Other

Total Projected 2022 AM
 2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020

Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 22.8	Intersection LOS: C
Intersection Capacity Utilization 93.2%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 2: Clyde Ave/Cole Ave & Carling Ave



Total Projected 2022 AM
 3: Carling Ave & Site Access

10/20/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	1387	732	26	0	75
Future Volume (vph)	0	1387	732	26	0	75
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		185.0	115.1		49.0	
Travel Time (s)		11.1	6.9		4.4	
Lane Group Flow (vph)	0	1387	758	0	0	75
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

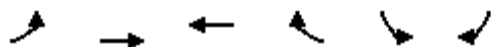
Control Type: Unsignalized

Intersection Capacity Utilization 43.8% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2022 AM
3: Carling Ave & Site Access

10/20/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	1387	732	26	0	75
Future Volume (Veh/h)	0	1387	732	26	0	75
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1387	732	26	0	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		185	115			
pX, platoon unblocked	0.90				0.81	0.90
vC, conflicting volume	758				1438	379
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	512				516	92
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	91
cM capacity (veh/h)	946				395	854
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	694	694	488	270	75	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	26	75	
cSH	1700	1700	1700	1700	854	
Volume to Capacity	0.41	0.41	0.29	0.16	0.09	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	2.2	
Control Delay (s)	0.0	0.0	0.0	0.0	9.6	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.6	
Approach LOS					A	
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			43.8%		ICU Level of Service	A
Analysis Period (min)			15			

Total Projected 2022 AM
4: Cole Ave & Tillbury Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Future Volume (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		51.0			51.8			95.8			66.5	
Travel Time (s)		4.6			4.7			8.6			6.0	
Lane Group Flow (vph)	0	4	0	0	51	0	0	138	0	0	99	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

















Control Type: Unsignalized

Intersection Capacity Utilization 24.4% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2022 AM
4: Cole Ave & Tillbury Ave

10/20/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	2	49	0	2	1	86	51	3	96	0
Future Volume (Veh/h)	1	1	2	49	0	2	1	86	51	3	96	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	218	241	96	218	216	112	96			137		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	218	241	96	218	216	112	96			137		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	100	100			100		
cM capacity (veh/h)	736	659	960	734	680	942	1498			1447		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	4	51	138	99								
Volume Left	1	49	1	3								
Volume Right	2	2	51	0								
cSH	806	741	1498	1447								
Volume to Capacity	0.00	0.07	0.00	0.00								
Queue Length 95th (m)	0.1	1.7	0.0	0.0								
Control Delay (s)	9.5	10.2	0.1	0.2								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.5	10.2	0.1	0.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			24.4%		ICU Level of Service				A			
Analysis Period (min)			15									

Total Projected 2022 AM
 5: Churchill Ave N & Tillbury Ave

10/20/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	19	44	14	315	581	16
Future Volume (vph)	19	44	14	315	581	16
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	69.4			90.1	43.5	
Travel Time (s)	6.2			6.5	3.1	
Lane Group Flow (vph)	63	0	0	329	597	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 43.9% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2022 AM
5: Churchill Ave N & Tillbury Ave

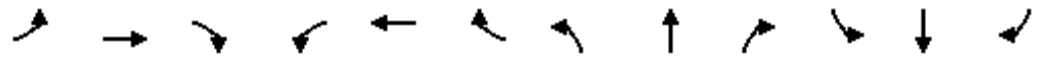
10/20/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	44	14	315	581	16
Future Volume (Veh/h)	19	44	14	315	581	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	19	44	14	315	581	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	90					
pX, platoon unblocked						
vC, conflicting volume	932	589	597			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	932	589	597			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	91	99			
cM capacity (veh/h)	292	508	980			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	63	329	597			
Volume Left	19	14	0			
Volume Right	44	0	16			
cSH	415	980	1700			
Volume to Capacity	0.15	0.01	0.35			
Queue Length 95th (m)	4.0	0.3	0.0			
Control Delay (s)	15.2	0.5	0.0			
Lane LOS	C	A				
Approach Delay (s)	15.2	0.5	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			43.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Total Projected 2022 PM
1: Churchill Ave N & Carling Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	238	652	18	19	1471	218	96	33	26	187	7	286
Future Volume (vph)	238	652	18	19	1471	218	96	33	26	187	7	286
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		106.9			137.3			86.0				92.7
Travel Time (s)		6.4			8.2			6.2				6.7
Lane Group Flow (vph)	238	652	18	19	1471	218	96	59	0	187	293	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	20.0	55.0	55.0	20.0	55.0	55.0	40.0	40.0		40.0		40.0
Total Split (%)	16.7%	45.8%	45.8%	16.7%	45.8%	45.8%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	26.6	77.8	77.8	7.0	50.9	50.9	23.5	23.5		23.5		23.5
Actuated g/C Ratio	0.22	0.65	0.65	0.06	0.42	0.42	0.20	0.20		0.20		0.20
v/c Ratio	0.63	0.30	0.02	0.19	1.02	0.32	0.98	0.17		0.75		0.57
Control Delay	67.7	8.8	0.1	57.8	64.7	13.1	133.4	23.8		63.1		9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	67.7	8.8	0.1	57.8	64.7	13.1	133.4	23.8		63.1		9.2
LOS	E	A	A	E	E	B	F	C		E		A
Approach Delay		24.1			58.0			91.7				30.2
Approach LOS		C			E			F				C
Queue Length 50th (m)	58.7	22.1	0.0	4.4	~196.8	16.1	22.6	6.4		41.8		1.5
Queue Length 95th (m)	#102.9	35.3	m0.0	11.9	#243.5	34.9	#47.5	16.1		61.1		22.6
Internal Link Dist (m)		82.9			113.3			62.0				68.7
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	375	2198	964	196	1437	673	138	475		351		612
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.30	0.02	0.10	1.02	0.32	0.70	0.12		0.53		0.48

Intersection Summary

Area Type: Other

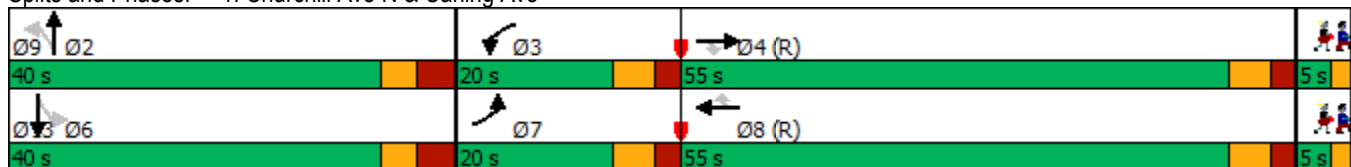
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Total Projected 2022 PM
 1: Churchill Ave N & Carling Ave

10/20/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 92 (77%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 135
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.02
 Intersection Signal Delay: 46.0 Intersection LOS: D
 Intersection Capacity Utilization 111.4% ICU Level of Service H
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Total Projected 2022 PM
2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020



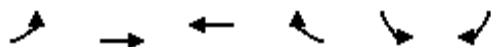
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	648	1	259	1489	63	126	87	210	30	54	62
Future Volume (vph)	77	648	1	259	1489	63	126	87	210	30	54	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			193.2			103.0				96.4
Travel Time (s)		7.1			11.6			7.4				8.7
Lane Group Flow (vph)	77	648	1	259	1489	63	126	87	210	30	116	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	25.0	55.0	55.0	25.0	55.0	55.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	20.8%	45.8%	45.8%	20.8%	45.8%	45.8%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	80.1	72.4	72.4	88.8	78.8	78.8	18.4	18.4	18.4	18.4	18.4	18.4
Actuated g/C Ratio	0.67	0.60	0.60	0.74	0.66	0.66	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.33	0.32	0.00	0.46	0.67	0.07	0.70	0.32	0.58	0.16	0.40	
Control Delay	9.8	13.6	0.0	10.9	15.4	4.2	67.0	46.3	17.6	42.8	29.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	9.8	13.6	0.0	10.9	15.4	4.2	67.0	46.3	17.6	42.8	29.6	
LOS	A	B	A	B	B	A	E	D	B	D	C	
Approach Delay		13.2			14.4			38.2				32.3
Approach LOS		B			B			D				C
Queue Length 50th (m)	4.1	36.0	0.0	20.6	78.4	1.0	28.6	18.6	9.2	6.2	14.4	
Queue Length 95th (m)	10.7	63.5	0.0	m26.0	m88.0	m1.6	45.2	30.9	30.0	13.8	29.2	
Internal Link Dist (m)		94.2			169.2			79.0				72.4
Turn Bay Length (m)	20.0		20.0	120.0		20.0			5.0	20.0		
Base Capacity (vph)	403	2046	901	638	2224	959	328	496	528	342	486	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.32	0.00	0.41	0.67	0.07	0.38	0.18	0.40	0.09	0.24	

Intersection Summary

Area Type: Other

Total Projected 2022 PM
 3: Carling Ave & Site Access

10/20/2020

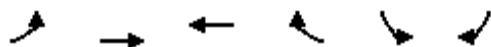


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	908	1790	70	0	48
Future Volume (vph)	0	908	1790	70	0	48
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		193.2	106.9		51.1	
Travel Time (s)		11.6	6.4		4.6	
Lane Group Flow (vph)	0	908	1860	0	0	48
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	64.6% ICU Level of Service C
Analysis Period (min)	15

Total Projected 2022 PM
3: Carling Ave & Site Access

10/20/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	908	1790	70	0	48
Future Volume (Veh/h)	0	908	1790	70	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	908	1790	70	0	48
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		193	107			
pX, platoon unblocked	0.58				0.63	0.58
vC, conflicting volume	1860				2279	930
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1042				1223	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	386				107	631
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	454	454	1193	667	48	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	70	48	
cSH	1700	1700	1700	1700	631	
Volume to Capacity	0.27	0.27	0.70	0.39	0.08	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.9	
Control Delay (s)	0.0	0.0	0.0	0.0	11.2	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		11.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			64.6%		ICU Level of Service	C
Analysis Period (min)			15			

Total Projected 2022 PM
4: Cole Ave & Tillbury Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Future Volume (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		45.6			49.4			96.4			68.4	
Travel Time (s)		4.1			4.4			8.7			6.2	
Lane Group Flow (vph)	0	11	0	0	42	0	0	196	0	0	66	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 28.8% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2022 PM
4: Cole Ave & Tillbury Ave

10/20/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	2	1	8	36	1	5	7	122	67	4	60	2
Future Volume (Veh/h)	2	1	8	36	1	5	7	122	67	4	60	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume												
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol												
tC, single (s)												
tC, 2 stage (s)												
tF (s)												
p0 queue free %												
cM capacity (veh/h)												
Direction, Lane #												
Volume Total												
Volume Left												
Volume Right												
cSH												
Volume to Capacity												
Queue Length 95th (m)												
Control Delay (s)												
Lane LOS												
Approach Delay (s)												
Approach LOS												
Intersection Summary												
Average Delay												
Intersection Capacity Utilization												
Analysis Period (min)												

Total Projected 2022 PM
 5: Churchill Ave N & Tillbury Ave

10/20/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	33	31	464	468	17
Future Volume (vph)	16	33	31	464	468	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	72.6			92.7	35.3	
Travel Time (s)	6.5			6.7	2.5	
Lane Group Flow (vph)	49	0	0	495	485	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 62.6% ICU Level of Service B

Analysis Period (min) 15

Total Projected 2022 PM
5: Churchill Ave N & Tillbury Ave

10/20/2020

























Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	33	31	464	468	17
Future Volume (Veh/h)	16	33	31	464	468	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	16	33	31	464	468	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	1002	476	485			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1002	476	485			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	94	97			
cM capacity (veh/h)	261	589	1078			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	49	495	485			
Volume Left	16	31	0			
Volume Right	33	0	17			
cSH	417	1078	1700			
Volume to Capacity	0.12	0.03	0.29			
Queue Length 95th (m)	3.0	0.7	0.0			
Control Delay (s)	14.8	0.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.8	0.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	1.1					
Intersection Capacity Utilization	62.6%			ICU Level of Service	B	
Analysis Period (min)	15					

Total Projected 2027

Total Projected 2027 AM
1: Churchill Ave N & Carling Ave

10/20/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	1173	98	85	522	154	11	5	11	347	31	247
Future Volume (vph)	169	1173	98	85	522	154	11	5	11	347	31	247
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		112.5			137.3			90.4				92.6
Travel Time (s)		6.8			8.2			6.5				6.7
Lane Group Flow (vph)	169	1173	98	85	522	154	11	16	0	347	278	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	40.0	40.0		40.0		40.0
Total Split (%)	20.8%	41.7%	41.7%	20.8%	41.7%	41.7%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	16.1	55.4	55.4	11.3	48.0	48.0	36.9	36.9		36.9		36.9
Actuated g/C Ratio	0.13	0.46	0.46	0.09	0.40	0.40	0.31	0.31		0.31		0.31
v/c Ratio	0.75	0.75	0.14	0.53	0.38	0.24	0.04	0.03		0.86		0.44
Control Delay	89.9	17.3	1.5	63.2	27.5	10.0	29.2	17.1		60.8		7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	89.9	17.3	1.5	63.2	27.5	10.0	29.2	17.1		60.8		7.9
LOS	F	B	A	E	C	A	C	B		E		A
Approach Delay		24.7			27.9			22.0				37.3
Approach LOS		C			C			C				D
Queue Length 50th (m)	41.1	89.3	0.0	19.4	46.8	6.9	1.8	0.8		75.6		5.1
Queue Length 95th (m)	m63.5	#98.5	m2.6	34.4	63.2	21.6	6.2	5.9		#125.4		25.6
Internal Link Dist (m)		88.5			113.3			66.4				68.6
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	266	1563	723	266	1356	639	247	493		405		634
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.64	0.75	0.14	0.32	0.38	0.24	0.04	0.03		0.86		0.44
Intersection Summary												
Area Type:	Other											

Total Projected 2027 AM
 1: Churchill Ave N & Carling Ave

10/20/2020

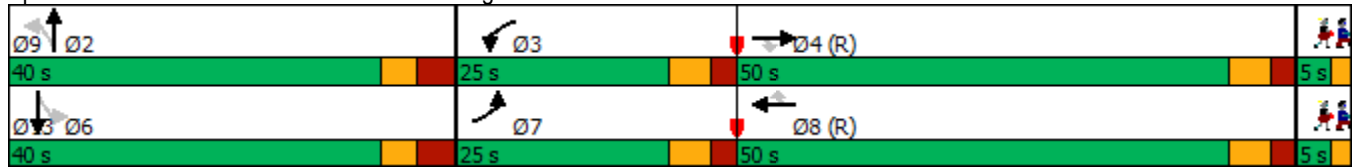
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Total Projected 2027 AM
 1: Churchill Ave N & Carling Ave

10/20/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 101 (84%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 28.3 Intersection LOS: C
 Intersection Capacity Utilization 82.3% ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Total Projected 2027 AM
2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	1246	0	269	516	57	121	51	147	35	63	66
Future Volume (vph)	61	1246	0	269	516	57	121	51	147	35	63	66
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			187.6			103.0				93.4
Travel Time (s)		7.1			11.3			7.4				8.4
Lane Group Flow (vph)	61	1246	0	269	516	57	121	51	147	35	129	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	23.0	60.0	60.0	23.0	60.0	60.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	19.2%	50.0%	50.0%	19.2%	50.0%	50.0%	30.8%	30.8%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	72.8	65.7		90.2	79.9	79.9	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.61	0.55		0.75	0.67	0.67	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.11	0.67		0.67	0.23	0.06	0.74	0.19	0.43	0.19	0.47	0.47
Control Delay	7.0	23.6		34.5	8.0	0.6	73.5	43.8	10.4	44.2	35.2	35.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	23.6		34.5	8.0	0.6	73.5	43.8	10.4	44.2	35.2	35.2
LOS	A	C		C	A	A	E	D	B	D	D	D
Approach Delay		22.9			16.0			39.7				37.2
Approach LOS		C			B			D				D
Queue Length 50th (m)	3.2	108.0		44.5	19.3	0.2	27.7	10.7	0.0	7.3	18.7	18.7
Queue Length 95th (m)	8.6	160.1		73.6	30.7	1.1	44.8	20.5	16.3	15.6	34.7	34.7
Internal Link Dist (m)		94.2			163.6			79.0				69.4
Turn Bay Length (m)	20.0			120.0		20.0			5.0	20.0		
Base Capacity (vph)	698	1856		414	2257	1002	280	451	483	322	444	444
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.67		0.65	0.23	0.06	0.43	0.11	0.30	0.11	0.29	0.29

Intersection Summary

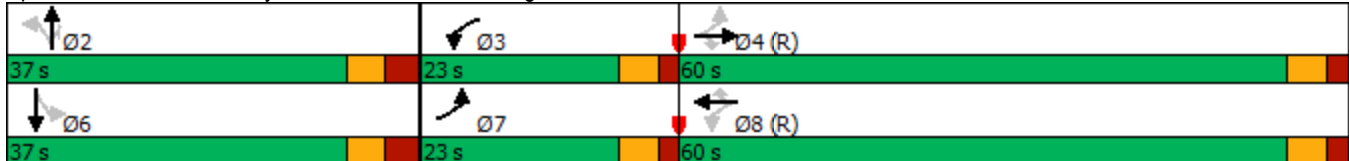
Area Type: Other

Total Projected 2027 AM
 2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020

Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 23.6	Intersection LOS: C
Intersection Capacity Utilization 94.9%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 2: Clyde Ave/Cole Ave & Carling Ave



Total Projected 2027 AM
 3: Carling Ave & Site Access

10/20/2020



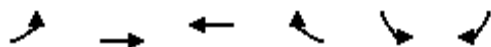
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	1453	769	26	0	75
Future Volume (vph)	0	1453	769	26	0	75
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		187.6	112.5		49.0	
Travel Time (s)		11.3	6.8		4.4	
Lane Group Flow (vph)	0	1453	795	0	0	75
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	45.7%
Analysis Period (min)	15
	ICU Level of Service A

Total Projected 2027 AM
3: Carling Ave & Site Access

10/20/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	1453	769	26	0	75
Future Volume (Veh/h)	0	1453	769	26	0	75
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1453	769	26	0	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		187	112			
pX, platoon unblocked	0.90				0.79	0.90
vC, conflicting volume	795				1508	398
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	537				499	92
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	91
cM capacity (veh/h)	920				393	847
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	726	726	513	282	75	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	26	75	
cSH	1700	1700	1700	1700	847	
Volume to Capacity	0.43	0.43	0.30	0.17	0.09	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	2.2	
Control Delay (s)	0.0	0.0	0.0	0.0	9.7	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.7	
Approach LOS					A	
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			45.7%		ICU Level of Service	A
Analysis Period (min)			15			

Total Projected 2027 AM
4: Cole Ave & Tillbury Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Future Volume (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		45.4			53.6			93.4			64.9	
Travel Time (s)		4.1			4.8			8.4			5.8	
Lane Group Flow (vph)	0	4	0	0	51	0	0	138	0	0	99	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 24.4% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2027 AM
4: Cole Ave & Tillbury Ave

10/20/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	1	2	49	0	2	1	86	51	3	96	0
Future Volume (Veh/h)	1	1	2	49	0	2	1	86	51	3	96	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	218	241	96	218	216	112	96			137		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	218	241	96	218	216	112	96			137		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	100	100			100		
cM capacity (veh/h)	736	659	960	734	680	942	1498			1447		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	4	51	138	99								
Volume Left	1	49	1	3								
Volume Right	2	2	51	0								
cSH	806	741	1498	1447								
Volume to Capacity	0.00	0.07	0.00	0.00								
Queue Length 95th (m)	0.1	1.7	0.0	0.0								
Control Delay (s)	9.5	10.2	0.1	0.2								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.5	10.2	0.1	0.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			24.4%		ICU Level of Service					A		
Analysis Period (min)			15									

Total Projected 2027 AM
 5: Churchill Ave N & Tillbury Ave

10/20/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	19	44	14	315	581	16
Future Volume (vph)	19	44	14	315	581	16
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	68.5			92.6	46.9	
Travel Time (s)	6.2			6.7	3.4	
Lane Group Flow (vph)	63	0	0	329	597	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 43.9% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2027 AM
5: Churchill Ave N & Tillbury Ave

10/20/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	44	14	315	581	16
Future Volume (Veh/h)	19	44	14	315	581	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	19	44	14	315	581	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	932	589	597			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	932	589	597			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	91	99			
cM capacity (veh/h)	292	508	980			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	63	329	597			
Volume Left	19	14	0			
Volume Right	44	0	16			
cSH	415	980	1700			
Volume to Capacity	0.15	0.01	0.35			
Queue Length 95th (m)	4.0	0.3	0.0			
Control Delay (s)	15.2	0.5	0.0			
Lane LOS	C	A				
Approach Delay (s)	15.2	0.5	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			43.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Total Projected 2027 PM
1: Churchill Ave N & Carling Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	238	684	18	19	1542	218	96	33	26	187	7	286
Future Volume (vph)	238	684	18	19	1542	218	96	33	26	187	7	286
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		111.6			137.3			86.0				93.0
Travel Time (s)		6.7			8.2			6.2				6.7
Lane Group Flow (vph)	238	684	18	19	1542	218	96	59	0	187	293	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	20.0	55.0	55.0	20.0	55.0	55.0	40.0	40.0		40.0		40.0
Total Split (%)	16.7%	45.8%	45.8%	16.7%	45.8%	45.8%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	26.6	77.8	77.8	7.0	50.9	50.9	23.5	23.5		23.5		23.5
Actuated g/C Ratio	0.22	0.65	0.65	0.06	0.42	0.42	0.20	0.20		0.20		0.20
v/c Ratio	0.63	0.31	0.02	0.19	1.07	0.32	0.98	0.17		0.75		0.57
Control Delay	67.9	8.7	0.1	57.8	80.1	13.1	133.4	23.8		63.1		9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	67.9	8.7	0.1	57.8	80.1	13.1	133.4	23.8		63.1		9.3
LOS	E	A	A	E	F	B	F	C		E		A
Approach Delay		23.6			71.6			91.7				30.3
Approach LOS		C			E			F				C
Queue Length 50th (m)	58.7	23.0	0.0	4.4	~215.1	16.1	22.6	6.4		41.8		1.7
Queue Length 95th (m)	#103.4	36.3	m0.0	11.9	#261.8	34.9	#47.5	16.1		61.1		22.9
Internal Link Dist (m)		87.6			113.3			62.0				69.0
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	375	2198	964	196	1437	673	138	475		351		611
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.31	0.02	0.10	1.07	0.32	0.70	0.12		0.53		0.48

Intersection Summary

Area Type: Other

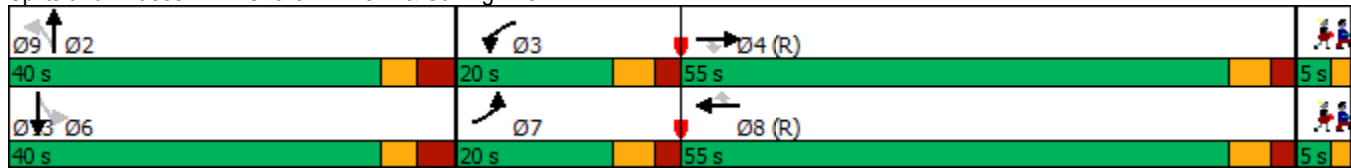
Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Total Projected 2027 PM
 1: Churchill Ave N & Carling Ave

10/20/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 92 (77%), Referenced to phase 4:EBT and 8:WBT, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.07
 Intersection Signal Delay: 53.2 Intersection LOS: D
 Intersection Capacity Utilization 113.4% ICU Level of Service H
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Churchill Ave N & Carling Ave



Total Projected 2027 PM
2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	680	1	259	1563	63	126	87	210	30	54	62
Future Volume (vph)	77	680	1	259	1563	63	126	87	210	30	54	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			188.5			103.0				96.0
Travel Time (s)		7.1			11.3			7.4				8.6
Lane Group Flow (vph)	77	680	1	259	1563	63	126	87	210	30	116	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	25.0	55.0	55.0	25.0	55.0	55.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	20.8%	45.8%	45.8%	20.8%	45.8%	45.8%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	80.1	72.4	72.4	88.8	78.8	78.8	18.4	18.4	18.4	18.4	18.4	18.4
Actuated g/C Ratio	0.67	0.60	0.60	0.74	0.66	0.66	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.35	0.33	0.00	0.48	0.70	0.07	0.70	0.32	0.58	0.16	0.40	
Control Delay	10.8	13.8	0.0	11.9	16.8	4.2	67.0	46.3	17.6	42.8	29.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.8	13.8	0.0	11.9	16.8	4.2	67.0	46.3	17.6	42.8	29.6	
LOS	B	B	A	B	B	A	E	D	B	D	C	
Approach Delay		13.5			15.7			38.2				32.3
Approach LOS		B			B			D				C
Queue Length 50th (m)	4.1	38.2	0.0	20.7	82.0	1.1	28.6	18.6	9.2	6.2	14.4	
Queue Length 95th (m)	10.7	67.2	0.0	m25.0	m87.7	m1.4	45.2	30.9	30.0	13.8	29.2	
Internal Link Dist (m)		94.2			164.5			79.0				72.0
Turn Bay Length (m)	20.0		20.0	120.0		20.0			5.0	20.0		
Base Capacity (vph)	387	2046	901	623	2224	959	328	496	528	342	486	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.33	0.00	0.42	0.70	0.07	0.38	0.18	0.40	0.09	0.24	

Intersection Summary

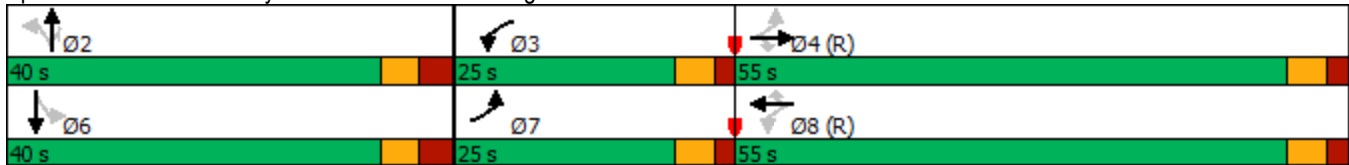
Area Type: Other

Total Projected 2027 PM
 2: Clyde Ave/Cole Ave & Carling Ave

10/20/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 93 (78%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.70
 Intersection Signal Delay: 18.9 Intersection LOS: B
 Intersection Capacity Utilization 83.5% ICU Level of Service E
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Clyde Ave/Cole Ave & Carling Ave



Total Projected 2027 PM
 3: Carling Ave & Site Access

10/20/2020



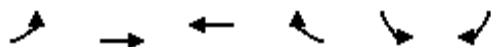
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	938	1880	48	0	30
Future Volume (vph)	0	938	1880	48	0	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		188.5	111.6		51.1	
Travel Time (s)		11.3	6.7		4.6	
Lane Group Flow (vph)	0	938	1928	0	0	30
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	66.5%
ICU Level of Service	C
Analysis Period (min)	15

Total Projected 2027 PM
3: Carling Ave & Site Access

10/20/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	938	1880	48	0	30
Future Volume (Veh/h)	0	938	1880	48	0	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	938	1880	48	0	30
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		188	112			
pX, platoon unblocked	0.58				0.63	0.58
vC, conflicting volume	1928				2373	964
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1160				1335	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	95
cM capacity (veh/h)	348				91	632
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	469	469	1253	675	30	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	48	30	
cSH	1700	1700	1700	1700	632	
Volume to Capacity	0.28	0.28	0.74	0.40	0.05	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.1	
Control Delay (s)	0.0	0.0	0.0	0.0	11.0	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		11.0	
Approach LOS					B	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			66.5%		ICU Level of Service	C
Analysis Period (min)			15			

Total Projected 2027 PM
4: Cole Ave & Tillbury Ave

10/20/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Future Volume (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		50.3			47.4			96.0			64.3	
Travel Time (s)		4.5			4.3			8.6			5.8	
Lane Group Flow (vph)	0	11	0	0	42	0	0	196	0	0	66	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 28.8% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2027 PM
4: Cole Ave & Tillbury Ave

10/20/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	2	1	8	36	1	5	7	122	67	4	60	2
Future Volume (Veh/h)	2	1	8	36	1	5	7	122	67	4	60	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)								96				
pX, platoon unblocked	0.98	0.98		0.98	0.98	0.98				0.98		
vC, conflicting volume	244	272	61	247	240	156	62			189		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	213	241	61	216	208	122	62			156		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	95	100	99	100			100		
cM capacity (veh/h)	717	639	1004	712	667	907	1541			1389		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	11	42	196	66								
Volume Left	2	36	7	4								
Volume Right	8	5	67	2								
cSH	893	730	1541	1389								
Volume to Capacity	0.01	0.06	0.00	0.00								
Queue Length 95th (m)	0.3	1.4	0.1	0.1								
Control Delay (s)	9.1	10.2	0.3	0.5								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.1	10.2	0.3	0.5								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			28.8%		ICU Level of Service					A		
Analysis Period (min)			15									

Total Projected 2027 PM
 5: Churchill Ave N & Tillbury Ave

10/20/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	33	31	464	468	17
Future Volume (vph)	16	33	31	464	468	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	70.0			93.0	32.3	
Travel Time (s)	6.3			6.7	2.3	
Lane Group Flow (vph)	49	0	0	495	485	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 62.6% ICU Level of Service B

Analysis Period (min) 15

Total Projected 2027 PM
5: Churchill Ave N & Tillbury Ave

10/20/2020



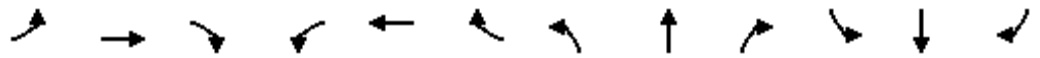
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	33	31	464	468	17
Future Volume (Veh/h)	16	33	31	464	468	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	16	33	31	464	468	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	1002	476	485			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1002	476	485			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	94	97			
cM capacity (veh/h)	261	589	1078			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	49	495	485			
Volume Left	16	31	0			
Volume Right	33	0	17			
cSH	417	1078	1700			
Volume to Capacity	0.12	0.03	0.29			
Queue Length 95th (m)	3.0	0.7	0.0			
Control Delay (s)	14.8	0.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.8	0.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			62.6%	ICU Level of Service	B	
Analysis Period (min)			15			

Total Projected 2027 (No Reduction)

Total Projected 2027 AM (No Reduction)

1: Churchill Ave N & Carling Ave

10/21/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	1457	98	85	651	154	11	5	11	347	31	247
Future Volume (vph)	169	1457	98	85	651	154	11	5	11	347	31	247
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		112.5			137.3			90.4				92.6
Travel Time (s)		6.8			8.2			6.5				6.7
Lane Group Flow (vph)	169	1457	98	85	651	154	11	16	0	347	278	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	25.0	50.0	50.0	25.0	50.0	50.0	40.0	40.0		40.0		40.0
Total Split (%)	20.8%	41.7%	41.7%	20.8%	41.7%	41.7%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	16.1	55.4	55.4	11.3	48.0	48.0	36.9	36.9		36.9		36.9
Actuated g/C Ratio	0.13	0.46	0.46	0.09	0.40	0.40	0.31	0.31		0.31		0.31
v/c Ratio	0.75	0.93	0.14	0.53	0.48	0.24	0.04	0.03		0.86		0.44
Control Delay	86.5	25.8	1.9	63.2	29.1	10.0	29.2	17.1		60.8		7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	86.5	25.8	1.9	63.2	29.1	10.0	29.2	17.1		60.8		7.9
LOS	F	C	A	E	C	A	C	B		E		A
Approach Delay		30.4			29.1			22.0				37.3
Approach LOS		C			C			C				D
Queue Length 50th (m)	42.4	~86.9	0.0	19.4	61.1	6.9	1.8	0.8		75.6		5.1
Queue Length 95th (m)	m51.5	#241.0	m1.7	34.4	80.6	21.6	6.2	5.9		#125.4		25.6
Internal Link Dist (m)		88.5			113.3			66.4				68.6
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	266	1563	723	266	1356	639	247	493		405		634
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.64	0.93	0.14	0.32	0.48	0.24	0.04	0.03		0.86		0.44

Intersection Summary

Area Type: Other

Total Projected 2027 AM (No Reduction)
 1: Churchill Ave N & Carling Ave

10/21/2020

Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Total Projected 2027 AM (No Reduction)

2: Clyde Ave/Cole Ave & Carling Ave

10/21/2020

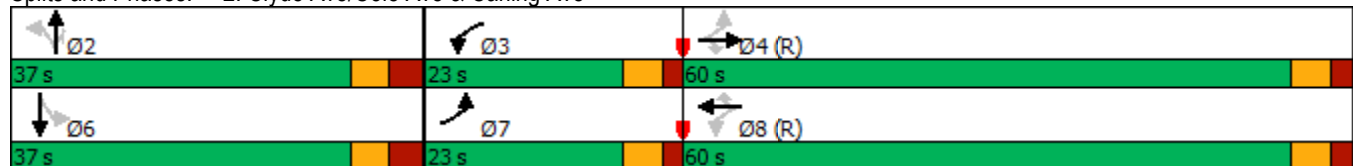
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	1557	0	269	642	57	121	51	147	35	63	66
Future Volume (vph)	61	1557	0	269	642	57	121	51	147	35	63	66
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			187.6			103.0				93.4
Travel Time (s)		7.1			11.3			7.4				8.4
Lane Group Flow (vph)	61	1557	0	269	642	57	121	51	147	35	129	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	23.0	60.0	60.0	23.0	60.0	60.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	19.2%	50.0%	50.0%	19.2%	50.0%	50.0%	30.8%	30.8%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	71.5	64.4		90.2	79.9	79.9	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.60	0.54		0.75	0.67	0.67	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.13	0.86		0.79	0.28	0.06	0.74	0.19	0.43	0.19	0.47	0.47
Control Delay	7.3	31.5		47.9	9.9	2.5	73.5	43.8	10.4	44.2	35.2	35.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	31.5		47.9	9.9	2.5	73.5	43.8	10.4	44.2	35.2	35.2
LOS	A	C		D	A	A	E	D	B	D	D	D
Approach Delay		30.6			20.0			39.7				37.2
Approach LOS		C			B			D				D
Queue Length 50th (m)	3.2	163.2		52.3	23.4	0.1	27.7	10.7	0.0	7.3	18.7	18.7
Queue Length 95th (m)	8.6	#246.6		#84.7	46.0	3.6	44.8	20.5	16.3	15.6	34.7	34.7
Internal Link Dist (m)		94.2			163.6			79.0				69.4
Turn Bay Length (m)	20.0			120.0		20.0			5.0	20.0		
Base Capacity (vph)	640	1820		351	2257	1002	280	451	483	322	444	444
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.86		0.77	0.28	0.06	0.43	0.11	0.30	0.11	0.29	0.29
Intersection Summary												
Area Type:	Other											

Total Projected 2027 AM (No Reduction)
 2: Clyde Ave/Cole Ave & Carling Ave

10/21/2020

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 84 (70%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
 Natural Cycle: 115
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 28.5 Intersection LOS: C
 Intersection Capacity Utilization 104.0% ICU Level of Service G
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

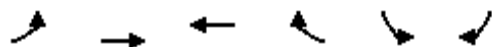
Splits and Phases: 2: Clyde Ave/Cole Ave & Carling Ave



Total Projected 2027 AM (No Reduction)

3: Carling Ave & Site Access

10/21/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	1737	897	26	0	75
Future Volume (vph)	0	1737	897	26	0	75
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		187.6	112.5		49.0	
Travel Time (s)		11.3	6.8		4.4	
Lane Group Flow (vph)	0	1737	923	0	0	75
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

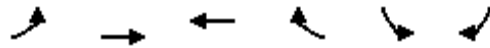
Intersection Capacity Utilization 54.0% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2027 AM (No Reduction)

3: Carling Ave & Site Access

10/21/2020

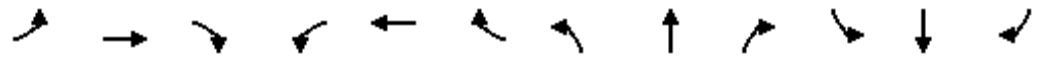


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	1737	897	26	0	75
Future Volume (Veh/h)	0	1737	897	26	0	75
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1737	897	26	0	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		187	112			
pX, platoon unblocked	0.86				0.66	0.86
vC, conflicting volume	923				1778	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	587				205	51
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	91
cM capacity (veh/h)	847				505	866
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	868	868	598	325	75	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	26	75	
cSH	1700	1700	1700	1700	866	
Volume to Capacity	0.51	0.51	0.35	0.19	0.09	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	2.2	
Control Delay (s)	0.0	0.0	0.0	0.0	9.6	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.6	
Approach LOS					A	
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			54.0%		ICU Level of Service	A
Analysis Period (min)			15			

Total Projected 2027 AM (No Reduction)

4: Cole Ave & Tillbury Ave

10/21/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Future Volume (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		45.4			53.6			93.4			64.9	
Travel Time (s)		4.1			4.8			8.4			5.8	
Lane Group Flow (vph)	0	4	0	0	51	0	0	138	0	0	99	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 24.4%

ICU Level of Service A

Analysis Period (min) 15

Total Projected 2027 AM (No Reduction)

4: Cole Ave & Tillbury Ave

10/21/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	1	1	2	49	0	2	1	86	51	3	96	0
Future Volume (Veh/h)	1	1	2	49	0	2	1	86	51	3	96	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	1	2	49	0	2	1	86	51	3	96	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	218	241	96	218	216	112	96			137		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	218	241	96	218	216	112	96			137		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	100	100			100		
cM capacity (veh/h)	736	659	960	734	680	942	1498			1447		
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	4	51	138	99								
Volume Left	1	49	1	3								
Volume Right	2	2	51	0								
cSH	806	741	1498	1447								
Volume to Capacity	0.00	0.07	0.00	0.00								
Queue Length 95th (m)	0.1	1.7	0.0	0.0								
Control Delay (s)	9.5	10.2	0.1	0.2								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.5	10.2	0.1	0.2								
Approach LOS	A	B										
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			24.4%	ICU Level of Service	A							
Analysis Period (min)			15									

Total Projected 2027 AM (No Reduction)
 5: Churchill Ave N & Tillbury Ave

10/21/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	19	44	14	315	581	16
Future Volume (vph)	19	44	14	315	581	16
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	68.5			92.6	46.9	
Travel Time (s)	6.2			6.7	3.4	
Lane Group Flow (vph)	63	0	0	329	597	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	43.9%
ICU Level of Service	A
Analysis Period (min)	15

Total Projected 2027 AM (No Reduction)
5: Churchill Ave N & Tillbury Ave

10/21/2020

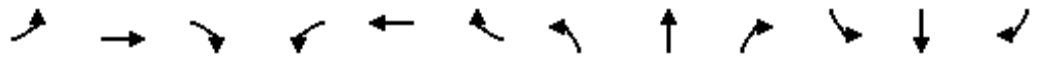


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	44	14	315	581	16
Future Volume (Veh/h)	19	44	14	315	581	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	19	44	14	315	581	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	932	589	597			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	932	589	597			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	91	99			
cM capacity (veh/h)	292	508	980			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	63	329	597			
Volume Left	19	14	0			
Volume Right	44	0	16			
cSH	415	980	1700			
Volume to Capacity	0.15	0.01	0.35			
Queue Length 95th (m)	4.0	0.3	0.0			
Control Delay (s)	15.2	0.5	0.0			
Lane LOS	C	A				
Approach Delay (s)	15.2	0.5	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			43.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Total Projected 2027 PM (No Reduction)

1: Churchill Ave N & Carling Ave

10/21/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	238	850	18	19	1916	218	96	33	26	187	7	286
Future Volume (vph)	238	850	18	19	1916	218	96	33	26	187	7	286
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	65.0		20.0	60.0		20.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			15.0			20.0			25.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				50
Link Distance (m)		111.6			137.3			86.0				93.0
Travel Time (s)		6.7			8.2			6.2				6.7
Lane Group Flow (vph)	238	850	18	19	1916	218	96	59	0	187	293	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0		10.0		10.0
Minimum Split (s)	11.1	34.1	34.1	11.1	34.1	34.1	40.0	40.0		40.0		40.0
Total Split (s)	20.0	55.0	55.0	20.0	55.0	55.0	40.0	40.0		40.0		40.0
Total Split (%)	16.7%	45.8%	45.8%	16.7%	45.8%	45.8%	33.3%	33.3%		33.3%		33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3		3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	3.5	3.5		3.5		3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.8	6.8		6.8		6.8
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None		None
Act Effct Green (s)	26.6	77.8	77.8	7.0	50.9	50.9	23.5	23.5		23.5		23.5
Actuated g/C Ratio	0.22	0.65	0.65	0.06	0.42	0.42	0.20	0.20		0.20		0.20
v/c Ratio	0.63	0.39	0.02	0.19	1.33	0.32	0.98	0.17		0.75		0.57
Control Delay	67.9	8.6	0.1	57.8	185.6	13.1	133.4	23.8		63.1		9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	67.9	8.6	0.1	57.8	185.6	13.1	133.4	23.8		63.1		9.6
LOS	E	A	A	E	F	B	F	C		E		A
Approach Delay		21.3			167.0			91.7				30.5
Approach LOS		C			F			F				C
Queue Length 50th (m)	58.9	27.3	0.0	4.4	~311.6	16.1	22.6	6.4		41.8		2.3
Queue Length 95th (m)	#103.5	40.9	m0.0	11.9	#358.0	34.9	#47.5	16.1		61.1		23.6
Internal Link Dist (m)		87.6			113.3			62.0				69.0
Turn Bay Length (m)	65.0		20.0	60.0		20.0	20.0			20.0		
Base Capacity (vph)	375	2198	964	196	1437	673	138	475		351		609
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.63	0.39	0.02	0.10	1.33	0.32	0.70	0.12		0.53		0.48

Intersection Summary

Area Type: Other

Total Projected 2027 PM (No Reduction)
 1: Churchill Ave N & Carling Ave

10/21/2020

Lane Group	Ø9	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (m)		
Storage Lanes		
Taper Length (m)		
Right Turn on Red		
Link Speed (k/h)		
Link Distance (m)		
Travel Time (s)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	4%	4%
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
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		

Total Projected 2027 PM (No Reduction)

2: Clyde Ave/Cole Ave & Carling Ave

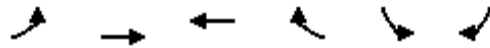
10/21/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	848	1	259	1953	63	126	87	210	30	54	62
Future Volume (vph)	77	848	1	259	1953	63	126	87	210	30	54	62
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	20.0		20.0	120.0		20.0	0.0		5.0	20.0		0.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	20.0			30.0			7.6			20.0		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		60			60			50				40
Link Distance (m)		118.2			188.5			103.0				96.0
Travel Time (s)		7.1			11.3			7.4				8.6
Lane Group Flow (vph)	77	848	1	259	1953	63	126	87	210	30	116	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.4	35.5	35.5	10.4	35.5	35.5	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (s)	25.0	55.0	55.0	25.0	55.0	55.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	20.8%	45.8%	45.8%	20.8%	45.8%	45.8%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.7	2.1	2.1	1.7	2.1	2.1	3.3	3.3	3.3	3.3	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.4	5.8	5.8	5.4	5.8	5.8	6.6	6.6	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	78.6	70.9	70.9	89.2	78.7	78.7	18.4	18.4	18.4	18.4	18.4	18.4
Actuated g/C Ratio	0.66	0.59	0.59	0.74	0.66	0.66	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.47	0.42	0.00	0.54	0.88	0.07	0.70	0.32	0.58	0.16	0.40	
Control Delay	26.9	16.1	0.0	16.3	24.3	4.2	67.0	46.3	17.6	42.8	29.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	26.9	16.1	0.0	16.3	24.3	4.2	67.0	46.3	17.6	42.8	29.6	
LOS	C	B	A	B	C	A	E	D	B	D	C	
Approach Delay		17.0			22.8			38.2				32.3
Approach LOS		B			C			D				C
Queue Length 50th (m)	4.1	53.0	0.0	26.2	129.7	1.1	28.6	18.6	9.2	6.2	14.4	
Queue Length 95th (m)	20.7	92.9	0.0	m21.4	m89.8	m1.1	45.2	30.9	30.0	13.8	29.2	
Internal Link Dist (m)		94.2			164.5			79.0				72.0
Turn Bay Length (m)	20.0		20.0	120.0		20.0			5.0	20.0		
Base Capacity (vph)	334	2001	883	550	2223	958	328	496	528	342	486	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.42	0.00	0.47	0.88	0.07	0.38	0.18	0.40	0.09	0.24	
Intersection Summary												
Area Type:	Other											

Total Projected 2027 PM (No Reduction)

3: Carling Ave & Site Access

10/21/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Volume (vph)	0	1118	2253	70	0	48
Future Volume (vph)	0	1118	2253	70	0	48
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		60	60		40	
Link Distance (m)		188.5	111.6		51.1	
Travel Time (s)		11.3	6.7		4.6	
Lane Group Flow (vph)	0	1118	2323	0	0	48
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

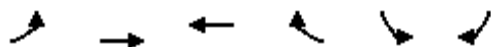
Intersection Capacity Utilization 78.1% ICU Level of Service D

Analysis Period (min) 15

Total Projected 2027 PM (No Reduction)

3: Carling Ave & Site Access

10/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Volume (veh/h)	0	1118	2253	70	0	48
Future Volume (Veh/h)	0	1118	2253	70	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1118	2253	70	0	48
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		188	112			
pX, platoon unblocked	0.58				0.65	0.58
vC, conflicting volume	2323				2847	1162
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1838				1838	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	191				44	632
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	559	559	1502	821	48	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	70	48	
cSH	1700	1700	1700	1700	632	
Volume to Capacity	0.33	0.33	0.88	0.48	0.08	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.9	
Control Delay (s)	0.0	0.0	0.0	0.0	11.2	
Lane LOS						B
Approach Delay (s)	0.0		0.0		11.2	
Approach LOS						B
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			78.1%	ICU Level of Service	D	
Analysis Period (min)			15			

Total Projected 2027 PM (No Reduction)

4: Cole Ave & Tillbury Ave

10/21/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Future Volume (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Link Speed (k/h)		40			40			40			40	
Link Distance (m)		50.3			47.4			96.0			64.3	
Travel Time (s)		4.5			4.3			8.6			5.8	
Lane Group Flow (vph)	0	11	0	0	42	0	0	196	0	0	66	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

















Intersection Capacity Utilization 28.8% ICU Level of Service A

Analysis Period (min) 15

Total Projected 2027 PM (No Reduction)

4: Cole Ave & Tillbury Ave

10/21/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1	8	36	1	5	7	122	67	4	60	2
Future Volume (Veh/h)	2	1	8	36	1	5	7	122	67	4	60	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	1	8	36	1	5	7	122	67	4	60	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume												
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol												
tC, single (s)												
tC, 2 stage (s)												
tF (s)												
p0 queue free %												
cM capacity (veh/h)												
Direction, Lane #												
Volume Total												
Volume Left												
Volume Right												
cSH												
Volume to Capacity												
Queue Length 95th (m)												
Control Delay (s)												
Lane LOS												
Approach Delay (s)												
Approach LOS												
Intersection Summary												
Average Delay												
Intersection Capacity Utilization												
Analysis Period (min)												

Total Projected 2027 PM (No Reduction)
 5: Churchill Ave N & Tillbury Ave

10/21/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	33	31	464	468	17
Future Volume (vph)	16	33	31	464	468	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Link Speed (k/h)	40			50	50	
Link Distance (m)	70.0			93.0	32.3	
Travel Time (s)	6.3			6.7	2.3	
Lane Group Flow (vph)	49	0	0	495	485	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	62.6%
ICU Level of Service	B
Analysis Period (min)	15

Total Projected 2027 PM (No Reduction)

5: Churchill Ave N & Tillbury Ave

10/21/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	33	31	464	468	17
Future Volume (Veh/h)	16	33	31	464	468	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	16	33	31	464	468	17
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)	93					
pX, platoon unblocked						
vC, conflicting volume	1002	476	485			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1002	476	485			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	94	97			
cM capacity (veh/h)	261	589	1078			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	49	495	485			
Volume Left	16	31	0			
Volume Right	33	0	17			
cSH	417	1078	1700			
Volume to Capacity	0.12	0.03	0.29			
Queue Length 95th (m)	3.0	0.7	0.0			
Control Delay (s)	14.8	0.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.8	0.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	1.1					
Intersection Capacity Utilization	62.6%			ICU Level of Service	B	
Analysis Period (min)	15					