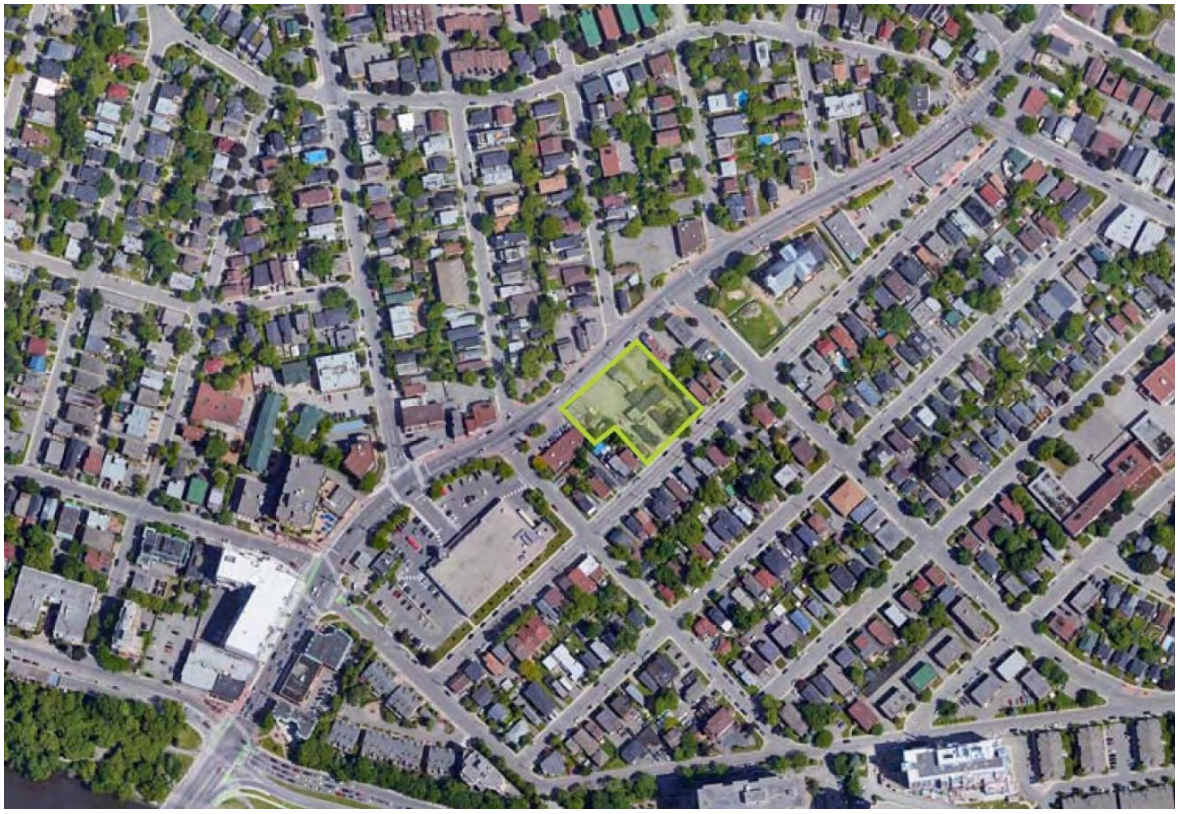
Transportation Impact Assessment – Step 4: Analysis

Mid-Rise Residential Development – 78-90 Beechwood/ 69-93 Barrette



Prepared for Minto Communities - Canada
by IBI Group
July 29, 2020

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Transmittal

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cc	Kevin Harper – Minto Communities-Canada	

From	David Hook, P.Eng.
Sent By	E-mail/Electronic Submission
Date	July 30, 2020
Project No	125192
Subject	78-90 Beechwood Avenue/ 69-93 Barrette Street - Transportation Impact Assessment: Step 4

Please find enclosed the finalized TIA report in support of the ZBLA submission relating to the proposed residential development at 78-90 Beechwood/ 69-93 Barrette on behalf of Minto Communities - Canada. We trust the circulation comments have been sufficiently addressed and incorporated in this report. All comments and responses associated with this study have been documented and provided in the report appendices.

If you require anything else, please don't hesitate to contact me at 613-225-1311 x64029.

Best Regards,

David Hook, P.Eng.

TIA Plan Reports - Certification

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 associate documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below:

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;

2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;

3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and

4. I am either a licensed[1] or registered[1] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering □ or transportation planning □.

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

Dated at Ottawa this 29th day of July, 2020.
(City)

Name: David Hook, P.Eng.

Professional Title: Project Engineer

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

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ORIGINATOR:	Ben Pascolo-Neveu
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CIRCULATION LIST:	Mike Giampa - City of Ottawa Transportation Project Manager
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Executive Summary

IBI Group (IBI) was retained by Minto Communities - Canada to undertake a Transportation Impact Assessment (TIA) in support of a combined Official Plan Amendment and Zoning By-law Amendment application for a proposed mid-rise residential development to be located at 78-90 Beechwood Avenue and 69-93 Barrette Street.

The proposed development consists of a 9-storey mixed-use building with 251 dwelling units, a 10th floor walkout terrace and ground floor commercial along the Beechwood Avenue frontage. To integrate with the low-rise residential community to the south, the building will transition to 6 storeys on Barrette Street. The subject lands are assumed to be built out in a single phase, with full occupancy expected by 2023. The horizon year of this study was therefore taken as 2028, representing 5 years beyond the expected full build-out of the site.

The site will provide a total of 157 vehicle parking spaces within the two-level underground parking facility, along with 2 at-grade spaces for a grand total of 159 spaces. In terms of bicycle parking, a total of 131 spaces are proposed, including three at-grade spaces for the commercial land use and the remainder within the underground parking garage. Access to the site will be provided via a two-way private approach on Barrette Street.

In 2017, the City of Ottawa implemented an interim re-design of Beechwood Avenue through the study area to reduce the road to one vehicle lane per direction. Curbside travel lanes were reallocated in both directions to provide dedicated right-of-way for parallel parking bays and on-road cycling facilities along the corridor. This design generally consisted of modifications to pavement markings to provide a low-cost, interim solution until a more permanent, longer-term solution could be developed and implemented. Since the implementation of these interim measures, a Complete Street RMA (Functional Design) for Beechwood Avenue has been undertaken along the corridor by the City, with plans to implement the design incrementally as development occurs along the corridor.

In conjunction with the redevelopment of the subject site, Beechwood Avenue will be reconstructed along its frontage to accommodate grade-separated cycle tracks in the eastbound direction, as well as a wider sidewalk. Westbound facilities on the north side of Beechwood Avenue will be improved by others in the future. Further, the proposed development will facilitate additional connectivity between Beechwood Avenue and Barrette Street through the implementation of a publicly accessible mid-block pedestrian connection along the eastern boundary of the site. The proposed development site is therefore well-positioned to encourage the use of sustainable transportation modes and will not be reliant on private automobile transportation. The design of the proposed development leverages the nearby multi-modal transportation alternatives offered in the area to minimize the use of private automobile transportation during peak periods.

The proposed mid-rise residential development is expected to generate up to 74 and 89 two-way vehicular trips during the weekday morning and afternoon peak hours, respectively. Travel demand was stratified by mode share from the Ottawa East Traffic Assessment Zone (TAZ) in the O-D Survey and divided amongst the numerous potential routes to access the arterial road network. No alternations were made to the mode share beyond the use of a blended rate, which considered both internal trips (i.e. within the TAZ), as well as inter-zonal trips.

A multi-modal analysis of each study area intersection identified deficiencies in the existing road network and potential remediation measures have been suggested in which the City could consider in order to meet the prescribed targets. These remediation measures would improve mobility and comfort for all transportation modes but are not required to safely accommodate the proposed development.

All study area intersections were shown to operate well under their theoretical capacities beyond the 2028 study horizon year. Based on the queuing analyses conducted for this study, the intersection of Beechwood & Charlevoix/ MacKay may be experiencing some spillback on the southbound left-turn auxiliary lane during weekday peak periods. Site-generated traffic volumes, however, are not expected to contribute to this

movement, and the Beechwood RMA indicates that the southbound left-turn lane will ultimately be extended from 15m to 25m of parallel lane length. As indicated by the queuing analysis, this increase in storage is expected to accommodate left-turning traffic volumes on the southbound approach beyond the study horizon year. A post-development monitoring plan is therefore not required for this study. As part of the Site Plan Control application, however, a detailed design and construction of streetscaping improvements will be undertaken exclusively along the development's frontage of Beechwood Avenue, based on the Beechwood functional design RMA.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network.

1 Introduction

IBI Group (IBI) was retained by Minto Communities - Canada to undertake a Transportation Impact Assessment (TIA) in support of a combined Zoning By-law Amendment and Site Plan Control application for a proposed mid-rise residential development to be located at 78-90 Beechwood Avenue and 69-93 Barrette Street in Ottawa.

In accordance with the City of Ottawa's Transportation Impact Assessment Guidelines, published in June 2017, the following report is divided into four major components:

- **Screening** – Prior to the commencement of a TIA, an initial assessment of the proposed development is undertaken to establish the need for a comprehensive review of the site based on three triggers: Trip Generation, Location and Safety.
- **Scoping** – This component of the TIA report describes both the existing and planned conditions in the vicinity of the development and defines study parameters such as the study area, analysis periods and analysis years of the development. It also provides an opportunity to identify any scope exemptions that would eliminate elements of scope described in the TIA Guidelines that are not relevant to the development proposal, based on consultation with City staff.
- **Forecasting** – The Forecasting component of the TIA is intended to review both the development-generated travel demand and the background network travel demand, and provides an opportunity to rationalize this demand to ensure projections are within the capacity constraints of the transportation network.
- **Analysis** – This component documents the results of any analyses undertaken to ensure that the transportation related features of the proposed development are in conformance with prescribed technical standards and that its impacts on the transportation network are both sustainable and effectively managed. It also identifies a development strategy to ensure that what is being proposed is aligned with the City of Ottawa's city-building objectives, targets and policies.

Throughout the development of a TIA report, each of the four study components above are submitted in draft form to the City of Ottawa and undergo a review by a designated Transportation Project Manager. Any comments received are addressed to the satisfaction of the City's Transportation Project Manager before proceeding with subsequent components of the study. All technical comments and responses throughout this process are included in **Appendix A**.

A Roadway Modification Application (RMA) Functional Design of bicycle infrastructure improvements along the entire length of Beechwood Avenue was previously completed by the City of Ottawa, therefore functional-level RMA component will not be required as part of this TIA. As part of the Site Plan Control application, however, a detailed design and construction of streetscaping improvements will be undertaken exclusively along the development's frontage of Beechwood Avenue, based on the Beechwood functional design RMA.

2 TIA Screening

An initial screening was completed to confirm the need for a Transportation Impact Assessment by reviewing the following three triggers:

- **Trip Generation**: Based on the proposed number of apartment dwelling units, the minimum development size threshold has been exceeded and therefore the Trip Generation trigger is satisfied.
- **Location**: The proposed development is located within a Design Priority Area (DPA) and is designated as a Transit Priority Corridor in the TMP, therefore the Location trigger is satisfied.
- **Safety**: Boundary street conditions were reviewed to determine if there is an elevated potential for safety concerns adjacent the site. Based on this review, the Safety Trigger is not satisfied.

As the proposed development meets the Trip Generation and Location triggers, the need to undertake a Transportation Impact Assessment is confirmed.

A copy of the Screening Form is provided in **Appendix B**.

3 Project Scoping

3.1 Description of Proposed Development

3.1.1 Site Location

The proposed development is located within the Vanier North community and consists of an amalgamation of 11 adjacent parcels of land with an approximate area of 0.41 hectares. The site is generally bound by Beechwood Avenue to the north, Barrette Street to the south, St. Charles Street to the east and Loyer Street to the west.

The site location and its surrounding context is illustrated in **Exhibit 1**.

3.1.2 Land Use Details

The subject site is currently occupied by mix of low-density residential and commercial uses. According to GeoOttawa, the site is zoned TM8 H(15) – Traditional Mainstreet.

The proposed development consists of a 9-storey mixed-use residential building with a 10th floor walkout terrace and ground floor commercial along the Beechwood Avenue frontage. The building transitions to 6 storeys on Barrette Street to integrate with the low-rise residential community to the south. **Table 1** summarizes the proposed land uses included in this development.

Table 1 - Land Use Statistics

LAND USE	SIZE
Apartments	251 dwelling units
Ground Floor Commercial	~570 m^2

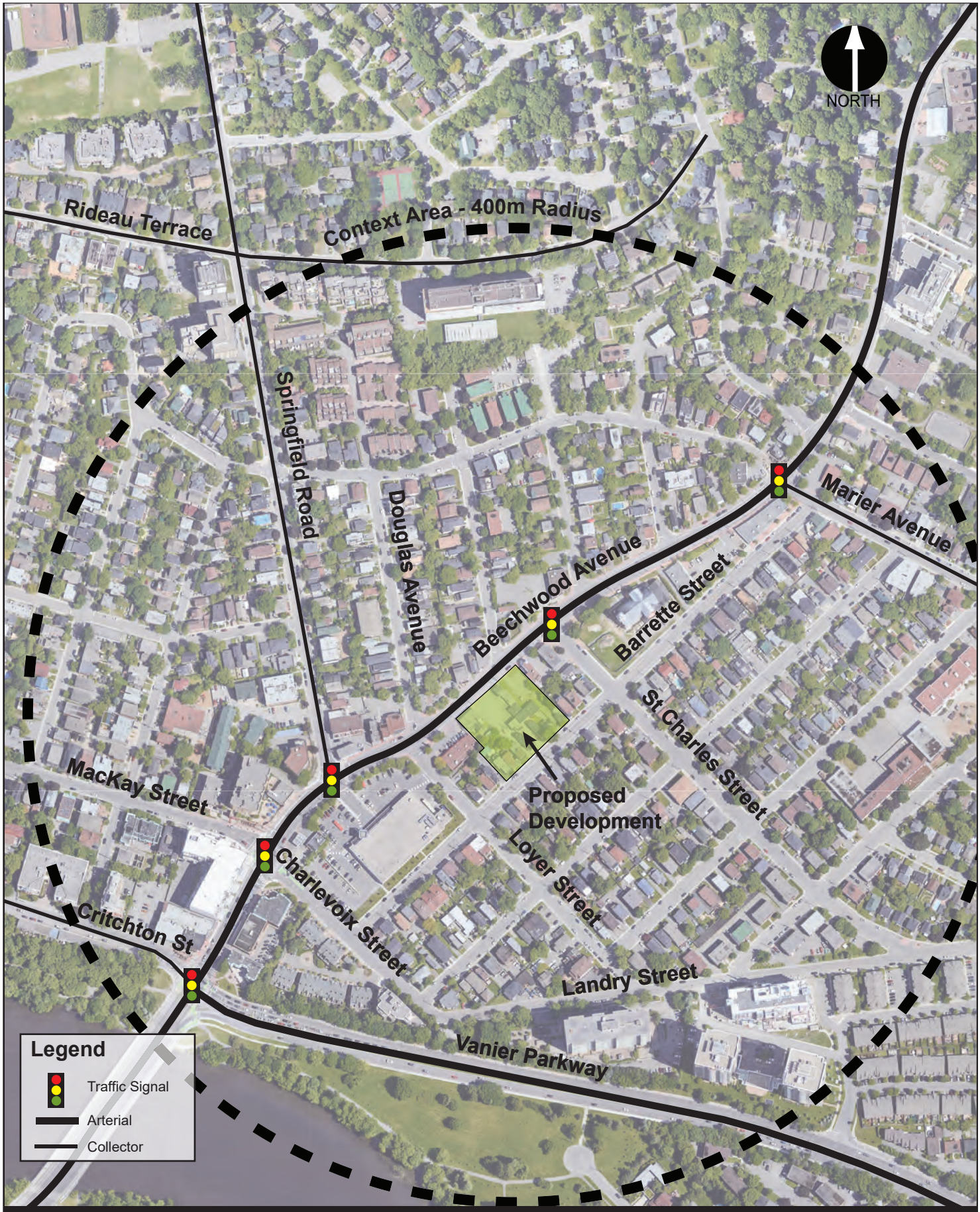
The site will provide a total of 157 vehicle parking spaces within the two-level underground parking facility, along with 2 at-grade spaces for a grand total of 159 spaces. In terms of bicycle parking, a total of 131 spaces are proposed, including three at-grade spaces for the commercial land use

and the remainder within the underground parking garage. Access to the site will be provided via a two-way private approach on Barrette Street.

The configuration of the proposed development is illustrated in **Exhibit 2**.

3.1.3 Development Phasing & Date of Occupancy

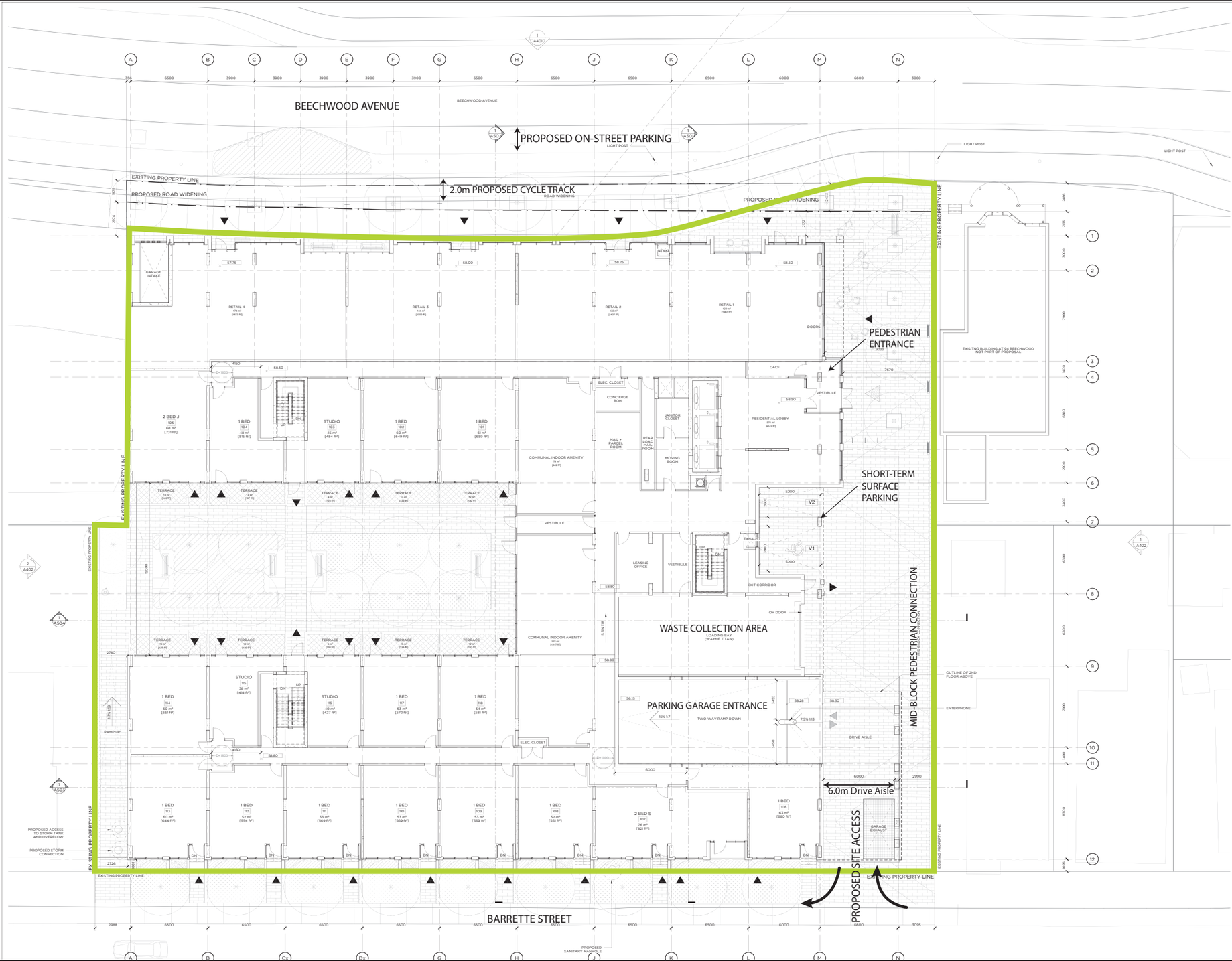
The proposed development is anticipated to be constructed and fully occupied in a single phase by the end of 2023.



Mid-Rise Residential Development
78-90 Beechwood/ 69-93 Barrette
Transportation Impact Assessment

Exhibit 1:
Site Location

PROJECT No. 125192
DATE: July 2020
SCALE: 0m 50m 100m



PLAN

Mid-Rise Residential Development
78-90 Beechwood/ 69-93 Barrette
Transportation Impact Assessment

Exhibit 2: Proposed Development

PROJECT No. 125192
DATE: July 2020
SCALE: 0m 10m 20m

3.1.4 Existing Road Network

3.1.4.1 Roadways

Table 2 below summarizes the details of the boundary roadways as well as other streets within the context area of the proposed development.

Table 2 - Existing Roadways

NAME	CLASS	JURISDICTION	ORIENTATION AND EXTENTS	CROSS-SECTION	RIGHT-OF-WAY	SPEED LIMIT
Beechwood Avenue	Arterial	City of Ottawa	East-West, from Hemlock Road to Springfield Road	Urban Two-Lane	24.5m[1]	50 km/h
	Arterial	City of Ottawa	East-West, from Springfield Road to St. Patrick Street	Urban Four-Lane	24.5m[1]	50 km/h
Barrette Street	Local	City of Ottawa	East-West, from Charlevoix Street to Marier Avenue	Urban Two-Lane	18.0m	50 km/h
Loyer Street	Local	City of Ottawa	North-South, from Beechwood Avenue to Landry Street	Urban Two-Lane	18.4m	50 km/h
Charlevoix Street	Local	City of Ottawa	North-South, from Beechwood Avenue to Landry Street	Urban Two-Lane	17.5m	50 km/h
St. Charles Street	Local	City of Ottawa	North-South, from Beechwood Avenue to Landry Street	Urban Two-Lane	19.0m	50 km/h

Notes: [1] Uneven cross-section from Marier Avenue to Vanier Parkway with 13m on north side & 11.5m on south side

3.1.4.2 Nearby Driveways

On Barrette Street, within 200m of the proposed development's site access driveway, there are numerous existing driveways serving single-family homes. East of St. Charles Street, a six-storey condominium building is presently under construction, referred to as 'St. Charles Market', which will also provide two-way access exclusively onto Barrette Street.

3.1.4.3 Intersections

The following intersections have the greatest potential to be impacted by the proposed development:

- **Beechwood Avenue & Charlevoix Street/ MacKay Street** is a four-legged, signalized intersection with two through lanes provided in each direction on Beechwood Avenue. Single through-right turn lanes and auxiliary left-turn lanes are provided on the sidestreets. Bicycle facilities include a westbound cross-ride and two-stage left-turn bike box, an eastbound on-road bike lane, and an exclusive bike lane on the northbound approach. This intersection is located approximately 185 metres west of the site.

- **Beechwood Avenue & Loyer Street/ Douglas Avenue** is a four-legged, two-way stop-controlled intersection with free-flow on Beechwood Avenue. A single vehicle travel lane is provided on each approach. This intersection is located approximately 40 metres west of the site.

- **Beechwood Avenue & St. Charles Street** is a three-legged, signalized intersection with a single vehicle travel lane provide on each approach. This intersection is located approximately 35 metres east of the site.

- **Barrette Street & St. Charles Street** is a four-legged, two-way stop-controlled intersection with free-flow on St. Charles Street. A single vehicle travel lane is provided on each approach. This intersection is located approximately 35 metres east of the site.

- **Barrette Street & Loyer Street** is a four-legged, all-way stop-controlled intersection with a single vehicle travel lane provided on each approach. This intersection is located approximately 35 metres west of the site.

The intersection control and lane configurations for all intersections described above are shown in **Exhibit 3**.

3.1.4.4 Traffic Management Measures

The following traffic management measures presently exist within the context area of the proposed development:

- On-street parking is permitted on both sides of Barrette Street along its entire length, narrowing vehicle travel lanes to 3.5m per direction and helping to discourage higher operating speeds;
- Painted parking bays exist on both sides of Beechwood Avenue through the context area, resulting in friction for motorists; and
- Signage exists to discourage cut-through traffic to the Vanier Parkway through the Claridge La Tiffani condominium development.

3.1.5 Existing Bicycle and Pedestrian Facilities

Pedestrian facilities are provided in the form of concrete sidewalks on both sides of all roadways within the context area.

On-road bicycle lanes are provided on both sides of Beechwood Avenue through the context area. Bicycle ‘sharrows’ exist in the centre of each vehicle lane on Barrette Street, indicating that

motorists and cyclists are required to share the road. All other roadways within the context area require cyclists to share the road with motorists.

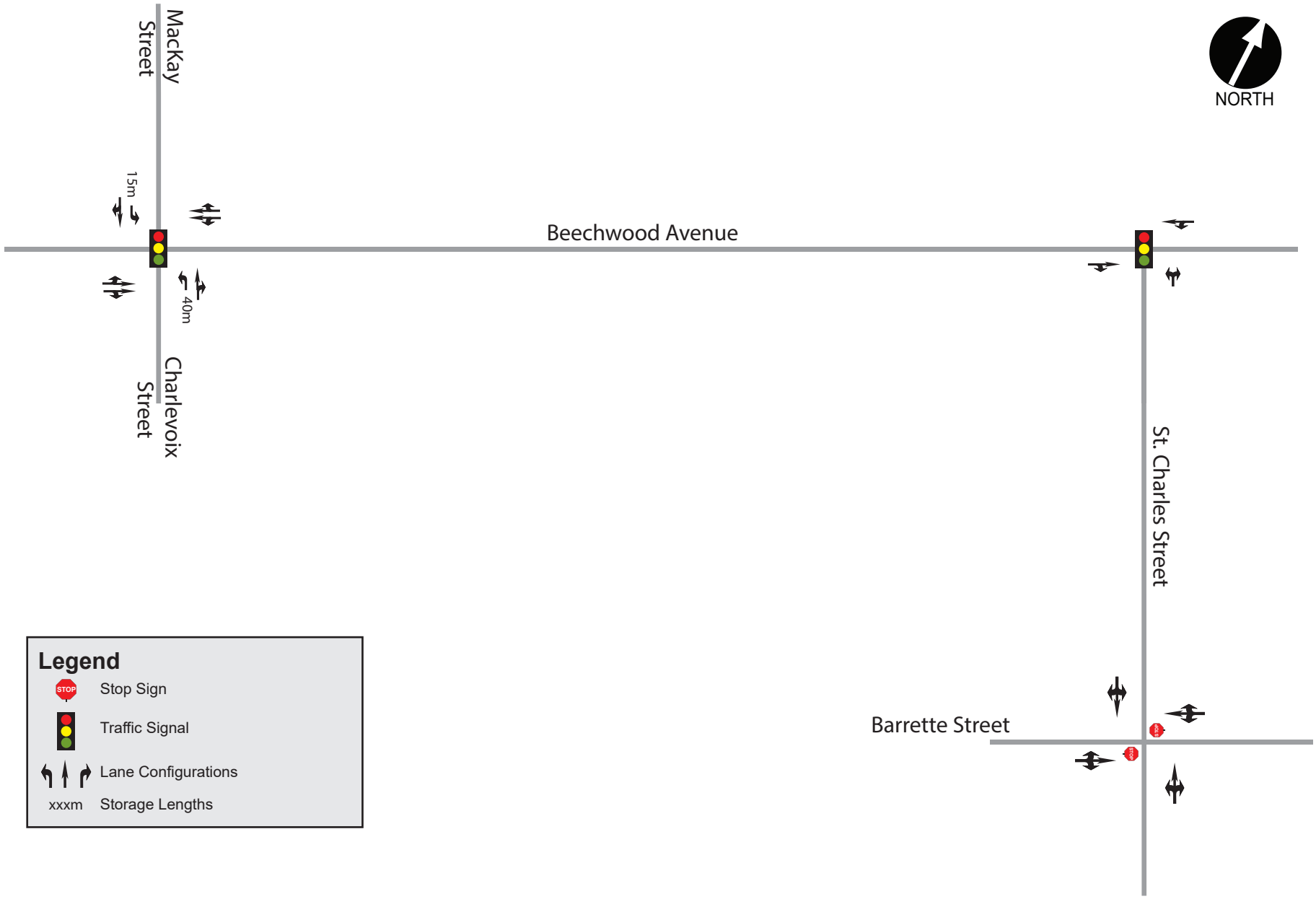
3.1.5.1 Existing Traffic Volumes

As the proposed development will consist primarily of residential land uses, the weekday peak hour traffic conditions will be most affected by any associated increase in traffic. Weekday morning and afternoon peak hour turning movement counts were therefore obtained from the City of Ottawa at the following intersections:

- Barrette Street & St. Charles Street (City of Ottawa, January 2018)
- Beechwood Avenue & Charlevoix Street/ MacKay Street (City of Ottawa, March 2019)
- Beechwood Avenue & St. Charles Street (City of Ottawa, March 2019)

Due to the COVID-19 pandemic resulting in major disruptions to regular travel patterns, it was not possible to conduct additional turning movement counts for other context area intersections that were not readily available from the City, including the intersections of Beechwood/ Loyer and Loyer/ Barrette.

Peak hour traffic volumes representative of existing conditions are shown in **Exhibit 4**. Weekday morning and afternoon peak hour turning movement counts have been provided in **Appendix C**.



Mid-Rise Residential Development
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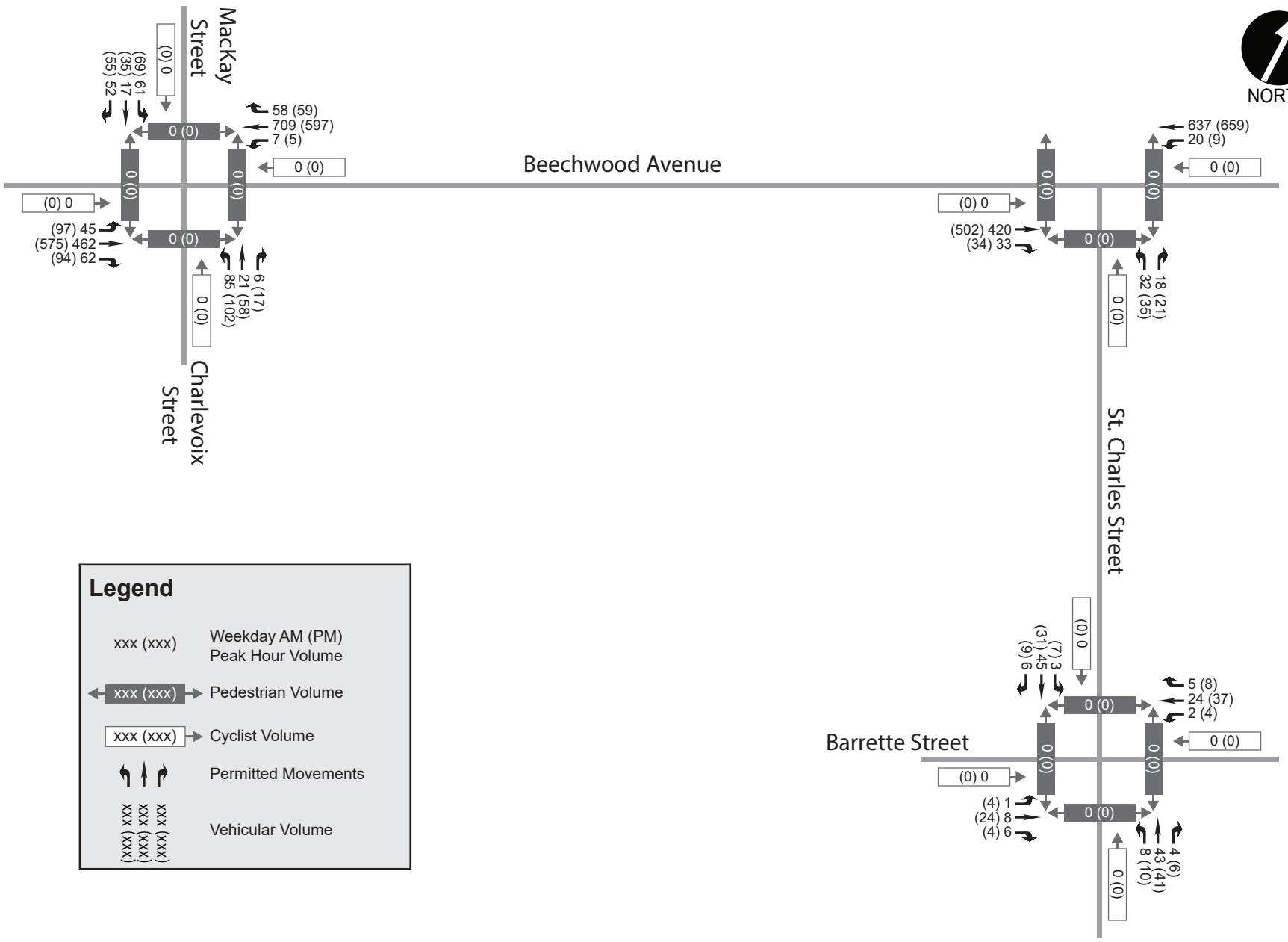
Transportation Impact Assessment

Exhibit 3:
Existing Lane Configurations &
Intersection Control

PROJECT No. 125192
DATE: July 2020
SCALE: N.T.S.



Mid-Rise Residential Development
78-90 Beechwood/ 69-93 Barrette
Transportation Impact Assessment

Exhibit 4:
Existing (2020)
Traffic

PROJECT No. 125192
DATE: July 2020
SCALE: N.T.S.

3.1.6 Existing Transit Facilities and Service

The following transit routes, operated by OC Transpo, exist within the vicinity of the site:

- **Route #6** provides regular, all-day service between Greenboro Station and Rockcliffe, generally operating on 12 and 15-minute headways during peak periods. On weekends, service is reduced to between 12- and 30-minute headways.
- **Route #7** provides regular, all-day service between St. Laurent Station and Carleton University, generally operates on 10- to 15-minute headways during peak periods. On weekends, service is reduced to between 12- and 30-minute headways.
- **Route #17** provides weekday peak period service between Wateridge Village and Gatineau with 15-minute headways. Service is provided towards Gatineau during the weekday morning peak period, and towards Wateridge Village during the weekday afternoon peak period. No service is provided on weekends or off-peak weekday periods.
- **Route #19** provides regular, all-day service between St. Laurent Station and Parliament Station, generally operating on a 15-minute headways during peak periods. On weekends, service is reduced to between 15- and 30-minute intervals.
- **Route #20** provides regular, all-day service between St. Laurent Station and Vanier North, generally operating on 15-minute headways during peak periods. On weekends, service is reduced to between 15- and 30-minute intervals.

The nearest eastbound bus stop serves Route #20 on Barrette Street, approximately 25m east of the proposed development. The nearest westbound bus stop is located on Beechwood Avenue, serving all of the above noted transit routes, and is located approximately 50 metres east of the development. The westbound bus stop provides amenities including a route map, schedule, bench and shelter.

Transit maps for the above noted routes are provided in **Appendix D**.

3.1.7 Collision History

A review of historical collision data has been undertaken for the boundary streets with the vicinity of the proposed development. The TIA Guidelines require a safety review if at least six collisions for any one movement or of a discernible pattern, have occurred over a five-year period. **Table 3** below summarizes all reported collisions between January 1, 2014 and December 31, 2018.

Table 3 - Reported Collisions within Vicinity of Proposed Development

LOCATION	# OF REPORTED COLLISIONS
INTERSECTIONS	
Beechwood Avenue & Charlevoix Street/ MacKay Street	22
Beechwood Avenue & Loyer Street/ Douglas Avenue	2
Beechwood Avenue & St. Charles Street	3
St. Charles Street & Barrette Street	9
Barrette Street & Loyer Street	1
SEGMENTS	
Beechwood Avenue – Charlevoix to Springfield	4
Beechwood Avenue – Springfield to Loyer	3
Beechwood Avenue – Loyer to St. Charles	5
Barrette Street – Loyer to St. Charles	3
St. Charles Street – Beechwood to Barrette	2
Loyer Street – Beechwood to Barrette	0

Based on a preliminary review of the collision history noted above, intersections or road segments with at least six collisions over the five-year period may require further review.

Detailed collision records are provided in **Appendix E**.

3.2 Planned Conditions

3.2.1 Transportation Network

3.2.1.1 Future Road Network Projects

The 2013 Transportation Master Plan (TMP) outlines future road network modifications required in the 2031 'Affordable Network'. A review of the TMP Affordable Plan indicates that there were no planned changes to the arterial road network within the broader area surrounding the proposed development.

Beechwood Avenue has since undergone a significant redesign to better align with the Complete Streets Policy, as presented in the TMP. In 2017, the City of Ottawa implemented an interim design of Beechwood Avenue through the context area to reduce the road to one vehicle lane per direction. Curbside travel lanes were reallocated in both directions to provide dedicated right-of-way for parallel parking bays and on-road cycling facilities along the corridor. This design generally consisted of modifications to pavement markings to provide a low-cost, interim solution until a more permanent, longer-term solution could be developed and implemented.

Since the implementation of these interim measures, a Complete Street RMA (Functional Design) for Beechwood Avenue has been undertaken through the context area, with plans to implement the design incrementally as development occurs along the corridor.

The Beechwood RMA Complete Street design includes enhancements to existing roadway features aimed at further increasing comfort and safety among vulnerable road users. This will be

achieved through the introduction of wider sidewalks, grade-separated cycle tracks and additional 'protected intersection' elements at select locations along the corridor.

Further details regarding these elements will be provided in subsequent sections of this study.

As the Beechwood Avenue RMA includes a Complete Streets functional-level design, Module 4.3 of the TIA Guidelines indicates that the following must be completed:

- Identify the design at the interface of the street and the subject development.
- Assess the potential impact of the subject development on the design.
    - If changes to the design are required, develop an interim design concept for the boundary street.

Detailed design and construction of streetscaping improvements along the property frontage will be required based on the Beechwood RMA.

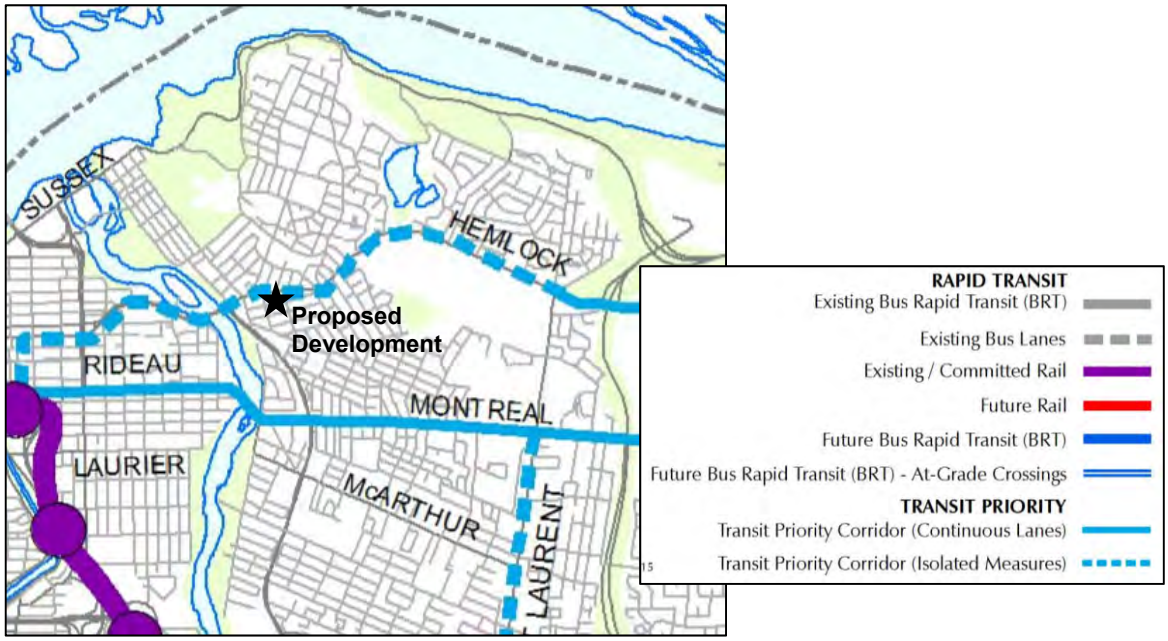
3.2.1.2 Future Transit Facilities and Services

The 2013 TMP outlines the future rapid transit and transit priority (RTTP) network. The following project was noted in the 'Affordable RTTP Network' that may have a significant impact on future travel demand in the vicinity of the proposed development:

- **Beechwood Avenue Transit Priority Corridor (Isolated Measures):** Beechwood Avenue is identified as a transit priority corridor in the TMP from St. Patrick Street to Hemlock Road. Subsequent to the 2013 TMP update, Beechwood Avenue pavement markings were reconfigured to provide a single travel lane per direction, limiting opportunities to provide transit priority measures to major intersections with multiple approach lanes such as Vanier Parkway & Beechwood/ St. Patrick Street. The longer-term RMA Complete Street Functional Design plan further supports the use of a two-lane cross-section through the context area, therefore signal priority measures are not expected to be a key consideration for this study.

Figure 1 illustrates the transit infrastructure projects in the vicinity of the proposed development that are part of the TMP's 2031 Affordable Network.

Figure 1 - Future 'Affordable RTTP Network Projects'



Source: 2013 Transportation Master Plan – Map 5 '2031 Affordable Network'

3.2.1.3 Future Cycling and Pedestrian Facilities

The 2013 Ottawa Cycling Plan (OCP) designates Beechwood Avenue as a 'Cross-town Bikeway', with the objective of providing continuous connectivity over long distances for cyclists crossing the city.

As shown on **Figure 2** below, Barrette Street a portion of Charlevoix Street are designated as 'Local Routes', while Marier Avenue is designated as a 'Neighbourhood Bikeway'. Both 'Local Routes' and 'Neighbourhood Bikeways' provide connections to higher-order cycling networks including the 'Cross-Town Bikeway' on Beechwood Avenue.

Figure 2 – Future Cycling Facilities within Context Area

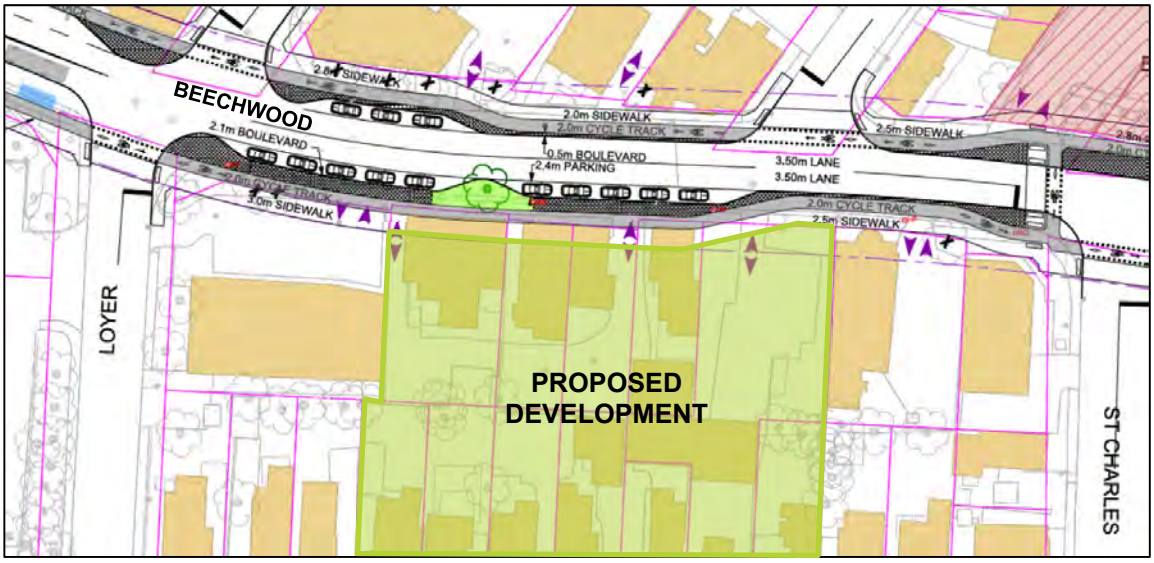
Source: GeoOttawa

In terms of improvements to cycling and pedestrian infrastructure, the Complete Street redesign of Beechwood Avenue includes the following elements to increase comfort and safety for these vulnerable road users within the context area:

- Conversion of Beechwood & St. Charles to a 'protected intersection', including fully-integrated pedestrian and cycling facilities on all four approaches;
- Upgrade of existing on-road cycling facilities to grade-separated cycle tracks on both sides of Beechwood Avenue through the context area. These facilities will be separated from the vehicle travel lanes by a minimum 0.5m interlock boulevard;
- Increasing sidewalk widths from 1.8m to approximately 2.5m to 3.0m; and
- Implementation curb bulb-outs at intersections to reduce pedestrian crossing distances and improve driver sightlines.

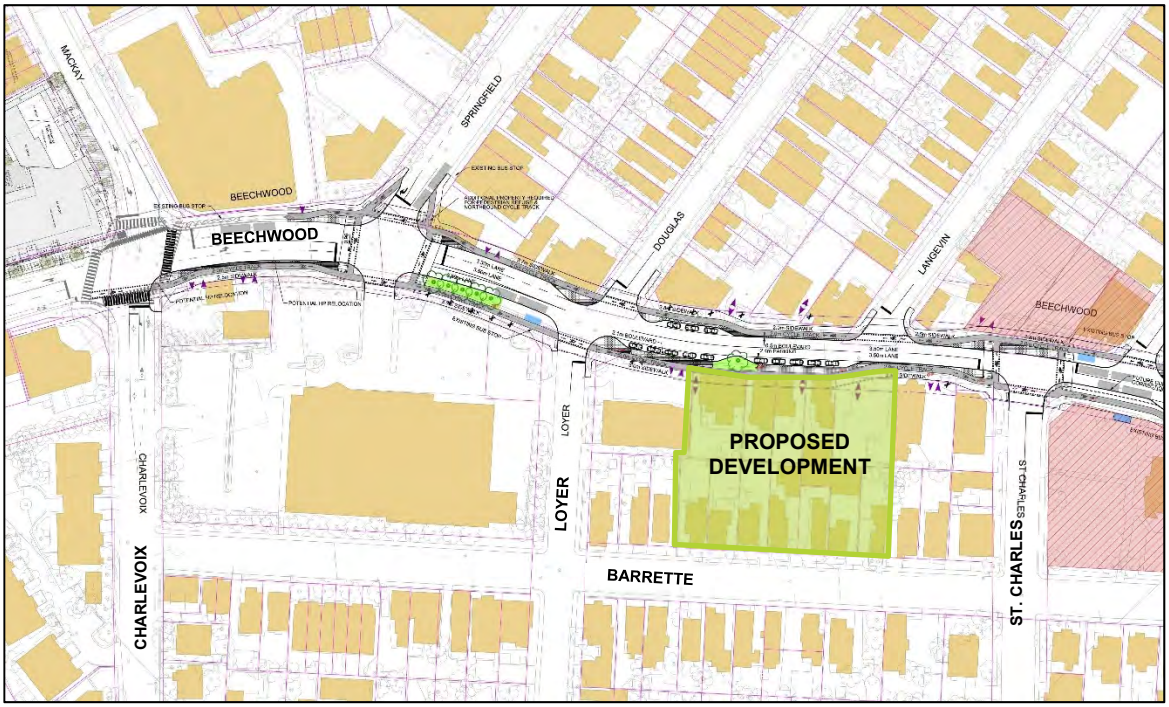
The Beechwood Avenue Complete Street RMA (Functional Design), with respect to the subject site, is illustrated in **Figure 3** and **Figure 4** below.

Figure 3 – Beechwood RMA (Functional Design) Along Development Frontage



Source: City of Ottawa (June 24, 2019)

Figure 4 - Beechwood RMA (Functional Design) Through the Context Area



Source: City of Ottawa (June 24, 2019)

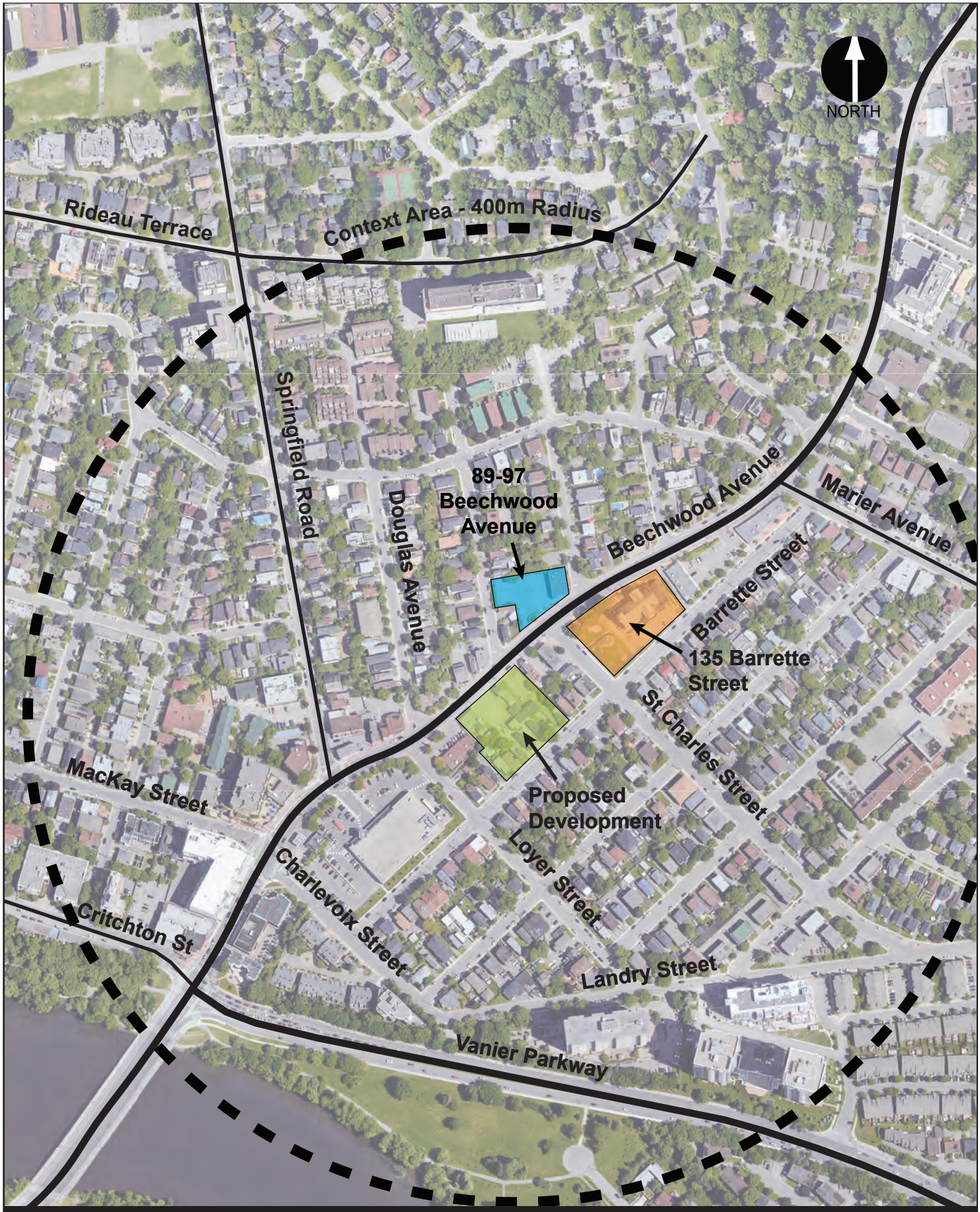
3.2.1.4 Future Adjacent Developments

The City of Ottawa Transportation Impact Assessment (TIA) Guidelines specify that all significant developments proposed within the surrounding area which are likely to occur within the study's horizon year must be identified and taken into consideration in the development of future background traffic projections.

There are currently only two development applications of significance in the vicinity of the proposed development:

- **135 Barrette Street** is a proposed residential development consisting of a 6-storey residential building with ground floor commercial space. This development is currently under construction.
- **89-97 Beechwood Avenue** is a proposed residential development consisting of a six-storey building with ground floor commercial space. Construction has not yet begun on this development.

The approximate locations of all developments and planned future developments are shown in **Exhibit 5** below. The targeted build-out dates identified are those stated in the respective studies.



Mid-Rise Residential Development
78-90 Beechwood/ 69-93 Barrette
Transportation Impact Assessment

Exhibit 5:
Adjacent Developments

PROJECT No. 125192
DATE: July 2020
SCALE: 0m 50m 100m

3.2.2 Network Concept Screenline

Not Applicable: A network screenline analysis is not expected to be necessary for this development, as it does not trigger the threshold prescribed by the TIA Guidelines of 200 person-trips during the peak hour beyond what is otherwise permitted by zoning. Detailed trip generation will be provided in the Forecasting section of this report.

3.3 Study Area

Based on preliminary trip generation results undertaken as part of the TIA Screening, the development context and direct access to a variety of transportation modes, the proposed development is expected to be a relatively low traffic generator, with approximately 205 person-trips projected during the weekday morning and weekday afternoon peak hours. Person-trip volumes were developed using the TRANS Trip Generation Study (August 2009), and will be further detailed in the Forecasting component of this study. Travel demand will subsequently be stratified by mode share, divided amongst the numerous potential routes to access the arterial road network and further diluted by the variation in travel routes within the broader study area. As such, the proposed development is expected to contribute minimal downstream impacts to signalized intersections on the periphery of the context area, including the intersection of the Vanier Parkway & Beechwood/ St. Patrick, as well as, the intersection of Beechwood & Marier.

The Beechwood Ave & Springfield Road intersection was not included in the study area, as the site-generated traffic volumes from this development will only be assigned to through movements on Beechwood Avenue at this intersection in keeping with typical road classification hierarchy. Traffic volumes, therefore, are not expected to impact any critical turning movements and as a result, any added traffic is expected to have little to no impact on the overall operations of the intersection.

The intersections of Loyer/ Barrette and Loyer/ Beechwood are not included in the study area either, as impacts to these intersections are expected to be minimal. It is assumed that the signalized intersection of Beechwood/ St. Charles will serve as a more favourable route to access Beechwood Avenue.

With consideration of the information presented thus far, the following intersections have been identified as being most impacted by the proposed development and will be assessed for vehicular capacity as part of this study:

- Beechwood Avenue & Charlevoix Street / MacKay Street (signalized)
- Beechwood Avenue & St. Charles Street (signalized)
- St. Charles Street & Barrette Street (stop-controlled)

Multi-Modal Level of Service (MMLOS) will be conducted for both signalized intersections listed above. Stop-controlled intersections are exempt from this analysis, as no methodology currently exists for evaluating MMLOS at unsignalized intersections.

Additional MMLOS analysis will be conducted for the relevant boundary street segments, which in this case is limited to segment of Barrette Street adjacent to the proposed development. The segment of Beechwood Avenue along the property frontage is exempt from this analysis, as a Complete Street functional design currently exists and is being implemented incrementally along the corridor.

3.4 Time Periods

The proposed development primarily consists of residential land uses with a small commercial component. As such, traffic generated during the weekday morning and afternoon peak hour is expected to result in the most significant impact to traffic operations on the adjacent road network

in terms of combined development-generated and background traffic. These two time periods will therefore be considered for operational analysis in this study.

3.5 Analysis Years

Based on the anticipated build-out year of the proposed development, the following two analysis years will be considered in this TIA:

- Year 2023 – Full Build-out of the Proposed Development
- Year 2028 – 5 Years Beyond Full Build-out / Occupancy

3.6 Exemptions Review

The TIA Guidelines provide exemption considerations for elements of the Design Review and Network Impact components. **Table 4** summarizes the TIA modules that are not applicable to this study.

Table 4 - Exemptions Review

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

4 Forecasting

4.1 Development Generated Traffic

4.1.1 Trip Generation Methodology

Peak hour site-generated traffic volumes for the residential land use were developed using the 2009 TRANS Trip Generation Residential Trip Rates Study Report. The TRANS trip generation rates are based on a blended rate derived from 17 trip generation studies undertaken in 2008, the ITE Trip Generation Manual and the 2005 TRANS Origin-Destination (O-D) Travel Survey. Separate trip generation rates exist for each of the four general geographic areas in Ottawa: Core, Urban (Inside the Greenbelt), Suburban (Outside the Greenbelt) and Rural. These trip generation rates reflect existing travel behavior by dwelling type and geographic area. The TIA Guidelines recommend that the TRANS trip generation rates be converted to person-trips based on the vehicular mode share proportions detailed in the TRANS Trip Generation study.

Peak hour site-generated traffic volumes for the commercial component were developed using the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition). The TIA Guidelines indicate that vehicle-trip generation rates from the ITE Trip Generation Manual should be converted to person-trips through the application of a 1.28 vehicle-to-person-trip conversion factor.

Person-trips for both the residential and commercial components of the proposed development were then subdivided based on representative mode share percentages applicable to the study area to determine the number of auto driver, auto passenger, transit, pedestrian, cycling and 'other' trip types.

4.1.2 Trip Generation Results

4.1.2.1 Vehicle Trip Generation

Weekday peak hour vehicular traffic volumes associated with the residential portion of the subject development were determined using the trip generation rates published in the TRANS Trip Generation study. The ground floor commercial component was determined using appropriate rates from the ITE Trip Generation Manual.

The base vehicular trip generation for the proposed development has been summarized in **Table 5** below.

Table 5 - Base Vehicular Trip Generation

LAND USE	SIZE	PERIOD	GENERATED TRIPS (VPH)		
			IN	OUT	TOTAL
Mid-Rise Apartment (TRANS Study)	251 units	AM	14	46	60
		PM	43	27	70
Shopping Centre (ITE – 820)	570 m^2 GLA	AM	2	4	6
		PM	14	9	23

Notes: vph = vehicles per hour; GLA = Gross Leasable Area

4.1.2.2 Person Trip Generation

For the residential land use, person-trip to vehicle-trip conversion factors for TRANS trip generation rates vary depending on the peak hour, geographic location and land use considered. The base vehicular trip generation values from the previous section were divided by the vehicle mode share to determine the number of person-trips generated by the Mid-Rise Apartment land use.

For the commercial component, the base vehicular trip generation values were translated to person-trips through the use of a 1.28 vehicle-to-person-trip conversion rate, as prescribed in the TIA Guidelines.

The resulting number of person-trips have been summarized in **Table 6** below.

Table 6 - Person-Trip Generation

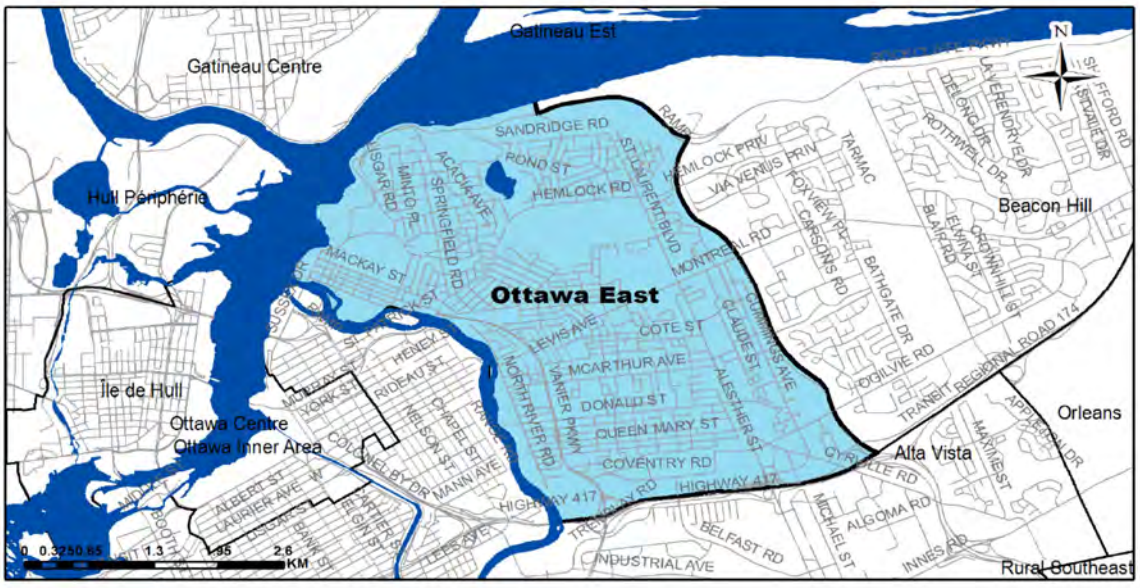
LAND USE	AUTO MODE SHARE OR CONVERSION FACTOR	PERIOD	PERSON TRIPS (PPH)		
			IN	OUT	TOTAL
Mid-Rise Apartment	37%	AM	37	125	162
	40%	PM	108	67	175
Shopping Centre	1.28	AM	2	6	8
	1.28	PM	19	11	30

Notes: pph = persons per hour

4.1.2.3 Mode Share Proportions

The 2011 TRANS Origin-Destination (O-D) Survey provides approximations of the existing modal share within the Ottawa East Traffic Assessment Zone (TAZ). The extents of the Ottawa East TAZ are illustrated in **Figure 5** below. Relevant extracts from the 2011 O-D Survey are provided in **Appendix F**.

Figure 5 - Ottawa East TAZ



Source: 2011 TRANS O-D Survey

The proposed weekday morning and afternoon mode share targets for the residential and commercial portion of the development were derived using a weighted averages of mode share distributions from the Ottawa East TAZ. The use of distinctive mode share distributions for each component of the development is intended to capture the specific characteristics associated with each land use type.

The existing mode share and the mode share targets for the residential and commercial components of the proposed development are outlined below in **Table 7**, respectively.

Table 7 - Proposed Mode Share Targets

TRAVEL MODE	EXISTING MODE SHARE						MODE SHARE TARGETS	
	AM FROM	AM TO	AM WITHIN	PM FROM	PM TO	PM WITHIN	RESIDENTIAL[1]	COMMERCIAL[2]
Auto Driver	45%	64%	33%	64%	48%	43%	44%	39%
Auto Passenger	10%	11%	15%	15%	15%	16%	14%	16%
Transit	30%	19%	4%	18%	27%	7%	21%	6%
Cycling	6%	1%	6%	2%	7%	3%	6%	4%
Walking	2%	1%	33%	1%	2%	25%	11%	29%
Other	6%	5%	8%	2%	2%	6%	5%	7%

Notes:

[1] Assumed a weighted average of AM 'From', AM 'Within', PM 'To' and PM 'Within' from the 2011 TRANS O-D Survey, Ottawa East TAZ

[2] Assumed a weighted average of AM 'Within' and PM 'Within' from the 2011 TRANS O-D Survey, Ottawa Inner Area TAZ

4.1.2.4 Trip Reduction Factors

Deduction of Existing Development Trips

There are existing commercial and low-rise residential land uses on the subject site, however the total traffic generation of the site is assumed to be insignificant. As such, no deduction of existing traffic volumes from the adjacent road network will be undertaken as part of this study.

Pass-by Traffic

Based on ITE Trip Generation Handbook (3rd Edition), approximately 66% of vehicular trips generated by the commercial component of the development are expected to be from pass-by traffic, or in other words, traffic that is already present on the adjacent roadway. As the commercial component of the development is not expected to generate a significant amount of traffic, the resulting volume of new commercial trips would be nominal.

Synergy/ Internalization

Synergy or internalization is typically applied to developments with two or more land uses to prevent double-counting of trips with multiple intermediate destinations within the same site. With respect to this site, the interaction between the residential and commercial land uses as the primary trip purpose is not expected to be significant. As such, no internalization has been considered in the analysis.

4.1.2.5 Trip Generation by Mode

The mode share targets presented above were applied to the number of development-generated person-trips to establish the number of trips per travel mode, as summarized in **Table 8** below.

Table 8 – Peak Hour Person-Trips by Mode

MODE	AM Peak Hour			PM Peak Hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Auto Driver	18	56	74	55	34	89
Auto Passenger	5	18	23	18	11	29
Transit	8	26	34	24	15	39
Cycling	2	7	9	7	4	11
Walking	5	15	20	17	10	27
Other	2	7	9	6	4	10
Total	**40**	**130**	**170**	**127**	**78**	**205**

Based on the above, the proposed development is expected to generate up to 74 and 89 new two-way vehicular trips during the weekday morning and afternoon peak hours, respectively.

4.1.3 Trip Distribution and Assignment

Route selection and weighting for the proposed development distribution was derived based on a review of travel patterns from Ottawa East Traffic Assessment Zone (TAZ), the configuration of the road network within the vicinity of the site and the concentration of employment nodes within adjacent TAZs. Consideration was also given to Google Maps travel times during peak hour conditions, as well as intersection-level turning movement counts at each study area intersection.

Based on the above, the following distribution of site-generated traffic has been assumed:

- 20% to/from the East
    - 100% on Beechwood Avenue via St. Charles Street
- 55% to/from the West
    - 100% on St. Patrick Street
        - 50% to the West via Beechwood/ St Charles
        - 50% to the West via Beechwood/ Charleboix
        - 50% from the West via Beechwood/ Loyer
        - 25% from the West via Beechwood/ St. Charles
        - 25% from the West via Beechwood/ Charleboix
- 25% to/from the South
    - 80% on Vanier Parkway
        - 50% to the West via Beechwood/ St Charles
        - 50% to the West via Beechwood/ Charleboix
        - 50% from the West via Beechwood/ Loyer
        - 25% from the West via Beechwood/ St. Charles
        - 25% from the West via Beechwood/ Charleboix
    - 10% via St. Charles Street
    - 10% via Loyer Street

Utilizing the estimated number of new auto trips and applying the above distribution, future site-generated traffic volumes are illustrated for each of the study area intersections in **Exhibit 6** below.

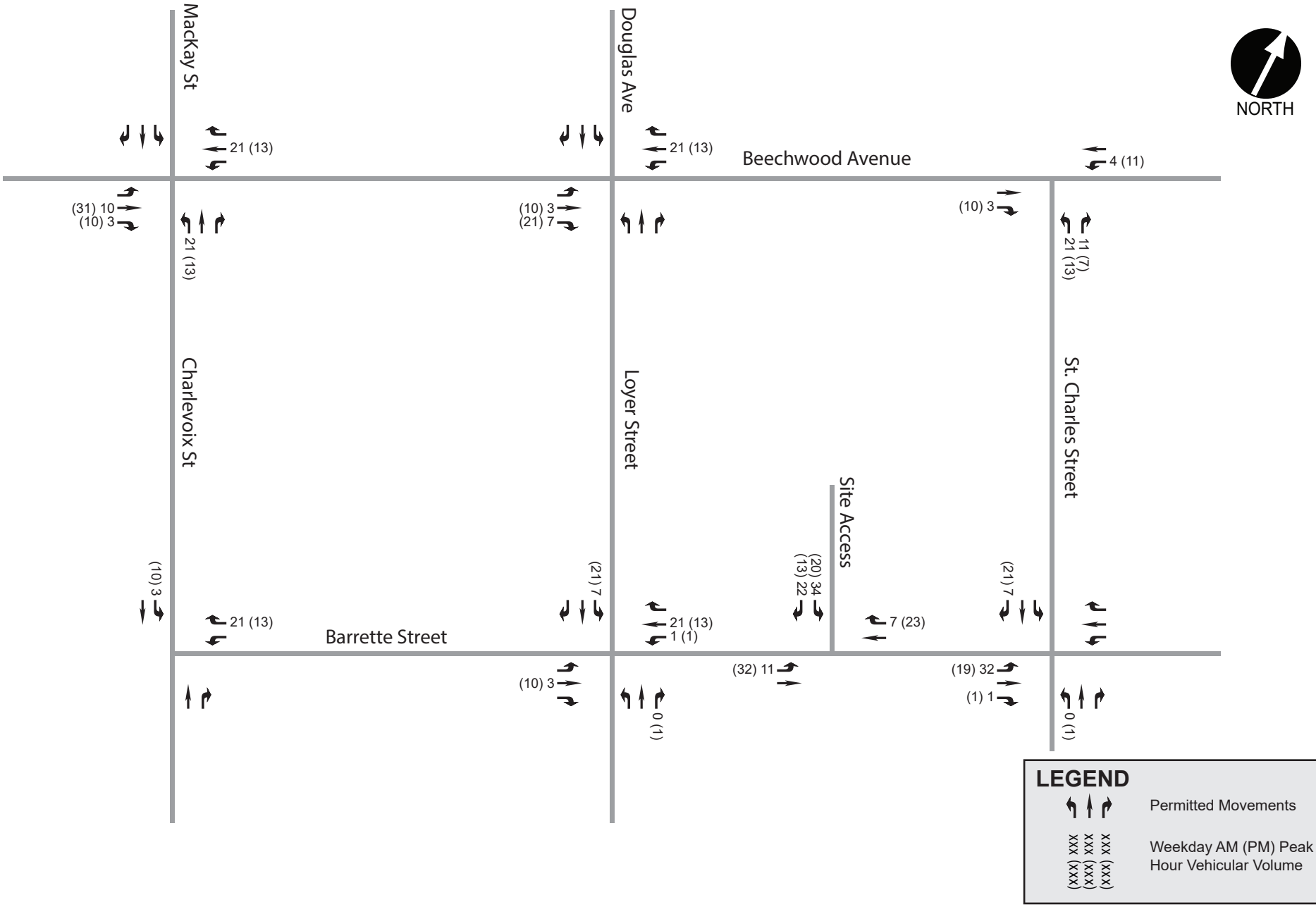


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Exhibit 6:
Site-Generated Traffic

PROJECT No. 125192
DATE: July 2020
SCALE: N.T.S.

4.2 Background Network Traffic

4.2.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, planned modifications to the transportation network that may impact travel patterns or demand within the study area must be considered. The scoping section of this TIA reviewed the anticipated network modifications within the study area and determined that the most notable network change within the study area is the ongoing transition of Beechwood Avenue into a Complete Street.

As discussed previously, an interim Beechwood Avenue Complete Street design was implemented in 2017 to serve as a cost-effective and short-term measure to improve cyclist safety along the Beechwood Crosstown Bikeway route, primarily through the use of signage and pavement markings. The purpose of this interim design was to help bridge the gap between the existing substandard facilities and its ultimate Complete Street configuration.

For the purposes of this study, the most notable elements associated with the ultimate design include further enhancements to pedestrian and cycling facilities through the implementation of measures such as wider sidewalks, 'protected intersections' and grade-separated cycle tracks. The implementation of the Beechwood Avenue RMA is developer-driven and its completion will therefore be dependent on the timing of development applications along the corridor. It has been conservatively assumed in this report that there will be no further refinements to existing facilities on Beechwood Avenue within the 2028 horizon year of this, with the exception of refinements along the proposed development's frontage.

4.2.2 General Background Growth Rates

The background growth rate is intended to represent any regional growth from outside the study area that will travel along the adjacent road network.

As indicated by City staff, there is no traffic growth projected along the Beechwood Avenue corridor, based on a comparison of 2011 and 2031 peak hour volumes from the Strategic Long-Range Model. The use of a 0% growth rate along the Beechwood Avenue is further supported by TIAs recently conducted for adjacent development. As such, no growth was applied to Beechwood Avenue in order to approximate existing conditions and subsequently to estimate future background traffic volumes. Similarly, no growth was applied to local roads within the study area. Any traffic growth on the adjacent road network was assumed to originate from future adjacent developments that are accounted for separately in this analysis.

4.2.3 Other Area Development

Future adjacent developments in the vicinity of the proposed development have been identified previously in the Scoping section of this report. **Table 9** below summarizes the land use details and expected build-out year of these future adjacent developments.

Table 9 - Future Adjacent Developments

DEVELOPMENT	LAND USE	EXPECTED BUILD-OUT YEAR
135 Barrette Street	• 38 Apartment Dwelling Units • 186 m^2 Coffee Shop • 418 m^2 Sit-Down Restaurant	2020
89-97 Beechwood Avenue	• 67 Residential Condos/ Townhome Dwelling Units • 1,162 m^2 Specialty Retail	2016 [1]

Notes:

[1] Constructed not yet started. Build-out/ occupancy assumed to occur by 2023 study horizon year.

4.3 Demand Rationalization

The purpose of this section is to rationalize future travel demands within the study area to account for potential capacity limitations in the transportation network and its ability to effectively accommodate the additional demand generated by a new development.

4.3.1 Description of Capacity Issues

There are no documented capacity issues at any of the study area intersections. A review of intersection capacity analysis results for adjacent development TIAs indicates that the intersections of Beechwood/ St. Charles and Barrette/ St. Charles are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) under existing and future traffic conditions.

Based on existing traffic count data, there is additional capacity on Beechwood Avenue, despite the significant reduction in vehicular capacity as part of the Complete Street redesign. It is generally accepted that the capacity of an arterial road is 1,000 vehicles per hour per lane (vphpl). Traffic count data collected by the City indicates that peak hour volumes on Beechwood Avenue are presently in the order of 650 to 700 vphpl through its intersections with St. Charles Street. Further west at Charlevoix Street, Beechwood Avenue consists of a four-lane cross-section and experiences peak direction volumes in the order of 850 vehicles per hour across both peak direction travel lanes. Additional traffic resulting from development-generated and background network demands are not expected to exceed the capacity thresholds at any of the study area intersections on Beechwood Avenue.

4.3.2 Adjustment to Development-Generated Demands

Development-generated demands were determined based on travel patterns for the Ottawa East TAZ in the O-D Survey. No alternations were made to the mode share beyond the use of a blended rate, which considered both internal trips (i.e. within the TAZ), as well as inter-zonal trips.

4.3.3 Adjustment to Background Network Demands

As prescribed in the TIA Guidelines, the effects of peak-hour spreading have been considered in in future analysis years of this study. It is anticipated that as traffic volumes continue to gradually increase, traffic volumes will have a natural tendency to be more evenly distributed across the peak hour (PHF = 1.0) and eventually increase demands in the shoulders of the peak as well. The impacts of peak hour spreading are accounted for in the Synchro modelling, completed as part of the Analysis component of this study.

As no specific capacity issues have been identified through previous studies, no further adjustments to background network demands are necessary.

4.4 Traffic Volume Summary

4.4.1 Future Background Traffic Volumes

Future background traffic volumes were derived by superimposing future adjacent development volumes directly onto existing traffic. As discussed previously, all background growth through the study area was assumed to originate from these adjacent developments and thus no growth rate was considered in the calculation of future background traffic volumes.

Since the build-out of both adjacent developments are expected by the build-out/ occupancy of the proposed development in 2023, future background volumes can be represented by a single scenario.

Exhibit 7 below presents the future background traffic volumes anticipated for both the 2023 and 2028 analysis years.

4.4.2 Future Total Traffic Volumes

Future total traffic volumes have been established by combining the site-generated traffic volumes with the future background traffic volumes. Similarly to the future background volumes, future total volumes can be represented by a single scenario for the purposes of this study.

Exhibit 8 below presents the future total traffic volumes anticipated for both the 2023 and 2028 analysis years.

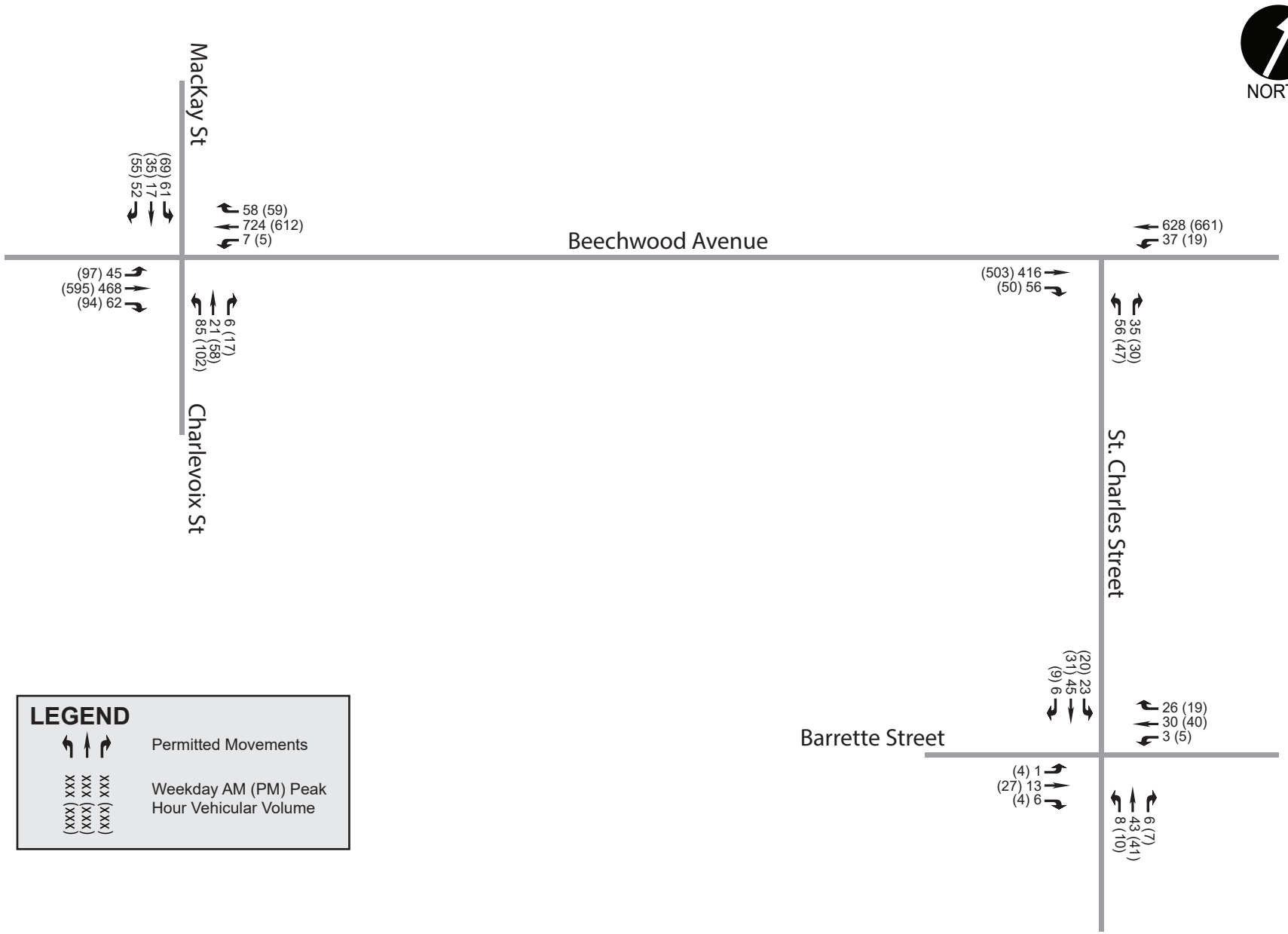

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Exhibit 7:
Future (2023 & 2028)
Background Traffic

PROJECT No. 125192
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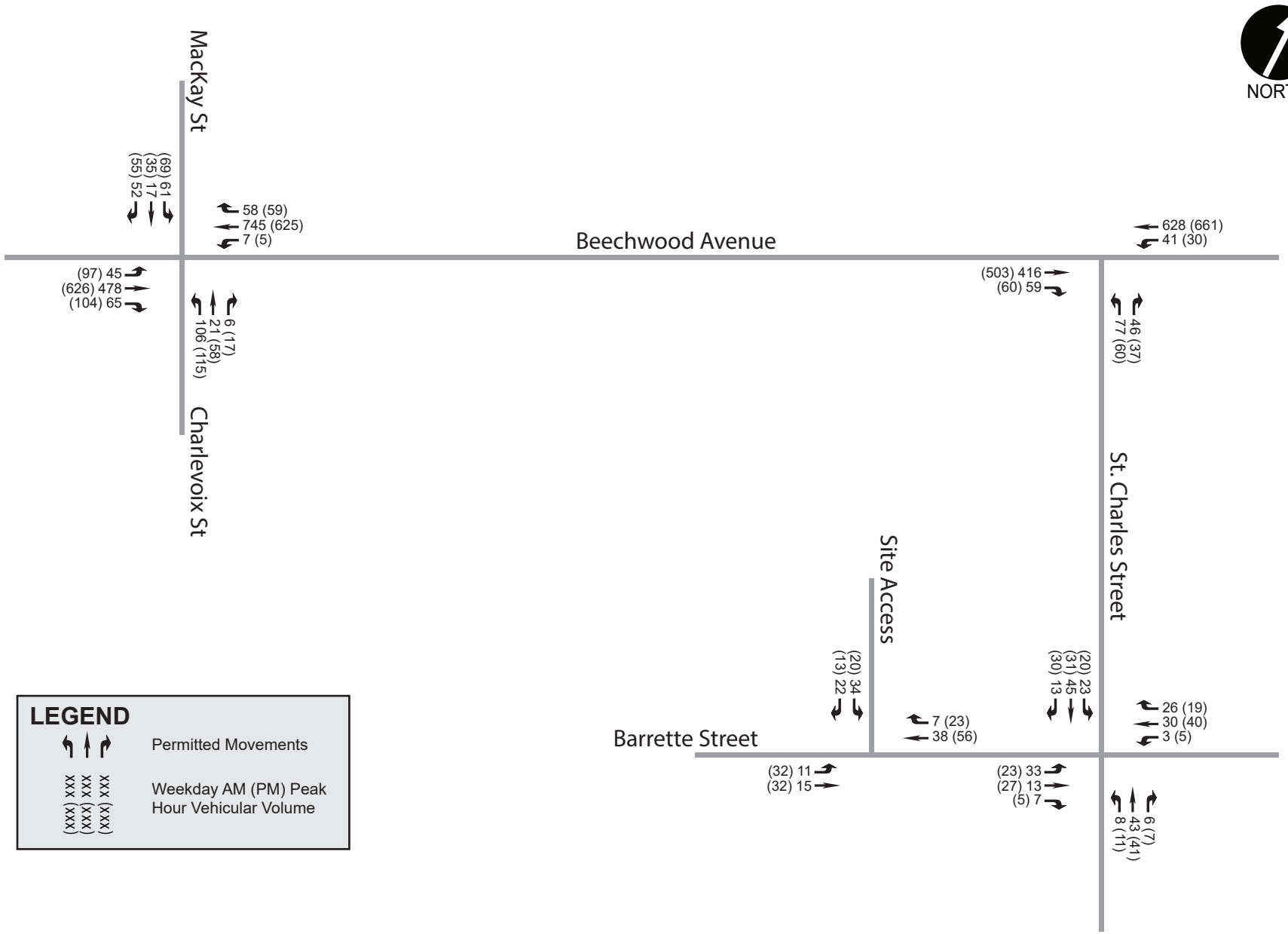
SCALE: N.T.S.



Mid-Rise Residential Development
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Exhibit 8:
Future (2023 & 2028)
Total Traffic

PROJECT No. 125192
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SCALE: N.T.S.

5 Analysis

5.1 Development Design

5.1.1 Design for Sustainable Modes

For consistency with the City of Ottawa's Urban Design Guidelines and transportation policies, new developments shall provide safe and efficient access for all users, while creating an environment that encourages walking, cycling and transit use.

The proposed development is located adjacent to Beechwood Avenue, a Traditional Mainstreet which presently has exclusive pedestrian and cycling facilities in both directions. In conjunction with the redevelopment of the subject site, Beechwood Avenue will be reconstructed along the site's frontage to accommodate grade-separated cycle tracks in the eastbound direction, as well as a wider sidewalk. Westbound facilities on the north side of Beechwood Avenue will be improved by others in the future. Furthermore, the proposed development will facilitate connectivity between Beechwood Avenue and Barrette Street through the implementation of a publicly accessible mid-block pedestrian connection along the eastern boundary of the site. The above noted design and infrastructure improvements will contribute to a development that encourages a reduction in private auto usage by integrating well with the existing and proposed sustainable transportation infrastructure.

Within the study area, Beechwood Avenue is served by five transit routes. The proposed development is located entirely within the minimum-prescribed distance of 400m to public transportation.

The TDM-Supportive Development Design and Infrastructure Checklist was completed and is provided in **Appendix G**. This checklist identifies specific measures that are being considered in association with the proposed development to offset the vehicular impact on the adjacent road network.

5.1.2 Circulation and Access

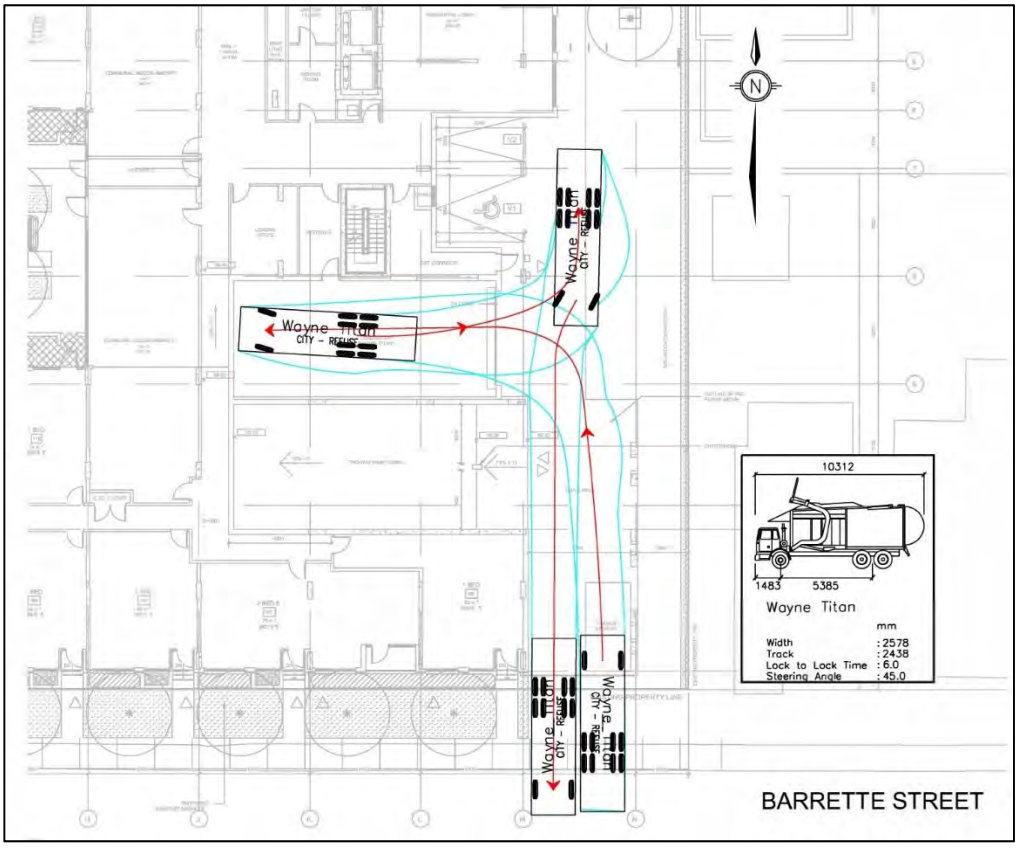
All site-generated traffic will access the proposed development via a two-way private approach on Barrette Street. Within the underground parking facility, all drive aisles will be a minimum of 6.0m wide.

The primary pedestrian access to the residential lobby is strategically located on the east side of the building to provide convenient access to Beechwood Avenue, as well as the proposed pedestrian mid-block connection to Barrette Street with active entrances for each commercial unit fronting directly on Beechwood Avenue. Ground-floor dwelling units along the Barrette Street frontage will have separate on-street entrances to align with the existing built form along the street.

Designated loading and waste collection areas are proposed adjacent to but segregated from the parking garage entrance. The waste collection area has been designed with sufficient width and height to accommodate a front-loading Garbage Truck. Garbage and recycling is collected in a single designated area located adjacent to the parking garage entrance, eliminating the need for these trucks to maneuver through the parking garage.

The vehicle turning templates for a Garbage Truck accessing the waste collection area are presented in **Figure 6** below.

Figure 6 – Turning Template Analyses



5.1.3 New Street Networks

Not Applicable: The New Street Networks element is exempt from this TIA, as defined in the study scope. This element is not required for development applications involving site plans.

5.2 Parking

5.2.1 Parking Supply

For the residential component of the site, two levels of underground parking will be provided with a total of 157 vehicle parking spaces, along with 2 at-grade spaces for a grand total of 159 spaces. A total of 131 bicycle parking spaces are proposed, with 3 at-grade spaces dedicated to the commercial land use, and the remaining 128 spaces located within P1 of the parking garage.

No commercial parking is proposed within the parking garage, therefore all parking for this land use is assumed to occur on-street within the site's Beechwood Avenue frontage. This parking arrangement is compliant with the Urban Design Guidelines for Traditional Mainstreets.

The Zoning Bylaw indicates that a minimum of 142 vehicle parking spaces, 23 visitor parking spaces and 129 bicycle parking spaces must be provided for the proposed development. The parking supply meets or exceeds all of the above noted requirements and therefore is in compliance with the Zoning Bylaw.

5.2.2 Spillover Parking

The minimum parking supply requirement has been met, therefore, no further review of parking will be necessary for the purposes of this study.

5.3 Boundary Streets

There are two existing boundary streets adjacent to the proposed development: Beechwood Avenue and Barrette Street.

5.3.1 Mobility

Segment-based Multi-Modal Level of Service (MMLOS) results for the Barrette Street frontage are provided in **Table 10** below. The Beechwood Avenue site frontage is exempt from this analysis, as a Complete Street functional design currently exists and is being implemented incrementally along the corridor

Details of the Multi-Modal Level of Service (MMLOS) analysis are provided in **Appendix H**.

Table 10 - Segment MMLOS Results

LOCATION	LEVEL OF SERVICE BY MODE			
	PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
SEGMENT(S)				
Barrette Street	B (Target: C)	D (Target: B)	D (Target: D)	B (Target: N/A)

The results of the Segment MMLOS indicate that Barrette Street is not currently meeting its BLOS target. The segment of Barrette Street presently accommodates cyclists through the use of bicycle 'sharrows'. It is anticipated by the City that on-street bicycle facilities along Beechwood Avenue will be incrementally upgraded to a cycle-track configuration in conjunction with adjacent development, thereby lessening the bicycle volumes on Barrette Street.

5.3.2 Road Safety

A summary of all reported collisions within the study period over the past five years was presented in the Scoping section of this TIA. The City requires a safety review if at least six collisions for any one movement or of a discernible pattern have occurred over a five-year period. Preliminary analyses identified some intersections and road segments of potential concern, therefore further review was conducted, as summarized below:

Barrette Street & St. Charles Street

In the past five years, there have been a total of nine collisions reported at this intersection. Further review of the City's collision records indicated that all nine collisions were classified as 'angle' collisions. It should be noted, however, that these angle collisions involved a relatively even distribution of vehicles from all four intersection approaches and thus no significant pattern was observed at this intersection. The majority of collisions (5/9) occurred during the weekday morning or afternoon peak hours. All recorded collisions were classified as being minor in nature, involving property damage only (7/9) or non-fatal injuries (2/9).

Beechwood Avenue & Charlevoix Street/ MacKay Street

There have been a total of 22 collisions observed at this intersections over the past five years. Upon further review of the data, however, it was evident that no collision type occurred six or more times over this five-year period.

A breakdown of the collision data by collision type is as follows:

- Rear End – 5 collisions
- Angle – 4 collisions
- Turning Movement – 5 collisions
- Sideswipe – 5 collisions
- Single Motor Vehicle – 2 collision
- Approach – 1 collision

As such, no significant reoccurring collision patterns have been observed at this intersection.

5.4 Access Intersections

5.4.1 Location and Design of Access

The proposed development will provide a new two-way private approach on Barrette Street. The proposed site access is in conformance with the City of Ottawa Private Approach By-law 2003-447, with particular confirmation of the following items:

- Width: A private approach shall have a minimum width of 2.4m and a maximum width of 9.0m. The City of Ottawa Zoning By-law, however, indicates that within a parking garage a two-way private approach shall have a minimum width of 6.0m.
  - The parking garage drive aisle will be 6.0m wide. ✓
- Quantity and Spacing of Private Approaches: For sites with frontage between 46 and 150 metres, one (1) two-way private approach and two (2) one-way private approaches or two (2) two-way private approaches are permitted. Any two private approaches must be separated by at least 9.0m and can be reduced to 2.0m in the case of two one-way driveways. On lots that abut more than one roadway, these provisions apply to each frontage separately.
  - The site's frontage on Beechwood Avenue is approximately 70m, therefore the single two-way private approach is compliant with the by-law. ✓
- Distance from Property Line: Private approaches must be at least 3.0m from the abutting property line, however this requirement can be reduced to 0.3m provided that the access is a safe distance from the access serving the adjacent property, sight lines are adequate and that it does not create a traffic hazard.
  - The private approach is approximately 3.0m from the property line. ✓
- Grade of Private Approach: The grade of a private approach serving a parking area of more than 50 spaces must not exceed 2% within the private property for a distance of 9m from the highway/curb line.
  - The grade of the private approaches will be less than 2% within 9m of the curb, before increasing to 7.5%. ✓

5.4.2 Access Intersection Control

It is expected that the site access intersection will operate acceptably as an unsignalized intersection.

5.4.3 Access Intersection Design (MMLOS)

Not Applicable – The site access driveway will be unsignalized, therefore MMLOS analysis is not required for this intersection.

5.5 Transportation Demand Management (TDM)

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a City-wide basis in an effort to reduce automobile dependence, particularly during the weekday peak travel periods. TDM initiatives are aimed at encouraging individuals to use non-auto modes of travel during the peak periods.

5.5.1 Context for TDM

As discussed previously, the proposed development is located adjacent to Beechwood Avenue, a Traditional Mainstreet, which is being gradually upgraded to include enhanced facilities to further support the use of active and sustainable modes of transportation. The site is also located in a Design Priority Area (DPA) and will provide apartment suites ranging in size from 400 to 1,050 square feet. The planned unit breakdown is as follows: 10% Studio, 47% One-Bedroom, 39% Two-Bedroom and 4% Two-Bedroom Plus Den.

5.5.2 Need and Opportunity

With the incremental reconstruction of Beechwood Avenue to accommodate enhanced active transportation facilities for pedestrians and cyclists, there is an opportunity to increase the overall proportion of sustainable transportation trip within the surrounding community. As indicated in the Forecasting component of this report and verified through intersection capacity analysis (see Section 5.9), however, with no capacity issues expected at any study area intersections, a more conservative approach was assumed in which site-generated trips were assumed to follow blended mode share distributions from the 2011 O-D Survey. No alternations were made to the mode shares derived from the O-D Survey to account for future transportation-related infrastructure improvements.

5.5.3 TDM Program

The proposed development conforms to the City's TDM principles by providing convenient and direct connections to adjacent pedestrian and transit facilities. A mid-block pedestrian connection is proposed between Beechwood Avenue and Barrette Street along the eastern property boundary, which will allow the development to more seamlessly integrate within the existing urban fabric.

The City of Ottawa's TDM Measures Checklist was completed for the proposed development and provided in **Appendix G**. This checklist indicates measures that are being contemplated as part of this development. A more detailed TDM program will be further developed at the site plan application stage.

5.6 Neighbourhood Traffic Management

5.6.1 Adjacent Neighbourhoods

As the development is dependent on local roads (i.e. Barrette Street and St. Charles Street) for access, a review of Neighbourhood Traffic Management thresholds is required as part of the TIA process.

The TIA Guidelines specify a liveability threshold of 120 vehicles per hour for local roads. Barrette Street is projected to operate with two-way total traffic volumes up to 105 and 140 vehicles during the weekday morning and afternoon peak hours, respectively. It is possible therefore that vehicular volumes may slightly exceed 120 vehicles per hour, however any such events are expected to occur infrequently and be restricted to the weekday afternoon peak hour.

Although technically identified in the TMP as a local road, St. Charles Street effectively functions as a 'collector' road by providing direct, signalized access to an arterial road (i.e. Beechwood Avenue). As such, it is projected to experience traffic volumes in the order of 190 to 225 vehicles per hour approaching Beechwood Avenue which are typically more characteristic of a collector road.

5.7 Transit

5.7.1 Route Capacity

The estimated future site-generated transit demand was provided in the Forecasting component of this study. The results have been summarized in **Table 11** below.

Table 11 – Development Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	8	26
PM	24	15

As indicated in **Table 11** above, site-generated two-way transit ridership volumes of roughly 34 and 39 passengers are expected during the weekday morning and afternoon peak hours, respectively. With consideration that the study area is served by five transit routes during the weekday peak hours with average headways of 15 minutes, these transit trips are expected to be easily accommodated. As such, no additional transit capacity will be required to accommodate the proposed development.

5.7.1 Transit Priority Measures

The expected increase in transit ridership associated with the proposed development is not expected to trigger the need for any isolated transit priority measures to offset any transit delays. Further, the Beechwood RMA Complete Street Functional Design supports the continued use of a two-lane cross-section through the study area, therefore signal priority measures are not expected to be a key consideration along this corridor.

5.8 Review of Network Concept

Not Applicable – The Network Concept element is exempt from this TIA, as defined in the study scope. This element is not required for proposed developments expected to generate less than 200 person-trips beyond what is otherwise permitted by zoning during the weekday morning and afternoon peak hours.

5.9 Intersection Design

The following sections summarize the methodology and results of the multi-modal intersection capacity analysis conducted within the study area.

5.9.1 Intersection Control

The following section evaluates the need to conduct traffic signal warrant analyses and roundabout analyses at any applicable study area intersections.

5.9.1.1 Traffic Signal Warrants

Not Applicable – All intersections within the study area are presently signalized with the exception of St. Charles & Barrette Street, which is configured with stop control on Barrette Street. The capacity analysis presented in subsequent sections of this report indicates that this intersection is expected to operate at an acceptable level of service (i.e. LOS 'D' or better) beyond the horizon year of this study. As such, no traffic signal warrant analysis is necessary for this study.

5.9.1.2 Roundabout Analysis

Not Applicable - As per the City's Roundabout Implementation Policy, intersections that satisfy any of the following criteria should be screened utilizing the Roundabout Initial Feasibility Screening Tool:

- At any new City intersection;
- Where traffic signals are warranted; or
- At intersections where capacity or safety problems are being experienced.

None of the study area intersections meet any of the above criteria, therefore no roundabout analysis is required for this study.

5.9.2 Intersection Analysis Criteria (Automobile)

The following section outlines the City of Ottawa's methodology for determining motor vehicle Level-of-Service (LOS) at signalized and unsignalized intersections.

5.9.2.1 Signalized Intersections

In qualitative terms, the Level-of-Service (LOS) defines operational conditions within a traffic stream and their perception by motorists. A LOS definition generally describes these conditions in terms of such factors as delay, speed and travel time, freedom to manoeuvre, traffic interruptions, safety, comfort and convenience. LOS can also be related to the ratio of the volume to capacity (v/c) which is simply the relationship of the traffic volume (either measured or forecast) to the capability of the intersection or road section to accommodate a given traffic volume. This capability varies depending on the factors described above. LOS are given letter designations from 'A' to 'F'. LOS 'A' represents the best operating conditions and LOS 'E' represents the level at which the intersection or an approach to the intersection is carrying the maximum traffic volume that can,

practicably, be accommodated. LOS 'F' indicates that the intersection is operating beyond its theoretical capacity.

The City of Ottawa has developed criteria as part of the Transportation Impact Assessment Guidelines, which directly relate the volume to capacity (v/c) ratio of a signalized intersection to a LOS designation. These criteria are presented in **Table 12** as follows:

Table 12 - LOS Criteria for Signalized Intersections

LOS	VOLUME TO CAPACITY RATIO (v/c)
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	> 1.00

The intersection capacity analysis technique provides an indication of the LOS for each movement at the intersection under consideration and for the intersection as a whole. The overall v/c ratio for an intersection is defined as the sum of equivalent volumes for all critical movements at the intersection divided by the sum of capacities for all critical movements.

The Level of Service calculation is based on locally-specific parameters as described in the TIA Guidelines and incorporates existing signal timing plans obtained from the City of Ottawa. The analysis existing conditions utilized a Peak Hour Factor (PHF) of 0.90, while future conditions considers optimized signal timing plans and use of a Peak Hour Factor (PHF) of 1.0 to recognize peak spreading beyond a 15-minute period in congested conditions.

5.9.2.2 Unsignalized Intersections

The capacity of an unsignalized intersection can also be expressed in terms of the LOS it provides. For an unsignalized intersection, the Level of Service is defined in terms of the average movement delays at the intersection. This is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this includes the time required for a vehicle to travel from the last-in-queue position to the first-in-queue position. The average delay for any particular minor movement at the un-signalized intersection is a function of the capacity of the approach and the degree of saturation.

The Highway Capacity Manual 2010 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for un-signalized intersections, related to average movement delays at the intersection, as indicated in **Table 13** below.

Table 13 - LOS Criteria for Unsignalized Intersections

LOS	DELAY (seconds)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	>50

The unsignalized intersection capacity analysis technique included in the HCM and used in the current study provides an indication of the Level of Service for each movement of the intersection under consideration. By this technique, the performance of the unsignalized intersection can be compared under varying traffic scenarios, using the Level of Service concept in a qualitative sense. One unsignalized intersection can be compared with another unsignalized intersection using this concept. Level of Service 'E' represents the capacity of the movement under consideration and generally, in large urban areas, Level of Service 'D' is considered to represent an acceptable operating condition. Level of Service 'E' is considered an acceptable operating condition for planning purposes for intersections located within Ottawa's Urban Core the downtown and its vicinity). Level of Service 'F' indicates that the movement is operating beyond its design capacity.

5.9.3 Intersection Capacity Analysis

Following the established intersection capacity analysis criteria described above, the existing and future conditions are analyzed during the weekday peak hour traffic volumes derived in this study.

The following section presents the results of the intersection capacity analysis. All tables summarize study area intersection LOS results during the weekday morning and afternoon peak hour periods.

The Synchro output files have been provided in **Appendix I**.

5.9.3.1 Existing (2020) Traffic

An intersection capacity analysis has been undertaken using the Existing (2020) Traffic volumes presented in **Exhibit 4.**

Table 14 below summarizes the results of the intersection capacity analysis.

Table 14 - Intersection Capacity Analysis: Existing (2020) Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Beechwood & Charlevoix/ MacKay	Signalized	A (0.38)	NBL (0.53)	A (0.51)	NBL (0.66)
Beechwood & St. Charles	Signalized	A (0.53)	WBTL (0.53)	A (0.52)	WBTL (0.52)
St. Charles & Barrette	Unsignalized	B (10.2s)	WBTRL (10.2s)	B (10.3s)	WBTRL (10.3s)

Based on the results of the analysis provided in **Table 14** above, all three study area intersections are presently operating at acceptable levels of service (i.e. LOS 'D' or better).

5.9.3.2 Future (2023 & 2028) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2023 & 2028) Background Traffic volumes presented in **Exhibit 7**, yielding the following results:

Table 15 - Intersection Capacity Analysis: Future (2023 & 2028) Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Beechwood & Charlevoix/ MacKay	Signalized	A (0.34)	NBL (0.49)	A (0.46)	NBL (0.66)
Beechwood & St. Charles	Signalized	A (0.50)	WBTL (0.50)	A (0.47)	WBTL (0.48)
St. Charles & Barrette	Unsignalized	B (10.1s)	WBTRL (10.1s)	B (10.3s)	EBTRL (10.3s)

Based on the results of the analysis provided in **Table 15** above, all three study area intersections are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) under Future (2023 & 2028) Background Traffic conditions.

As discussed previously in the TIA Forecasting (Step 3), it is expected that the 2023 and 2028 analysis years will experience similar background traffic volumes at all of the study area intersections and are therefore represented by a single Future Background scenario.

5.9.3.3 Future (2023 & 2028) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2023 & 2028) Total Traffic volumes presented in **Exhibit 8**, yielding the following results:

Table 16 - Intersection Capacity Analysis: Future (2023 & 2028) Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Beechwood & Charlevoix/ MacKay	Signalized	A (0.37)	NBL (0.58)	A (0.48)	NBL (0.66)
Beechwood & St. Charles	Signalized	A (0.55)	WBTL (0.55)	A (0.50)	WBTL (0.50)
St. Charles & Barrette	Unsignalized	B (10.5s)	EBTRL (10.5s)	B (10.6s)	EBTRL (10.6s)
Barrette & Site Access	Unsignalized	A (9.0s)	SBRL (9.0s)	A (9.3s)	SBRL (9.3s)

Based on the above results, the addition of site-generated traffic is expected to have a minor impact on all study area intersections under Future (2023 & 2028) Total Traffic conditions. Traffic operations will not be significantly affected, and all intersection movements are expected to continue operating at acceptable levels of service (i.e. LOS 'D' or better) within the 2028 study horizon year.

5.9.4 Intersection Design (MMLOS)

5.9.4.1 Intersection MMLOS Methodology

The analysis criteria for each of the four non-auto modes are briefly described as follows:

Intersection Pedestrian Level of Service (PLOS)

The PLOS at intersections is based on several factors including the number of traffic lanes that pedestrians must cross, corner radii, and whether the crossing allows for permissive or protective right or left turns, among others. The City of Ottawa target for PLOS along a Traditional Mainstreet (i.e. Beechwood Avenue) is 'B'.

Intersection Bicycle Level of Service (BLOS)

The BLOS at intersections is dependent on a few key factors: the number of lanes that the cyclist is required to cross to make a left-turn; the presence of a dedicated right-turn lane on the approach; and the operating speed of each approach. The City target for BLOS for a cross-town bikeway on a Traditional Mainstreet is 'A'.

Intersection Transit Level of Service (TLOS)

Intersection TLOS is based on the average signal delay experienced by transit vehicles at each intersection. The City Target TLOS along a Traditional Mainstreet with a Transit Priority Corridor (Isolated Measures) is 'D'.

Intersection Truck Level of Service (TkLOS)

The Truck LOS (TkLOS) is based on the right-turn radii, as well as the number of receiving lanes for vehicles making a right-turn from the traffic lane being analyzed. The City of Ottawa target for TkLOS along an arterial road classified as a Traditional Mainstreet is 'E' for non-truck routes.

5.9.4.2 Intersection MMLOS Results

An analysis of the existing and future conditions for each mode has been conducted based on the methodology prescribed in the City of Ottawa Multi-Modal Level of Service (MMLOS) Guidelines. The Level of Service (LOS) for each mode has been calculated for each intersection where traffic signals exist or are anticipated. The Future conditions reflect the full implementation of the Beechwood RMA.

The intersection MMLOS results have been summarized in **Table 17** below.

Detailed intersection MMLOS analysis results are provided **Appendix H**.

Table 17 - Intersection MMLOS

LOCATION	LEVEL OF SERVICE BY MODE			
	PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
INTERSECTIONS – EXISTING CONDITIONS				
Beechwood & Charlevoix/ MacKay	**E** (Target: B)	**C** (Target: A)	**B** (Target: D)	**D** (Target: E)
Beechwood & St. Charles	**E** (Target: B)	**B** (Target: A)	**E** (Target: D)	**F** (Target: E)
INTERSECTIONS – FUTURE CONDITIONS [1]				
Beechwood & Charlevoix/ MacKay	**E** (Target: B)	**C** (Target: A)	**B** (Target: D)	**D** (Target: E)
Beechwood & St. Charles	**E** (Target: B)	**A** (Target: A)	**E** (Target: D)	**E** (Target: E)

Notes: [1] Considers full implementation of Beechwood Avenue RMA

5.9.4.3 Summary of Potential Improvements

Based on the MMLOS results outlined in **Table 17**, the following measures have been identified that could improve conditions for each travel mode:

Pedestrians

- The analysis indicates that both study area intersections are presently operating below the City's PLOS target of 'B', with the primary cause of this deficiency resulting from the delay component. The delay component would require a significant reduction in traffic signal cycle length at both intersections, which may not be feasible given the need to respect minimum phasing parameters such as the pedestrian don't walk time of 1.0 m/s and coordination with adjacent intersections. By contrast, the PETSI evaluation performs at or slightly above the PLOS target, with values ranging from 'B' to 'D'. With the reconfiguration of Beechwood & St. Charles as a 'protected intersection', the PETSI score would improve to align with the PLOS target. At the intersection of Beechwood & Charlevoix/ MacKay, implementing elements such as a raised crosswalk would help to marginally improve the PETSI score, however the overall PLOS would similarly remain unchanged.

Cyclists

- Based on the analysis, both study area intersections are presently operating marginally above the BLOS target of 'A'. This is primarily due to a combination of assumed operating speeds (50km/h) and the number of lanes that cyclists must cross to make a left-turn. The introduction of a 'protected intersection' configuration at Beechwood & St. Charles as part of the Beechwood Avenue redesign will help to achieve the BLOS of 'A' at this intersection. Providing facilities for cyclists to make two-stage left-turns on all approaches at the Beechwood & Charlevoix/ MacKay intersection would allow this intersection to achieve the BLOS target as well.

Transit

- The results of the analysis indicate that both intersections operate within the TLOS target of 'D', with the exception of the northbound approach at the Beechwood & St. Charles intersection, which currently experiences delays in the order of 30 to 40 seconds. It should be noted that the TLOS deficiency is primarily a result of background traffic demand and is negligibly impacted by site-generated traffic demand. Further, this delay would potentially impact only one of the five transit routes serving the study area.

Truck

- The results of the analysis indicates that the Beechwood & Charlevoix/ MacKay intersection is presently meeting its TkLOS target of 'E', while the intersection of Beechwood & St. Charles is operating with a TkLOS of 'F'. Failure to meet the TkLOS target at the latter intersection can be attributed to the single receiving lane on Beechwood Avenue, as well as the relatively tight turning radii, which fall short of the desired 10m threshold. With the redesign of the Beechwood & St. Charles intersection planned as part of the Beechwood RMA, the turning radii are expected to increase to above 10m, allowing for the TkLOS target of 'E' to be achieved at both intersections.

The recommended measures listed above are intended only as suggestions to the City on how the MMLOS within the study area could be improved and do not identify measures to be implemented as a direct consequence of this development. The MMLOS analysis identifies existing deficiencies in the study area and are not expected to be exacerbated by the proposed development.

5.10 Geometric Review

The following section reviews all geometric requirements for the study area intersections.

5.10.1 Sight Distance and Corner Clearances

The proposed site access is located along a straight segment of Barrette Street with clear sightlines in both directions. The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads indicates that a minimum corner clearance of 15m should be maintained between a private approach on a local road and any intersecting roadway. The proposed site access will be located approximately 38.0 metres from St. Charles Street and therefore meets this requirement.

5.10.2 Auxiliary Lane Analysis

5.10.2.1 Signalized Auxiliary Left-Turn Requirements

A review of auxiliary left-turn lane storage requirements was completed at all signalized intersections within the study area under Future (2028) Total Traffic conditions. The review compared the projected 95th percentile queue lengths from Synchro operational results, and the standard queue length calculation based on the following equation:

$$Storage\ Length = \frac{NL}{C} \times 1.5$$

Where:
N = number of vehicles per hour
L = Length occupied by a vehicle in the queue = 7 m
C = number of traffic signal cycles per hour

The results of the auxiliary left-turn lane analysis are summarized below in **Table 18** below.

Table 18 - Auxiliary Left-Turn Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	95TH %ILE QUEUE LENGTH / CALCULATED QUEUE (M)		EXISTING PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY (M)
		AM PEAK HR	PM PEAK HR		
Beechwood & Charlevoix/ MacKay	NB	31.2 / 27.8	39.6 / 30.1	40	-
	SB	19.7 / 16.0	25.3 / 18.1	15	10
	EB	28.1 [1]/ 11.8	53.0 [1]/ 25.5	-	-
	WB	30.3 [1] / 1.8	37.1 [1]/ 1.3	-	-
Beechwood & St. Charles	NB	30.3 [1]/ 20.2	27.3 [1] /15.7	-	-
	WB	77.2 [1]/ 10.7	74.1 [1]/ 7.9	-	-

Notes: [1] Synchro 95th percentile queue lengths reported with shared through-left configuration

The results of the queue length analysis presented in **Table 18** above indicate that the southbound auxiliary left-turn lane at the intersection of Beechwood & Charlevoix/ MacKay may experience some spillback beyond the available 15m storage within the 2028 horizon year of this study. Further analysis reveals that this is an existing deficiency that will not be exacerbated by the addition of site-generated traffic on the adjacent road network. The Beechwood RMA Functional Design proposes lengthening the southbound left-turn lane to accommodate vehicle storage

lengths of up to 25 metres, which would accommodate the storage projections calculated under Future (2028) Total Traffic conditions.

No additional storage deficiencies are expected under 2028 total traffic projections, based on the left-turn lane analysis conducted for signalized intersections.

5.10.2.2 Signalized Auxiliary Right-Turn Lane Requirements

Similarly for signalized intersections, Section 9.14 of TAC suggests that auxiliary right-turn lanes shall be considered when more than 10% of vehicles on an approach are turning right and when the peak hour demand exceeds 60 vehicles. The purpose of this guideline is to mitigate operational impacts to through-traffic, particularly on high-speed arterial roadways, and may not be applicable in all circumstances.

The results of the auxiliary right-turn lane analysis are summarized below in **Table 19** below:

Table 19 – Auxiliary Right-Turn Lane Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	NUMBER OF RIGHT-TURNS / % RIGHT-TURNS		95TH %ILE QUEUE (M) AM / PM [1]	EXISTING PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY (M) [2]
		AM PEAK HOUR	PM PEAK HOUR			
Beechwood & Charlevoix/ MacKay	NB	6 / 5%	17 / 9%	9.7 / 23.4	-	-
	SB	52 / 40%	55 / 35%	12.9 / 19.4	-	-
	EB	65 / 11%	104 / 12%	28.1 / 53.0	-	- [2]
	WB	58 / 7%	59 / 9%	30.3 / 37.0	-	-
Beechwood & St. Charles	NB	46 / 37%	37 / 38%	30.3 / 27.3	-	-
	EB	59 / 12%	60 / 11%	31.1 / 51.5	-	- [2]

Notes:
1. Synchro queue length results reported with shared through-right configuration on all approaches
2. Technically meets right-turn criteria, however, this criteria is not applicable for low posted-speed limit (50 km/h) arterial roads such as Beechwood Avenue

Based on the results of the analysis presented in **Table 19** above, no additional right-turn parallel lanes are required at either of the signalized study area intersections to accommodate 2028 total traffic projections. The proposed development is expected to contribute nominal traffic volumes to the two right-turn movements noted above which meet the criteria for consideration of an auxiliary lane. Even though both approaches technically meet the right-turn criteria, this evaluation may not be appropriate for Traditional Mainstreets such as Beechwood Avenue, which typically have relatively low operating speeds and exist in a constrained urban environment.

5.11 Summary of Recommended Modifications

All study area intersections were shown to operate at an acceptable level of service (i.e. LOS 'D' or better) during the weekday morning and afternoon peak hours and throughout the timeframe of the study.

Based on the queuing analyses conducted for this study, the intersection of Beechwood & Charlevoix/ MacKay may be experiencing some spillback on the southbound left-turn auxiliary lane during weekday peak periods. Site-generated traffic volumes, however, are not expected to contribute to this movement, and the Beechwood RMA indicates that the southbound left-turn lane will ultimately be extended from 15m to 25m of parallel lane length. As indicated through queuing analysis, this increase in storage is expected to accommodate left-turning traffic volumes on the southbound approach beyond the study horizon year.

The MMLOS analysis indicated existing deficiencies with respect to user comfort that could be considered for implementation by the City but are not required to safely accommodate the proposed development.

6 Conclusion

The proposed mid-rise residential development at 78-90 Beechwood Avenue and 69-93 Barrette Street is expected to generate up to 74 and 89 two-way vehicular trips during the weekday morning and afternoon peak hours, respectively. Travel demand was stratified by mode share from the Ottawa East Traffic Assessment Zone (TAZ) in the O-D Survey and divided amongst the numerous potential routes to access the arterial road network. No alternations were made to the mode share beyond the use of a blended rate, which considered both internal trips (i.e. within the TAZ), as well as inter-zonal trips.

A multi-modal analysis of each study area intersection identified deficiencies in the existing road network and potential remediation measures have been suggested in which the City could consider in order to meet the prescribed targets. These remediation measures would improve mobility and comfort for all transportation modes but are not required to safely accommodate the proposed development.

All study area intersections were shown to operate well under their theoretical capacities beyond the 2028 study horizon year. Based on the queuing analyses conducted for this study, the intersection of Beechwood & Charlevoix/ MacKay may be experiencing some spillback on the southbound left-turn auxiliary lane during weekday peak periods. Site-generated traffic volumes, however, are not expected to contribute to this movement, and the Beechwood RMA indicates that the southbound left-turn lane will ultimately be extended from 15m to 25m of parallel lane length. As indicated through queuing analysis, this increase in storage is expected to accommodate left-turning traffic volumes on the southbound approach beyond the study horizon year. A post-development monitoring plan is therefore not a requirement of this study. As part of the Site Plan Control application, however, a detailed design and construction of streetscaping improvements will be undertaken exclusively along the development's frontage of Beechwood Avenue, based on the Beechwood functional design RMA.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network.

Appendix A – City Circulation Comments

Step 1 & 2 Submission (Screening, Scoping) – Circulation Comments & Response

Report Submitted: May 1, 2020
Comments Received: May 15, 2020
Transportation Project Manager: Mike Giampa

1. Mike Giampa confirmed via email on May 15, 2020 that he had no comments regarding Steps 1 & 2 of the TIA and therefore the study should proceed to Step 3.

Step 3 Submission (Forecasting) – Circulation Comments & Response

Report Submitted: May 23, 2020
Comments Received: June 9, 2020
Transportation Project Manager: Mike Giampa

Transportation Engineering Services

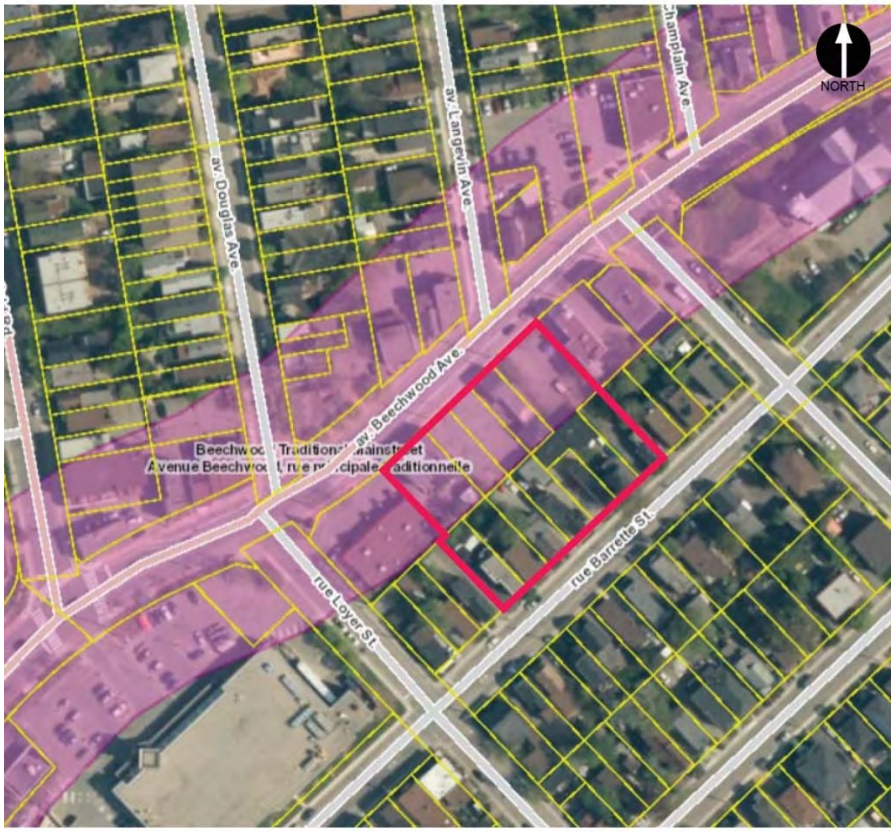
Justify the suggested background growth rate of 1%. Looking at the City of Ottawa's 2013 TMP and Strategic Long-Range Model (comparing snapshots of 2011 and 2031 peak volumes), there is no projected growth along Beechwood Avenue.

- IBI Response: The background growth rate on Beechwood Avenue has been adjusted to reflect no growth along the corridor, based on a comparison of 2011 and 2031 peak hour volumes from the Strategic Long-Range Model completed by City staff.

Appendix B – Screening Form

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	78-89 Beechwood Avenue, 69-93 Barrette Street
Description of Location	The site is situated south of Beechwood Avenue, north of Barrette Street and east of Loyer Street and west of St. Charles Street 
Land Use Classification	Mid-Rise Residential Development
Development Size (units)	250 Residential Units
Development Size (m^2)	567m^2 ground floor commercial
Number of Accesses and Locations	One full-movement access on Barrette Street
Phase of Development	Single Phase
Buildout Year	2023

If available, please attach a sketch of the development or site plan to this form.

Proposed Development:

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-family homes	40 units
Townhomes or apartments	90 units ✓
Office	3,500 m^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

** If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

Based on preliminary trip generation results, the proposed development is expected to generate approximately 203 person-trips during the weekday morning and afternoon peak hours. Further details regarding the trip generation will be provided in the Forecasting step of this TIA.

- **Based on the results above, the Trip Generation Trigger is satisfied.**

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	✓	
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*	✓	

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).*

- **Based on the results above, the Location Trigger is satisfied.**

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?		✓
Are there any horizontal/vertical curvatures on a boundary street that limits sight lines at a proposed driveway?		✓
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?		✓
Is the proposed driveway within auxiliary lanes of an intersection?		✓
Does the proposed driveway make use of an existing median break that serves an existing site?		✓
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		✓
Does the development include a drive-thru facility?		✓

- **Based on the results above, the Safety Trigger is not satisfied.**

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?	✓	
Does the development satisfy the Location Trigger?	✓	
Does the development satisfy the Safety Trigger?		✓

CONCLUSION: The Trip Generation and Location Triggers are satisfied, therefore a TIA is required.

Appendix C – Turning Movement Counts

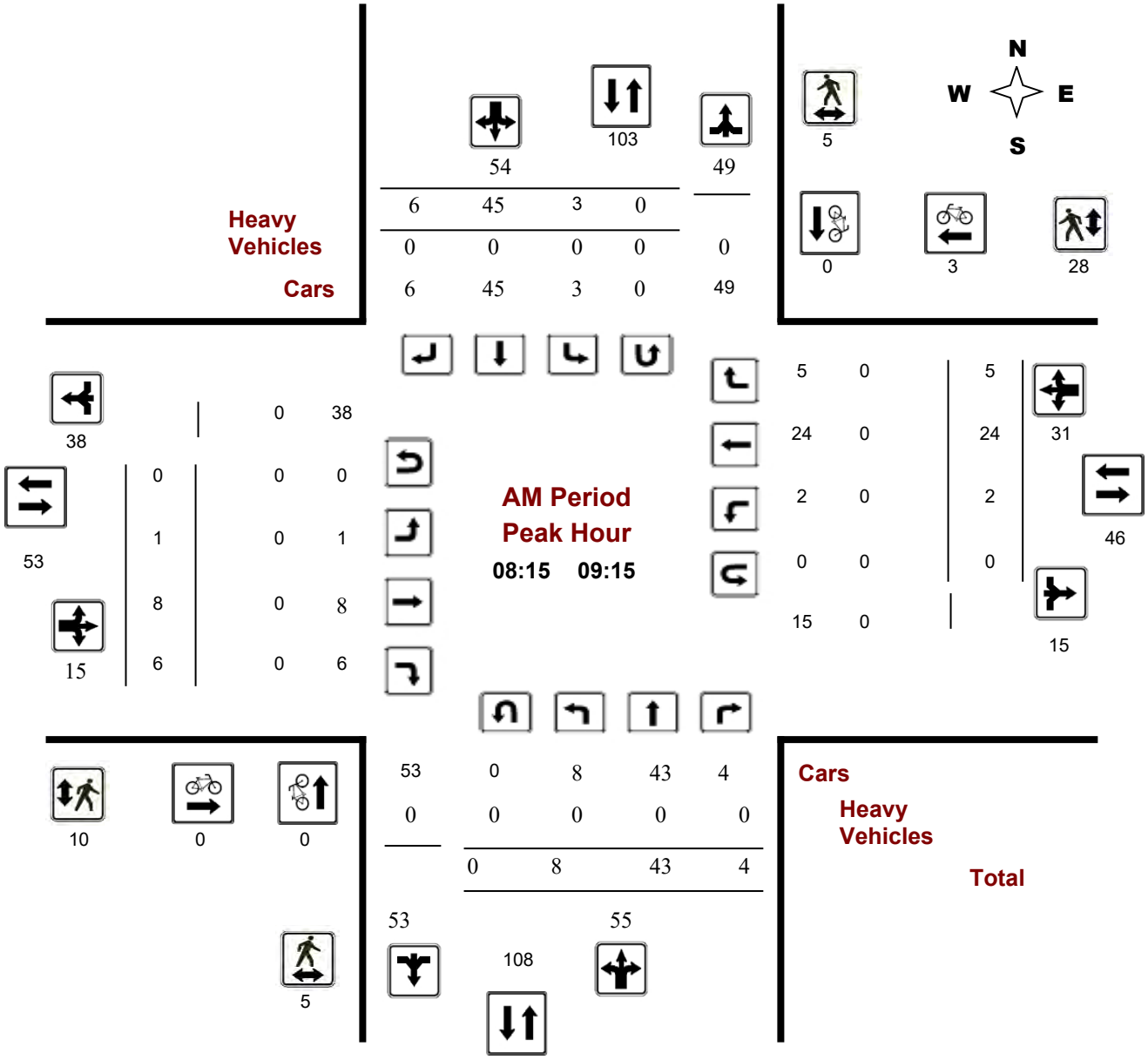
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BARRETTE ST @ ST. CHARLES ST

Survey Date: Thursday, January 11, 2018 **WO No:** 37414

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



Comments

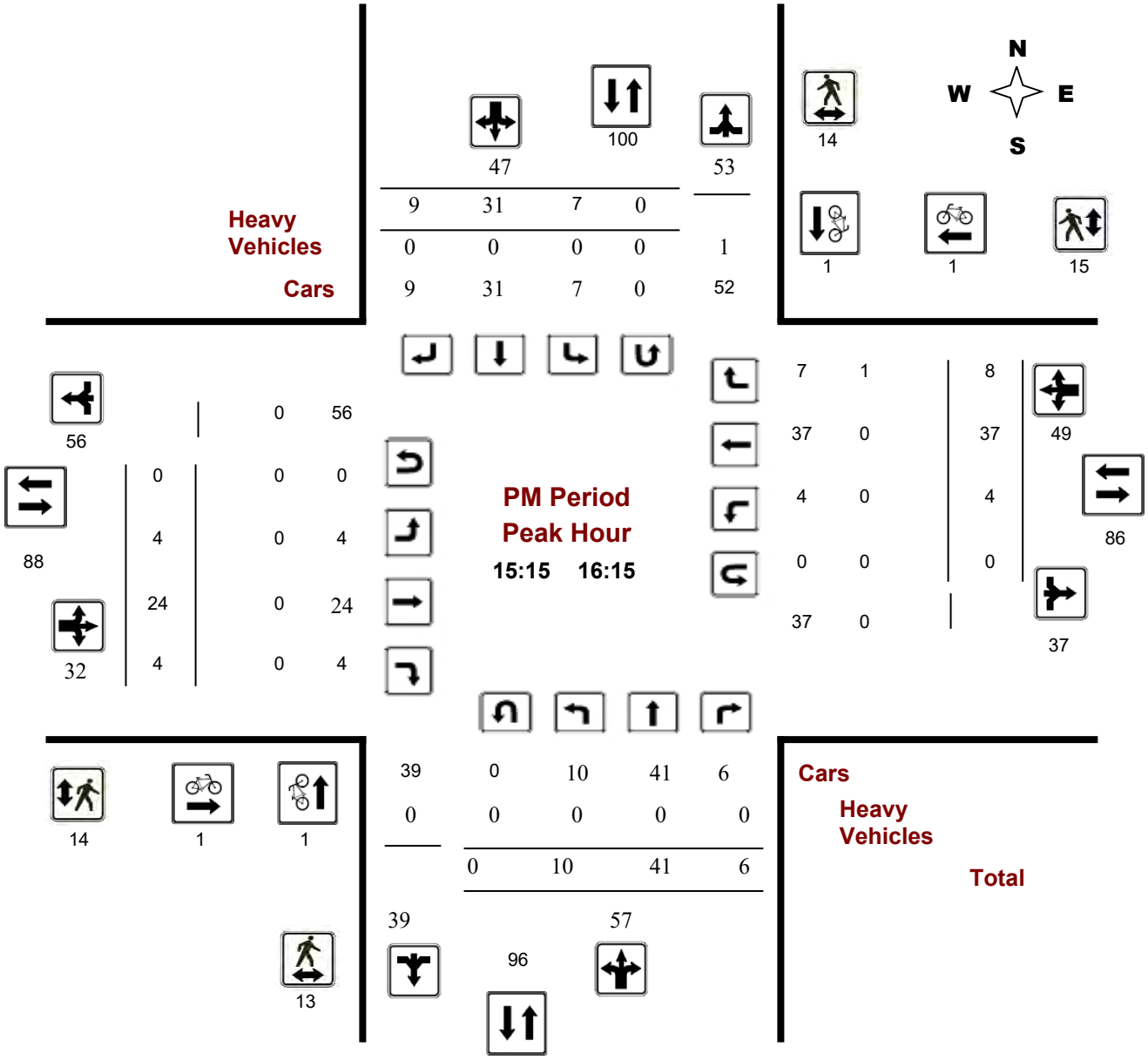
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BARRETTE ST @ ST. CHARLES ST

Survey Date: Thursday, January 11, 2018 **WO No:** 37414

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



Comments

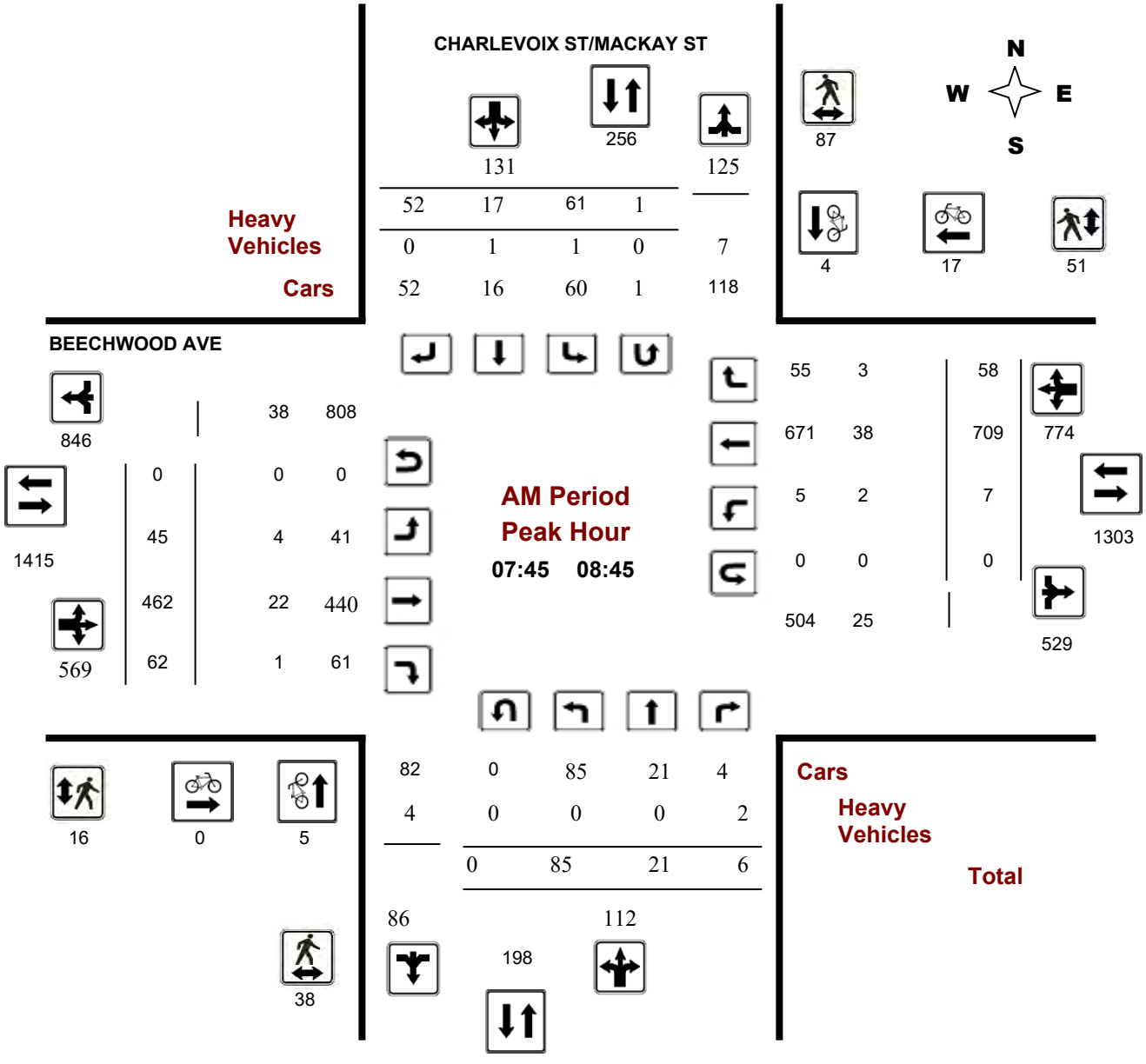
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BEECHWOOD AVE @ CHARLEVOIX ST/MACKAY ST

Survey Date: Thursday, March 21, 2019 **WO No:** 38453

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



Comments

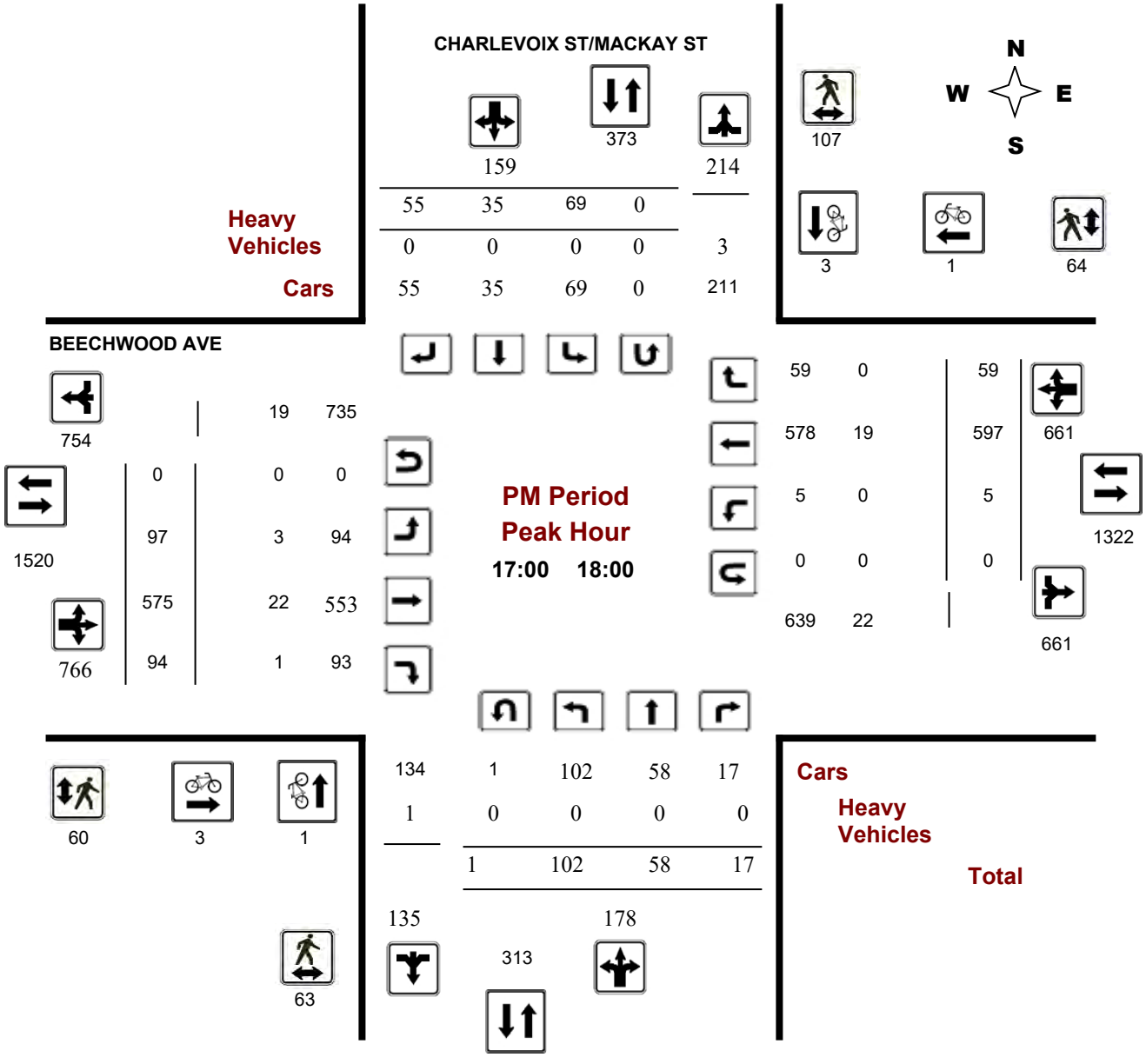
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BEECHWOOD AVE @ CHARLEVOIX ST/MACKAY ST

Survey Date: Thursday, March 21, 2019
Start Time: 07:00

WO No: 38453
Device: Miovision



Comments

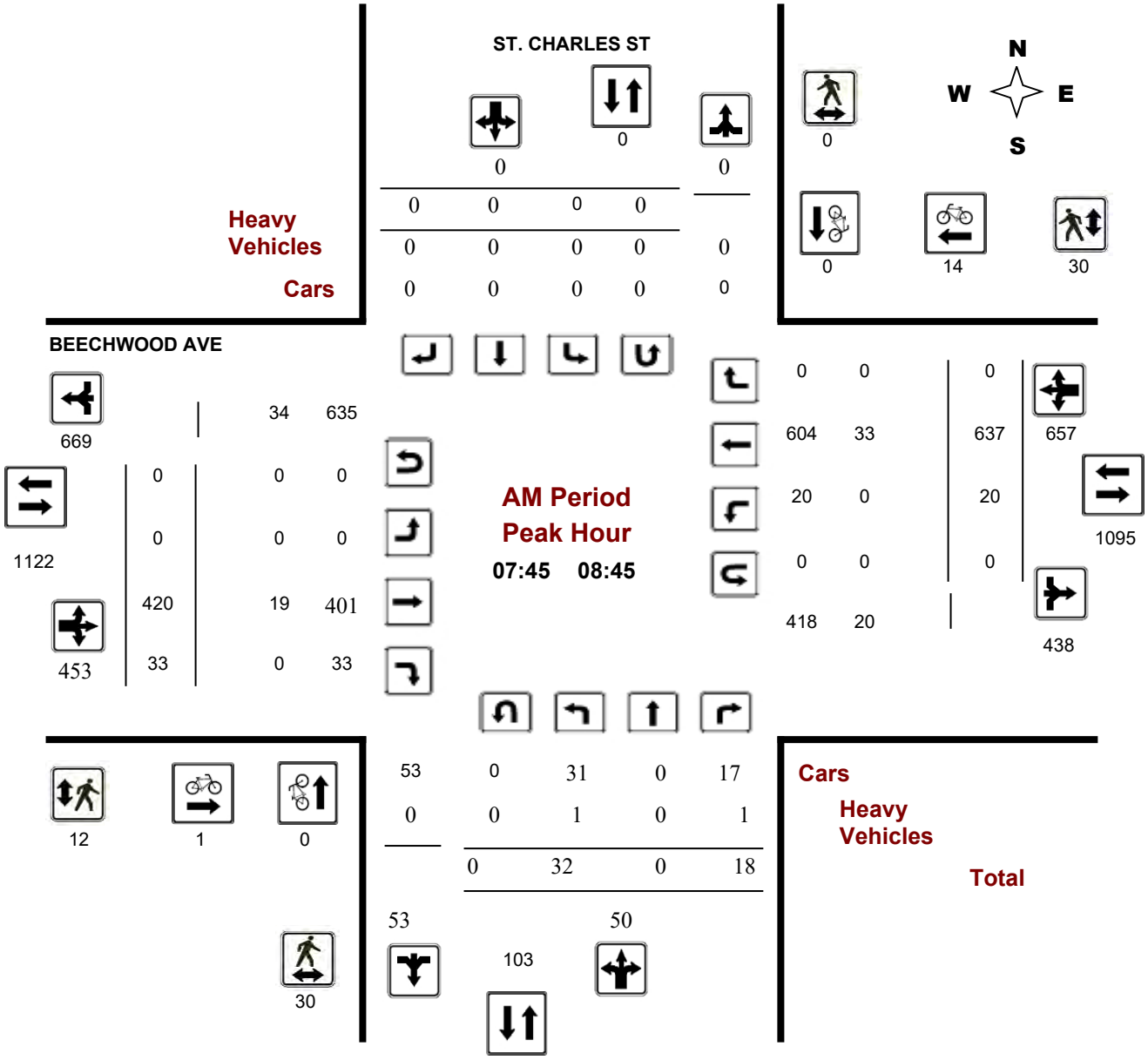
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BEECHWOOD AVE @ ST. CHARLES ST

Survey Date: Thursday, March 21, 2019 **WO No:** 38455

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



Comments

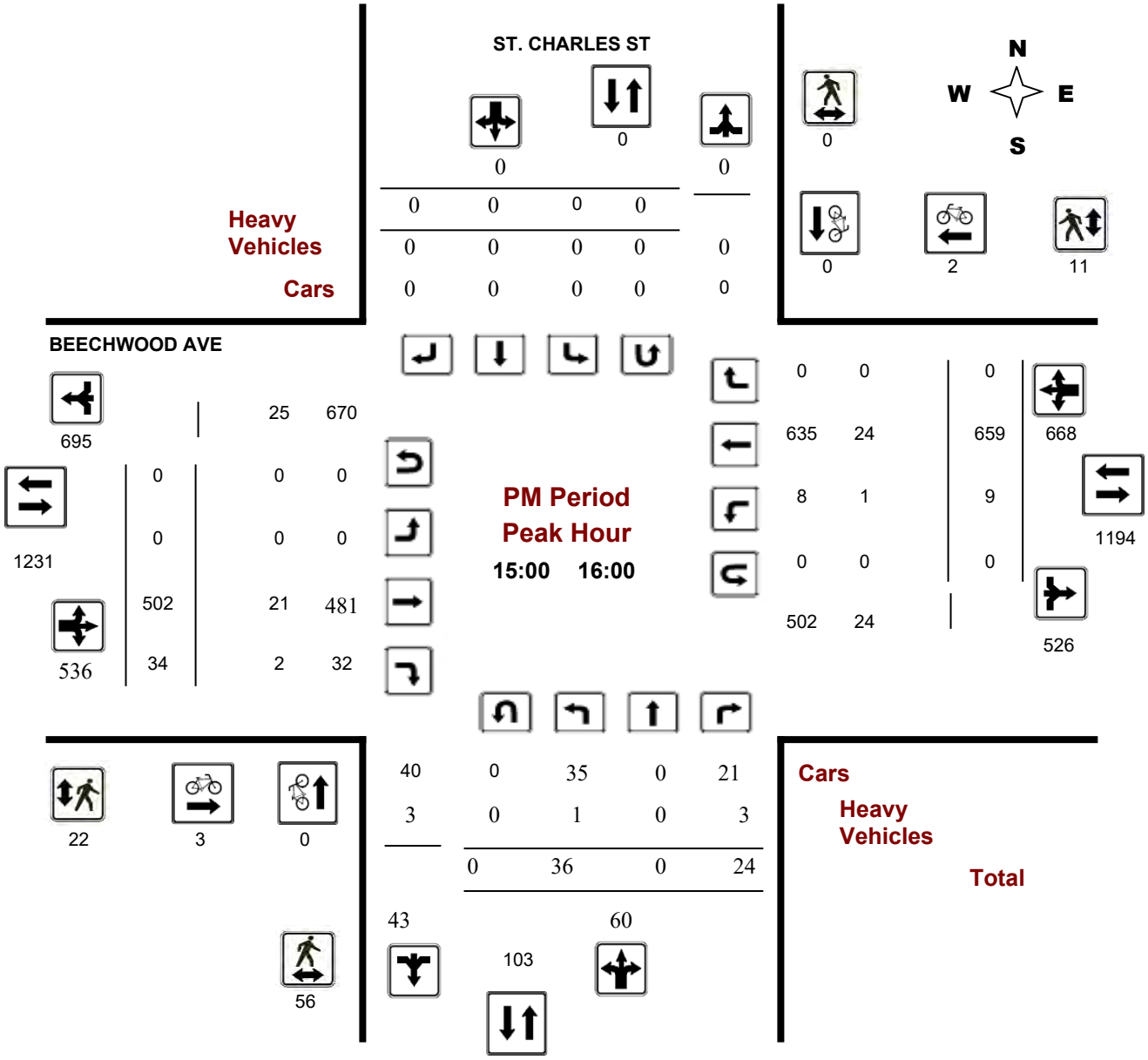
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BEECHWOOD AVE @ ST. CHARLES ST

Survey Date: Thursday, March 21, 2019 **WO No:** 38455

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



Comments

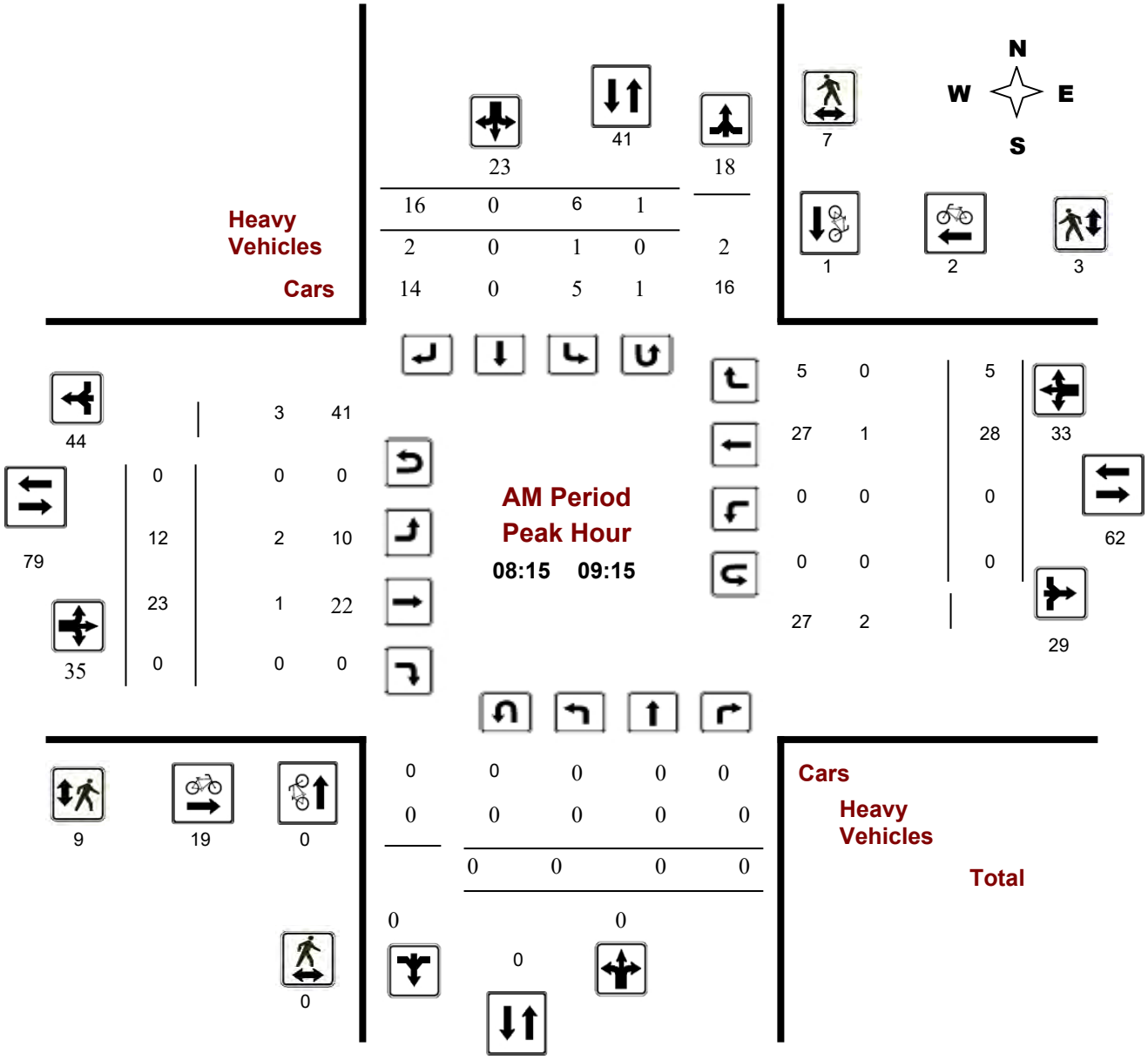
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

LANDRY ST @ LOYER ST

Survey Date: Wednesday, July 04, 2018 **WO No:** 38028

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



Comments

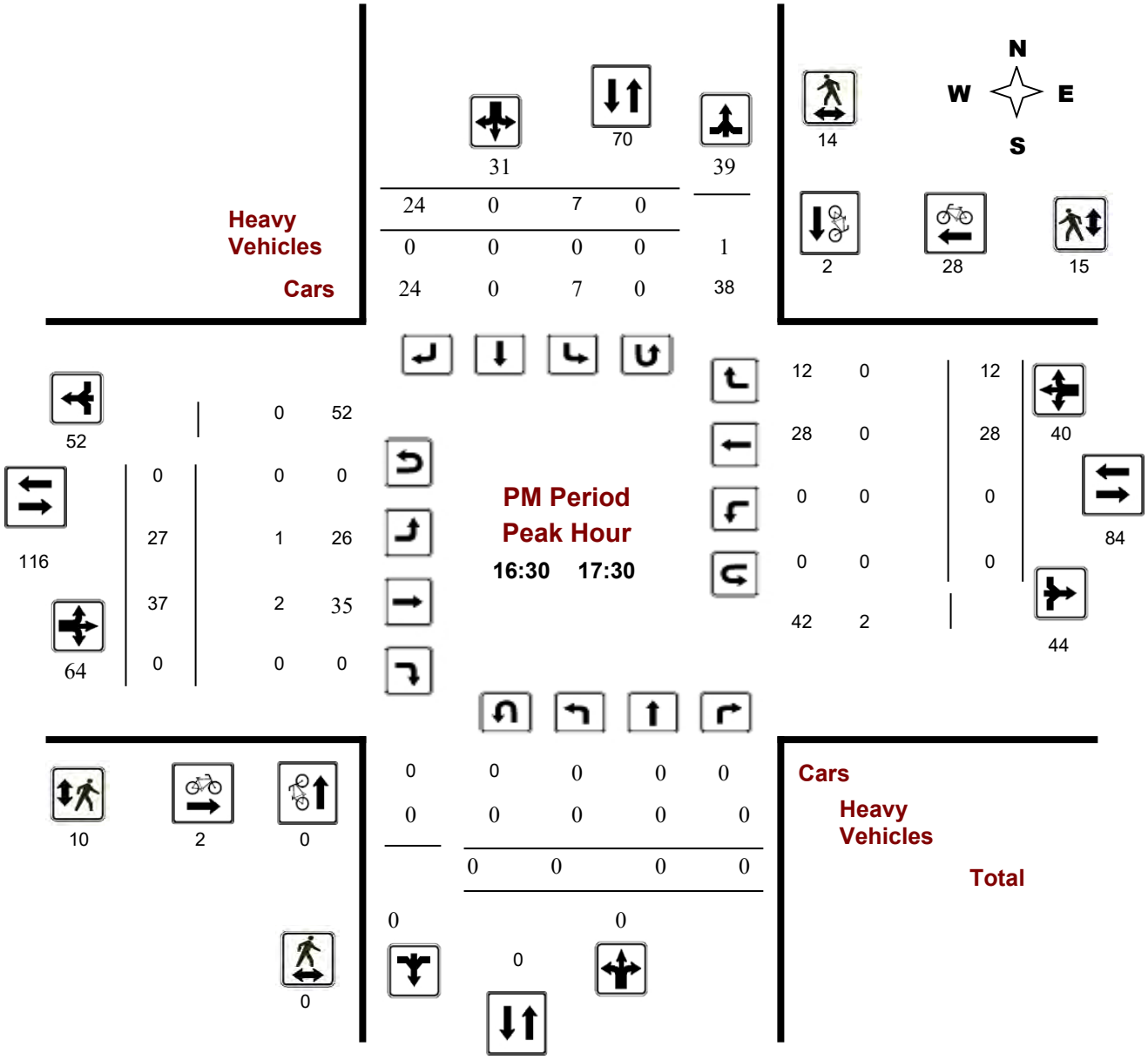
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

LANDRY ST @ LOYER ST

Survey Date: Wednesday, July 04, 2018 **WO No:** 38028

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



Comments

Appendix D – OC Transpo Routes

6

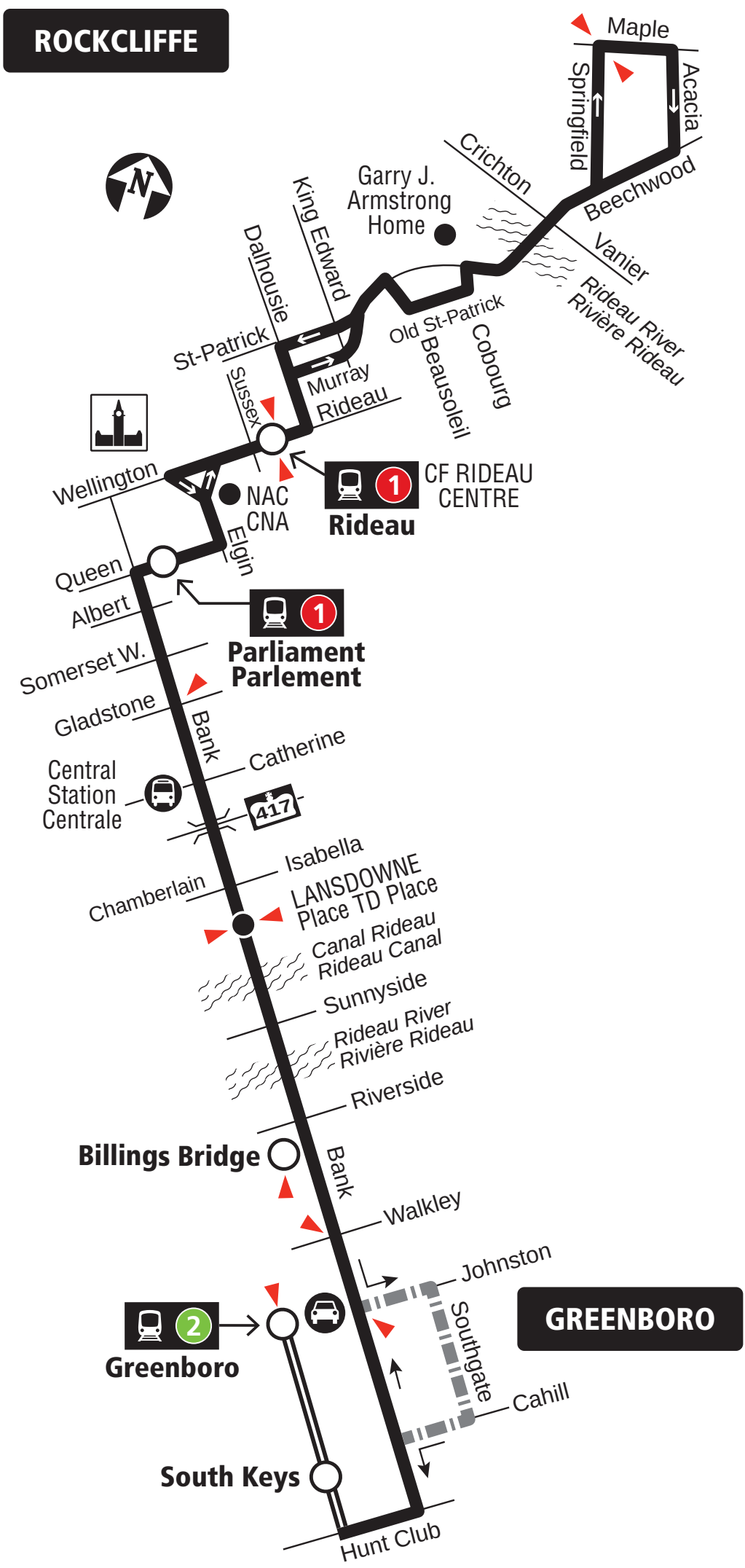
ROCKCLIFFE
GREENBORO

Fréquent

7 days a week / 7 jours par semaine

All day service

Service toute la journée



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 **613-741-4390**

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

Security / Sécurité **613-741-2478**

Effective September 2, 2018
En vigueur 2 septembre 2018

OC Transpo

INFO 613-741-4390
octranspo.com

7

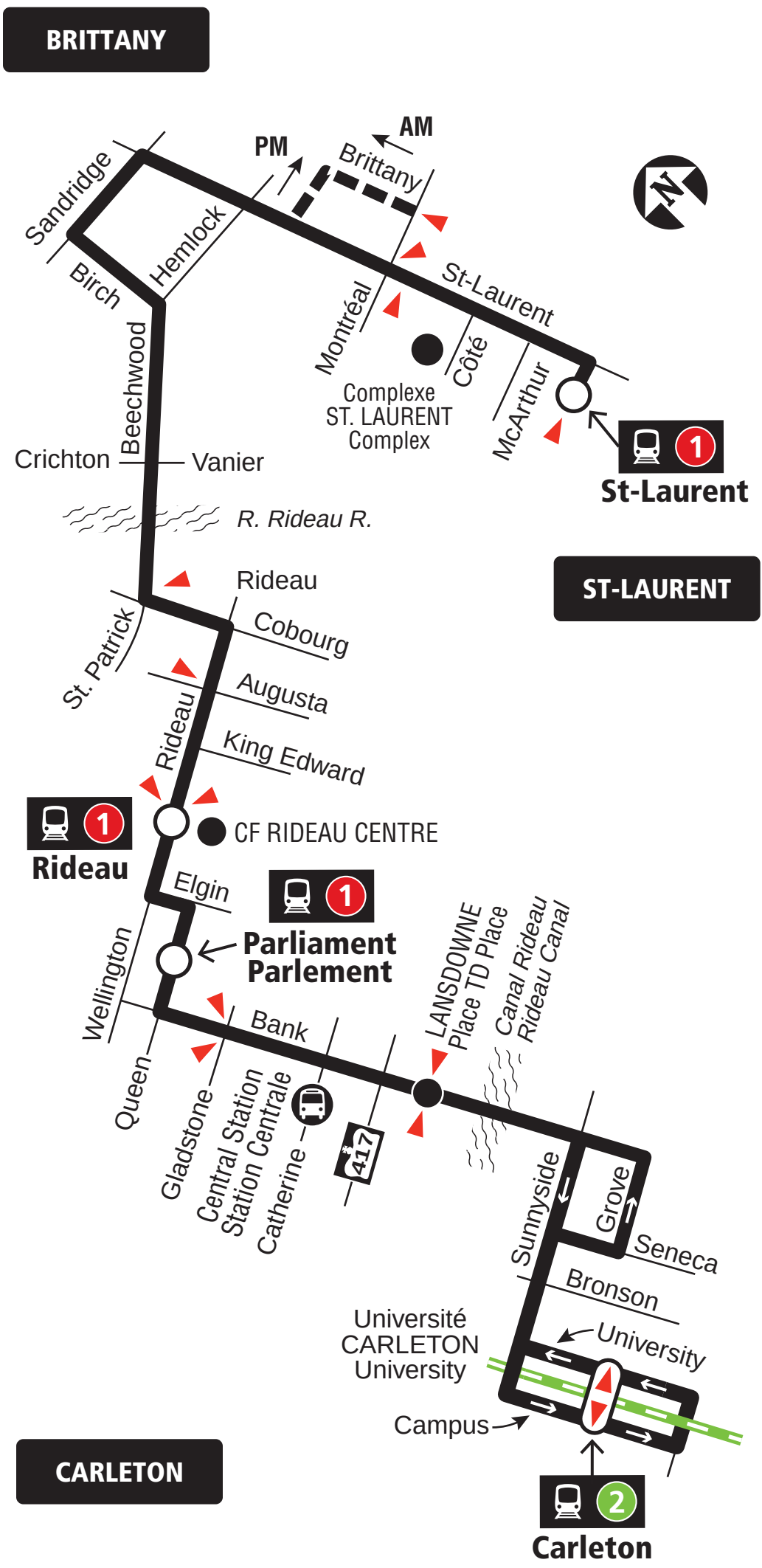
CARLETON
ST-LAURENT

Fréquent

7 days a week / 7 jours par semaine

All day service

Service toute la journée



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 **613-741-4390**

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

Security / Sécurité **613-741-2478**

Effective September 2, 2018
En vigueur 2 septembre 2018

OC Transpo

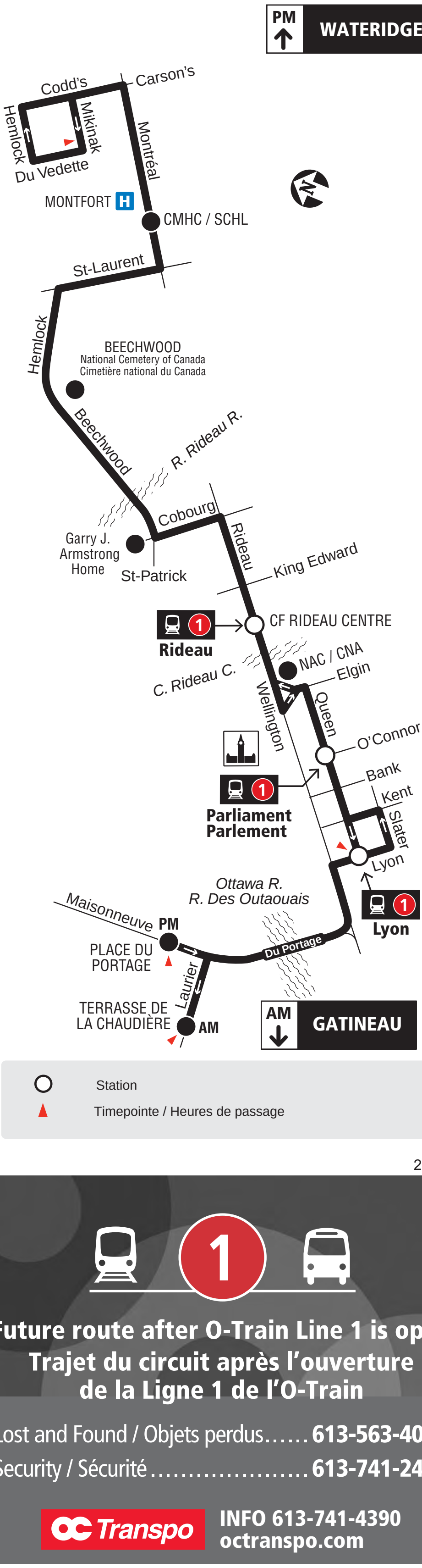
INFO 613-741-4390
octranspo.com

17

WATERIDGE
GATINEAU

Local

Monday to Friday / Lundi au vendredi
Peak periods only
Périodes de pointe seulement



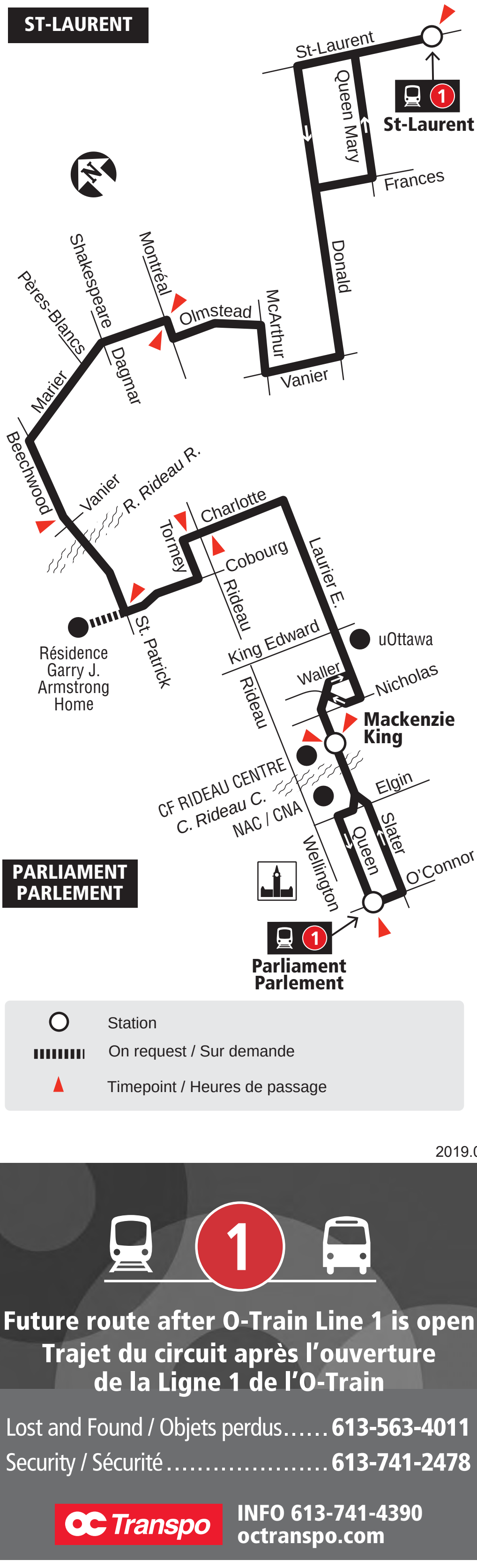
2019.07

19

ST-LAURENT
PARLIAMENT
PARLEMENT

Local

7 days a week / 7 jours par semaine
All day service
Service toute la journée

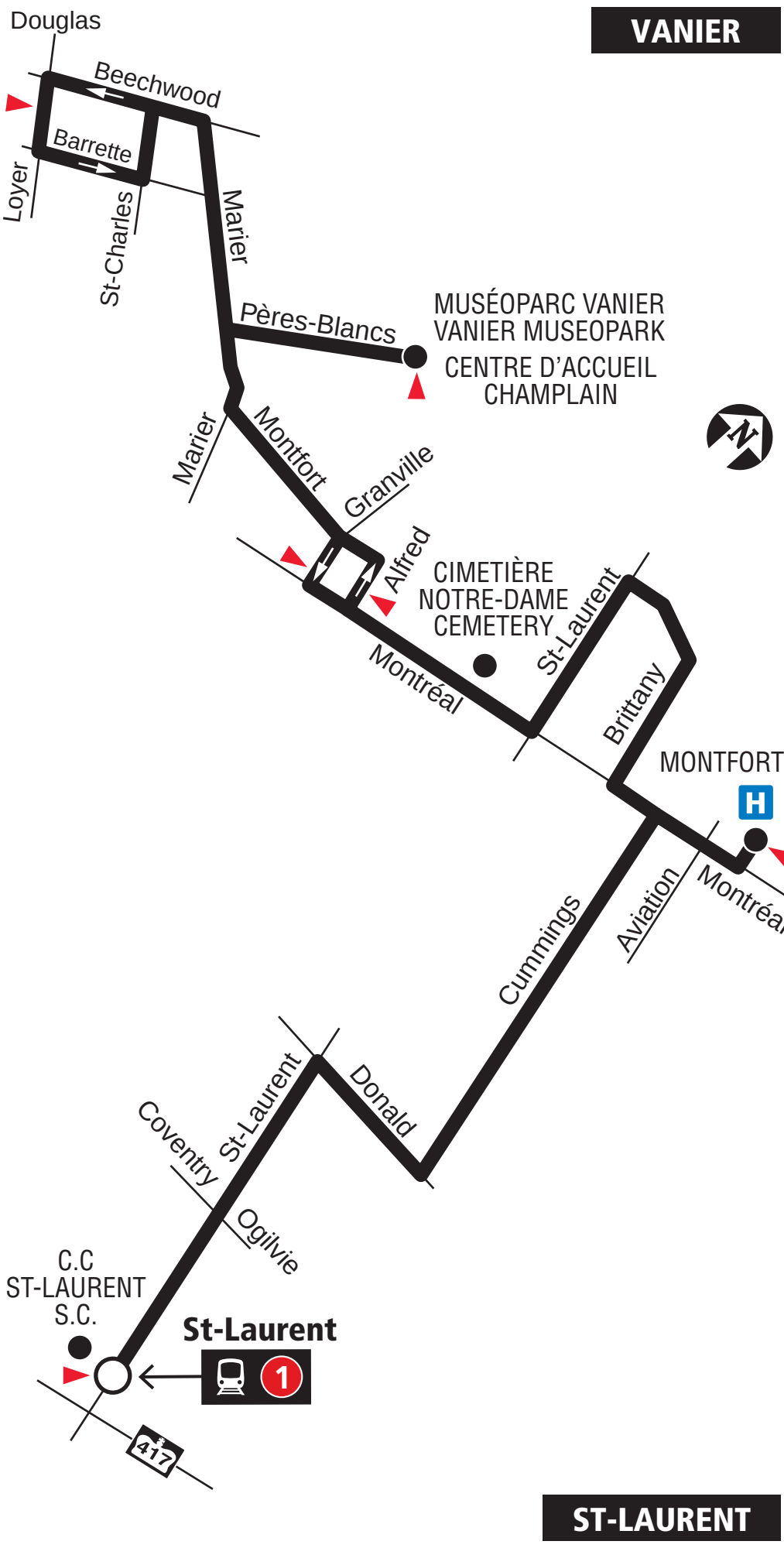


2019.07

20 VANIER — ST-LAURENT

7 days a week / 7 jours par semaine

All day service
Service toute la journée



Station

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 **613-741-4390**

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

Security / Sécurité **613-741-2478**

Effective September 2, 2018
En vigueur 2 septembre 2018

OC Transpo

INFO 613-741-4390
octranspo.com

Appendix E – Collision Data

City Operations - Transportation Services

Collision Details Report - Public Version

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

Location: BARRETTE ST @ LOYER ST

Traffic Control: Stop sign **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Feb-24, Tue,23:34	Clear	SMV other	P.D. only	Loose snow	South	Turning left	Automobile, station wagon	Curb	

Location: BARRETTE ST @ ST. CHARLES ST

Traffic Control: Stop sign **Total Collisions:** 9

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Dec-13, Thu,11:45	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Sep-27, Thu,15:46	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Jul-20, Fri,21:54	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-May-03, Wed,19:02	Clear	Angle	P.D. only	Dry	North	Going ahead	Passenger van	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

2017-Mar-09, Thu,13:49	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2016-May-05, Thu,17:04	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Feb-17, Wed,15:44	Snow	Angle	Non-fatal injury	Loose snow	West	Going ahead	Construction equipment	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2015-Jul-15, Wed,09:00	Clear	Angle	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Passenger van	Other motor vehicle
2014-Dec-05, Fri,15:39	Clear	Angle	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle

Location: BARRETTE ST btwn LOYER ST & ST. CHARLES ST

Traffic Control: No control **Total Collisions:** 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Sep-03, Sat,16:17	Clear	SMV other	P.D. only	Dry	West	Reversing	Police vehicle	Pole (utility, power)	
2016-Jun-25, Sat,13:00	Clear	Angle	P.D. only	Dry	South	Reversing	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

2015-Apr-15, Wed,07:59	Clear	Angle	P.D. only	Dry	South	Reversing	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: BEECHWOOD AVE @ CHARLEVOIX ST/MACKAY ST

Traffic Control: Traffic signal

Total Collisions: 22

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Nov-13, Tue,15:45	Clear	Rear end	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Sep-26, Wed,16:10	Clear	Angle	P.D. only	Dry	West	Stopped	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Bus (other)	Other motor vehicle	
					South	Going ahead	Motorcycle	Other motor vehicle	
2018-Jul-24, Tue,17:00	Rain	Turning movement	P.D. only	Wet	North	Turning left	Pick-up truck	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Jun-23, Sat,09:56	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Municipal transit bus	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Mar-02, Fri,05:15	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Municipal transit bus	Other motor vehicle	

2017-Dec-11, Mon,09:17	Clear	Angle	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle
					North	Going ahead	Delivery van	Other motor vehicle
2017-Oct-02, Mon,17:04	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Unknown	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Sep-29, Fri,15:44	Clear	Turning movement	P.D. only	Dry	East	Turning left	Truck - closed	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2016-Mar-03, Thu,18:12	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
2015-Dec-11, Fri,08:50	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2015-Nov-25, Wed,09:09	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Unknown	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Oct-02, Fri,12:49	Clear	Rear end	P.D. only	Dry	West	Going ahead	Truck - closed	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle

2015-Jun-02, Tue,18:34	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Pedestrian	1
2015-Apr-30, Thu,19:00	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Pedestrian	1
2015-Mar-06, Fri,14:45	Clear	Approaching	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Passenger van	Other motor vehicle	
2015-Feb-04, Wed,10:33	Snow	Rear end	P.D. only	Loose snow	East	Slowing or stopping	Delivery van	Other motor vehicle	
					East	Stopped	Pick-up truck	Other motor vehicle	
2015-Jan-13, Tue,14:07	Clear	Angle	P.D. only	Wet	West	Going ahead	Pick-up truck	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jun-19, Thu,14:45	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	
2014-May-06, Tue,05:17	Clear	Rear end	P.D. only	Dry	East	Stopped	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Apr-08, Tue,08:40	Rain	Sideswipe	P.D. only	Wet	West	Changing lanes	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

2014-Mar-28, Fri,12:46	Rain	Turning movement	P.D. only	Wet	West	Turning left	Passenger van	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Jan-10, Fri,17:40	Clear	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: BEECHWOOD AVE @ DOUGLAS AVE

Traffic Control: Stop sign

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Nov-05, Thu,18:19	Clear	Other	P.D. only	Dry	South	Reversing	Pick-up truck	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Jun-09, Tue,16:33	Clear	Turning movement	P.D. only	Dry	West	Turning left	Unknown	Other motor vehicle	
					East	Going ahead	Municipal transit bus	Other motor vehicle	

Location: BEECHWOOD AVE @ LANGEVIN AVE

Traffic Control: Stop sign

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Sep-08, Sat,20:53	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	
2014-Sep-19, Fri,18:15	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	

					East	Going ahead	Pick-up truck	Other motor vehicle	

Location: BEECHWOOD AVE @ SPRINGFIELD RD

Traffic Control: Traffic signal **Total Collisions:** 11

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Sep-20, Thu,08:27	Rain	Rear end	Non-fatal injury	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Aug-02, Thu,17:40	Clear	Sideswipe	P.D. only	Dry	West	Overtaking	Unknown	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Feb-23, Fri,17:44	Clear	Rear end	P.D. only	Ice	West	Going ahead	Pick-up truck	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Oct-31, Mon,13:02	Clear	SMV other	Non-fatal injury	Dry	North	Turning right	Automobile, station wagon	Pedestrian	1
2016-Jan-13, Wed,15:15	Clear	Rear end	P.D. only	Dry	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Delivery van	Other motor vehicle	
2015-Sep-28, Mon,15:30	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Passenger van	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

2015-Jan-14, Wed,07:39	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Passenger van	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Nov-28, Fri,17:50	Clear	SMV other	Fatal injury	Dry	South	Turning left	School bus	Pedestrian	1
2014-Nov-14, Fri,14:44	Clear	Other	P.D. only	Dry	North	Reversing	Truck - dump	Other motor vehicle	
					South	Turning right	Automobile, station wagon	Other motor vehicle	
2014-Nov-11, Tue,11:58	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2014-Aug-01, Fri,08:42	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Slowing or stopping	Pick-up truck	Other motor vehicle	

Location: BEECHWOOD AVE @ ST. CHARLES ST

Traffic Control: Traffic signal **Total Collisions:** 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-May-12, Thu,08:52	Clear	Rear end	P.D. only	Dry	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	
2015-Jun-08, Mon,17:02	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Pick-up truck	Pedestrian	1
2014-Apr-30, Wed,16:45	Rain	Rear end	P.D. only	Wet	West	Slowing or stopping	Passenger van	Other motor vehicle	

					West	Stopped	Automobile, station wagon	Other motor vehicle	

Location: BEECHWOOD AVE btwn DOUGLAS AVE & LANGEVIN AVE

Traffic Control: No control **Total Collisions:** 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Mar-08, Tue,07:28	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2015-Aug-29, Sat,11:30	Clear	Turning movement	P.D. only	Dry	East	Making "U" turn	Passenger van	Other motor vehicle	
					East	Changing lanes	Automobile, station wagon	Other motor vehicle	
2015-Aug-29, Sat,11:29	Clear	Turning movement	P.D. only	Dry	East	Making "U" turn	Passenger van	Other motor vehicle	
					East	Overtaking	Automobile, station wagon	Other motor vehicle	

Location: BEECHWOOD AVE btwn LANGEVIN AVE & ST. CHARLES ST

Traffic Control: No control **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Sep-18, Thu,00:46	Rain	SMV other	Non-fatal injury	Wet	East	Going ahead	Automobile, station wagon	Ran off road	
2014-Jan-09, Thu,08:30	Clear	Sideswipe	P.D. only	Ice	West	Changing lanes	Passenger van	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	

Location: BEECHWOOD AVE btwn MACKAY ST & SPRINGFIELD RD

Traffic Control: No control

Total Collisions: 4

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Dec-06, Thu,18:05	Clear	Sideswipe	P.D. only	Wet	West	Changing lanes	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Dec-22, Thu,11:57	Clear	Turning movement	P.D. only	Wet	West	Turning left	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-May-11, Wed,10:08	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2015-Sep-11, Fri,18:18	Rain	Turning movement	Non-fatal injury	Wet	West	Turning left	Automobile, station wagon	Cyclist	
					East	Going ahead	Bicycle	Other motor vehicle	

Location: BEECHWOOD AVE btwn SPRINGFIELD RD & LOYER ST

Traffic Control: No control

Total Collisions: 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Jan-25, Thu,08:39	Clear	SMV unattended vehicle	P.D. only	Wet	North	Pulling onto shoulder or toward curb	Automobile, station wagon	Unattended vehicle	
2017-Aug-29, Tue,18:44	Clear	SMV other	Non-fatal injury	Dry	West	Going ahead	Motorcycle	Other	
2016-Feb-18, Thu,15:34	Clear	Turning movement	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	

					East	Turning right	Pick-up truck	Other motor vehicle	

Location: BEECHWOOD AVE btwn ST. PATRICK ST & MACKAY ST

Traffic Control: No control

Total Collisions: 9

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Nov-10, Sat,16:18	Clear	SMV unattended vehicle	P.D. only	Dry	East	Unknown	Unknown	Unattended vehicle	
2017-Jun-04, Sun,00:00	Clear	SMV unattended vehicle	P.D. only	Dry	Unknown	Unknown	Unknown	Unattended vehicle	
2016-Jul-18, Mon,16:31	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Mar-30, Wed,20:42	Clear	SMV unattended vehicle	P.D. only	Dry	Unknown	Unknown	Unknown	Unattended vehicle	
2015-Feb-13, Fri,13:42	Clear	SMV unattended vehicle	P.D. only	Dry	Unknown	Unknown	Unknown	Unattended vehicle	
2015-Jan-06, Tue,16:34	Clear	Sideswipe	Non-fatal injury	Slush	East	Overtaking	Automobile, station wagon	Cyclist	
					East	Going ahead	Bicycle	Other motor vehicle	
2014-Jul-03, Thu,13:05	Clear	Sideswipe	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Pulling onto shoulder or toward curb	Pick-up truck	Other motor vehicle	

2014-Jan-24, Fri,10:09	Clear	Turning movement	P.D. only	Dry	West	Making "U" turn	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2014-Jan-18, Sat,09:55	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	

Location: ST. CHARLES ST btwn BEECHWOOD AVE & BARRETTE ST

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Feb-13, Tue,00:00	Clear	SMV unattended vehicle	P.D. only	Dry	Unknown	Unknown	Unknown	Unattended vehicle	
2016-Feb-20, Sat,14:21	Rain	SMV unattended vehicle	P.D. only	Slush	East	Reversing	Pick-up truck	Unattended vehicle	

Location: VANIER PKWY/CRICHTON ST @ BEECHWOOD AVE/ST. PA

Traffic Control: Traffic signal

Total Collisions: 115

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Dec-13, Thu,09:36	Clear	Sideswipe	P.D. only	Dry	North	Stopped	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Nov-24, Sat,04:47	Clear	SMV other	P.D. only	Wet	East	Turning right	Police vehicle	Skidding/sliding	
2018-Nov-22, Thu,13:20	Clear	SMV other	P.D. only	Dry	East	Turning right	Pick-up truck	Skidding/sliding	
2018-Nov-15, Thu,19:38	Clear	Rear end	P.D. only	Dry	West	Going ahead	Pick-up truck	Other motor vehicle	

					West	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2018-Nov-04, Sun,17:10	Clear	Rear end	P.D. only	Dry	North	Going ahead	Unknown	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2018-Oct-17, Wed,13:34	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2018-Aug-28, Tue,23:45	Clear	Rear end	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2018-Jul-24, Tue,21:17	Rain	Rear end	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2018-Jul-06, Fri,13:42	Clear	Angle	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Apr-13, Fri,12:15	Clear	Rear end	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle

2018-Mar-04, Sun,16:21	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Feb-08, Thu,00:38	Clear	Sideswipe	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Jan-18, Thu,23:01	Clear	Sideswipe	P.D. only	Wet	West	Changing lanes	Municipal transit bus	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Nov-25, Sat,12:19	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Stopped	Pick-up truck	Other motor vehicle	
2017-Nov-07, Tue,10:20	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	
2017-Nov-04, Sat,13:58	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Oct-02, Mon,14:09	Clear	SMV other	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Pedestrian	1

2017-Sep-21, Thu,09:33	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2017-Sep-03, Sun,23:51	Clear	SMV other	Non-fatal injury	Dry	East	Turning right	Automobile, station wagon	Other
2017-Sep-02, Sat,11:28	Clear	Rear end	P.D. only	Dry	South	Going ahead	Passenger van	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2017-Aug-31, Thu,18:46	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Aug-05, Sat,13:44	Clear	Rear end	P.D. only	Dry	East	Turning right	Unknown	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2017-Jul-13, Thu,07:54	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jun-13, Tue,20:00	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle

2017-Jun-01, Thu,10:00	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2017-May-27, Sat,17:40	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Unknown	Other motor vehicle
2017-Apr-24, Mon,14:25	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2017-Apr-04, Tue,17:21	Rain	Rear end	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2017-Mar-25, Sat,17:14	Clear	Rear end	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2017-Mar-06, Mon,19:49	Snow	Turning movement	P.D. only	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Turning left	Passenger van	Other motor vehicle
2017-Mar-03, Fri,10:15	Clear	Other	P.D. only	Dry	West	Reversing	Truck and trailer	Other motor vehicle

					East	Stopped	Pick-up truck	Other motor vehicle	
2017-Feb-20, Mon,18:00	Clear	SMV other	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Pedestrian	1
2017-Feb-15, Wed,08:56	Snow	Rear end	Non-fatal injury	Loose snow	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Jan-17, Tue,08:43	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	
2017-Jan-11, Wed,07:46	Clear	Sideswipe	P.D. only	Slush	South	Overtaking	Pick-up truck	Other motor vehicle	
					South	Stopped	Municipal transit bus	Other motor vehicle	
2016-Dec-03, Sat,18:30	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle	
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2016-Nov-16, Wed,14:17	Clear	Turning movement	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Sep-23, Fri,08:48	Clear	Other	Non-fatal injury	Dry	East	Turning right	Pick-up truck	Cyclist	
					West	Going ahead	Bicycle	Other motor vehicle	

2016-Sep-22, Thu,14:47	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2016-Sep-21, Wed,19:25	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Sep-17, Sat,02:58	Clear	SMV other	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Curb
2016-Sep-11, Sun,17:00	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2016-Sep-02, Fri,09:05	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Aug-30, Tue,21:33	Clear	Sideswipe	P.D. only	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Municipal transit bus	Other motor vehicle
2016-Aug-26, Fri,09:48	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle

2016-Aug-23, Tue,15:30	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-Aug-23, Tue,11:01	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Jul-14, Thu,11:50	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Unknown	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jul-05, Tue,01:34	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Motorcycle	Other motor vehicle
2016-Jun-25, Sat,12:48	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Jun-14, Tue,09:46	Clear	Rear end	P.D. only	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle
					West	Turning left	Automobile, station wagon	Other motor vehicle
2016-Jun-05, Sun,02:30	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
2016-May-28, Sat,16:55	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2016-Apr-25, Mon,16:02	Clear	Sideswipe	P.D. only	Dry	North	Unknown	Unknown	Other motor vehicle
					North	Turning left	Pick-up truck	Other motor vehicle
2016-Mar-18, Fri,11:10	Clear	Turning movement	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2016-Mar-05, Sat,18:27	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2016-Feb-21, Sun,04:18	Rain	SMV other	P.D. only	Wet	East	Turning right	Automobile, station wagon	Curb
2016-Feb-17, Wed,16:41	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2016-Feb-17, Wed,08:00	Snow	Rear end	P.D. only	Wet	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle

2016-Feb-14, Sun,06:29	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2016-Feb-12, Fri,04:57	Clear	SMV other	P.D. only	Ice	East	Turning right	Automobile, station wagon	Skidding/sliding
2016-Feb-04, Thu,19:20	Clear	Rear end	P.D. only	Dry	East	Going ahead	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jan-24, Sun,15:56	Snow	Rear end	P.D. only	Wet	East	Turning right	Passenger van	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Unknown	Other motor vehicle
2016-Jan-19, Tue,17:28	Clear	Rear end	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2015-Dec-21, Mon,16:10	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Changing lanes	Pick-up truck	Other motor vehicle
2015-Nov-27, Fri,17:13	Rain	Rear end	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle

2015-Nov-27, Fri,09:56	Clear	Rear end	P.D. only	Wet	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2015-Nov-09, Mon,16:46	Clear	Sideswipe	P.D. only	Dry	North	Unknown	Pick-up truck	Other motor vehicle
					North	Unknown	Pick-up truck	Other motor vehicle
2015-Nov-06, Fri,13:06	Rain	Rear end	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2015-Nov-03, Tue,06:15	Clear	Rear end	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2015-Oct-29, Thu,11:17	Clear	Rear end	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle
2015-Oct-24, Sat,18:00	Rain	Turning movement	P.D. only	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2015-Oct-09, Fri,18:58	Clear	Rear end	P.D. only	Dry	North	Going ahead	Pick-up truck	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle

2015-Sep-18, Fri,13:36	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2015-Sep-03, Thu,21:21	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Aug-11, Tue,15:20	Clear	Rear end	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2015-Jul-25, Sat,21:08	Clear	SMV other	P.D. only	Wet	East	Turning right	Automobile, station wagon	Ran off road
2015-Jul-23, Thu,17:54	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Pick-up truck	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jul-19, Sun,12:30	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2015-Jul-19, Sun,12:15	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle

2015-Jul-18, Sat,08:44	Rain	Sideswipe	P.D. only	Wet	West	Changing lanes	Automobile, station wagon	Other motor vehicle
					West	Pulling onto shoulder or toward curb	Automobile, station wagon	Other motor vehicle
2015-Jul-15, Wed,09:00	Clear	Sideswipe	P.D. only	Dry	North	Going ahead	Municipal transit bus	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jun-17, Wed,16:05	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Pick-up truck	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2015-Jun-03, Wed,08:55	Clear	Rear end	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2015-Apr-30, Thu,19:23	Clear	Sideswipe	P.D. only	Dry	North	Going ahead	Unknown	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2015-Apr-11, Sat,02:41	Strong wind	SMV other	P.D. only	Dry	East	Turning right	Automobile, station wagon	Ran off road
2015-Apr-01, Wed,19:21	Clear	Turning movement	P.D. only	Dry	West	Turning left	Municipal transit bus	Other motor vehicle
					West	Going ahead	Pick-up truck	Other motor vehicle

2015-Mar-17, Tue,08:46	Clear	Rear end	P.D. only	Ice	East	Turning right	Delivery van	Other motor vehicle	
					East	Turning right	Pick-up truck	Other motor vehicle	
2015-Feb-17, Tue,03:53	Clear	SMV other	P.D. only	Dry	East	Turning right	Automobile, station wagon	Ran off road	
2015-Jan-28, Wed,18:30	Clear	Rear end	Non-fatal injury	Dry	West	Going ahead	Pick-up truck	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Dec-27, Sat,13:00	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Passenger van	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Dec-18, Thu,11:41	Clear	Rear end	P.D. only	Wet	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Dec-12, Fri,18:25	Clear	SMV other	Non-fatal injury	Wet	East	Changing lanes	Pick-up truck	Pedestrian	1
2014-Dec-11, Thu,20:33	Clear	Turning movement	P.D. only	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2014-Dec-09, Tue,00:00	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Unknown	Other motor vehicle	
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

2014-Dec-01, Mon,16:40	Clear	Sideswipe	P.D. only	Dry	West	Overtaking	Pick-up truck	Other motor vehicle
					West	Stopped	Pick-up truck	Other motor vehicle
2014-Aug-15, Fri,17:42	Rain	Rear end	P.D. only	Wet	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2014-Aug-08, Fri,11:15	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Stopped	Passenger van	Other motor vehicle
2014-Jul-29, Tue,07:30	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Jul-22, Tue,22:18	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Stopped	Passenger van	Other motor vehicle
2014-Jul-09, Wed,09:05	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Jun-05, Thu,17:00	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Automobile, station wagon	Other motor vehicle
					North	Turning left	Pick-up truck	Other motor vehicle

2014-Jun-03, Tue,09:30	Rain	Rear end	P.D. only	Wet	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Jun-01, Sun,14:00	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2014-Apr-23, Wed,16:20	Clear	Sideswipe	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Pick-up truck	Other motor vehicle
2014-Apr-12, Sat,23:00	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Apr-12, Sat,11:28	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2014-Apr-08, Tue,06:22	Rain	Turning movement	P.D. only	Wet	West	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Mar-26, Wed,19:55	Clear	Angle	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle

					West	Turning left	Pick-up truck	Other motor vehicle
2014-Mar-18, Tue,08:19	Clear	Rear end	Non-fatal injury	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2014-Mar-07, Fri,07:45	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Skidding/sliding
					East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Mar-02, Sun,11:47	Clear	Rear end	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Slowing or stopping	Pick-up truck	Other motor vehicle
2014-Feb-11, Tue,23:15	Clear	SMV other	P.D. only	Other	East	Changing lanes	Automobile, station wagon	Debris on road
2014-Feb-03, Mon,08:49	Clear	Rear end	Non-fatal injury	Loose snow	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Jan-22, Wed,15:57	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Slowing or stopping	Pick-up truck	Other motor vehicle

Appendix F – Trip Generation Data

Table 3.12: Person Trip Generation Rates – (all households with residents not older than 55 years of age)

Person Trip Generation Rates
All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area Person Trip Rate	Core Area %▽	Urban Area (Inside the greenbelt) Person Trip Rate	Urban Area %▽	Suburban (Outside the greenbelt) Person Trip Rate	Suburban %▽	Rural Person Trip Rate	Rural %▽	All Areas Person Trip Rate
Single detached:	AM	0.85	- 7%	0.99	+ 9%	0.94	+ 3%	0.78	- 14%	0.91
	PM	0.74	- 3%	0.75	- 1%	0.79	+ 4%	0.71	- 7%	0.76
Semi-detached:	AM	0.79	- 10%	0.97	10%	0.89	+ 1%	0.64	- 27%	0.88
	PM	0.74	- 1%	0.68	- 9%	0.82	+ 9%	0.60	- 20%	0.75
Row Townhouse:	AM	0.71	- 3%	0.78	+ 7%	0.67	- 8%	0.74	+ 1%	0.73
	PM	0.62	- 3%	0.60	- 6%	0.69	+ 8%	0.56	- 13%	0.64
Apartment:	AM	0.48	- 4%	0.51	+ 2%	0.53	+ 6%	0.36	- 28%	0.50
	PM	0.45	0%	0.42	- 7%	0.52	+ 16%	0.52	+ 16%	0.45
All Types:	AM	0.62	- 23%	0.82	+ 2%	0.86	+ 8%	0.76	- 5%	0.80
	PM	0.57	- 16%	0.63	- 7%	0.75	+ 10%	0.69	+ 1%	0.68

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

Table 3.13: Mode Shares - (all households with residents not older than 55 years of age)

Reported Mode Shares
All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area Vehicle Trips	Core Area Transit Share	Core Area Non-Motorised	Urban Area (Inside the greenbelt) Vehicle Trips	Urban Area Transit Share	Urban Area Non-Motorised	Suburban (Outside the greenbelt) Vehicle Trips	Suburban Transit Share	Suburban Non-Motorised	Rural * Vehicle Trips	Rural * Transit Share	Rural * Non-Motorised	All Areas Vehicle Trips	All Areas Transit Share	All Areas Non-Motorised
Single - Detached:	AM	35%	20%	33%	51%	26%	11%	55%	25%	9%	60%	27%	4%	54%	25%	10%
	PM	45%	11%	32%	58%	19%	13%	64%	19%	6%	73%	13%	2%	63%	17%	8%
Semi-Detached:	AM	38%	30%	26%	44%	35%	10%	52%	24%	12%	64%	27%	5%	49%	28%	12%
	PM	36%	20%	34%	51%	27%	13%	62%	17%	7%	77%	12%	1%	58%	20%	10%
Row / Townhouse:	AM	33%	22%	40%	45%	34%	10%	55%	27%	8%	73%	15%	3%	49%	30%	11%
	PM	39%	15%	42%	53%	28%	8%	61%	22%	6%	74%	15%	1%	57%	24%	9%
Apartment:	AM	27%	27%	43%	37%	41%	14%	44%	34%	13%	76%	8%	16%	36%	35%	23%
	PM	23%	29%	42%	40%	37%	14%	44%	33%	9%	48%	4%	17%	35%	33%	23%
All Types:	AM	32%	24%	38%	47%	31%	11%	54%	26%	9%	61%	26%	4%	51%	27%	11%
	PM	34%	21%	38%	53%	24%	12%	62%	20%	6%	73%	13%	2%	59%	20%	10%

Note: Percentages do not necessarily sum to 100% as the proportion of automobile passengers have not been tabulated. Vehicle trips reflect the percentage of vehicle drivers.
* - Rural area sample size is extremely low and mode shares are highly influenced by school types where public transportation levels are high during the AM versus the PM peaks.

Table 6.1: Vehicle Trip Generation Rates

Vehicle Trip Generation Rates AM and PM Peak Hours						
ITE Land Use Code	Dwelling Unit Type / Data Source		Vehicle Trip Generation Rate			
			2008 Count Data	ITE	OD Survey	Blended Rate
210	Single-detached dwellings	AM	0.66	0.75	0.56	0.66
		PM	0.89	1.01	0.53	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.40	0.70	0.46	0.52
		PM	0.64	0.72	0.46	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.53	0.67	0.21	0.47
		PM	0.41	0.78	0.18	0.46
232	High-rise condominiums (3+ floors)	AM	0.53	0.34	0.21	0.36
		PM	0.41	0.38	0.18	0.32
233	Luxury condominiums	AM	0.53	0.56	0.21	0.43
		PM	0.41	0.55	0.18	0.38
221	Low-rise apartments (2 floors)	AM	0.19	0.46	0.21	0.29
		PM	0.21	0.58	0.18	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.39	0.18	0.26
222	High-rise apartments (10+ floors)	AM	0.19	0.30	0.21	0.23
		PM	0.21	0.35	0.18	0.25

Table 6.2: Recommended Vehicle Trip Directional Splits

Comparison of Directional Splits (Inbound/Outbound) AM and PM Peak Hours								
ITE Land Use Code	Area Dwelling Unit Type / Data Source		2008 Count Data		ITE		Blended Rate	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
210	Single-detached dwellings	AM	33%	67%	25%	75%	29%	71%
		PM	60%	40%	63%	37%	62%	39%
224	Semi-detached dwellings, townhouses, rowhouses	AM	40%	60%	33%	67%	37%	64%
		PM	55%	45%	51%	49%	53%	47%
231	Low-rise condominiums (1 or 2 floors)	AM	36%	64%	25%	75%	31%	70%
		PM	54%	46%	58%	42%	56%	44%
232	High-rise condominiums (3+ floors)	AM	36%	64%	19%	81%	28%	73%
		PM	54%	46%	62%	38%	58%	42%
233	Luxury condominiums	AM	36%	64%	23%	77%	30%	71%
		PM	54%	46%	63%	37%	59%	42%
221	Low-rise apartments (2 floors)	AM	22%	78%	21%	79%	22%	79%
		PM	62%	38%	65%	35%	64%	37%
223	Mid-rise apartments (3-10 floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%
222	High-rise apartments (10+ floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%

Table 6.3: Recommended Vehicle Trip Generation Rates for Residential Land Uses with Transit Bonus

Recommended Vehicle Trip Generation Rates with Transit Bonus AM and PM Peak Hours									
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rate						
			Core		Urban (Inside the Greenbelt)		Suburban (Outside the Greenbelt)		Rural
			Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate
210	Single-detached dwellings	AM	0.40	0.31	0.67	0.50	0.70	0.49	0.62
		PM	0.60	0.33	0.76	0.57	0.90	0.63	0.92
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.34	0.51	0.50	0.54	0.39	0.62
		PM	0.39	0.38	0.51	0.51	0.71	0.51	0.67
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.34	0.50	0.50	0.60	0.60	0.71
		PM	0.29	0.29	0.49	0.49	0.66	0.66	0.72
232	High-rise condominiums (3+ floors)	AM	0.26	0.26	0.38	0.38	0.46	0.46	0.54
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
233	Luxury condominiums	AM	0.31	0.31	0.45	0.45	0.55	0.55	0.65
		PM	0.24	0.24	0.40	0.40	0.55	0.55	0.59
221	Low-rise apartments (2 floors)	AM	0.21	0.21	0.31	0.31	0.37	0.37	0.44
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.28	0.28	0.37	0.37	0.41
222	High-rise apartments (10+ floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.27	0.27	0.36	0.36	0.39

Note: The transit bonus was only applied to geographic areas and dwelling unit types where the reported transit mode shares were less than the transit mode share reported for residential development located within the 600m proximity to a rapid transit station. It is noted that condominium and apartment housing categories reported similar levels of transit mode shares independent of location to rapid transit stations.

6.5 Future Data Collection

While the rates presented in were prepared by blending the vehicle trip rates from ITE, the OD Survey and the 2008 local trip generation studies, it is important to stress the importance and need for ongoing local trip generation surveys to monitor changes in travel behaviour. The 2008 trip generation studies undertaken to support this study provide insight into local travel patterns and a well organized ongoing annual data collection program aimed at trip generation surveys of key land uses or requirement for data collection by local developers will continue to provide recent and accurate local trip generation rates. For example the high-rise apartment category of dwelling units reported the lowest peak hour vehicle trip rates.

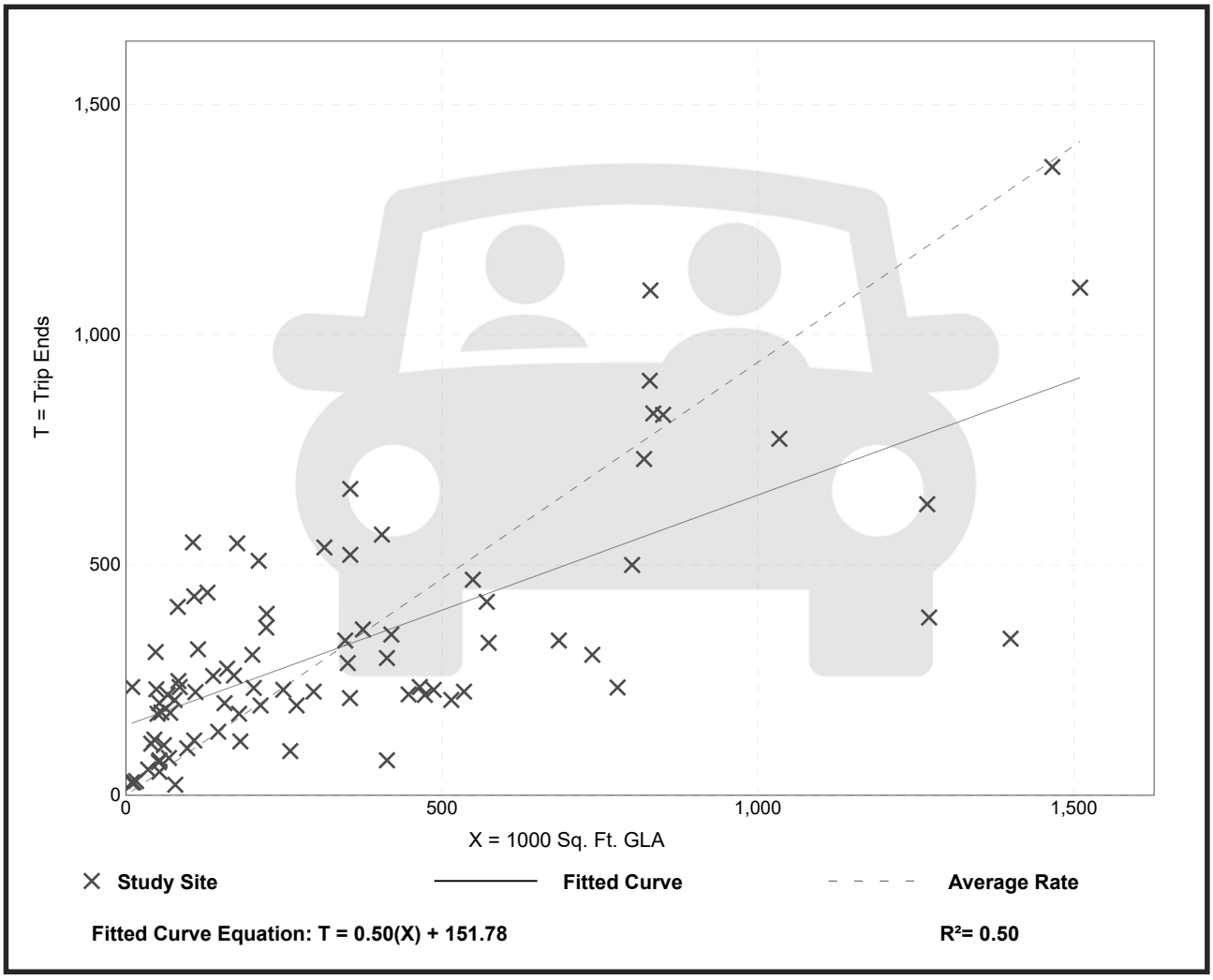
Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 84
Avg. 1000 Sq. Ft. GLA: 351
Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



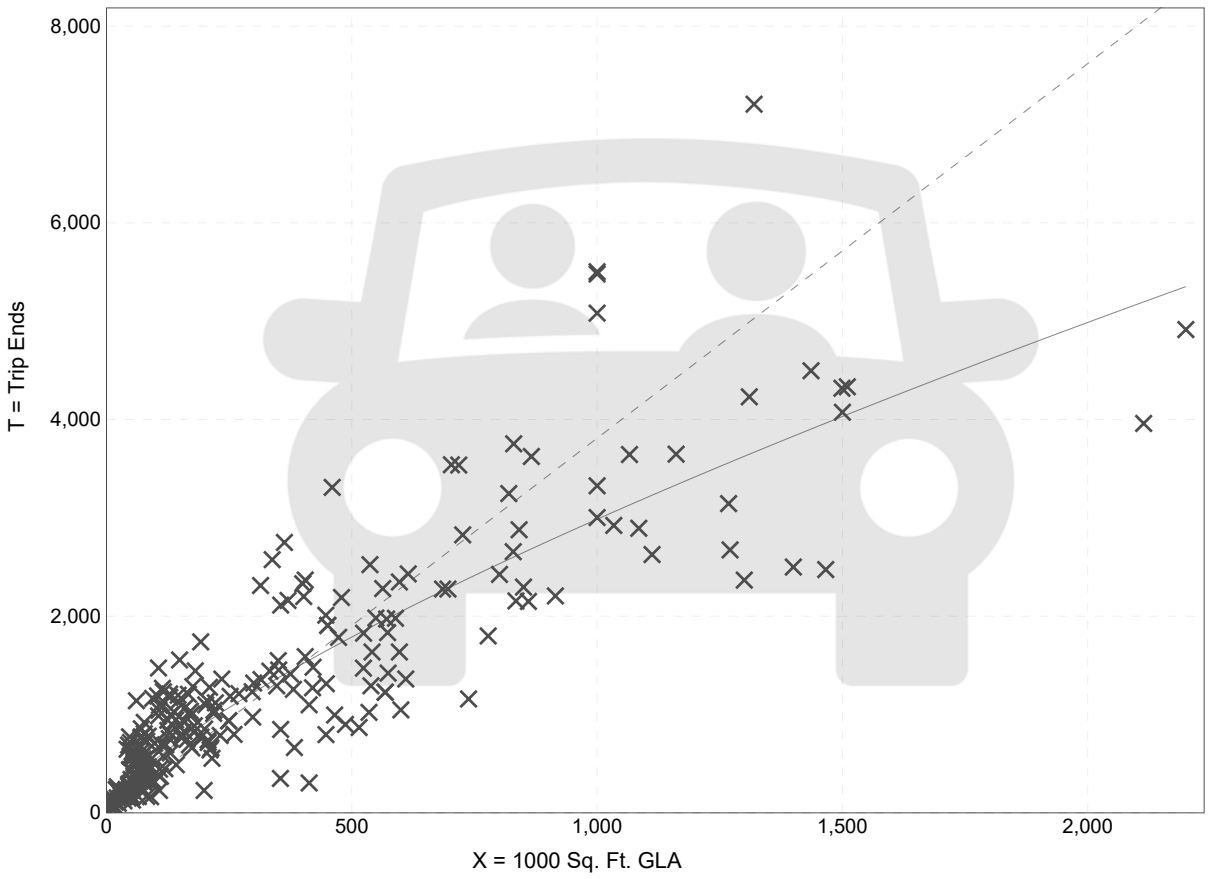
Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 261
Avg. 1000 Sq. Ft. GLA: 327
Directional Distribution: 48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.74 Ln(X) + 2.89

R^2= 0.82

Ottawa East

Demographic Characteristics

Population	51,920	Actively Travelled	40,620
Employed Population	23,900	Number of Vehicles	24,190
Households	25,240	Area (km^2)	16

Primary Occupation Status (age 5+)	Male	Female	Total
Full Time Employed	10,920	9,880	20,800
Part Time Employed	1,370	1,730	3,100
Student	4,240	4,710	8,950
Retiree	4,380	6,060	10,450
Unemployed	1,470	1,020	2,490
Homemaker	220	1,650	1,870
Other	850	910	1,760
Total:	23,450	25,970	49,420

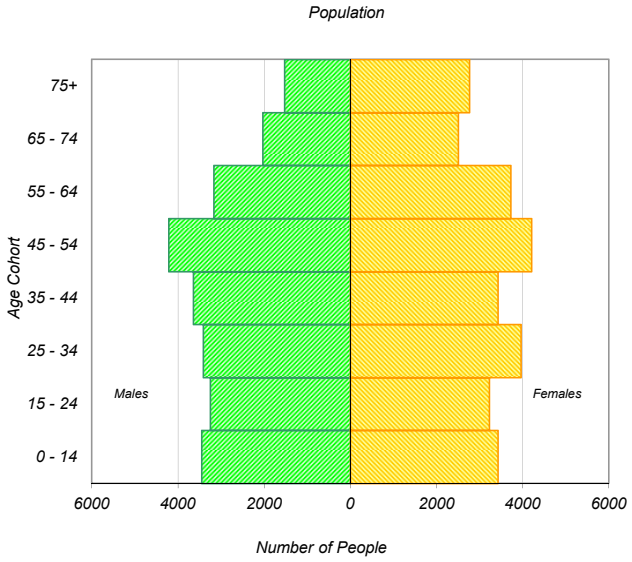
Traveller Characteristics	Male	Female	Total
Transit Pass Holders	4,420	6,060	10,480
Licensed Drivers	16,280	16,350	32,620
Telecommuters	190	40	230
Trips made by residents	61,610	67,100	128,710

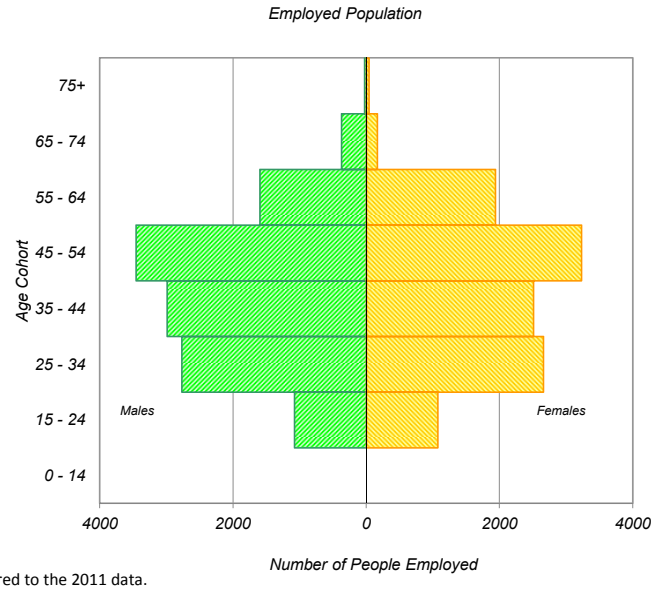
Selected Indicators	
Daily Trips per Person (age 5+)	2.60
Vehicles per Person	0.47
Number of Persons per Household	2.06
Daily Trips per Household	5.10
Vehicles per Household	0.96
Workers per Household	0.95
Population Density (Pop/km2)	3150

Household Size		
1 person	10,330	41%
2 persons	8,320	33%
3 persons	3,170	13%
4 persons	2,080	8%
5+ persons	1,340	5%
Total:	25,240	100%

Households by Vehicle Availability		
0 vehicles	7,290	29%
1 vehicle	13,190	52%
2 vehicles	3,750	15%
3 vehicles	720	3%
4+ vehicles	290	1%
Total:	25,240	100%

Households by Dwelling Type		
Single-detached	4,700	19%
Semi-detached	1,900	8%
Townhouse	3,940	16%
Apartment/Condo	14,700	58%
Total:	25,240	100%



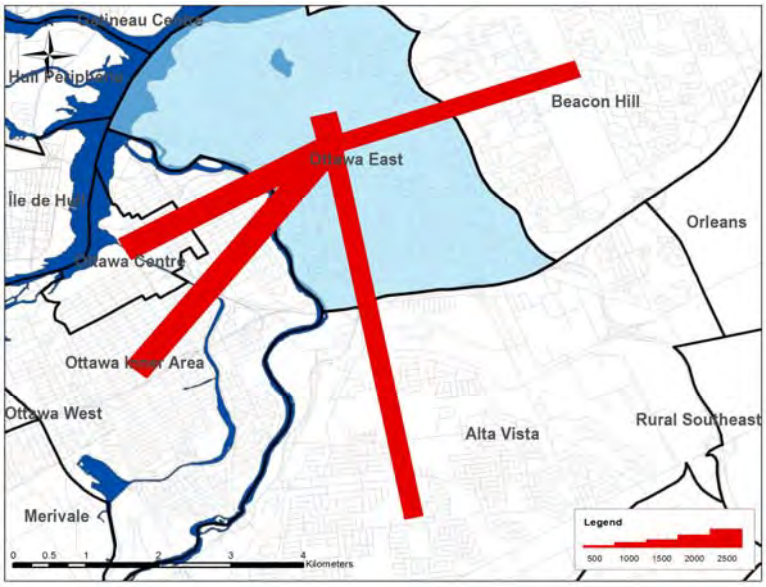


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from Ottawa East

AM Peak Period



Summary of Trips to and from Ottawa East

AM Peak Period (6:30 - 8:59) Districts	Destinations of Trips From District	% Total	Origins of Trips To District	% Total
Ottawa Centre	3,400	14%	310	1%
Ottawa Inner Area	3,670	15%	1,960	8%
Ottawa East	7,280	30%	7,280	32%
Beacon Hill	2,110	9%	1,750	8%
Alta Vista	2,370	10%	1,940	8%
Hunt Club	540	2%	960	4%
Merivale	1,610	7%	780	3%
Ottawa West	460	2%	310	1%
Bayshore / Cedarview	280	1%	310	1%
Orléans	600	2%	2,840	12%
Rural East	70	0%	160	1%
Rural Southeast	40	0%	260	1%
South Gloucester / Leitrim	40	0%	240	1%
South Nepean	50	0%	630	3%
Rural Southwest	20	0%	120	1%
Kanata / Stittsvile	260	1%	660	3%
Rural West	90	0%	80	0%
Île de Hull	790	3%	240	1%
Hull Périphérie	450	2%	550	2%
Plateau	0	0%	130	1%
Aylmer	20	0%	500	2%
Rural Northwest	10	0%	190	1%
Pointe Gatineau	50	0%	420	2%
Gatineau Est	100	0%	290	1%
Rural Northeast	90	0%	100	0%
Buckingham / Masson-Angers	10	0%	90	0%
Ontario Sub-Total:	22,890	94%	20,590	89%
Québec Sub-Total:	1,520	6%	2,510	11%
Total:	24,410	100%	23,100	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	17,910	22%	17,810	22%	4,150	8%
School	4,920	6%	2,850	3%	3,010	6%
Shopping	7,690	9%	13,780	17%	10,880	22%
Leisure	6,320	8%	7,910	10%	4,340	9%
Medical	2,140	3%	1,850	2%	910	2%
Pick-up / drive passenger	5,200	6%	4,600	6%	2,690	5%
Return Home	35,280	43%	30,610	37%	20,780	42%
Other	3,240	4%	2,930	4%	2,450	5%
Total:	82,700	100%	82,340	100%	49,210	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	10,560	62%	10,340	65%	1,870	26%
School	3,480	20%	2,120	13%	2,680	37%
Shopping	260	2%	500	3%	340	5%
Leisure	470	3%	370	2%	220	3%
Medical	290	2%	300	2%	60	1%
Pick-up / drive passenger	1,140	7%	1,130	7%	1,030	14%
Return Home	360	2%	500	3%	670	9%
Other	580	3%	580	4%	430	6%
Total:	17,140	100%	15,840	100%	7,300	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	370	2%	1,080	5%	320	3%
School	150	1%	150	1%	40	0%
Shopping	1,490	8%	2,720	14%	1,960	17%
Leisure	990	6%	1,690	8%	1,020	9%
Medical	240	1%	320	2%	20	0%
Pick-up / drive passenger	1,380	8%	1,420	7%	720	6%
Return Home	12,630	70%	12,030	60%	6,810	60%
Other	730	4%	580	3%	460	4%
Total:	17,980	100%	19,990	100%	11,350	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	214,250		23%
AM Peak Period	40,280	19%	18%
PM Peak Period	49,320	23%	23%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	48,290	58%	47,600	58%	21,140	43%
Auto Passenger	12,390	15%	12,020	15%	7,390	15%
Transit	16,060	19%	16,550	20%	3,790	8%
Bicycle	2,330	3%	2,370	3%	1,290	3%
Walk	1,270	2%	1,260	2%	12,390	25%
Other	2,360	3%	2,530	3%	3,210	7%
Total:	82,700	100%	82,330	100%	49,210	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	7,690	45%	10,160	64%	2,390	33%
Auto Passenger	1,770	10%	1,720	11%	920	13%
Transit	5,160	30%	2,940	19%	660	9%
Bicycle	1,050	6%	170	1%	210	3%
Walk	380	2%	140	1%	1,730	24%
Other	1,070	6%	720	5%	1,380	19%
Total:	17,120	100%	15,850	100%	7,290	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	11,440	64%	9,660	48%	4,850	43%
Auto Passenger	2,630	15%	2,900	15%	1,800	16%
Transit	3,220	18%	5,430	27%	830	7%
Bicycle	300	2%	1,300	7%	380	3%
Walk	110	1%	390	2%	2,800	25%
Other	280	2%	300	2%	690	6%
Total:	17,980	100%	19,980	100%	11,350	100%

Avg Vehicle Occupancy	From District	To District	Within District
24 Hours	1.26	1.25	1.35
AM Peak Period	1.23	1.17	1.38
PM Peak Period	1.23	1.30	1.37

Transit Modal Split	From District	To District	Within District
24 Hours	21%	22%	12%
AM Peak Period	35%	20%	17%
PM Peak Period	19%	30%	11%

Appendix G – TDM Checklists

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

Legend

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

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	●
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	●
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	●
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	●
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	●

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

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

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

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

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

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

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

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

Appendix H – MMLOS Analysis

Multi-Modal Level of Service

78-90 Beechwood/ 69-93 Barrette - Transportation Impact Assessment

Scenario: Existing Conditions

July 20, 2020

IBI

INTERSECTIONS		Beechwood & Charlevoix/ MacKay				Beechwood & St. Charles			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	4	4		2	4	4
	Median	No Median	No Median	No Median	No Median		No Median	No Median	No Median
	Island Refuge								
	Conflicting Left Turns (from street to right)	Permissive	Permissive	Permissive	Permissive		Permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	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
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited		RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No		No	No	No
	Corner Radius	> 3m to 5m	> 5m to 10m	Less than/equal to 3m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel		No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings		Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSI)	**75 B**	**74 C**	**59 D**	**60 C**		**86 B**	**54 D**	**54 D**
	Cycle Length (sec)	110	110	110	110		100	100	100
	Pedestrian Walk Time (solid white symbol) (sec)	10	10	10	10		7	7	7
	LOS (Delay,seconds)	**47.0 E**	**47.0 E**	**47.0 E**	**47.0 E**		**44.3 E**	**44.3 E**	**44.3 E**
	Overall Level of Service	**E**				**E**			
Cyclist	Type of Bikeway	Mixed Traffic	Bike Pocket at Intersection	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow		Slow	Slow	Slow
	Right Turn Storage Length								
	Dual Right Turn?	No	No	No	No		No	No	No
	Shared Through-Right?	Yes	Yes	No	Yes		Yes	Yes	Yes
	Bike Box?	No	Yes	Yes	Yes		No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	No Lanes Crossed	No Lanes Crossed	1 Lane Crossed		No Lanes Crossed	No Lanes Crossed	No Lanes Crossed
	Operating Speed on Approach	50km/h	50km/h	50km/h	50km/h		50km/h	50km/h	50km/h
	Dual Left Turn Lanes?	No	No	No	No		No	No	No
	Level of Service	**C**	**B**	**B**	**C**		**B**	**B**	**B**
		C				**B**			
Transit	Average Signal Delay	≤10 sec	≤10 sec				≤40 sec	≤10 sec	≤10 sec
	Level of Service	**B**	**B**				**E**	**B**	**B**
		B				**E**			
Truck	Turning Radius (Right Turn)			< 10m	< 10m			< 10m	
	Number of Receiving Lanes			2+	2+			1	
				D	**D**			**F**	
		D				**F**			

SEGMENTS			Barrette Street - Adjacent to Proposed Development					
			1	2	3			
Pedestrian	Sidewalk Width		1.8					
	Boulevard Width		0					
	AADT		< 3000					
	On-Street Parking		N/A					
	Operating Speed		31 to 50 km/h					
	Level of Service		**B**					
			B					
Cyclist	Type of Bikeway		Mixed Traffic					
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction					
	Raised Median?							
	Bike Lane Width							
	Operating Speed		50 km/h					
	Bike Lane Blockages (Commercial Areas)							
	Median Refuge							
	Number of Travel Lanes on Sidestreet							
	Sidestreet Operating Speed		50 km/h					
	Level of Service		**D**					
Transit	Facility Type		Mixed Traffic					
	Friction		Limited parking/driveway friction					
	Level of Service		**D**					
Truck	Curb Lane Width		>3.7					
	Number of Travel Lanes		2					
			B					
			B					

Multi-Modal Level of Service **July 20, 2020**

78-89 Beechwood Ave - Transportation Impact Assessment

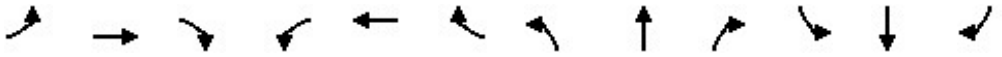
Scenario: Future Conditions (with Beechwood RMA Design Fully Implemented)

INTERSECTIONS		Beechwood & Charlevoix/ MacKay				Beechwood & St. Charles			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	4	4		2	2	2
	Median	No Median	No Median	No Median	No Median		No Median	No Median	No Median
	Island Refuge								
	Conflicting Left Turns (from street to right)	Permissive	Permissive	Permissive	Permissive		Permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	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
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited		RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No		No	No	No
	Corner Radius	> 3m to 5m	> 5m to 10m	Less than/equal to 3m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel		No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings		Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSI)	**75 B**	**74 C**	**59 D**	**60 C**		**86 B**	**86 B**	**86 B**
	Cycle Length (sec)	110	110	110	110		100	100	100
	Pedestrian Walk Time (solid white symbol) (sec)	10	10	10	10		7	7	7
	LOS (Delay,seconds)	**47.0 E**	**47.0 E**	**47.0 E**	**47.0 E**		**44.3 E**	**44.3 E**	**44.3 E**
	Overall Level of Service	**E**				**E**			
Cyclist	Type of Bikeway	Mixed Traffic	Bike Pocket at Intersection	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow		Slow	Slow	Slow
	Right Turn Storage Length								
	Dual Right Turn?	No	No	No	No		No	No	No
	Shared Through-Right?	Yes	Yes	No	Yes		Yes	Yes	Yes
	Bike Box?	No	Yes	Yes	Yes		Yes	Yes	Yes
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	No Lanes Crossed	No Lanes Crossed	1 Lane Crossed		No Lanes Crossed	No Lanes Crossed	No Lanes Crossed
	Operating Speed on Approach	50km/h	50km/h	50km/h	50km/h		50km/h	50km/h	50km/h
	Dual Left Turn Lanes?	No	No	No	No		No	No	No
	Level of Service	**C**	**B**	**B**	**C**		**A**	**A**	**A**
		C				**A**			
Transit	Average Signal Delay	≤10 sec	≤10 sec				≤40 sec	≤10 sec	≤10 sec
	Level of Service	**B**	**B**				**E**	**B**	**B**
		B				**E**			
Truck	Turning Radius (Right Turn)			< 10m	< 10m			10 to 15m	
	Number of Receiving Lanes			2+	2+			1	
				D	**D**			**E**	
		D				**E**			

SEGMENTS			Barrette Street - Adjacent to Proposed Development					
			1	2	3			
Pedestrian	Sidewalk Width		1.8					
	Boulevard Width		0					
	AADT		< 3000					
	On-Street Parking		N/A					
	Operating Speed		31 to 50 km/h					
	Level of Service		**B**					
			B					
Cyclist	Type of Bikeway		Mixed Traffic					
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction					
	Raised Median?							
	Bike Lane Width							
	Operating Speed		50 km/h					
	Bike Lane Blockages (Commercial Areas)							
	Median Refuge							
	Number of Travel Lanes on Sidestreet							
	Sidestreet Operating Speed		50 km/h					
	Level of Service		**D**					
Transit	Facility Type		Mixed Traffic					
	Friction		Limited parking/driveway friction					
	Level of Service		**D**					
Truck	Curb Lane Width		>3.7					
	Number of Travel Lanes		2					
			B					
			B					

Appendix I – Intersection Capacity Analyses

Existing (2020)
Traffic

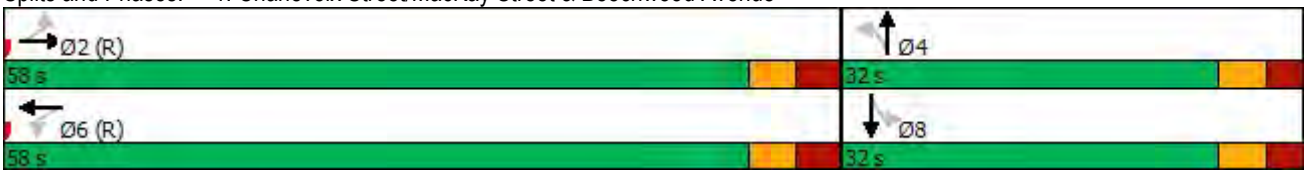


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	462	62	7	709	58	85	21	6	61	17	52
Future Volume (vph)	45	462	62	7	709	58	85	21	6	61	17	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	40.0		0.0	15.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			0.99		0.99	0.98		0.95	0.98	
Frt		0.984			0.989			0.965			0.887	
Flt Protected		0.996					0.950			0.950		
Satd. Flow (prot)	0	3200	0	0	3210	0	1729	1605	0	1695	1553	0
Flt Permitted		0.824			0.949		0.707			0.738		
Satd. Flow (perm)	0	2639	0	0	3046	0	1268	1605	0	1250	1553	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			15			7			58	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		120.8			84.3			190.2			207.1	
Travel Time (s)		8.7			6.1			13.7			14.9	
Confl. Peds. (#/hr)	87		38	38		87	16		51	51		16
Confl. Bikes (#/hr)						17			5			4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	9%	5%	2%	29%	5%	5%	0%	0%	33%	2%	6%	0%
Adj. Flow (vph)	50	513	69	8	788	64	94	23	7	68	19	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	632	0	0	860	0	94	30	0	68	77	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5		31.9	31.9		31.9	31.9	
Total Split (s)	58.0	58.0		58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Maximum Green (s)	51.5	51.5		51.5	51.5		26.1	26.1		26.1	26.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.2	3.2		3.2	3.2		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.5			6.5		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		69.3			69.3		12.8	12.8		12.8	12.8	
Actuated g/C Ratio		0.77			0.77		0.14	0.14		0.14	0.14	
v/c Ratio		0.31			0.37		0.53	0.13		0.38	0.29	
Control Delay		4.8			4.3		45.8	27.6		40.5	15.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		4.8			4.3		45.8	27.6		40.5	15.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A			A		D	C		D	B	
Approach Delay		4.8			4.3			41.4			27.3	
Approach LOS		A			A			D			C	
Queue Length 50th (m)		16.2			20.0		15.4	3.6		10.9	2.9	
Queue Length 95th (m)		29.7			31.6		28.7	10.4		21.9	13.9	
Internal Link Dist (m)		96.8			60.3			166.2			183.1	
Turn Bay Length (m)							40.0			15.0		
Base Capacity (vph)		2038			2349		367	470		362	491	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.31			0.37		0.26	0.06		0.19	0.16	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 26 (29%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.53			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 82.3%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Charlevoix Street/MacKay Street & Beechwood Avenue

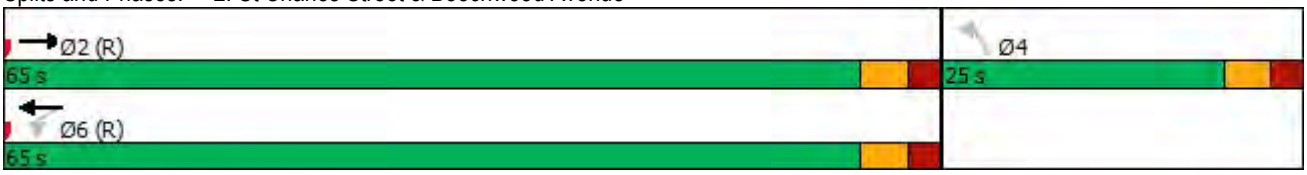


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	420	33	20	637	32	18
Future Volume (vph)	420	33	20	637	32	18
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			1.00	0.95	
Frt	0.990				0.952	
Flt Protected				0.998	0.969	
Satd. Flow (prot)	1711	0	0	1732	1562	0
Flt Permitted				0.980	0.969	
Satd. Flow (perm)	1711	0	0	1700	1533	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	9				20	
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.7			220.4	77.2	
Travel Time (s)	11.1			15.9	5.6	
Confl. Peds. (#/hr)		30	30		12	30
Confl. Bikes (#/hr)		1				
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	5%	0%	0%	5%	3%	6%
Adj. Flow (vph)	467	37	22	708	36	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	504	0	0	730	56	0
Turn Type	NA		Perm	NA	Perm	
Protected Phases	2			6		
Permitted Phases			6		4	
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	24.7		15.7	15.7	24.6	
Total Split (s)	65.0		65.0	65.0	25.0	
Total Split (%)	72.2%		72.2%	72.2%	27.8%	
Maximum Green (s)	59.3		59.3	59.3	19.4	
Yellow Time (s)	3.3		3.3	3.3	3.3	
All-Red Time (s)	2.4		2.4	2.4	2.3	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	5.7			5.7	5.6	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Min		C-Min	C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	12.0				12.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	72.7			72.7	10.2	
Actuated g/C Ratio	0.81			0.81	0.11	
v/c Ratio	0.36			0.53	0.29	
Control Delay	3.4			5.8	30.3	
Queue Delay	0.0			0.0	0.0	
Total Delay	3.4			5.8	30.3	
LOS	A			A	C	
Approach Delay	3.4			5.8	30.3	
Approach LOS	A			A	C	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (m)	19.1			41.4	5.8	
Queue Length 95th (m)	22.2			67.9	16.6	
Internal Link Dist (m)	129.7			196.4	53.2	
Turn Bay Length (m)						
Base Capacity (vph)	1384			1373	346	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.36			0.53	0.16	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 18 (20%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.53			
Intersection Signal Delay: 5.9		Intersection LOS: A	
Intersection Capacity Utilization 74.9%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: St Charles Street & Beechwood Avenue



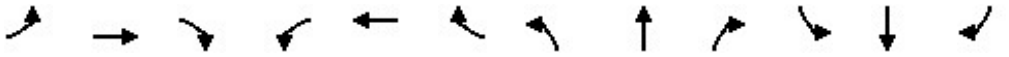
Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	8	6	2	24	5	8	43	4	3	45	6
Future Vol, veh/h	1	8	6	2	24	5	8	43	4	3	45	6
Conflicting Peds, #/hr	5	0	5	5	0	5	10	0	28	28	0	10
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	1	9	7	2	27	6	9	48	4	3	50	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	160	168	69	169	169	83	67	0	0	80	0	0
Stage 1	70	70	-	96	96	-	-	-	-	-	-	-
Stage 2	90	98	-	73	73	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	810	728	1000	799	728	982	1547	-	-	1531	-	-
Stage 1	945	841	-	916	819	-	-	-	-	-	-	-
Stage 2	922	818	-	942	838	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	766	697	986	757	697	952	1533	-	-	1491	-	-
Mov Cap-2 Maneuver	766	697	-	757	697	-	-	-	-	-	-	-
Stage 1	931	832	-	887	793	-	-	-	-	-	-	-
Stage 2	876	792	-	920	829	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.6	10.2	1.1	0.4
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1533	-	-	795	732	1491	-	-
HCM Lane V/C Ratio	0.006	-	-	0.021	0.047	0.002	-	-
HCM Control Delay (s)	7.4	0	-	9.6	10.2	7.4	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

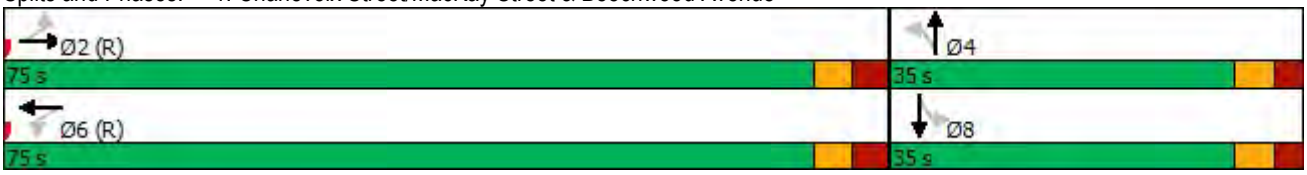


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	575	94	5	597	59	102	58	17	69	35	55
Future Volume (vph)	97	575	94	5	597	59	102	58	17	69	35	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	40.0		0.0	15.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.97			0.98		0.93	0.98		0.93	0.95	
Frt		0.982			0.987			0.966			0.908	
Flt Protected		0.994					0.950			0.950		
Satd. Flow (prot)	0	3204	0	0	3256	0	1729	1721	0	1729	1563	0
Flt Permitted		0.733			0.949		0.692			0.703		
Satd. Flow (perm)	0	2342	0	0	3089	0	1176	1721	0	1187	1563	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			18			13			61	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		120.8			84.3			190.2			207.1	
Travel Time (s)		8.7			6.1			13.7			14.9	
Confl. Peds. (#/hr)	107		63	63		107	60		64	64		60
Confl. Bikes (#/hr)			3			1			1			3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	4%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	108	639	104	6	663	66	113	64	19	77	39	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	851	0	0	735	0	113	83	0	77	100	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5		31.9	31.9		31.9	31.9	
Total Split (s)	75.0	75.0		75.0	75.0		35.0	35.0		35.0	35.0	
Total Split (%)	68.2%	68.2%		68.2%	68.2%		31.8%	31.8%		31.8%	31.8%	
Maximum Green (s)	68.5	68.5		68.5	68.5		29.1	29.1		29.1	29.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.2	3.2		3.2	3.2		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.5			6.5		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		81.4			81.4		16.2	16.2		16.2	16.2	
Actuated g/C Ratio		0.74			0.74		0.15	0.15		0.15	0.15	
v/c Ratio		0.49			0.32		0.66	0.32		0.44	0.36	
Control Delay		7.4			5.7		61.2	36.7		49.4	21.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		7.4			5.7		61.2	36.7		49.4	21.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A			A		E	D		D	C	
Approach Delay		7.4			5.7			50.9			33.5	
Approach LOS		A			A			D			C	
Queue Length 50th (m)		31.8			23.2		23.3	13.6		15.3	7.5	
Queue Length 95th (m)		56.7			40.0		39.2	25.8		28.0	21.1	
Internal Link Dist (m)		96.8			60.3			166.2			183.1	
Turn Bay Length (m)							40.0			15.0		
Base Capacity (vph)		1740			2291		311	464		314	458	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.49			0.32		0.36	0.18		0.25	0.22	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 13.4		Intersection LOS: B	
Intersection Capacity Utilization 83.2%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Charlevoix Street/MacKay Street & Beechwood Avenue

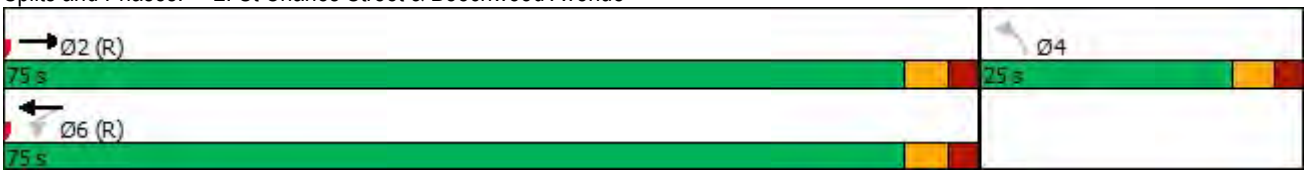


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	502	34	9	659	35	21
Future Volume (vph)	502	34	9	659	35	21
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			1.00	0.95	
Frt	0.991				0.950	
Flt Protected				0.999	0.970	
Satd. Flow (prot)	1714	0	0	1747	1538	0
Flt Permitted				0.992	0.970	
Satd. Flow (perm)	1714	0	0	1733	1482	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	8				23	
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.7			220.4	77.2	
Travel Time (s)	11.1			15.9	5.6	
Confl. Peds. (#/hr)		56	56		22	11
Confl. Bikes (#/hr)		3				
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	4%	6%	11%	4%	3%	14%
Adj. Flow (vph)	558	38	10	732	39	23
Shared Lane Traffic (%)						
Lane Group Flow (vph)	596	0	0	742	62	0
Turn Type	NA		Perm	NA	Perm	
Protected Phases	2			6		
Permitted Phases			6		4	
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	24.7		15.7	15.7	24.6	
Total Split (s)	75.0		75.0	75.0	25.0	
Total Split (%)	75.0%		75.0%	75.0%	25.0%	
Maximum Green (s)	69.3		69.3	69.3	19.4	
Yellow Time (s)	3.3		3.3	3.3	3.3	
All-Red Time (s)	2.4		2.4	2.4	2.3	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	5.7			5.7	5.6	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Min		C-Min	C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	12.0				12.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	82.5			82.5	10.4	
Actuated g/C Ratio	0.82			0.82	0.10	
v/c Ratio	0.42			0.52	0.36	
Control Delay	4.3			5.3	34.8	
Queue Delay	0.0			0.0	0.0	
Total Delay	4.3			5.3	34.8	
LOS	A			A	C	
Approach Delay	4.3			5.3	34.8	
Approach LOS	A			A	C	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (m)	29.0			42.1	7.1	
Queue Length 95th (m)	48.7			70.4	19.2	
Internal Link Dist (m)	129.7			196.4	53.2	
Turn Bay Length (m)						
Base Capacity (vph)	1416			1430	306	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.42			0.52	0.20	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 1 (1%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 6.2		Intersection LOS: A	
Intersection Capacity Utilization 64.3%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: St Charles Street & Beechwood Avenue



Intersection	
Int Delay, s/veh	5.2

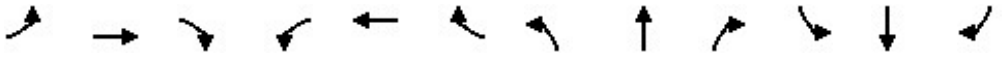
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	24	4	4	37	8	10	41	6	7	31	9
Future Vol, veh/h	4	24	4	4	37	8	10	41	6	7	31	9
Conflicting Peds, #/hr	14	0	13	13	0	14	14	0	15	15	0	14
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	12	0	0	0	0	0	0
Mvmt Flow	4	27	4	4	41	9	11	46	7	8	34	10

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	180	159	66	171	161	79	58	0	0	68	0	0
Stage 1	69	69	-	87	87	-	-	-	-	-	-	-
Stage 2	111	90	-	84	74	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.32	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.408	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	786	737	1003	797	735	954	1559	-	-	1546	-	-
Stage 1	946	841	-	926	827	-	-	-	-	-	-	-
Stage 2	899	824	-	929	837	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	718	709	978	744	707	929	1539	-	-	1525	-	-
Mov Cap-2 Maneuver	718	709	-	744	707	-	-	-	-	-	-	-
Stage 1	927	826	-	907	810	-	-	-	-	-	-	-
Stage 2	828	807	-	880	822	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.1	10.3	1.3	1.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1539	-	-	735	739	1525	-	-
HCM Lane V/C Ratio	0.007	-	-	0.048	0.074	0.005	-	-
HCM Control Delay (s)	7.4	0	-	10.1	10.3	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

Future (2023 & 2028)
Background Traffic

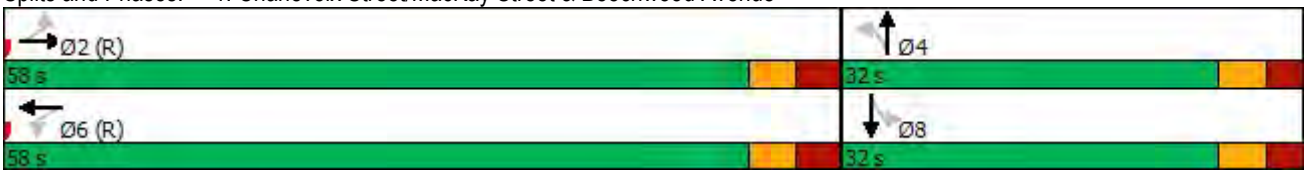


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	468	62	7	724	58	85	21	6	61	17	52
Future Volume (vph)	45	468	62	7	724	58	85	21	6	61	17	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	40.0		0.0	15.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			0.99		0.98	0.99		0.95	0.98	
Frt		0.984			0.989			0.967			0.887	
Flt Protected		0.996					0.950			0.950		
Satd. Flow (prot)	0	3200	0	0	3211	0	1729	1615	0	1695	1553	0
Flt Permitted		0.842			0.950		0.712			0.740		
Satd. Flow (perm)	0	2696	0	0	3049	0	1276	1615	0	1253	1553	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			15			6			52	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		120.8			84.3			190.2			207.1	
Travel Time (s)		8.7			6.1			13.7			14.9	
Confl. Peds. (#/hr)	87		38	38		87	16		51	51		16
Confl. Bikes (#/hr)						17			5			4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	9%	5%	2%	29%	5%	5%	0%	0%	33%	2%	6%	0%
Adj. Flow (vph)	45	468	62	7	724	58	85	21	6	61	17	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	575	0	0	789	0	85	27	0	61	69	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5		31.9	31.9		31.9	31.9	
Total Split (s)	58.0	58.0		58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Maximum Green (s)	51.5	51.5		51.5	51.5		26.1	26.1		26.1	26.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.2	3.2		3.2	3.2		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.5			6.5		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		69.8			69.8		12.3	12.3		12.3	12.3	
Actuated g/C Ratio		0.78			0.78		0.14	0.14		0.14	0.14	
v/c Ratio		0.27			0.33		0.49	0.12		0.36	0.27	
Control Delay		4.4			4.1		45.1	28.4		40.4	16.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		4.4			4.1		45.1	28.4		40.4	16.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A			A		D	C		D	B	
Approach Delay		4.4			4.1			41.1			27.6	
Approach LOS		A			A			D			C	
Queue Length 50th (m)		13.6			18.0		14.0	3.3		9.8	2.7	
Queue Length 95th (m)		25.1			28.6		26.6	9.9		20.3	13.3	
Internal Link Dist (m)		96.8			60.3			166.2			183.1	
Turn Bay Length (m)							40.0			15.0		
Base Capacity (vph)		2096			2368		370	472		363	487	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.27			0.33		0.23	0.06		0.17	0.14	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 26 (29%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.49			
Intersection Signal Delay: 8.7		Intersection LOS: A	
Intersection Capacity Utilization 82.6%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Charlevoix Street/MacKay Street & Beechwood Avenue

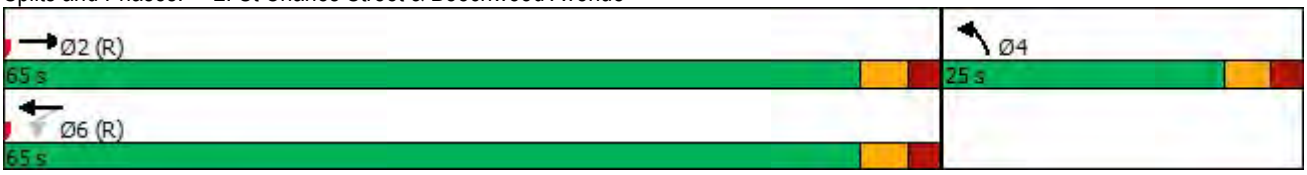


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	416	56	37	628	56	35
Future Volume (vph)	416	56	37	628	56	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			1.00	0.95	
Frt	0.984				0.948	
Flt Protected				0.997	0.970	
Satd. Flow (prot)	1697	0	0	1733	1551	0
Flt Permitted				0.959	0.970	
Satd. Flow (perm)	1697	0	0	1664	1524	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	16				32	
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.7			220.4	77.2	
Travel Time (s)	11.1			15.9	5.6	
Confl. Peds. (#/hr)		30	30		12	30
Confl. Bikes (#/hr)		1				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	5%	0%	0%	5%	3%	6%
Adj. Flow (vph)	416	56	37	628	56	35
Shared Lane Traffic (%)						
Lane Group Flow (vph)	472	0	0	665	91	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			6	4	
Permitted Phases			6			
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	24.7		15.7	15.7	24.6	
Total Split (s)	65.0		65.0	65.0	25.0	
Total Split (%)	72.2%		72.2%	72.2%	27.8%	
Maximum Green (s)	59.3		59.3	59.3	19.4	
Yellow Time (s)	3.3		3.3	3.3	3.3	
All-Red Time (s)	2.4		2.4	2.4	2.3	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	5.7			5.7	5.6	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Min		C-Min	C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	12.0				12.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	72.2			72.2	10.8	
Actuated g/C Ratio	0.80			0.80	0.12	
v/c Ratio	0.35			0.50	0.43	
Control Delay	3.5			5.8	31.2	
Queue Delay	0.0			0.0	0.0	
Total Delay	3.5			5.8	31.2	
LOS	A			A	C	
Approach Delay	3.5			5.8	31.2	
Approach LOS	A			A	C	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (m)	17.6			35.7	9.6	
Queue Length 95th (m)	24.2			66.8	22.9	
Internal Link Dist (m)	129.7			196.4	53.2	
Turn Bay Length (m)						
Base Capacity (vph)	1364			1334	359	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.35			0.50	0.25	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 18 (20%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.50			
Intersection Signal Delay: 6.8		Intersection LOS: A	
Intersection Capacity Utilization 89.3%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 2: St Charles Street & Beechwood Avenue



Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	13	6	3	30	26	8	43	6	23	45	6
Future Vol, veh/h	1	13	6	3	30	26	8	43	6	23	45	6
Conflicting Peds, #/hr	5	0	5	5	0	5	10	0	28	28	0	10
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	1	13	6	3	30	26	8	43	6	23	45	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	199	197	63	199	197	79	61	0	0	77	0	0
Stage 1	104	104	-	90	90	-	-	-	-	-	-	-
Stage 2	95	93	-	109	107	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	764	702	1007	764	702	987	1555	-	-	1535	-	-
Stage 1	907	813	-	922	824	-	-	-	-	-	-	-
Stage 2	917	822	-	901	811	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	697	663	993	714	663	957	1541	-	-	1495	-	-
Mov Cap-2 Maneuver	697	663	-	714	663	-	-	-	-	-	-	-
Stage 1	894	793	-	893	798	-	-	-	-	-	-	-
Stage 2	850	797	-	863	791	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10	10.1	1	2.3
HCM LOS	B	B		

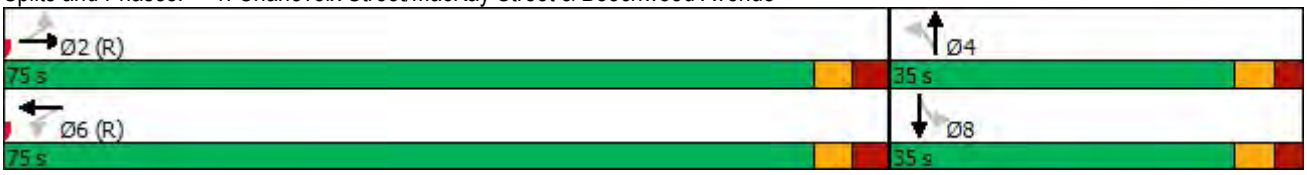
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1541	-	-	738	770	1495	-	-
HCM Lane V/C Ratio	0.005	-	-	0.027	0.077	0.015	-	-
HCM Control Delay (s)	7.3	0	-	10	10.1	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-

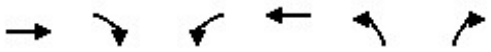
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	595	94	5	612	59	102	58	17	69	35	55
Future Volume (vph)	97	595	94	5	612	59	102	58	17	69	35	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	40.0		0.0	15.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.97			0.98		0.93	0.98		0.93	0.95	
Frt		0.982			0.987			0.966			0.908	
Flt Protected		0.994					0.950			0.950		
Satd. Flow (prot)	0	3205	0	0	3257	0	1729	1721	0	1729	1563	0
Flt Permitted		0.758			0.950		0.699			0.708		
Satd. Flow (perm)	0	2421	0	0	3093	0	1187	1721	0	1194	1563	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25			17			13			55	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		120.8			84.3			190.2			207.1	
Travel Time (s)		8.7			6.1			13.7			14.9	
Confl. Peds. (#/hr)	107		63	63		107	60		64	64		60
Confl. Bikes (#/hr)			3			1			1			3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	4%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	97	595	94	5	612	59	102	58	17	69	35	55
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	786	0	0	676	0	102	75	0	69	90	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5		31.9	31.9		31.9	31.9	
Total Split (s)	75.0	75.0		75.0	75.0		35.0	35.0		35.0	35.0	
Total Split (%)	68.2%	68.2%		68.2%	68.2%		31.8%	31.8%		31.8%	31.8%	
Maximum Green (s)	68.5	68.5		68.5	68.5		29.1	29.1		29.1	29.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.2	3.2		3.2	3.2		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.5			6.5		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		82.4			82.4		15.2	15.2		15.2	15.2	
Actuated g/C Ratio		0.75			0.75		0.14	0.14		0.14	0.14	
v/c Ratio		0.43			0.29		0.63	0.30		0.42	0.34	
Control Delay		6.3			5.1		60.5	36.9		49.8	22.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		6.3			5.1		60.5	36.9		49.8	22.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A			A		E	D		D	C	
Approach Delay		6.3			5.1			50.5			34.1	
Approach LOS		A			A			D			C	
Queue Length 50th (m)		26.3			19.7		21.0	12.1		13.8	6.8	
Queue Length 95th (m)		46.6			34.3		36.2	23.9		25.8	19.8	
Internal Link Dist (m)		96.8			60.3			166.2			183.1	
Turn Bay Length (m)							40.0			15.0		
Base Capacity (vph)		1820			2321		314	464		315	453	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.43			0.29		0.32	0.16		0.22	0.20	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 12.7		Intersection LOS: B	
Intersection Capacity Utilization 83.7%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Charlevoix Street/MacKay Street & Beechwood Avenue



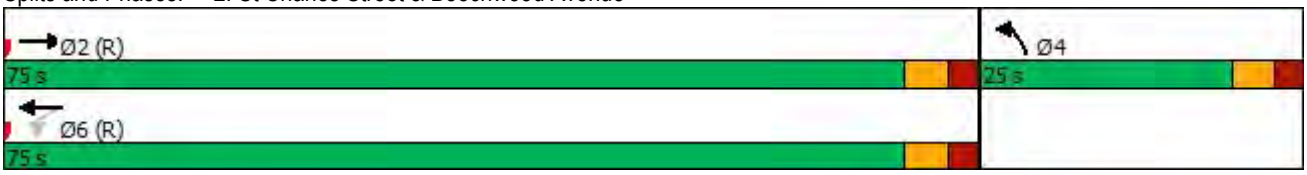


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	503	50	19	661	47	30
Future Volume (vph)	503	50	19	661	47	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			1.00	0.95	
Frt	0.988				0.947	
Flt Protected				0.999	0.970	
Satd. Flow (prot)	1700	0	0	1745	1529	0
Flt Permitted				0.981	0.970	
Satd. Flow (perm)	1700	0	0	1711	1475	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	12				29	
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.7			220.4	77.2	
Travel Time (s)	11.1			15.9	5.6	
Confl. Peds. (#/hr)		56	56		22	11
Confl. Bikes (#/hr)		3				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	6%	11%	4%	3%	14%
Adj. Flow (vph)	503	50	19	661	47	30
Shared Lane Traffic (%)						
Lane Group Flow (vph)	553	0	0	680	77	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			6	4	
Permitted Phases			6			
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	24.7		15.7	15.7	24.6	
Total Split (s)	75.0		75.0	75.0	25.0	
Total Split (%)	75.0%		75.0%	75.0%	25.0%	
Maximum Green (s)	69.3		69.3	69.3	19.4	
Yellow Time (s)	3.3		3.3	3.3	3.3	
All-Red Time (s)	2.4		2.4	2.4	2.3	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	5.7			5.7	5.6	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Min		C-Min	C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	12.0				12.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	82.3			82.3	10.7	
Actuated g/C Ratio	0.82			0.82	0.11	
v/c Ratio	0.39			0.48	0.41	
Control Delay	4.2			5.1	34.4	
Queue Delay	0.0			0.0	0.0	
Total Delay	4.2			5.1	34.4	
LOS	A			A	C	
Approach Delay	4.2			5.1	34.4	
Approach LOS	A			A	C	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (m)	25.8			36.6	8.8	
Queue Length 95th (m)	45.6			64.0	22.2	
Internal Link Dist (m)	129.7			196.4	53.2	
Turn Bay Length (m)						
Base Capacity (vph)	1401			1408	320	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.39			0.48	0.24	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 1 (1%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 6.4		Intersection LOS: A	
Intersection Capacity Utilization 72.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: St Charles Street & Beechwood Avenue



Intersection	
Int Delay, s/veh	5.7

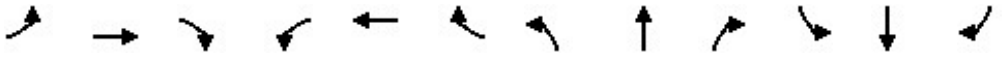
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	27	4	5	40	19	10	41	7	20	31	9
Future Vol, veh/h	4	27	4	5	40	19	10	41	7	20	31	9
Conflicting Peds, #/hr	14	0	13	13	0	14	14	0	15	15	0	14
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	12	0	0	0	0	0	0
Mvmt Flow	4	27	4	5	40	19	10	41	7	20	31	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	198	173	63	184	174	74	54	0	0	63	0	0
Stage 1	90	90	-	80	80	-	-	-	-	-	-	-
Stage 2	108	83	-	104	94	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.32	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.408	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	765	724	1007	781	723	961	1564	-	-	1553	-	-
Stage 1	922	824	-	934	832	-	-	-	-	-	-	-
Stage 2	902	830	-	907	821	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	687	691	982	724	690	935	1544	-	-	1531	-	-
Mov Cap-2 Maneuver	687	691	-	724	690	-	-	-	-	-	-	-
Stage 1	904	803	-	914	815	-	-	-	-	-	-	-
Stage 2	824	813	-	851	800	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.3	10.2	1.3	2.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1544	-	-	715	751	1531	-	-
HCM Lane V/C Ratio	0.006	-	-	0.049	0.085	0.013	-	-
HCM Control Delay (s)	7.3	0	-	10.3	10.2	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.3	0	-	-

Future (2023 & 2028)
Total Traffic

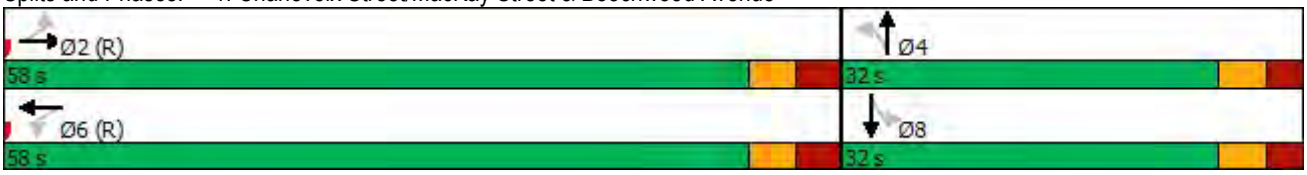


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	478	65	7	745	58	106	21	6	61	17	52
Future Volume (vph)	45	478	65	7	745	58	106	21	6	61	17	52
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	40.0		0.0	15.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			0.99		0.98	0.99		0.95	0.98	
Frt		0.983			0.989			0.967			0.887	
Flt Protected		0.996					0.950			0.950		
Satd. Flow (prot)	0	3197	0	0	3212	0	1729	1615	0	1695	1553	0
Flt Permitted		0.840			0.950		0.712			0.740		
Satd. Flow (perm)	0	2688	0	0	3051	0	1276	1615	0	1253	1553	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25			15			6			52	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		120.8			84.3			190.2			207.1	
Travel Time (s)		8.7			6.1			13.7			14.9	
Confl. Peds. (#/hr)	87		38	38		87	16		51	51		16
Confl. Bikes (#/hr)						17			5			4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	9%	5%	2%	29%	5%	5%	0%	0%	33%	2%	6%	0%
Adj. Flow (vph)	45	478	65	7	745	58	106	21	6	61	17	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	588	0	0	810	0	106	27	0	61	69	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5		31.9	31.9		31.9	31.9	
Total Split (s)	58.0	58.0		58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Maximum Green (s)	51.5	51.5		51.5	51.5		26.1	26.1		26.1	26.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.2	3.2		3.2	3.2		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.5			6.5		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		68.7			68.7		13.4	13.4		13.4	13.4	
Actuated g/C Ratio		0.76			0.76		0.15	0.15		0.15	0.15	
v/c Ratio		0.29			0.35		0.56	0.11		0.33	0.25	
Control Delay		4.9			4.4		46.3	27.0		37.8	15.3	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		4.9			4.4		46.3	27.0		37.8	15.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A			A		D	C		D	B	
Approach Delay		4.9			4.4			42.4			25.9	
Approach LOS		A			A			D			C	
Queue Length 50th (m)		15.2			17.3		17.4	3.2		9.6	2.6	
Queue Length 95th (m)		28.1			30.3		31.2	9.7		19.7	12.9	
Internal Link Dist (m)		96.8			60.3			166.2			183.1	
Turn Bay Length (m)							40.0			15.0		
Base Capacity (vph)		2057			2331		370	472		363	487	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.29			0.35		0.29	0.06		0.17	0.14	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 26 (29%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 9.3		Intersection LOS: A	
Intersection Capacity Utilization 83.4%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Charlevoix Street/MacKay Street & Beechwood Avenue

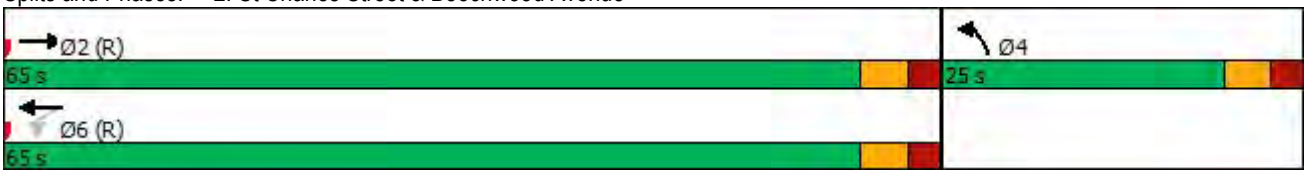


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	416	59	41	628	77	46
Future Volume (vph)	416	59	41	628	77	46
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			1.00	0.95	
Frt	0.983				0.950	
Flt Protected				0.997	0.970	
Satd. Flow (prot)	1695	0	0	1733	1557	0
Flt Permitted				0.953	0.970	
Satd. Flow (perm)	1695	0	0	1653	1529	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	17				30	
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.7			220.4	77.2	
Travel Time (s)	11.1			15.9	5.6	
Confl. Peds. (#/hr)		30	30		12	30
Confl. Bikes (#/hr)		1				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	5%	0%	0%	5%	3%	6%
Adj. Flow (vph)	416	59	41	628	77	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	475	0	0	669	123	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			6	4	
Permitted Phases			6			
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	24.7		15.7	15.7	24.6	
Total Split (s)	65.0		65.0	65.0	25.0	
Total Split (%)	72.2%		72.2%	72.2%	27.8%	
Maximum Green (s)	59.3		59.3	59.3	19.4	
Yellow Time (s)	3.3		3.3	3.3	3.3	
All-Red Time (s)	2.4		2.4	2.4	2.3	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	5.7			5.7	5.6	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Min		C-Min	C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	12.0				12.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	66.8			66.8	11.9	
Actuated g/C Ratio	0.74			0.74	0.13	
v/c Ratio	0.38			0.55	0.53	
Control Delay	4.4			7.5	35.5	
Queue Delay	0.0			0.0	0.0	
Total Delay	4.4			7.5	35.5	
LOS	A			A	D	
Approach Delay	4.4			7.5	35.5	
Approach LOS	A			A	D	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (m)	18.7			38.4	15.3	
Queue Length 95th (m)	31.1			77.2	30.3	
Internal Link Dist (m)	129.7			196.4	53.2	
Turn Bay Length (m)						
Base Capacity (vph)	1261			1226	359	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.38			0.55	0.34	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 18 (20%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 91.8%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 2: St Charles Street & Beechwood Avenue



Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	33	13	7	3	30	26	8	43	6	23	45	13
Future Vol, veh/h	33	13	7	3	30	26	8	43	6	23	45	13
Conflicting Peds, #/hr	5	0	5	5	0	5	10	0	28	28	0	10
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	33	13	7	3	30	26	8	43	6	23	45	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	203	201	67	203	204	79	68	0	0	77	0	0
Stage 1	108	108	-	90	90	-	-	-	-	-	-	-
Stage 2	95	93	-	113	114	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	759	699	1002	759	696	987	1546	-	-	1535	-	-
Stage 1	902	810	-	922	824	-	-	-	-	-	-	-
Stage 2	917	822	-	897	805	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	691	661	988	708	658	957	1532	-	-	1495	-	-
Mov Cap-2 Maneuver	691	661	-	708	658	-	-	-	-	-	-	-
Stage 1	889	790	-	893	798	-	-	-	-	-	-	-
Stage 2	850	797	-	858	785	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	10.1	1	2.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1532	-	-	711	766	1495	-	-
HCM Lane V/C Ratio	0.005	-	-	0.075	0.077	0.015	-	-
HCM Control Delay (s)	7.4	0	-	10.5	10.1	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

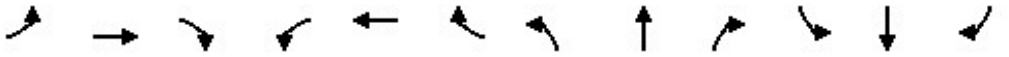
Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	15	38	7	34	22
Future Vol, veh/h	11	15	38	7	34	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	15	38	7	34	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	45	0	-	0	79	42
Stage 1	-	-	-	-	42	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1576	-	-	-	929	1034
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	991	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1576	-	-	-	922	1034
Mov Cap-2 Maneuver	-	-	-	-	922	-
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	991	-

Approach	EB	WB	SB
HCM Control Delay, s	3.1	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1576	-	-	-	963
HCM Lane V/C Ratio	0.007	-	-	-	0.058
HCM Control Delay (s)	7.3	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

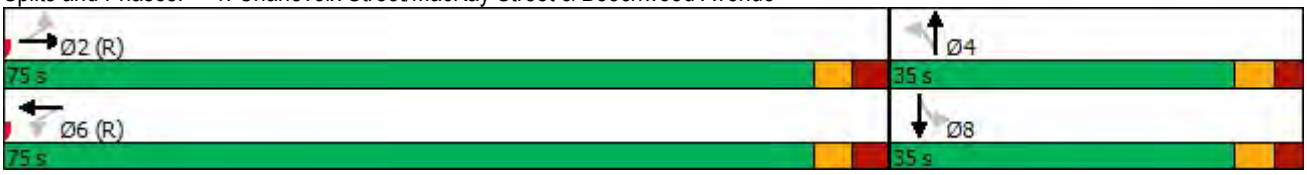


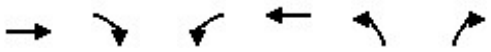
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	626	104	5	625	59	115	58	17	69	35	55
Future Volume (vph)	97	626	104	5	625	59	115	58	17	69	35	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	40.0		0.0	15.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.97			0.98		0.93	0.98		0.93	0.95	
Frt		0.981			0.987			0.966			0.908	
Flt Protected		0.994					0.950			0.950		
Satd. Flow (prot)	0	3199	0	0	3258	0	1729	1721	0	1729	1563	0
Flt Permitted		0.761			0.950		0.699			0.708		
Satd. Flow (perm)	0	2428	0	0	3095	0	1187	1721	0	1194	1563	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		27			17			13			55	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		120.8			84.3			190.2			207.1	
Travel Time (s)		8.7			6.1			13.7			14.9	
Confl. Peds. (#/hr)	107		63	63		107	60		64	64		60
Confl. Bikes (#/hr)			3			1			1			3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	4%	1%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	97	626	104	5	625	59	115	58	17	69	35	55
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	827	0	0	689	0	115	75	0	69	90	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5		31.9	31.9		31.9	31.9	
Total Split (s)	75.0	75.0		75.0	75.0		35.0	35.0		35.0	35.0	
Total Split (%)	68.2%	68.2%		68.2%	68.2%		31.8%	31.8%		31.8%	31.8%	
Maximum Green (s)	68.5	68.5		68.5	68.5		29.1	29.1		29.1	29.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.2	3.2		3.2	3.2		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.5			6.5		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	18.0	18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		81.4			81.4		16.2	16.2		16.2	16.2	
Actuated g/C Ratio		0.74			0.74		0.15	0.15		0.15	0.15	
v/c Ratio		0.46			0.30		0.66	0.28		0.39	0.32	
Control Delay		7.0			5.5		61.1	35.5		47.3	21.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		7.0			5.5		61.1	35.5		47.3	21.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A			A		E	D		D	C	
Approach Delay		7.0			5.5			51.0			32.5	
Approach LOS		A			A			D			C	
Queue Length 50th (m)		29.8			21.4		23.7	12.0		13.6	6.7	
Queue Length 95th (m)		53.0			37.1		39.6	23.4		25.3	19.4	
Internal Link Dist (m)		96.8			60.3			166.2			183.1	
Turn Bay Length (m)							40.0			15.0		
Base Capacity (vph)		1803			2294		314	464		315	453	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.46			0.30		0.37	0.16		0.22	0.20	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 13.1		Intersection LOS: B	
Intersection Capacity Utilization 85.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Charlevoix Street/MacKay Street & Beechwood Avenue



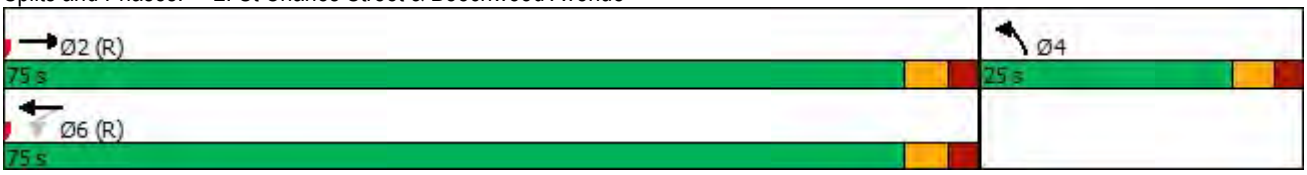


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	503	60	30	661	60	37
Future Volume (vph)	503	60	30	661	60	37
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98			1.00	0.95	
Frt	0.986				0.949	
Flt Protected				0.998	0.970	
Satd. Flow (prot)	1692	0	0	1741	1534	0
Flt Permitted				0.964	0.970	
Satd. Flow (perm)	1692	0	0	1678	1479	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	14				28	
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.7			220.4	77.2	
Travel Time (s)	11.1			15.9	5.6	
Confl. Peds. (#/hr)		56	56		22	11
Confl. Bikes (#/hr)		3				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	6%	11%	4%	3%	14%
Adj. Flow (vph)	503	60	30	661	60	37
Shared Lane Traffic (%)						
Lane Group Flow (vph)	563	0	0	691	97	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			6	4	
Permitted Phases			6			
Detector Phase	2		6	6	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	24.7		15.7	15.7	24.6	
Total Split (s)	75.0		75.0	75.0	25.0	
Total Split (%)	75.0%		75.0%	75.0%	25.0%	
Maximum Green (s)	69.3		69.3	69.3	19.4	
Yellow Time (s)	3.3		3.3	3.3	3.3	
All-Red Time (s)	2.4		2.4	2.4	2.3	
Lost Time Adjust (s)	0.0			0.0	0.0	
Total Lost Time (s)	5.7			5.7	5.6	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	C-Min		C-Min	C-Min	None	
Walk Time (s)	7.0				7.0	
Flash Dont Walk (s)	12.0				12.0	
Pedestrian Calls (#/hr)	0				0	
Act Effct Green (s)	81.6			81.6	11.3	
Actuated g/C Ratio	0.82			0.82	0.11	
v/c Ratio	0.41			0.50	0.49	
Control Delay	4.6			5.7	38.2	
Queue Delay	0.0			0.0	0.0	
Total Delay	4.6			5.7	38.2	
LOS	A			A	D	
Approach Delay	4.6			5.7	38.2	
Approach LOS	A			A	D	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (m)	26.4			38.0	12.8	
Queue Length 95th (m)	51.5			74.1	27.3	
Internal Link Dist (m)	129.7			196.4	53.2	
Turn Bay Length (m)						
Base Capacity (vph)	1383			1369	320	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.41			0.50	0.30	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 1 (1%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.50			
Intersection Signal Delay: 7.6		Intersection LOS: A	
Intersection Capacity Utilization 82.5%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 2: St Charles Street & Beechwood Avenue



Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	23	27	5	5	40	19	11	41	7	20	31	30
Future Vol, veh/h	23	27	5	5	40	19	11	41	7	20	31	30
Conflicting Peds, #/hr	14	0	13	13	0	14	14	0	15	15	0	14
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	12	0	0	0	0	0	0
Mvmt Flow	23	27	5	5	40	19	11	41	7	20	31	30

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	210	185	73	197	197	74	75	0	0	63	0	0
Stage 1	100	100	-	82	82	-	-	-	-	-	-	-
Stage 2	110	85	-	115	115	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.32	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.408	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	752	713	995	766	702	961	1537	-	-	1553	-	-
Stage 1	911	816	-	931	831	-	-	-	-	-	-	-
Stage 2	900	828	-	895	804	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	675	679	970	709	669	935	1517	-	-	1531	-	-
Mov Cap-2 Maneuver	675	679	-	709	669	-	-	-	-	-	-	-
Stage 1	893	794	-	911	814	-	-	-	-	-	-	-
Stage 2	822	811	-	838	782	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	10.4	1.4	1.8
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1517	-	-	696	734	1531	-	-
HCM Lane V/C Ratio	0.007	-	-	0.079	0.087	0.013	-	-
HCM Control Delay (s)	7.4	0	-	10.6	10.4	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	32	32	56	23	20	13
Future Vol, veh/h	32	32	56	23	20	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	32	32	56	23	20	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	79	0	-	0	164	68
Stage 1	-	-	-	-	68	-
Stage 2	-	-	-	-	96	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1532	-	-	-	831	1001
Stage 1	-	-	-	-	960	-
Stage 2	-	-	-	-	933	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1532	-	-	-	814	1001
Mov Cap-2 Maneuver	-	-	-	-	814	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	933	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1532	-	-	-	879
HCM Lane V/C Ratio	0.021	-	-	-	0.038
HCM Control Delay (s)	7.4	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1