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## **Byron Place Apartments 433-435 Churchill Avenue and 468-472 Byron Place Transportation Impact Assessment**

**Engineering excellence. Planning precision. Inspired landscapes.**

**Byron Place Apartments  
433-435 Churchill Avenue and  
468-472 Byron Place**

**Transportation Impact Assessment**

Prepared By:

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April 2019

Novatech File: 118024  
Ref: R-2018-028

April 5<sup>th</sup>, 2019

City of Ottawa  
Planning and Growth Management Department  
110 Laurier Ave. W., 4<sup>th</sup> Floor,  
Ottawa, Ontario K1P 1J1

**Attention: Mr. Wally Dubyk**  
**Project Manager, Infrastructure Approvals**

Dear Mr. Dubyk:

**Reference: 433-435 Churchill Avenue and 468-472 Byron Place**  
**Transportation Impact Assessment**  
**Novatech File No. 117198**

---

We are pleased to submit the following Transportation Impact Assessment (TIA) in support of applications for rezoning and Site Plan Control for 433-435 Churchill Avenue and 468-472 Byron Place. The structure and format of this report is in accordance with the City of Ottawa Transportation Impact Assessment Guidelines (June 2017).

If you have any questions or comments regarding this report, please feel free to contact the undersigned.

Yours truly,

**NOVATECH**



Brad Byvelds, P. Eng.  
Project Coordinator | Transportation/Traffic



## **TIA Plan Reports**

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

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

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

## **CERTIFICATION**

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

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

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Dated at Ottawa this 5th day of April, 2019.  
(City)

Name: Brad Byvelds, P.Eng.  
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B. Byvelds  
Signature of Individual certifier that s/he meets the above four criteria

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## EXECUTIVE SUMMARY

This Transportation Impact Assessment (TIA) has been prepared in support of applications for rezoning and Site Plan Control for 433-435 Churchill Avenue and 468-472 Byron Place. The subject site has an area of approximately 0.2 hectares and is currently occupied by an automobile sales development and three low-rise residential developments. The subject site is surrounded by the following:

- Byron Place/Byron Avenue to the north;
- Low-rise residential development and office/commercial development to the south;
- Highcroft Avenue and low-rise residential development to the east; and
- Churchill Avenue, Churchill Alternative School and Westboro Masonic Hall to the west.

The proposed development will include 76 apartment units and two retail units with a combined gross floor area (GFA) of approximately 3,450ft<sup>2</sup>. The proposed development will include an underground parking garage containing 65 vehicle parking spaces and 45 bicycle parking spaces.

The City's 2017 TIA Guidelines identify three triggers for completing a TIA report, including trip generation, location, and safety. The criteria for each trigger are outlined in the City's TIA Screening Form. Based on the TIA Screening Form, the subject application satisfies the trip generation and safety triggers for completing a TIA.

The conclusions and recommendations of this TIA can be summarized as follows:

### Development Design and Parking

- Byron Place will be partially closed to provide a public park area in the southeast corner of the Churchill Avenue/Byron Avenue intersection. The portion of Byron Place that remains open will function as the fire route for the proposed development. The width of Byron Place will be reduced to 6.0m in order to provide a wider landscape buffer between the proposed building and sidewalk. The turnaround hammerhead within Byron Place will also facilitate short-term parking for drop-offs/pick-ups.
- On-site pedestrian facilities will be provided between the retail entrances and the sidewalks along Churchill Avenue. A sidewalk will be provided along the northern frontage of the site along Byron Place, providing pedestrian connectivity between the residential entrances and the existing sidewalk along Churchill Avenue.
- A garbage room will be provided within the building. Garbage bins will be wheeled down the pathway south of the building, and will be picked up curbside along Churchill Avenue.
- All required TDM-supportive design and infrastructure measures in the TDM checklist are met.
- The proposed vehicular and bicycle parking meets the minimum requirement of the ZBL.

### Boundary Streets

- Churchill Avenue currently meets the target BLOS B, TkLOS D and Auto LOS E, however it does not meet the target PLOS A. Byron Avenue meets the target Auto LOS E, however it does not meet the target PLOS A and BLOS B.
- To achieve the target PLOS A along both Churchill Avenue and Byron Avenue, either a reduction in the daily curb traffic to less than 3000 vehicles per day or a reduction in the operational speed to 30km/hr is required.

- The City of Ottawa's Ultimate Cycling Network identifies a future separated major pathway on the north side of Byron Avenue. The separated pathway will result in a BLOS A, achieving the target within 300m of a school.

#### Access Design

- Site access to Highcroft Avenue will provide access to the full movement intersection at Byron Avenue. The existing curb extension restricting the southbound through movement along Highcroft Avenue south of Byron Place will be removed and a new island will be provided to south of the proposed access to the parking garage for the proposed development.
- The width and length of the proposed island will eliminate any opportunity for vehicles leaving the site to turn right to travel southbound on Highcroft Avenue, as well as restrict westbound vehicles along Byron Avenue to cut through the residential community to avoid the traffic light at Churchill Avenue/Byron Avenue. The proposed island width (4.5m included curb offset) is an improvement on the existing curb extension which narrows the roadway by approximately 2.4m.
- The proposed driveway width and location adheres to the requirements of the City's ZBL and Private Approach By-law

#### Transportation Demand Management and Transit

- To encourage travel by sustainable modes, the proponent agrees to implement the following TDM measures from the checklist:
  - Display local area maps with walking/cycling access routes and key destinations at major entrances;
  - Display relevant transit schedules and route maps at entrances;
  - unbundle parking cost from monthly rent; and
  - provide multimodal travel option information package to new residents.

#### Intersection Design

- The Churchill Avenue/Byron Avenue and Churchill Avenue/Richmond Road intersections do not meet the target PLOS A, BLOS B, TkLOS D, however they do meet the target Auto LOS E.
- A reduction in the pedestrian crossing distance would have the greatest improvement to the PLOS at these intersections.
- To achieve the target BLOS, consideration could be given by the City to reducing the operational speed to 50km/hr and providing a two-stage left turn bike box on all legs of these intersections.
- To achieve the target TkLOS, an effective turn radius greater than 15m is required on all four corners of these intersections. Increasing the turn radius at these intersections could be considered by the City, however it should be noted that the increased radius will have a negative impact on the PLOS.
- Critical movements at all study area intersections are anticipated to operate with a LOS D or better under background traffic conditions.
- The addition of site generated traffic volumes are not anticipated to have a significant impact to the intersection operations within the study area.
- Based on anticipated trip distribution, one vehicle during the AM peak hour and three vehicles during the PM peak hour are anticipated to arrive from the south. If these trips were to use Kenwood Avenue/Highcroft Avenue to access the site during the PM peak hour, this would result in one new vehicle approximately every 20 minutes. This increase in traffic is not

anticipated to be noticeable and will not have a significant impact on the existing operations along Highcroft Avenue.

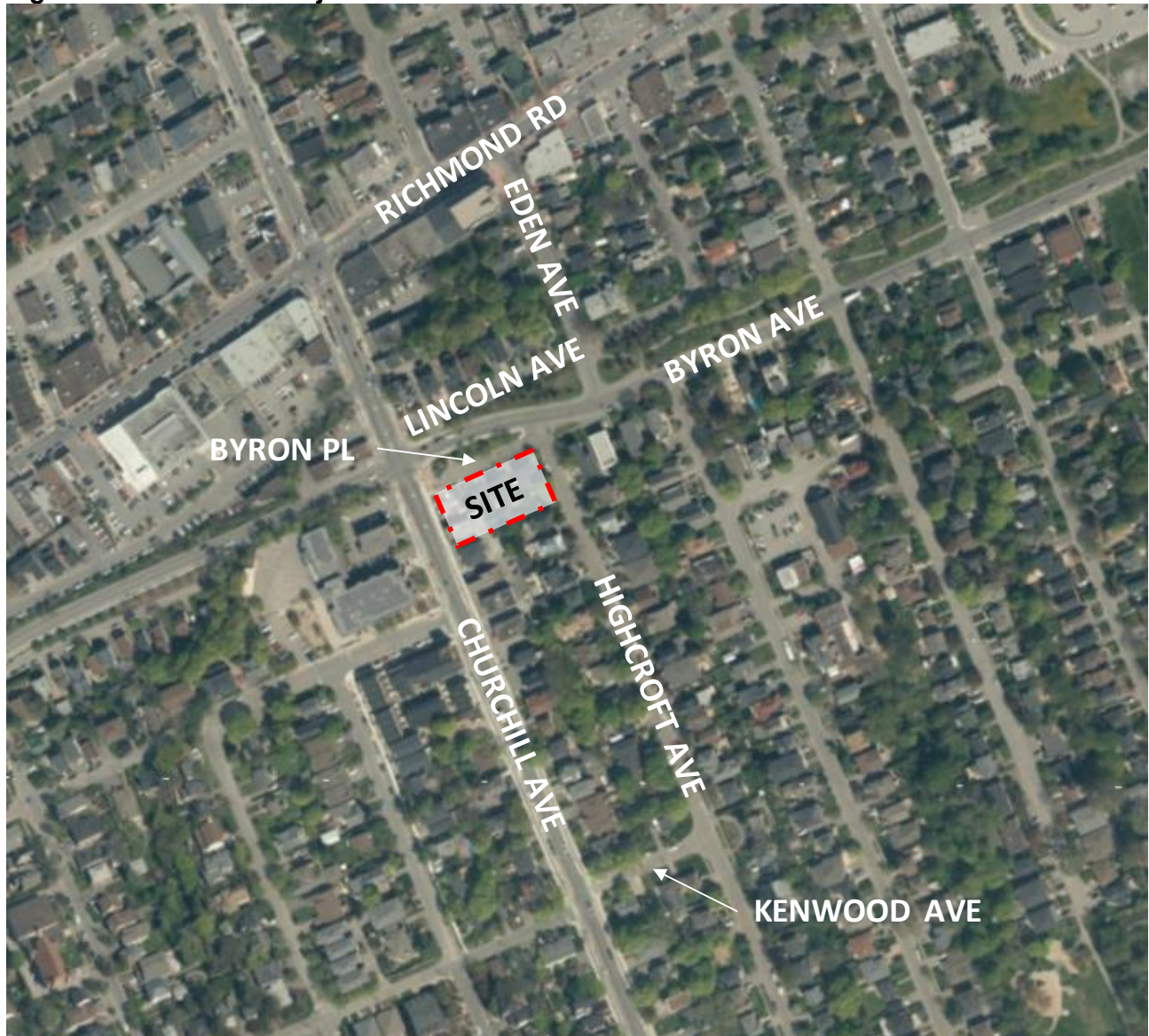
## 1.0 INTRODUCTION

This Transportation Impact Assessment (TIA) has been prepared in support of applications for rezoning and Site Plan Control for 433-435 Churchill Avenue and 468-472 Byron Place. The subject site has an area of approximately 0.2 hectares and is currently occupied by an automobile sales development and three low-rise residential developments. The subject site is surrounded by the following:

- Byron Place/Byron Avenue to the north;
- Low-rise residential development and office/commercial development to the south;
- Highcroft Avenue and low-rise residential development to the east; and
- Churchill Avenue, Churchill Alternative School and Westboro Masonic Hall to the west.

An aerial photo of the subject site is provided in **Figure 1**.

**Figure 1: View of the Subject Lands**



## 2.0 PROPOSED DEVELOPMENT

The proposed development will include 76 apartment units and two retail units with a combined gross floor area (GFA) of approximately 3,450ft<sup>2</sup>. The proposed development will include an underground parking garage containing 65 vehicle parking spaces and 45 bicycle parking spaces.

A preliminary review of various access options was conducted, including access to Churchill Avenue, Byron Avenue, Byron Place and Highcroft Avenue. Access to Highcroft Avenue is recommended based on the following factors.

- Access along Byron Avenue and Churchill Avenue requires a minimum corner clearance of 55m from the Churchill Avenue/Byron Avenue intersection, and is unachievable.
- OC Transpo bus stop and school bus loading zone are located along the west side of Churchill Avenue and create additional conflict opposite the site.
- The northbound left turn lane and taper at the Churchill Avenue/Byron Avenue extend past the site.
- The raised northbound cycle track transitions to on-road shared travel lane across the Churchill Avenue frontage.
- Westbound and northbound queues at the Churchill Avenue/Byron Avenue intersection periodically extend to Highcroft Avenue and Ravenhill Avenue during weekday peak hours.
- The non-standard intersection configuration/traffic calming feature at Byron Place/Highcroft Avenue/Byron Avenue currently operates with low-volume on Byron Place.
- The City of Ottawa's Private Approach By-law requires the access to be located on the lower class of roadway where possible.

Site access to Highcroft Avenue will provide access to the full movement intersection at Byron Avenue. A 16 unit residential development was recently constructed at 450 Churchill Avenue. All movement access to this development is provided along Churchill Avenue south of Ravenhill Avenue. This driveway serves a smaller development compared to the proposed development, is not located in close proximity to a signalized intersection with turn lanes and tapers, and is not located across from a transit stop/school bus loading zone. The access provided for 450 Churchill Avenue development is not comparable to the proposed development.

The existing curb extension restricting the southbound through movement along Highcroft Avenue south of Byron Place will be moved to south of the proposed access to the parking garage for the proposed development. This will eliminate any opportunity for vehicles leaving the site to turn right to travel southbound on Highcroft Avenue.

The proposed development will be constructed in one phase, with an estimated completion date of 2020. The proposed Site Plan is included in **Appendix A**.

## 3.0 SCREENING AND SCOPING

### 3.1 Screening Form

The City's 2017 TIA Guidelines identify three triggers for completing a TIA report, including trip generation, location, and safety. The criteria for each trigger are outlined in the City's TIA Screening Form. A copy of the TIA Screening Form is included in **Appendix B**.



Based on the TIA Screening Form, the subject application satisfies the trip generation and safety triggers for completing a TIA.

### 3.2 Existing Conditions

#### 3.2.1 Roadways

All roadways within the study area fall under the jurisdiction of the City of Ottawa.

Byron Avenue is a collector roadway that generally runs on an east-west alignment in the vicinity of the subject site. It has a two-lane undivided urban cross section with a regulatory speed limit of 50km/hr.

Richmond Road is an arterial roadway that generally runs on an east-west alignment in the vicinity of the subject site. It has a two-lane undivided urban cross section with a regulatory speed limit of 50km/h. Richmond Road is a full load truck route.

Churchill Avenue runs on a north-south alignment and is classified as a major collector roadway between Richmond Road and Carling Avenue, and an arterial roadway between Richmond Road and Scott Street. It has a two-lane undivided urban cross section with a posted speed limit of 50 km/hr. Churchill Avenue is a full load truck route.

Highcroft Avenue is local roadway that runs on a north-south alignment. It has a two-lane undivided urban cross section and a regulatory speed limit of 50 km/hr.

Byron Place is a local roadway that runs on an east-west alignment parallel to Byron Avenue, commencing at Highcroft Avenue and terminating approximately 60m to the west. It has a two-lane undivided urban cross section with a sidewalk on the south side.

#### 3.2.2 Intersections

A review of the existing lane configurations and traffic control at the study area intersections is provided below.

##### Churchill Avenue/Byron Avenue

- Signalized intersection
- Northbound/Southbound: one left turn lane and one shared through/right turn lane
- Eastbound/Westbound: one approach lane
- Ladder striped crosswalks are provided on all four legs
- A bike lane is provided on the west leg



**Richmond Road/Churchill Avenue**

- Signalized intersection
- Northbound/Southbound: one approach lane
- Eastbound/Westbound: one left turn lane and one shared through/right turn lane
- Ladder striped crosswalks are provided on all four legs

**Byron Avenue/Highcroft Avenue/Byron Place**

- Unsignalized intersection, stop control on Highcroft Avenue
- One approach lane on all legs
- Northbound right turn movement is channelized
- A concrete island and curb extension restrict the southbound through movement along Highcroft Avenue south of Byron Place



### 3.2.3 Driveways

In accordance with the City's 2017 TIA guidelines, a review of adjacent driveways along the boundary roads are provided as follows:

**Highcroft Avenue, East Side:**

- Residential driveways to 462 Byron Avenue, and 441 and 445 Highcroft Avenue

**Highcroft Avenue, West Side:**

- Residential driveways to 440 and 444 Highcroft Avenue

**Churchill Avenue, East Side:**

- Driveways to commercial developments at 439 and 445 Churchill Avenue

**Churchill Avenue, West Side:**

- Driveway to Westboro Masonic Hall
- Driveway to Churchill Alternative School

The subject lands (435 Churchill Avenue) share a driveway with the development to the south (439 Churchill Avenue). There is no easement registered between the properties. The property at 439 Churchill Avenue also shares a driveway with 445 Churchill Avenue. Access to 439 Churchill Avenue can be maintained adjacent to the proposed building.

### 3.2.4 Pedestrian and Bicycle Facilities

Sidewalks are provided on both sides of Churchill Avenue, Richmond Road and Byron Avenue between Churchill Avenue and Eden Avenue. Byron Avenue, east of Eden Avenue and west of Churchill Avenue has a sidewalk on the south side of the roadway.

Churchill Avenue and Richmond Road are classified as spine cycling routes, and Byron Avenue is classified as a local cycling route in the City's Ultimate Cycling Network. A bike lane is provided on the south side of Byron Avenue west of Churchill Avenue. Cycle tracks are provided along Churchill Avenue south of Byron Avenue.

### 3.2.5 Transit

The locations of all OC Transpo bus stops within a 400m walking distance, or approximately a 5 minute walk, of the subject site are described as follows:

- #7538 and #7539 are located along Churchill Avenue south of Byron Avenue;
- #4987 and #5616 are located along Churchill Avenue north of Richmond Road;
- #4864 and #4865 are located along Richmond Road between Eden Avenue and Edgewood Avenue; and
- #4876 is located along Richmond Avenue west of Churchill Avenue.

The location of the bus stops is shown in **Figure 2**.

**Figure 2: OC Transpo Bus Stop Locations**

The aforementioned bus stops serve OC Transpo Route 11, Route 50 and Route 151. Descriptions of the foregoing transit routes are provided in the following table. Route maps are included in **Appendix C**.



**Table 1: OC Transpo Route Information**

| Route | Description   | Schedule           |                       |  |
|-------|---|--------------------|-----------------------|--|
|       |   | Days               | Service               | Headways   |
| 11    | Travels between Lincoln Fields Transit Station and Parliament Transit Station       | 7 Days/Week        | All Day               | <u>Weekday/Saturday</u><br>Morning/Afternoon: 15 min<br>Night: 30 min  |
| 50    | Travels between Lincoln Fields Transit Station and Tunney's Pasture Transit Station | Monday to Saturday | All Day               | <u>Weekday</u><br>AM/PM Peak: 15 min<br>Mid-Day/Night: 30 min<br><u>Saturday</u><br>Morning/Afternoon: 30 min<br>Night: 60 min |
| 151   | Travels between Carlingwood Shopping Centre and Tunney's Pasture Transit Station    | Monday to Friday   | Selected Time Periods | Once in the morning and evening, twice in the afternoon  |

### 3.2.6 Existing Area Traffic Management Measures

A concrete island and curb extension restrict the southbound through movement along Highcroft Avenue south of Byron Place. There are currently no other area traffic management measures in place along any of the study area roadways.

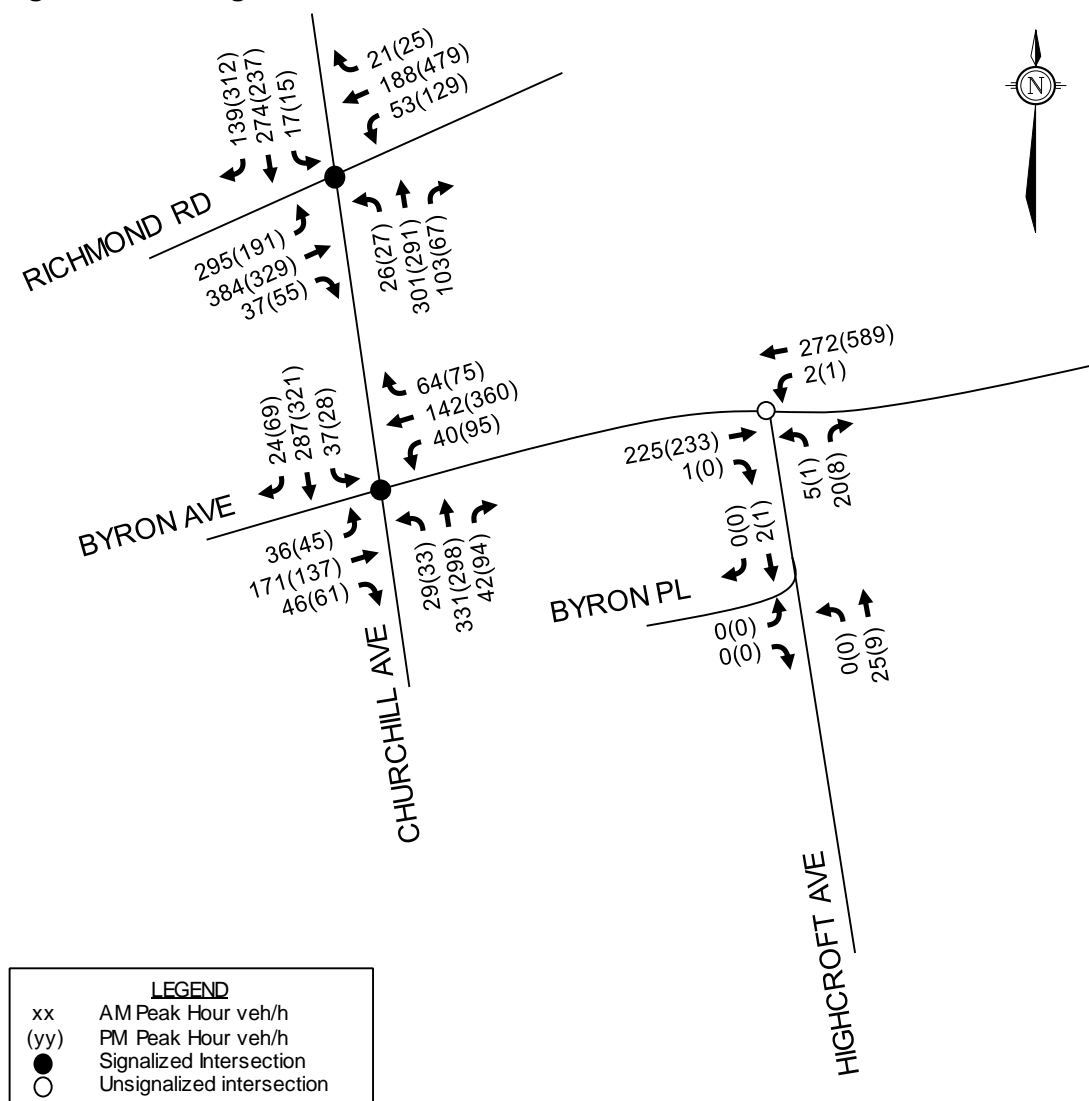
### 3.2.7 Existing Traffic Volumes

Weekday traffic counts were completed by the City of Ottawa and Novatech at the study area intersections on the following dates:

- Churchill Avenue/Richmond Road November 22<sup>nd</sup>, 2017 (City)
- Churchill Avenue/Byron Avenue August 25<sup>th</sup>, 2016 (City)
- Byron Avenue/Highcroft Avenue/Byron Place October 3<sup>rd</sup>, 2018 (Novatech)

Due to seasonal variation, the traffic volumes between the Churchill Avenue/Byron Avenue and Byron Avenue/Highcroft Avenue/Byron Place have been balanced to within 10%. The existing traffic volumes at these intersections during the weekday AM and PM peak hours are shown in **Figure 3**. Peak hour summary sheets of the aforementioned traffic count are included in **Appendix D**.

**Figure 3: Existing Traffic Volumes**



It is noteworthy that a total of nine illegal southbound through movements were recorded along Highcroft Avenue over the eight-hour period. As shown in Figure 3, two illegal southbound movements were recorded during the AM peak hour and one was recorded during the weekday PM peak hour.

### 3.2.8 Collision Records

Historical collision data from the last five years was obtained from the City's Public Works and Service Department for the study area intersections. Copies of the collision summary reports are included in **Appendix E**. The following table summarizes the reported collisions at each intersection within the last five years.

**Table 2: Historical Collision Records**

| Intersection                       | Number of Collision |          |       |                  |           |       |
|------------------------------------|---------------------|----------|-------|------------------|-----------|-------|
|                                    | Single Vehicle      | Rear-End | Angle | Turning Movement | Sideswipe | Total |
| Churchill Avenue/<br>Richmond Road | 8                   | 10       | 7     | 2                | 6         | 33    |
| Churchill Avenue/<br>Byron Avenue  | 1                   | 3        | 2     | 2                | 0         | 8     |
| Byron Avenue/<br>Highcroft Avenue  | 1                   | 0        | 0     | 0                | 0         | 1     |

**Churchill Avenue/Richmond Road**

A total of 33 collisions were reported at the Churchill Avenue/Richmond Road intersection over the last five years. Personal injuries were incurred from six of the 33 collisions.

Ten of the total collisions were rear-end impacts, of which five involved eastbound vehicles, three involved southbound vehicles and two involved westbound vehicles. Forty percent of the rear-end impacts occurred under wet or icy surface conditions, suggesting environmental factors played a role in the rear-end collision history at this intersection.

Seven of the total collisions were angle impacts, of which five involved a southbound and an eastbound vehicle, one involved a northbound and an eastbound vehicle and one involved a northbound and a westbound vehicle. The setback of the existing building in the northwest quadrant of the Churchill Avenue/Richmond Road intersection (337 Richmond Road) from the right-of-way (ROW) is minimal. This building limits the sight distance between the southbound and eastbound approaches, and is anticipated to be a contributing factor for the number of angle impacts between these approaches.

Eight of the total collisions were single vehicle impacts, four of which involved a turning vehicle and a pedestrian and four involved an unattended vehicle. Ladder striped crosswalks are currently provided on all legs of this intersection to enhance visibility of the crosswalk and increase drivers' awareness of potential conflicts. Three of the impacts involving an unattended vehicle occurred on the north and south approaches (the fourth was unknown).

**Churchill Avenue/Byron Avenue**

A total of eight collisions were reported at the Churchill Avenue/Byron Avenue intersection over the last five years. Personal injuries were not incurred from any of the reported collisions at this intersection. There was no pattern associated with the collision history at this intersection.

**Byron Avenue/Highcroft Avenue**

The only collision reported at the Byron Avenue/Highcroft Avenue intersection over the last five years was a single vehicle impact with a building/wall on the northbound approach.

**3.3 Planned Conditions**

The 2031 Rapid Transit and Transit Priority Network in the City of Ottawa's 2013 Transportation Master Plan (TMP) identifies the implementation of transit signal priority measures and queue jump lanes at select intersections along Richmond Road, Wellington Street West and Somerset Street

between Woodroffe Avenue and Bank Street. The City's 2013 TMP does not identify any roadway projects within the study area.

A Transportation Brief was submitted to the City of Ottawa dated May 2016, and updated in March and July 2017 in support of a Site Plan Control application for a 187 unit apartment building at 190 Richmond Road.

### 3.4 Study Area and Time Periods

This report will review the design elements along Churchill Avenue and Byron Avenue boundary streets. The proposed study area for this report includes all accesses to the proposed development and the following intersections:

- Churchill Avenue/Richmond Road
- Churchill Avenue/Byron Avenue
- Byron Avenue/Highcroft Avenue

The selected time periods for the analysis are the weekday AM and PM peak hours, which represent the 'worst case' combination of site generated traffic and adjacent street traffic. Analysis will be completed for the 2020 build-out year and the 2025 horizon year.

### 3.5 Exemptions Review

This module reviews possible exemptions from the final TIA, as outlined in the TIA Guidelines. The applicable exemptions for the subject lands are shown in **Table 3**.

**Table 3: TIA Exemptions**

| Module   | Element                          | Exemption Criteria  | Exemption Applies |
|--|----------------------------------|---|-------------------|
| <b>Design Review Component</b>                 |                                  |   |                   |
| <b>4.1</b><br>Development Design               | 4.1.2<br>Circulation and Access  | • Only required for site plans  | No                |
|  | 4.1.3<br>New Street Networks     | • Only required for plans of subdivision  | Yes               |
| <b>4.2</b><br>Parking                          | 4.2.1<br>Parking Supply          | • Only required for site plans  | No                |
|  | 4.2.2<br>Spillover Parking       | • Only required for site plans where parking supply is 15% below unconstrained demand   | Yes               |
| <b>Network Impact Component</b>                |                                  |   |                   |
| <b>4.5</b><br>Transportation Demand Management | <i>All elements</i>              | • Not required for non-residential site plans expected to have fewer than 60 employees and/or students on location at any given time  | No                |
| <b>4.6</b><br>Neighbourhood Traffic Management | 4.6.1<br>Adjacent Neighbourhoods | • Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds | Yes               |



| Module                        | Element             | Exemption Criteria   | Exemption Applies |
|-------------------------------|---------------------|--|-------------------|
| <b>4.8</b><br>Network Concept | <i>All elements</i> | <ul style="list-style-type: none"> <li>Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by the established zoning</li> </ul> | Yes               |

Churchill Avenue is classified as a major collector roadway south of Richmond Road, and Byron Avenue is classified as a collector roadway. Based on the existing traffic volumes at the Churchill Avenue/Byron Avenue intersection, as presented in Figure 3, the following traffic volumes are currently using these roadways:

- Churchill Avenue south of Byron Avenue:
  - AM Peak: approximately 775 vehicles two-way (400 northbound, 375 southbound)
  - PM Peak: approximately 900 vehicles two-way (425 northbound, 475 southbound)
- Byron Avenue east of Churchill Avenue:
  - AM Peak: approximately 450 vehicles two-way (255 eastbound, 195 westbound)
  - PM Peak: approximately 705 vehicles two-way (245 eastbound, 460 westbound)

The lane capacity along Churchill Avenue and Byron Avenue are estimated at 600 vehicles per hour per lane (vphpl) based on the City's Long Range Transportation Model. Based on the foregoing the peak directional traffic along Churchill Avenue is operating with a volume to capacity ratio of 0.67 and 0.79 during the weekday AM and PM peak hours respectively. The peak directional traffic along Byron Avenue is operating with a volume to capacity ratio of 0.43 and 0.77 during the weekday AM and PM peak hours respectively. Total traffic, including the additional traffic generated by the proposed development, as presented in Figure 4 below, is not anticipated to increase above the peak directional capacity of 600vphpl. As such, the Neighbourhood Traffic Management module is exempt from the required analysis in the TIA.

## 4.0 FORECASTING

### 4.1 Development-Generated Traffic

#### 4.1.1 Trip Generation

Trips generated by the proposed residential development were estimated using the TRANS Trip Generation Manual prepared in 2009. Trips generated by the residential development were calculated using the recommended trip generation rates for mid-rise apartments (3-10 floors) in the urban area (inside the greenbelt), as presented in Table 3.18 of the TRANS report. The directional splits are based on the blended splits presented in Table 3.17 of the report.

Trips generated by the proposed retail development have been developed based on the Shopping Centre (Land Use 820) in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10<sup>th</sup> Edition.

The following table presents the trip generation for the proposed development.

**Table 4: TRANS/ITE Trip Generation**

| Land Use                         | Units / GFA | AM Peak |     |     | PM Peak |     |     |
|----------------------------------|-------------|---------|-----|-----|---------|-----|-----|
|                                  |             | IN      | OUT | TOT | IN      | OUT | TOT |
| Mid-rise Apartment (3-10 Floors) | 76          | 5       | 14  | 19  | 14      | 9   | 23  |
| Shopping Centre                  | 3,450 s.f.  | 2       | 1   | 3   | 7       | 6   | 13  |

The residential trip generation was converted to person trips using the Apartment modal shares presented in Table 3.13 of the TRANS report. Trips generated by the Shopping Centre land use were converted to person trips using a 1.28 ITE trip to person trip adjustment factor. The person trips generated by the proposed development are summarized in the following table.

**Table 5: Person Trip Generation**

| Land Use                         | AM Peak |     |     | PM Peak |     |     |
|----------------------------------|---------|-----|-----|---------|-----|-----|
|                                  | IN      | OUT | TOT | IN      | OUT | TOT |
| Mid-rise Apartment (3-10 Floors) | 12      | 39  | 51  | 36      | 22  | 58  |
| Shopping Centre                  | 2       | 2   | 4   | 8       | 9   | 17  |

The modal shares for the proposed development are anticipated to be consistent with the modal shares outlined in the 2011 TRANS O-D Survey Report, specific to the Ottawa West Area. The modal shares applied to the residential development have been derived based on all observed trips within the Ottawa West Area, as well as trips departing during the AM peak and arriving during the PM peak. The modal shares applied to the commercial development have been derived based on all observed trips within the Ottawa West Area during the weekday AM and PM peak hours. A full breakdown of the projected person trips by modal share are shown in the below table.

**Table 6: Person Trips by Modal Share**

| Travel Mode              |     | Modal Share | AM Peak |     |     | PM Peak |     |     |
|--------------------------|-----|-------------|---------|-----|-----|---------|-----|-----|
|                          |     |             | IN      | OUT | TOT | IN      | OUT | TOT |
| Residential Person Trips |     |             | 12      | 39  | 51  | 36      | 22  | 58  |
| Auto Driver              | 45% |             | 6       | 17  | 23  | 16      | 10  | 26  |
| Auto Passenger           | 15% |             | 2       | 6   | 8   | 5       | 3   | 8   |
| Transit                  | 20% |             | 2       | 8   | 10  | 7       | 5   | 12  |
| Non-Auto                 | 20% |             | 2       | 8   | 10  | 8       | 4   | 12  |
| Commercial Person Trips  |     |             | 2       | 2   | 4   | 8       | 9   | 17  |
| Auto Driver              | 35% |             | 1       | 1   | 2   | 3       | 3   | 6   |
| Auto Passenger           | 15% |             | 0       | 0   | 0   | 1       | 2   | 3   |
| Transit                  | 5%  |             | 0       | 0   | 0   | 0       | 0   | 0   |
| Non-Auto                 | 45% |             | 1       | 1   | 2   | 4       | 4   | 8   |
| Auto Driver (Total)      |     |             | 7       | 18  | 25  | 19      | 13  | 32  |
| Auto Passenger (Total)   |     |             | 2       | 6   | 8   | 6       | 5   | 11  |
| Transit (Total)          |     |             | 2       | 8   | 10  | 7       | 5   | 12  |
| Non-Auto (Total)         |     |             | 3       | 9   | 12  | 12      | 8   | 20  |

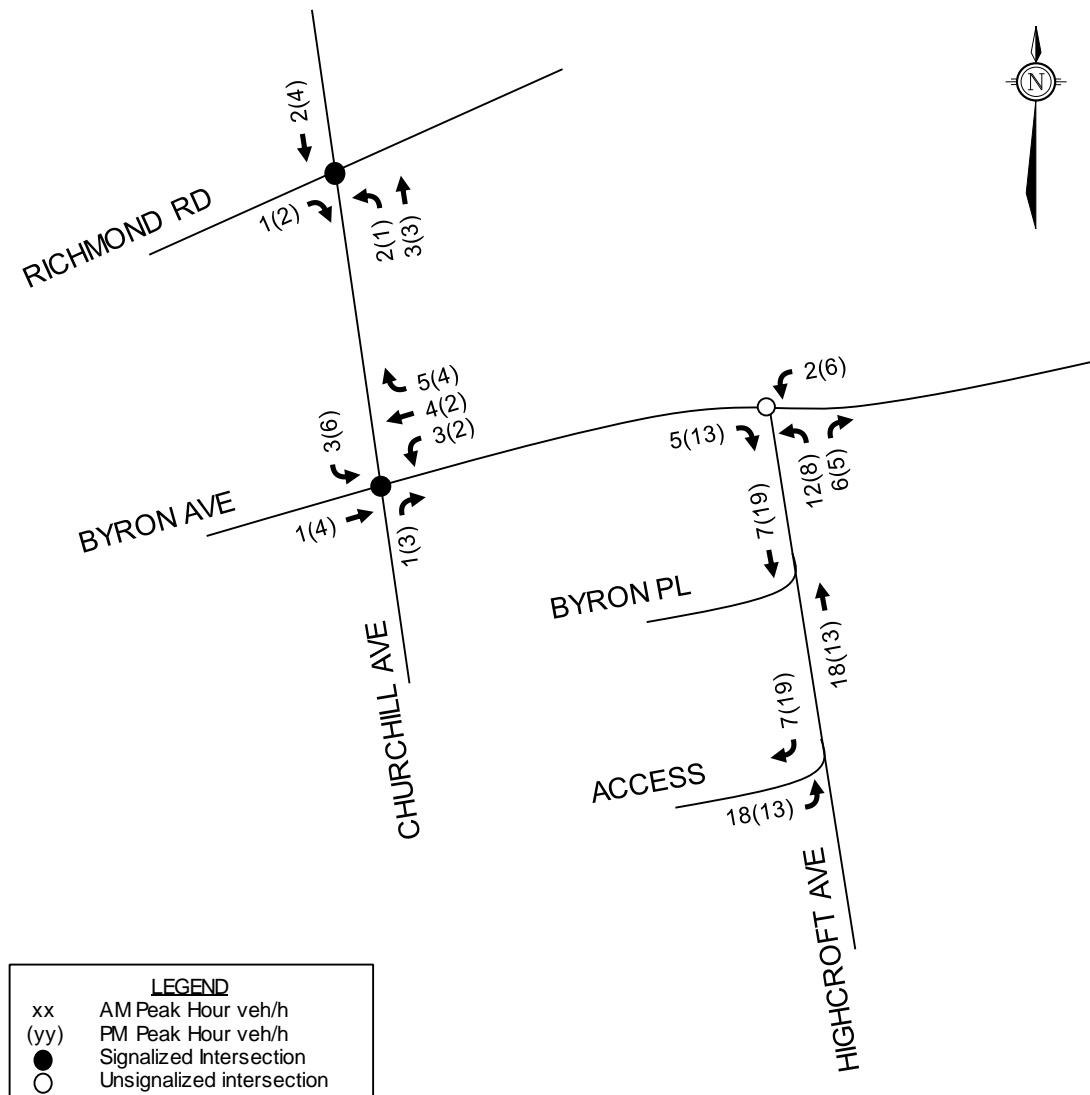
### 4.1.2 Trip Distribution

The assumed distribution of trips generated by the proposed development has been derived from existing traffic patterns on the roadways within the study area. As the proposed development is predominantly residential, the majority of peak hour trips are anticipated to be to/from work. It is appropriate for the assumed trip distribution to be based on the distribution of existing traffic volumes exiting the study area during the AM peak hour and arriving to the study area during the PM peak hour. The projected distribution of trips is summarized as follows:

- 35% to/from the east via either Byron Avenue or Richmond Road
- 30% to/from the west via either Byron Avenue or Richmond Road
- 20% to/from the north via Churchill Avenue
- 15% to/from the south via Churchill Avenue

Site generated traffic volumes are shown in **Figure 4**.

**Figure 4: Site Generated Traffic**



## 4.2 Background Traffic

### 4.2.1 General Background Growth Rate

A review of historic traffic counts, as well as snapshots from the City's Long Range Transportation Model were reviewed to determine an appropriate background growth rate along the study area roadways.

Based on the historic traffic counts (2012 and 2016 at Churchill Avenue/Byron Avenue, 2015 and 2017 at Churchill Avenue/Richmond Road), traffic volumes have generally decreased along the study area roadways. This is consistent with the 2031 and 2011 snapshots from the City's long range transportation model, which suggests no growth along the area roadways.

Based on the foregoing, no growth rate has been applied to the existing traffic volumes within the study area.

### 4.2.2 Other Area Development Traffic

As identified above, a Transportation Brief was submitted to the City of Ottawa dated May 2016, and updated in March and July 2017 in support of a Site Plan Control application for a 187 unit apartment building at 190 Richmond Road. Traffic generated by this development has been added to the through traffic volumes along Richmond Road in the future background traffic projections. Relevant excerpts from the 190 Richmond Road report are included in **Appendix F**.

As no annual growth rate has been applied to the existing traffic volumes, the 2020 and 2025 background traffic volumes are anticipated to be the same. The background traffic volumes along the study area roadways are shown in **Figure 5**. Total traffic volumes for the 2020 and 2025 build-out years are shown in **Figure 6**.

Figure 5: 2020 and 2025 Background Traffic

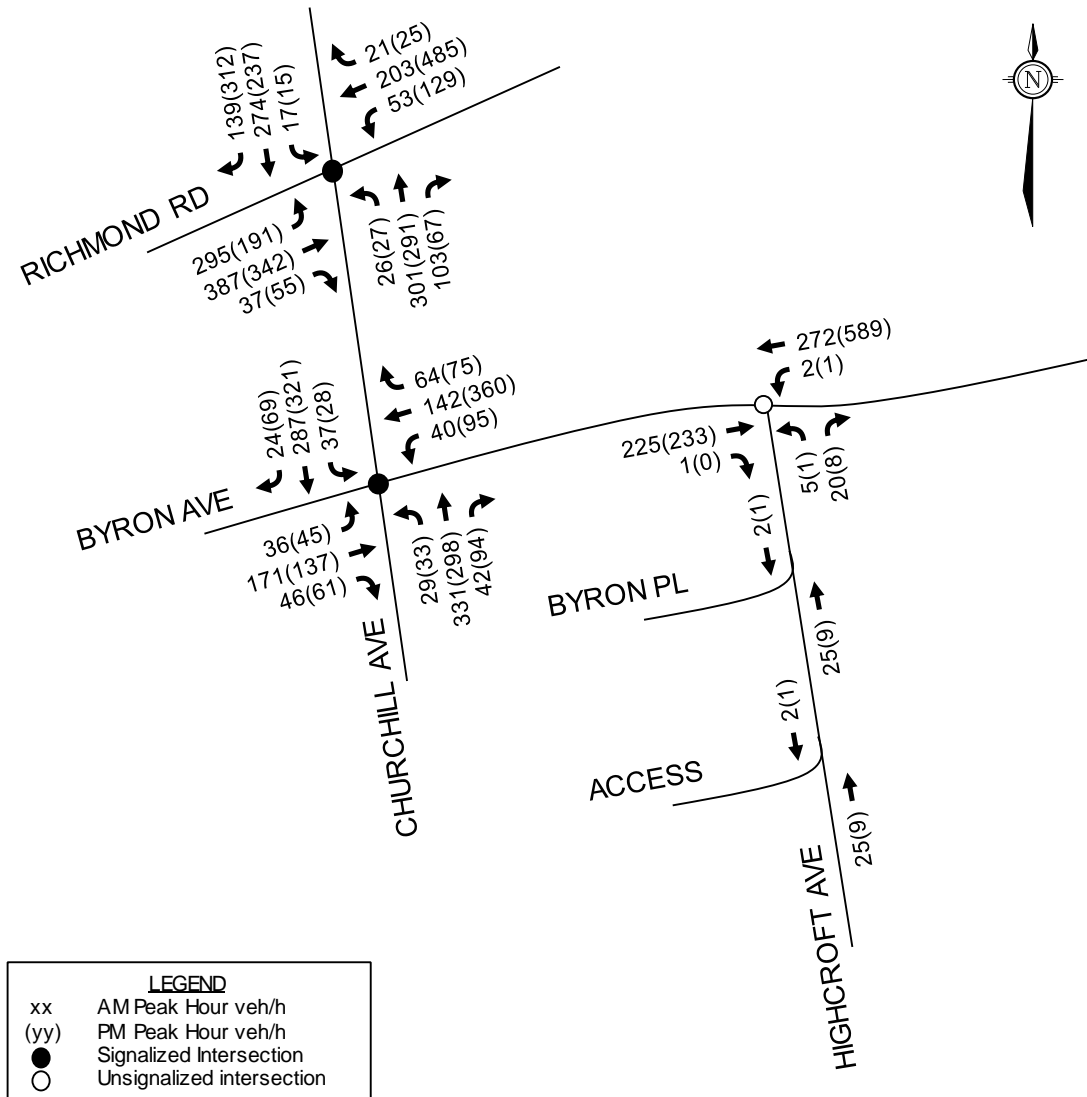
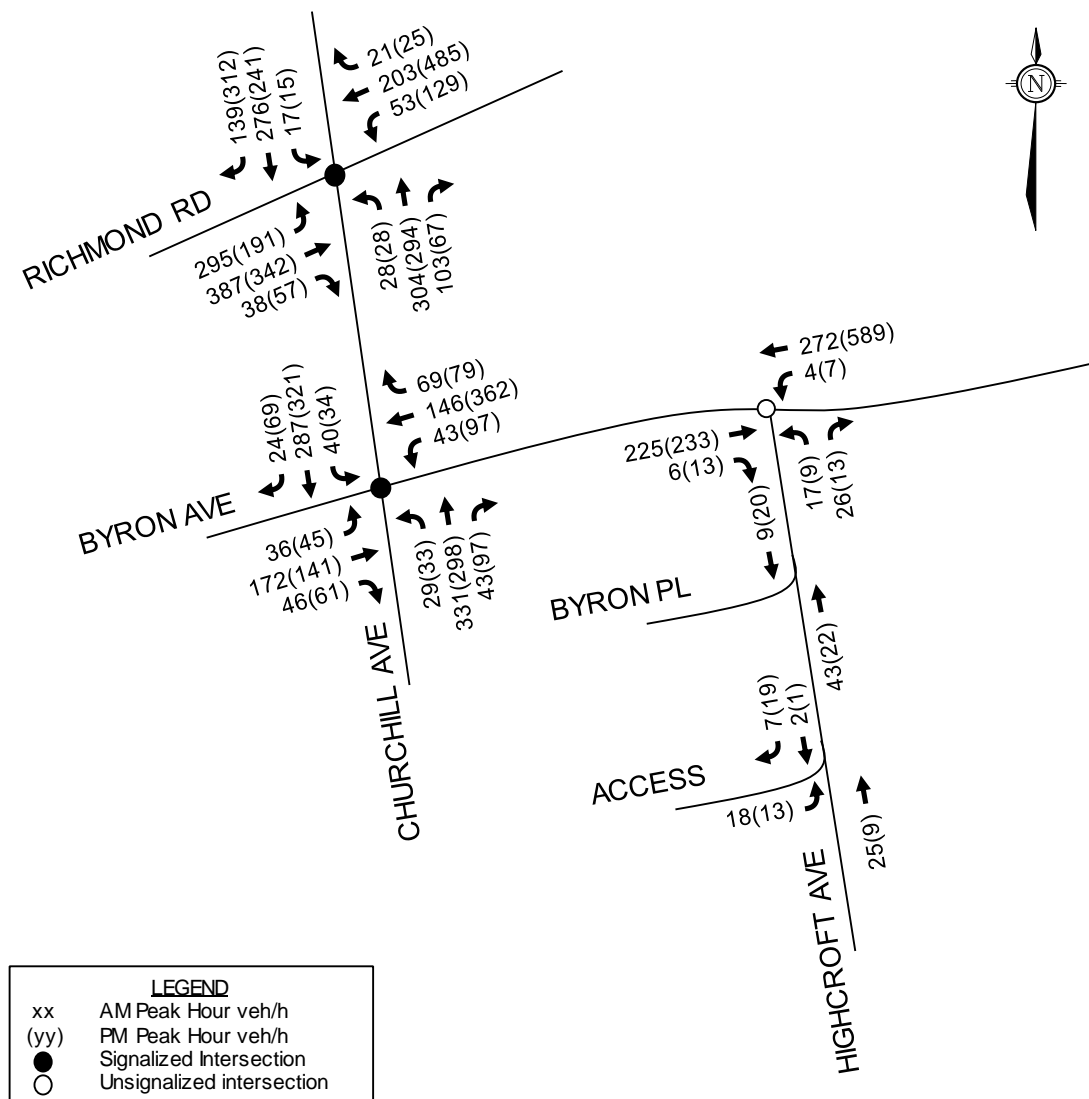


Figure 6: 2020 and 2025 Total Traffic



## 5.0 ANALYSIS

### 5.1 Development Design

Byron Place will be partially closed to provide a public park area in the southeast corner of the Churchill Avenue/Byron Avenue intersection. The portion of Byron Place that remains open will function as the fire route for the proposed development. The width of Byron Place will be reduced to 6.0m in order to provide a wider landscape buffer between the proposed building and sidewalk. The turnaround hammerhead within Byron Place will also facilitate short-term parking for drop-offs/pick-ups.

A Road Modification Approval (RMA) application is required to alter the existing curbs along Highcroft Avenue and Byron Place. A functional design of the proposed Highcroft Avenue and Byron Place roadway modifications is provided in **Appendix G**. A RMA application will be submitted to the City of Ottawa under a separate cover.

On-site pedestrian facilities will be provided between the retail entrances and the sidewalks along Churchill Avenue. A sidewalk will be provided along the northern frontage of the site along Byron Place, providing pedestrian connectivity between the residential entrances and the existing sidewalk along Churchill Avenue.

Bicycle parking for the proposed development will be in accordance with the minimum requirements of the City's Zoning By-law (ZBL), as described in Section 5.2. Bicycle parking will be provided underground.

A garbage room will be provided within the building. Garbage bins will be wheeled down the pathway south of the building, and will be picked up curbside along Churchill Avenue.

A review of the Transportation Demand Management (TDM) – *Supportive Development Design and Infrastructure Checklist* has been conducted. A copy of the TDM checklist is included in **Appendix H**. All required TDM-supportive design and infrastructure measures in the TDM checklist are met.

### 5.2 Parking

The subject site is located in Area B on Schedule 1 and Area X on Schedule 1A of the City's Zoning By-law (ZBL). Minimum vehicular and bicycle parking rates for the proposed development are identified in the ZBL and are summarized in the following table.

**Table 7: Parking Requirement**

| Land Use            |         | Rate   | Units/GFA         | Required | Provided |
|---------------------|---------|--|-------------------|----------|----------|
| Vehicle Parking     |         |  |                   |          |          |
| Apartment           | Tenant  | 0.5 per dwelling unit in excess of 12 units                  | 76 Units          | 32       | 57       |
|                     | Visitor | 0.1 per dwelling unit in excess of 12 units                  |                   | 6        | 7        |
| Commercial Unit One |         | None for commercial units with 200m <sup>2</sup> GFA or less | 158m <sup>2</sup> | 0        | 0        |
| Commercial Unit Two |         |  | 197m <sup>2</sup> | 0        | 0        |
| Total               |         |  |                   | 38       | 65       |
| Bicycle Parking     |         |  |                   |          |          |
| Apartment           |         | 0.5 per Dwelling Unit  | 76 Units          | 38       | 46       |
| Commercial Unit One |         | 1 per 250m <sup>2</sup> of GFA                               | 161m <sup>2</sup> | 0        | 0        |
| Commercial Unit Two |         |  | 160m <sup>2</sup> | 0        | 0        |
| Total               |         |  |                   | 38       | 46       |

Based on the foregoing table, the proposed vehicular and bicycle parking meets the minimum requirement of the ZBL.

### 5.3 Boundary Streets

This section provides a review of the boundary streets using complete streets principles. The Multi-Modal Level of Service (MMLOS) guidelines produced by IBI Group in 2015 were used to evaluate the Level of Service (LOS) of the boundary roadways for each mode of transportation. Schedule B of the City of Ottawa's Official Plan indicates Churchill Avenue and Byron Avenue are within the General Urban Area. The boundary streets are also located within 600m of the Dominion Transit Station and within 300m of the Churchill Alternative School. Photos of the boundary Streets (provided by Google Streetview) are provided below.

**Figure 7: Churchill Avenue**



**Figure 8: Byron Avenue**

Target Pedestrian LOS (PLOS), Bicycle LOS (BLOS), Transit LOS (TLOS), Truck LOS (TkLOS) and Auto LOS for the study area roadways are based on the targets within 300m of a school, as identified in Exhibit 22 of the MMLOS guidelines. The following table summarizes the findings of the MMLOS segment analysis. Detailed segment MMLOS calculations are included in **Appendix I**.

**Table 8: Segment MMLOS Summary**

| Segment          | PLOS     | BLOS     | TLOS     | TkLOS    | Auto LOS |
|------------------|----------|----------|----------|----------|----------|
| Churchill Avenue | C        | A        | F        | B        | C        |
| <b>Target</b>    | <b>A</b> | <b>B</b> | <b>-</b> | <b>D</b> | <b>E</b> |
| Byron Avenue     | E        | F        | D        | B        | B        |
| <b>Target</b>    | <b>A</b> | <b>B</b> | <b>-</b> | <b>-</b> | <b>E</b> |

Churchill Avenue currently meets the target BLOS B, TkLOS D and Auto LOS E, however it does not meet the target PLOS A. Byron Avenue meets the target Auto LOS E, however it does not meet the target PLOS A and BLOS B.

Based on an operating speed of 60km/hr and average daily curb lane traffic greater than 3000 vehicles per day, the target PLOS A is unachievable. To achieve the target PLOS A along both Churchill Avenue and Byron Avenue, either a reduction in the daily curb traffic to less than 3000 vehicles per day or a reduction in the operational speed to 30km/hr is required.

A review of the Ontario Traffic Manual (OTM) Book 18 Desirable Cycling Facility Pre-Selection Nomograph suggests either bike lanes or a separated facility are appropriate along Byron Avenue based on the AADT and operating speed. A copy of the OTM Desirable Cycling Facility Pre-Selection Nomograph is included in **Appendix I**. The City of Ottawa's Ultimate Cycling Network identifies a future separated major pathway on the north side of Byron Avenue. The separated pathway will result in a BLOS A, achieving the target within 300m of a school.

## 5.4 Access Intersections Design

As described Section 2.0, a preliminary review of various access options was conducted, including access to Churchill Avenue, Byron Avenue, Byron Place and Highcroft Avenue. Access to Highcroft Avenue is recommended based on the following factors.

- Access along Byron Avenue and Churchill Avenue requires a minimum corner clearance of 55m from the Churchill Avenue/Byron Avenue intersection, and is unachievable.
- OC Transpo bus stop and school bus loading zone are located along the west side of Churchill Avenue and create additional conflict opposite the site.
- The northbound left turn lane and taper at the Churchill Avenue/Byron Avenue extend past the site.
- The raised northbound cycle track transitions to on-road shared travel lane across the Churchill Avenue frontage.
- Westbound and northbound queues at the Churchill Avenue/Byron Avenue intersection periodically extend to Highcroft Avenue and Ravenhill Avenue during weekday peak hours.
- The non-standard intersection configuration/traffic calming feature at Byron Place/Highcroft Avenue/Byron Avenue currently operates with low-volume on Byron Place.
- The City of Ottawa's Private Approach By-law requires the access to be located on the lower class of roadway where possible.

Site access to Highcroft Avenue will provide access to the full movement intersection at Byron Avenue. The existing curb extension restricting the southbound through movement along Highcroft Avenue south of Byron Place will be removed and a new island will be provided to south of the proposed access to the parking garage for the proposed development.

The proposed island will be 3m in width and 8.7m in length. The island will be offset 1.5m from the existing curb-line to permit southbound cyclists along Highbury Park Drive. The width and length of the proposed island will eliminate any opportunity for vehicles leaving the site to turn right to travel southbound on Highcroft Avenue, as well as restrict westbound vehicles along Byron Avenue to cut through the residential community to avoid the traffic light at Churchill Avenue/Byron Avenue. The proposed island width (4.5m included curb offset) is an improvement on the existing curb extension which narrows the roadway by approximately 2.4m.

A RMA application is required to alter the existing curbs along Highcroft Avenue and Byron Place. A functional design of the proposed Highcroft Avenue and Byron Place roadway modifications is provided in **Appendix G**. A RMA application will be submitted to the City of Ottawa under a separate cover.

The proposed access will be 6.2m in width and will be located approximately 6.7m from the southern property line, and approximately 19m from the Byron Place right-of-way limit. The City's ZBL identifies a minimum width of 6.0m for a driveway leading to a parking garage containing more than 20 parking spaces. The City's Private Approach By-law requires the access to be 3.0m from any adjacent property line. The Private Approach By-law also identifies where a property abuts or is within 46m of an arterial or major collector roadway, in the case of an apartment building containing 20 to 99 parking spaces, a minimum distance of 18m is required between the proposed access and the nearest intersecting street line. The proposed driveway width and location adheres to the requirements of the City's ZBL and Private Approach By-law.

A review of the intersection operations at the proposed access was conducted for the 2020 and 2025 total traffic conditions was conducted. Based on the analysis, the proposed access will operate with a LOS A under the 2020 and 2025 total traffic conditions. Detailed summary sheets of the Synchro analysis are provided in **Appendix J**.

## 5.5 Transportation Demand Management

A review of the Transportation Demand Management (TDM) Measures checklist was conducted and can be found in **Appendix H**. To encourage travel by sustainable modes, the proponent agrees to implement the following TDM measures from the checklist:

- Display local area maps with walking/cycling access routes and key destinations at major entrances;
- Display relevant transit schedules and route maps at entrances;
- unbundle parking cost from monthly rent; and
- provide multimodal travel option information package to new residents.

## 5.6 Transit

Relevant boarding/alighting information and bus occupancy information from the winter 2018 service period for OC Transpo bus stops #4876, #4987, #5616, #7538 and #7539 were received from OC Transpo. OC Transpo has also advised that both Route 11 and Route 50 operate with 40-foot buses during the weekday AM and PM peak periods. Information received from OC Transpo is included in **Appendix C**. The following table summarizes the transit information received from OC Transpo.

**Table 9: Existing OC Transpo Utilization**

| OC Transpo Stop | OC Transpo Route | AM Period      |                 |              | PM Period      |                 |              |
|-----------------|------------------|----------------|-----------------|--------------|----------------|-----------------|--------------|
|                 |                  | Total Boarding | Total Alighting | Average Load | Total Boarding | Total Alighting | Average Load |
| #4876           | 11               | 1              | 15              | 8            | 13             | 19              | 17           |
| #4987           | 11               | 5              | 19              | 17           | 18             | 7               | 14           |
|                 | 50               | 1              | 4               | 15           | 3              | 1               | 10           |
| #5616           | 50               | 0              | 0               | 9            | 5              | 3               | 12           |
| #7538           | 50               | 6              | 5               | 15           | 1              | 1               | 10           |
| #7539           | 50               | 0              | 2               | 9            | 2              | 5               | 11           |

Based on the trip generation presented in Section 4.1, the proposed development is anticipated to generate 10 transit trips (2 in, 8 out) during the AM peak hour and 11 transit trips (7 in, 4 out) during the PM peak hour. Based on the transit utilization data received from OC Transpo, the existing bus stops/routes in the vicinity of the subject site have capacity to accommodate the transit trips generated by the proposed development.

## 5.7 Intersection Design

### 5.7.1 Existing Intersection MMLOS Analysis

This section provides a review of the signalized study area intersections using complete streets principles. The MMLOS guidelines produced by IBI Group in October 2015 were used to evaluate the LOS of the signalized study area intersections for each mode of transportation. Schedule B of

the City of Ottawa's Official Plan indicates the study area intersections are located in the General Urban Area. The study area intersections are also located within 600m of the Dominion Transit Station and within 300m of the Churchill Alternative School. Aerial photos of the study area intersections are provided in Section 3.2.2.

Target PLOS, BLOS, TLOS, TkLOS and Auto LOS for the study area intersections are based on the targets within 300m of a school, as identified in Exhibit 22 of the MMLOS guidelines. The following table summarizes the findings of the MMLOS intersection analysis.

A site visit was conducted to review the intersection operations. Although the north and south approaches to the Churchill Avenue/Richmond Road intersection are painted as one approach lane, the wide lane widths permit drivers to travel around a queued vehicle. For the purposes of the intersection capacity analysis, the north and south approaches to this intersection have been modeled as a through/left turn lane and a right turn lane.

Detailed intersection MMLOS calculations are included in **Appendix K**.

**Table 10: Intersection MMLOS Summary**

| Intersection                       | PLOS     | BLOS     | TLOS     | TkLOS    | Auto LOS |
|------------------------------------|----------|----------|----------|----------|----------|
| Churchill Avenue/<br>Byron Avenue  | D        | F        | C        | F        | E        |
| <b>Target</b>                      | <b>A</b> | <b>B</b> | <b>-</b> | <b>D</b> | <b>E</b> |
| Churchill Avenue/<br>Richmond Road | D        | F        | F        | E        | E        |
| <b>Target</b>                      | <b>A</b> | <b>B</b> | <b>-</b> | <b>D</b> | <b>E</b> |

The Churchill Avenue/Byron Avenue and Churchill Avenue/Richmond Road intersections do not meet the target PLOS A, BLOS B, TkLOS D, however they do meet the target Auto LOS E.

A reduction in the pedestrian crossing distance would have the greatest improvement to the PLOS at these intersections. To achieve the target BLOS, consideration could be given by the City to reducing the operational speed to 50km/hr and providing a two-stage left turn bike box on all legs of these intersections. To achieve the target TkLOS, an effective turn radius greater than 15m is required on all four corners of these intersections. Increasing the turn radius at these intersections could be considered by the City, however it should be noted that the increased radius will have a negative impact on the PLOS.

### 5.7.2 2020 and 2025 Background Intersection Operations

Intersection capacity analysis has been completed for the 2020 and 2025 background traffic conditions. The intersection parameters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800 vphpl, PHF: 1.0).

The results of the intersection capacity analysis are summarized in the following table. Detailed summary sheets are provided in **Appendix J**.

**Table 11: 2020 and 2025 Background Intersection Operations**

| Intersection                       | AM Peak          |     |      | PM Peak          |     |       |
|------------------------------------|------------------|-----|------|------------------|-----|-------|
|                                    | Max V/C or Delay | LOS | Mvmt | Max V/C or Delay | LOS | Mvmt  |
| Churchill Avenue/<br>Byron Avenue  | 0.73             | C   | WBT  | 0.88             | D   | WBT   |
| Churchill Avenue/<br>Richmond Road | 0.86             | D   | EBL  | 0.83             | D   | WBT/R |
| Byron Avenue/<br>Highcroft Avenue  | 10 sec           | B   | NB   | 10 sec           | B   | NB    |

Based on the foregoing, critical movements at all study area intersections are anticipated to operate with a LOS D or better under background traffic conditions. Based on the previous table, the background traffic conditions appear to improve when compared to the existing traffic conditions. This can be attributed to differences in the Peak Hour Factor (set to 0.90 in existing conditions and 1.0 in future conditions, as per the 2017 TIA Guidelines).

### 5.7.3 2020 and 2025 Total Intersection Operations

Intersection capacity analysis has been completed for the 2020 and 2025 total traffic conditions. The intersection parameters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800 vphpl, PHF: 1.0).

The results of the intersection capacity analysis are summarized in the following table. Detailed summary sheets are provided in **Appendix J**.

**Table 12: 2020 and 2025 Total Intersection Operations**

| Intersection                       | AM Peak          |     |      | PM Peak          |     |       |
|------------------------------------|------------------|-----|------|------------------|-----|-------|
|                                    | Max V/C or Delay | LOS | Mvmt | Max V/C or Delay | LOS | Mvmt  |
| Churchill Avenue/<br>Byron Avenue  | 0.76             | C   | WBT  | 0.89             | D   | WBT   |
| Churchill Avenue/<br>Richmond Road | 0.86             | D   | EBL  | 0.83             | D   | WBT/R |
| Byron Avenue/<br>Highcroft Avenue  | 11 sec           | B   | NB   | 13 sec           | B   | NB    |

Based on the foregoing, the addition of site generated traffic volumes are not anticipated to have a significant impact to the intersection operations within the study area.

For the purposes of this analysis, it has been assumed that all trips from the south will travel north on Churchill Avenue to Byron Avenue, and turn right from Byron Avenue onto Highcroft Avenue. However it is acknowledged that some of these drivers may choose to turn right from Churchill Avenue onto Kenwood Avenue, and travel northbound on Highcroft Avenue to access the site.

Based on anticipated trip distribution, one vehicle during the AM peak hour and three vehicles during the PM peak hour are anticipated to arrive from the south. If these trips were to use Kenwood Avenue/Highcroft Avenue to access the site during the PM peak hour, this would result in one new

vehicle approximately every 20 minutes. This increase in traffic is not anticipated to be noticeable and will not have a significant impact on the existing operations along Highcroft Avenue.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing, the conclusions and recommendations of this TIA can be summarized as follows:

### Development Design and Parking

- Byron Place will be partially closed to provide a public park area in the southeast corner of the Churchill Avenue/Byron Avenue intersection. The portion of Byron Place that remains open will function as the fire route for the proposed development. The width of Byron Place will be reduced to 6.0m in order to provide a wider landscape buffer between the proposed building and sidewalk. The turnaround hammerhead within Byron Place will also facilitate short-term parking for drop-offs/pick-ups.
- On-site pedestrian facilities will be provided between the retail entrances and the sidewalks along Churchill Avenue. A sidewalk will be provided along the northern frontage of the site along Byron Place, providing pedestrian connectivity between the residential entrances and the existing sidewalk along Churchill Avenue.
- A garbage room will be provided within the building. Garbage bins will be wheeled down the pathway south of the building, and will be picked up curbside along Churchill Avenue.
- All required TDM-supportive design and infrastructure measures in the TDM checklist are met.
- The proposed vehicular and bicycle parking meets the minimum requirement of the ZBL.

### Boundary Streets

- Churchill Avenue currently meets the target BLOS B, TkLOS D and Auto LOS E, however it does not meet the target PLOS A. Byron Avenue meets the target Auto LOS E, however it does not meet the target PLOS A and BLOS B.
- To achieve the target PLOS A along both Churchill Avenue and Byron Avenue, either a reduction in the daily curb traffic to less than 3000 vehicles per day or a reduction in the operational speed to 30km/hr is required.
- The City of Ottawa's Ultimate Cycling Network identifies a future separated major pathway on the north side of Byron Avenue. The separated pathway will result in a BLOS A, achieving the target within 300m of a school.

### Access Design

- Site access to Highcroft Avenue will provide access to the full movement intersection at Byron Avenue. The existing curb extension restricting the southbound through movement along Highcroft Avenue south of Byron Place will be removed and a new island will be provided to south of the proposed access to the parking garage for the proposed development.
- The width and length of the proposed island will eliminate any opportunity for vehicles leaving the site to turn right to travel southbound on Highcroft Avenue, as well as restrict westbound vehicles along Byron Avenue to cut through the residential community to avoid the traffic light at Churchill Avenue/Byron Avenue. The proposed island width (4.5m included curb offset) is an improvement on the existing curb extension which narrows the roadway by approximately 2.4m.
- The proposed driveway width and location adheres to the requirements of the City's ZBL and Private Approach By-law

Transportation Demand Management and Transit

- To encourage travel by sustainable modes, the proponent agrees to implement the following TDM measures from the checklist:
  - Display local area maps with walking/cycling access routes and key destinations at major entrances;
  - Display relevant transit schedules and route maps at entrances;
  - unbundle parking cost from monthly rent; and
  - provide multimodal travel option information package to new residents.

Intersection Design

- The Churchill Avenue/Byron Avenue and Churchill Avenue/Richmond Road intersections do not meet the target PLOS A, BLOS B, TkLOS D, however they do meet the target Auto LOS E.
- A reduction in the pedestrian crossing distance would have the greatest improvement to the PLOS at these intersections.
- To achieve the target BLOS, consideration could be given by the City to reducing the operational speed to 50km/hr and providing a two-stage left turn bike box on all legs of these intersections.
- To achieve the target TkLOS, an effective turn radius greater than 15m is required on all four corners of these intersections. Increasing the turn radius at these intersections could be considered by the City, however it should be noted that the increased radius will have a negative impact on the PLOS.
- Critical movements at all study area intersections are anticipated to operate with a LOS D or better under background traffic conditions.
- The addition of site generated traffic volumes are not anticipated to have a significant impact to the intersection operations within the study area.
- Based on anticipated trip distribution, one vehicle during the AM peak hour and three vehicles during the PM peak hour are anticipated to arrive from the south. If these trips were to use Kenwood Avenue/Highcroft Avenue to access the site during the PM peak hour, this would result in one new vehicle approximately every 20 minutes. This increase in traffic is not anticipated to be noticeable and will not have a significant impact on the existing operations along Highcroft Avenue.

**NOVATECH**

Prepared by:



Brad Byvelds, P. Eng.  
Project Coordinator | Transportation/Traffic

## **APPENDIX A**

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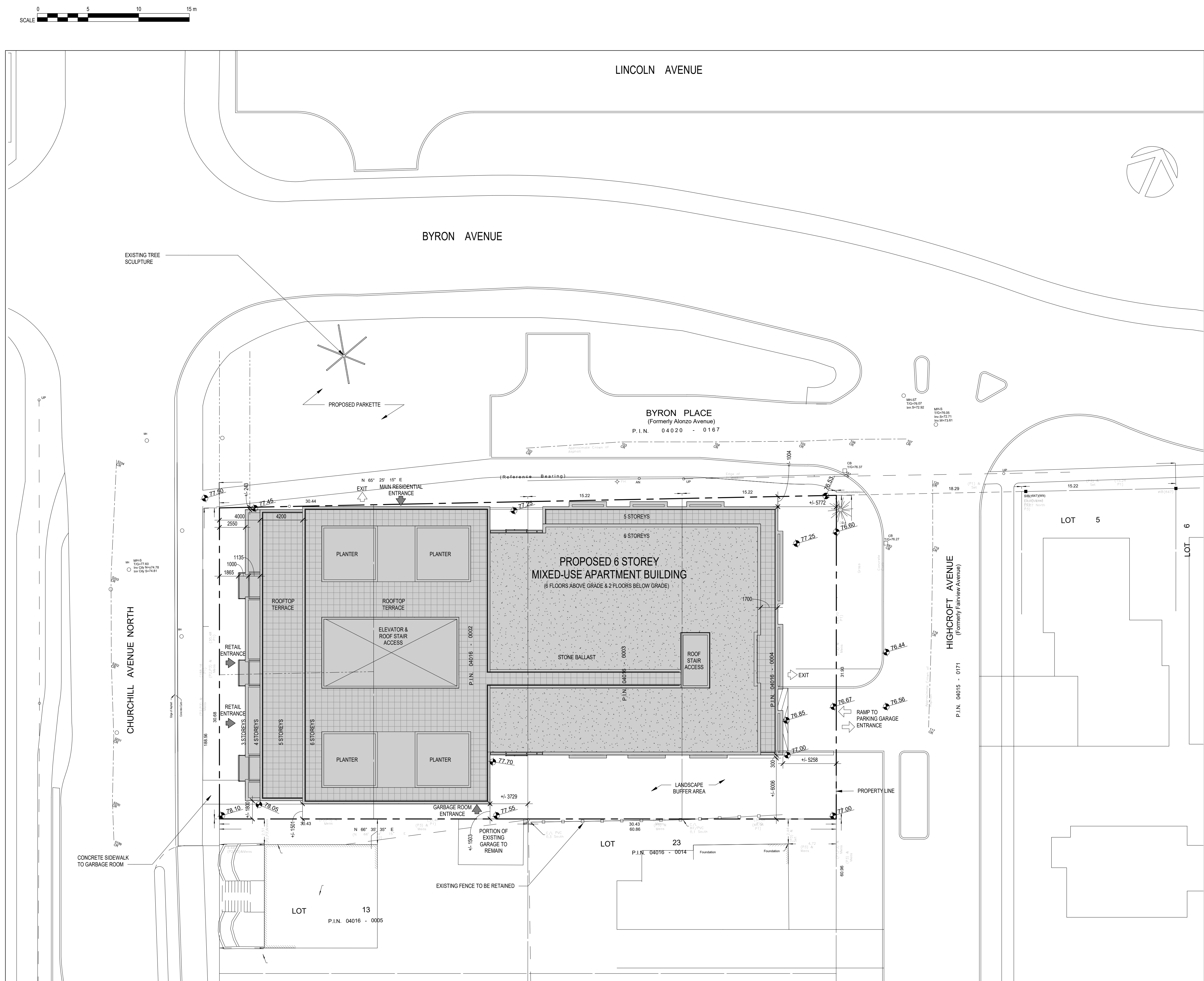
Proposed Site Plan



| PROJECT INFORMATION  | PROJECT TEAM   |
|--|--|
| LEGAL DESCRIPTION:<br><br>LOTS 1,2,3 AND 4<br>REGISTERED PLAN 269<br>CITY OF OTTAWA<br><br>PIN # 04016-0001<br>04016-0002<br>04016-0003<br>04016-0004<br><br>ZONING: R5B (H)15.5 | PROJECT NAME BYRON & CHURCHILL APARTMENTS<br><br>OWNER SIMON SI<br><br><br><br>ARCHITECT CHMIEL ARCHITECTS<br>109 BANK STREET, SUITE 200,<br>OTTAWA, ONTARIO, K1P 5N5<br><br><br><br>PLANNER & CIVIL NOVATECH<br>240 MICHAEL COWPLAND DR., SUITE 200,<br>OTTAWA, ONTARIO, K2M 1P6<br><br><br><br>MECHANICAL & ELECTRICAL S+A ENGINEERS<br>1600 CARLING AVE, SUITE 530<br>OTTAWA, ONTARIO, K1Z 1G3<br><br><br><br>SURVEYOR FARLEY, SMITH & DENIS SURVEYING LTD<br>195 COLONADE ROAD, SUITE 10<br>OTTAWA, ONTARIO, K2E 7J5<br><br><br><br>LANDSCAPE JAMES B. LENNOX & ASSOCIATES INC.<br>3332 CARLING AVE<br>OTTAWA, ONTARIO K2H 5A8 |

| City Area Calculations |                        |                       |                       |                       |
|------------------------|------------------------|-----------------------|-----------------------|-----------------------|
| Level                  | City GFA               | City GLA              | Amenity Area          | Communal Amenity Area |
| LEVEL 1                | 435.00 m <sup>2</sup>  | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 1                | 0.00 m <sup>2</sup>    | 320.92 m <sup>2</sup> | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 1                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 49.13 m <sup>2</sup>  | 0.00 m <sup>2</sup>   |
| LEVEL 1                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 52.39 m <sup>2</sup>  |
| LEVEL 2                | 1133.74 m <sup>2</sup> | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 2                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 51.77 m <sup>2</sup>  | 0.00 m <sup>2</sup>   |
| Level 3                | 1133.45 m <sup>2</sup> | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 3                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 51.74 m <sup>2</sup>  | 0.00 m <sup>2</sup>   |
| LEVEL 4                | 1140.52 m <sup>2</sup> | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 4                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 49.17 m <sup>2</sup>  | 0.00 m <sup>2</sup>   |
| LEVEL 5                | 1029.69 m <sup>2</sup> | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 5                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 100.98 m <sup>2</sup> | 0.00 m <sup>2</sup>   |
| LEVEL 6                | 918.89 m <sup>2</sup>  | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   |
| LEVEL 6                | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 132.92 m <sup>2</sup> | 0.00 m <sup>2</sup>   |
| ROOF                   | 0.00 m <sup>2</sup>    | 0.00 m <sup>2</sup>   | 0.00 m <sup>2</sup>   | 441.04 m <sup>2</sup> |
| Grand total: 59        | 5791.29 m <sup>2</sup> | 320.92 m <sup>2</sup> | 435.71 m <sup>2</sup> | 493.43 m <sup>2</sup> |

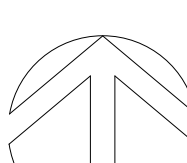
| Zoning Information: R5B H (19.5) Zone                                |  |             |
|--|--|-------------|
| City of Ottawa Consolidated Zoning By-law 2008-250                   |  |             |
| Proposed Mixed-Use Apartment Building                                |  |             |
| Performance Standards  | Required                                     | Proposed    |
| <b>Residential Fifth Density (Sections 163-164)</b>                  |  |             |
| Minimum Lot Area (m <sup>2</sup> )                                   | 675  | 1900        |
| Minimum Lot Width (m)  | 22.5   | 30.6        |
| Minimum Front Yard (m)   | 3  | 2.5         |
| Corner Side Yard Setback (m)   | 3  | 0           |
| Minimum Interior Side Yard Setback (m)                               |  |             |
| Abutting a Residential Zone  | 7.5  | 6.0         |
| If located within 21m of front lot line                              | 1.5  | 1.5         |
| If located beyond 21m of front lot line                              | 6.0  | 1.5 and 6.0 |
| Minimum Rear Yard Setback (m)  | 3  | 5.7         |
| Maximum Building Height (m)  | Varies                                       | 19.5        |
| <b>Parking Requirements (Area X) (Section 100-114)</b>               |  |             |
| Minimum Parking Space Rates  |  |             |
| Dwelling Units in a Mixed-use Building<br>(in excess of 12)          | 0.5 per dwelling unit = 32                   | 59          |
| Non-Residential Uses<br>(where gfa is less than 200 m <sup>2</sup> ) | 0  | 0           |
| Minimum Visitor Parking Space Rate                                   |  |             |
| Dwelling Units in a Mixed-use Building<br>(in excess of 12)          | 0.1 per dwelling unit = 6                    | 6           |
| Aisle and Driveway Provisions  |  |             |
| Minimum Width of a Double Traffic Lane (m)                           | 6  | 6           |
| Driveway providing access to Parking Garage (m)                      | 6  | 6.2         |
| Minimum Bicycle Parking Space Rates                                  |  |             |
| Dwelling Unit in a Mixed-use Building                                | 0.5 per dwelling unit = 38                   | 46          |
| <b>Amenity Area (Section 137)</b>                                    |  |             |
| Minimum Total Amenity Area (m <sup>2</sup> )                         | 6m <sup>2</sup> per dwelling unit = 456      | 929.1       |
| Mixed Use Building, with 9 or more Dwelling Units                    |  |             |
| Minimum Communal Amenity Area (m <sup>2</sup> )                      | 50% of the required total amenity area = 228 | 493.4       |
| Mixed Use Building, with 9 or more Dwelling Units                    |  |             |



**NOTE: THIS DRAWING IS THE PROPERTY OF THE ARCHITECT AND MAY NOT BE REPRODUCED OR USED WITHOUT THE EXPRESSED CONSENT OF THE ARCHITECT. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY OMISSIONS OR DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.**

**DO NOT SCALE THE DRAWINGS**

[illegible]

|                 |  |
|-----------------|--|
| OWNER           |  |
| 472 BYRON PLACE |  |
| PROJECT NORTH   |  <p>MAY NOT BE USED FOR CONSTRUCTION<br/>UNITS. SIGNED BY THE ARCHITECT</p> |

**chmiel**architects  
200 - 109 Bank Street  
Ottawa ON K1P 5N5  
t (613) 234-3585  
f (613) 234-6224

|   |  |
|---|--|
| <h1 style="text-align: center;">BYRON PLACE<br/>APARTMENTS</h1> |  |
| <h2 style="text-align: center;">472 BYRON PLACE</h2>            |  |
| PROJECT NO:<br><h3 style="text-align: center;">17-1547</h3>     | DRAWN<br><h3 style="text-align: center;">CG</h3>   |
| SCALE<br><h3 style="text-align: center;">As indicated</h3>      | CHECKED<br><h3 style="text-align: center;">RC</h3> |

## SITE PLAN

DRAFTING NO.

## **APPENDIX B**

---

TIA Screening Form

## City of Ottawa 2017 TIA Guidelines Screening Form

### 1. Description of Proposed Development

|                                    |  |
|------------------------------------|--|
| Municipal Address                  | <b>433 and 435 Churchill Avenue North,<br/>468 and 472 Byron Place</b>   |
| Description of Location            | <b>The 0.19 ha parcel is four existing properties bound by Churchill Avenue North to west, Highcroft Avenue to the east and Byron Place to the north</b> |
| Land Use Classification            | <b>General Mixed Use</b>   |
| Development Size (units)           | <b>84 residential units</b>  |
| Development Size (m <sup>2</sup> ) | <b>325m<sup>2</sup> retail</b>   |
| Number of Accesses and Locations   | <b>One proposed access on Highcroft Avenue</b>   |
| Phase of Development               | <b>N/A</b>   |
| Buildout Year                      | <b>2019</b>  |

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

### 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 <sup>2</sup>     |
| Industrial                          | 5,000 m <sup>2</sup>     |
| Fast-food restaurant or coffee shop | 100 m <sup>2</sup>       |
| Destination retail                  | 1,000 m <sup>2</sup>     |
| Gas station or convenience market   | 75 m <sup>2</sup>        |

*\* 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.*

If the proposed development size is greater than the sizes identified 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? |     | X  |
| Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*  |     | X  |

\*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).

**If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.**

### 4. Safety Triggers

|   | Yes | No |
|---|-----|----|
| Are posted speed limits on a boundary street are 80 km/hr or greater?   |     | X  |
| Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?  |     | X  |
| 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)? | X   |    |
| Is the proposed driveway within auxiliary lanes of an intersection?   |     | X  |
| Does the proposed driveway make use of an existing median break that serves an existing site?   |     | X  |
| Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?  |     | X  |
| Does the development include a drive-thru facility?   |     | X  |

**If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.**

### 5. Summary

|   | Yes | No |
|---|-----|----|
| Does the development satisfy the Trip Generation Trigger? | X   |    |
| Does the development satisfy the Location Trigger?        |     | X  |
| Does the development satisfy the Safety Trigger?          | X   |    |

**If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).**

## **APPENDIX C**

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### OC Transpo System Information





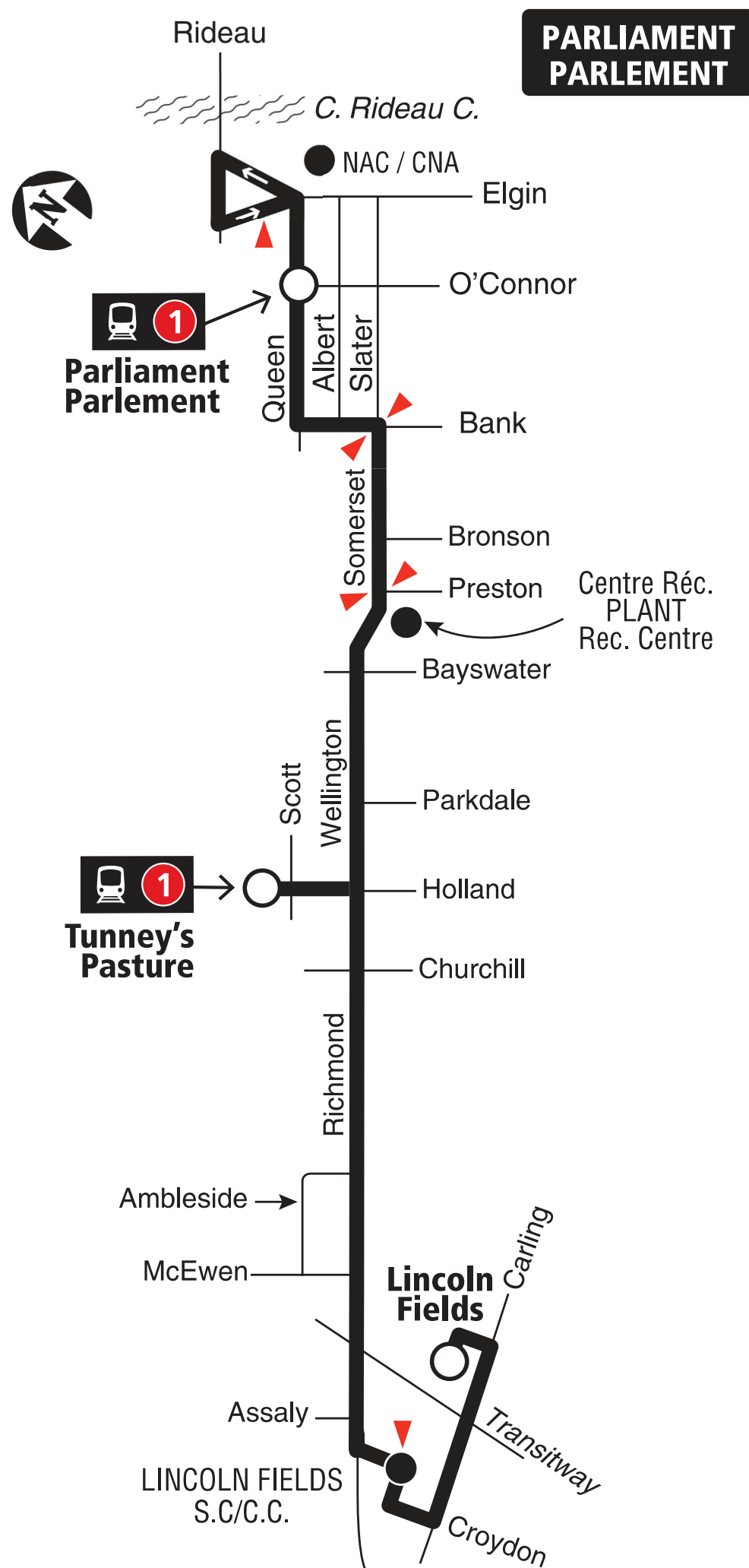
★ SUBJECT SITE

# 11

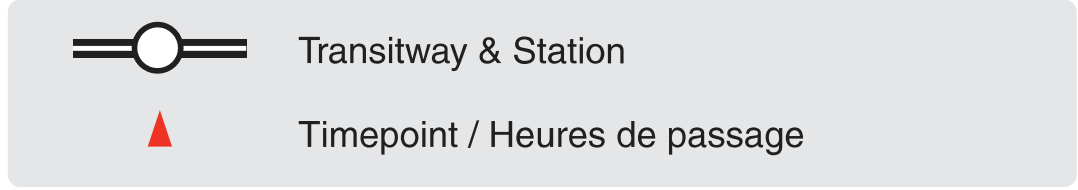
**Fréquent**

**7 days a week / 7 jours par semaine**

All day service  
Service toute la journée



**LINCOLN FIELDS**



2018.09



**Schedule / Horaire.....613-560-1000**

**Text / Texto .....560560**

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

Customer Relations

Service à la clientèle ..... **613-741-4390**

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

Security / Sécurité ..... **613-741-2478**

**Effective Septembre 2, 2018**

**En vigueur 2 septembre 2018**



**INFO 613-741-4390**  
**octranspo.com**

FORMER / ANCIEN 150

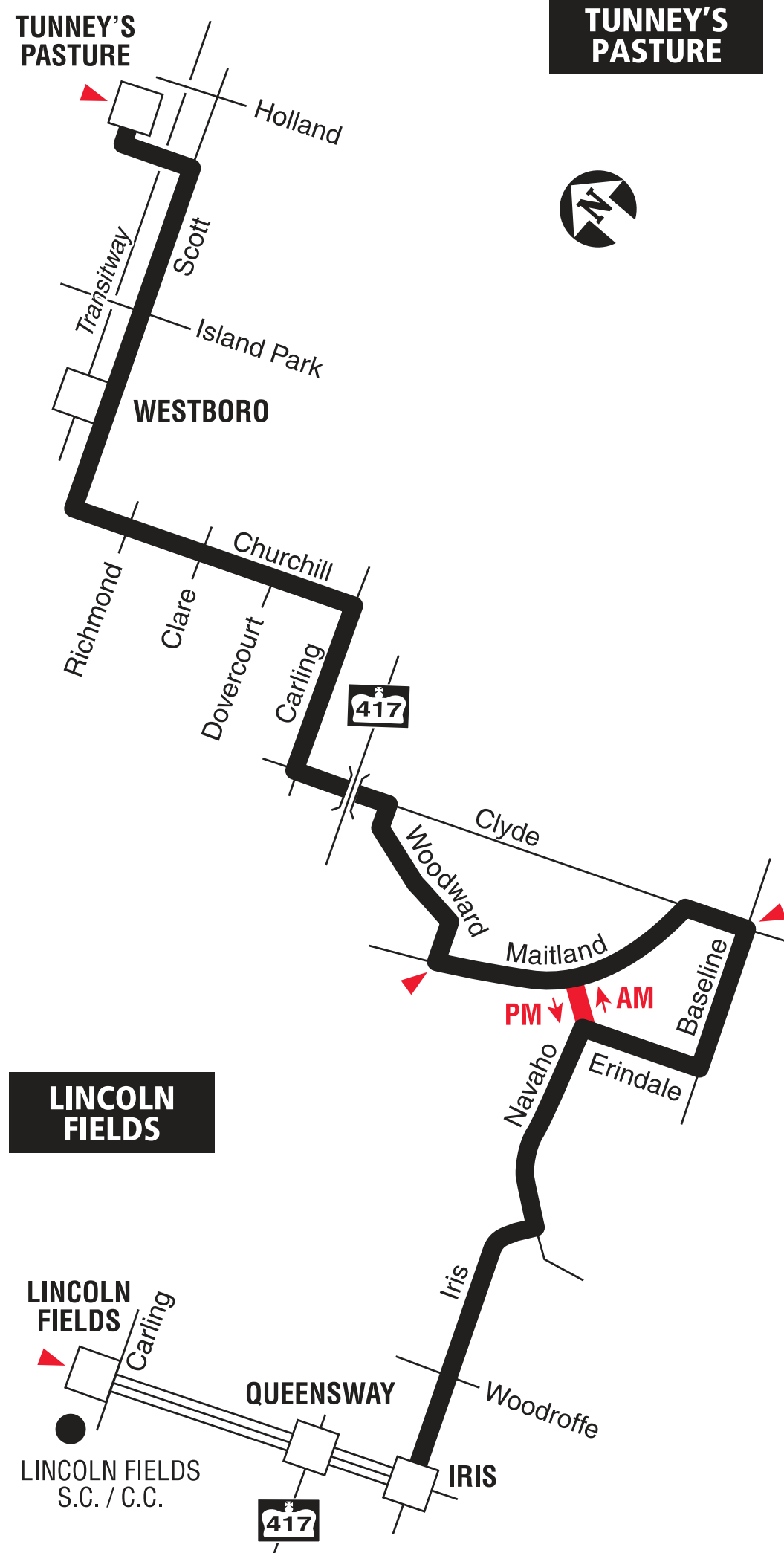
50

## TUNNEY'S PASTURE LINCOLN FIELDS

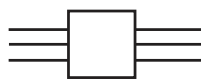
*Local*

**Monday to Saturday / Lundi au samedi**

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



Legend • Légende



Transitway & Station



Peak Periods only /  
Périodes de pointe seulement



Timepoint / Heures de passage

2017.04



**Schedule / Horaire.....613-560-1000**

**Text / Texto .....560560**

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

Customer Relations

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

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

Security / Sécurité ..... **613-741-2478**

**Effective April 24, 2017**

**En vigueur 24 avril 2017**



**INFO 613-741-4390**  
**octranspo.com**



FORMER / ANCIEN 11X

151

TUNNEY'S  
PASTURE

CARLINGWOOD

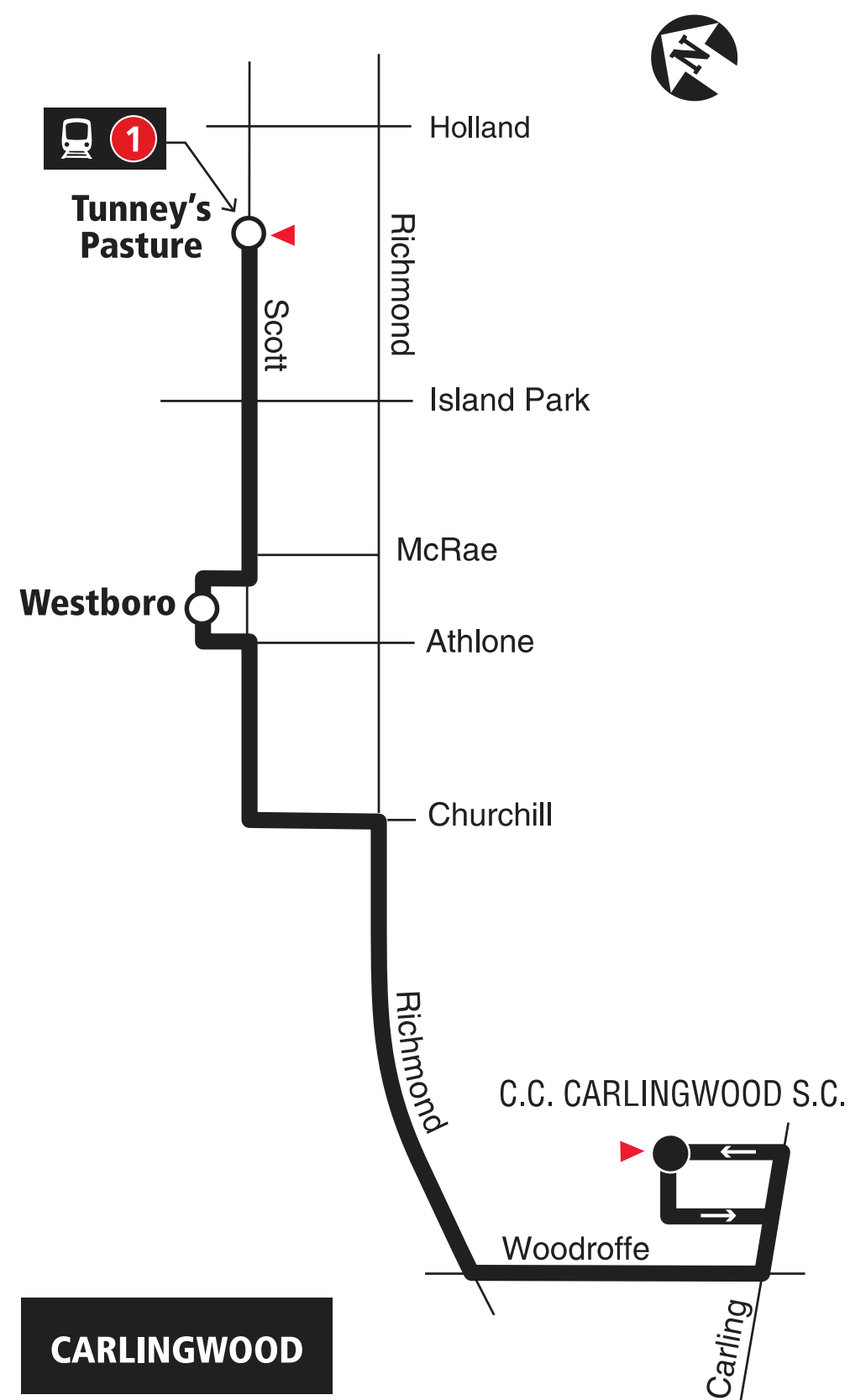
*Local*

**Monday to Friday / Lundi au vendredi**

Selected time periods only

Périodes sélectionnées seulement

TUNNEY'S  
PASTURE



CARLINGWOOD



Station



Timepoint / Heures de passage

2018.06



**Schedule / Horaire.....613-560-1000**

**Text / Texto .....560560**

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

Customer Relations

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

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

Security / Sécurité ..... **613-741-2478**

**Effective June 24, 2018**

**En vigueur 24 juin 2018**



**INFO 613-741-4390**  
**octranspo.com**

Hi Brad,

Please see the requested data below. All data is for an average weekday of the Winter 2018 booking period, during the AM and PM peak periods (6-9am and 3-6pm, respectively). Passenger counts for stops 4864 and 4865 are not available as Route 11 did not serve them during the Winter 2018 booking.

As shown below, some stops are served by Route 11 and others by Route 50. Both routes are planned to operate with 40-foot buses during the AM and PM peak periods.

| Stop | Route | Direction | AM Peak Period  |                  |                           | PM Peak Period  |                  |                           |
|------|-------|-----------|-----------------|------------------|---------------------------|-----------------|------------------|---------------------------|
|      |       |           | Total Boardings | Total Alightings | Average Load at Departure | Total Boardings | Total Alightings | Average Load at Departure |
| 4876 | 11    | Westbound | 1               | 15               | 8                         | 13              | 19               | 17                        |
| 4987 | 11    | Eastbound | 5               | 19               | 17                        | 18              | 7                | 14                        |
|      | 50    | Eastbound | 1               | 4                | 15                        | 3               | 1                | 10                        |
| 5616 | 50    | Westbound | 0               | 0                | 9                         | 5               | 3                | 12                        |
| 7538 | 50    | Eastbound | 6               | 5                | 15                        | 1               | 1                | 10                        |
| 7539 | 50    | Westbound | 0               | 2                | 9                         | 2               | 5                | 11                        |

If you have any questions, please don't hesitate to contact me.

Best regards,  
Genya

## **APPENDIX D**

---

### Traffic Count Data

## Turning Movement Count - Peak Hour Diagram

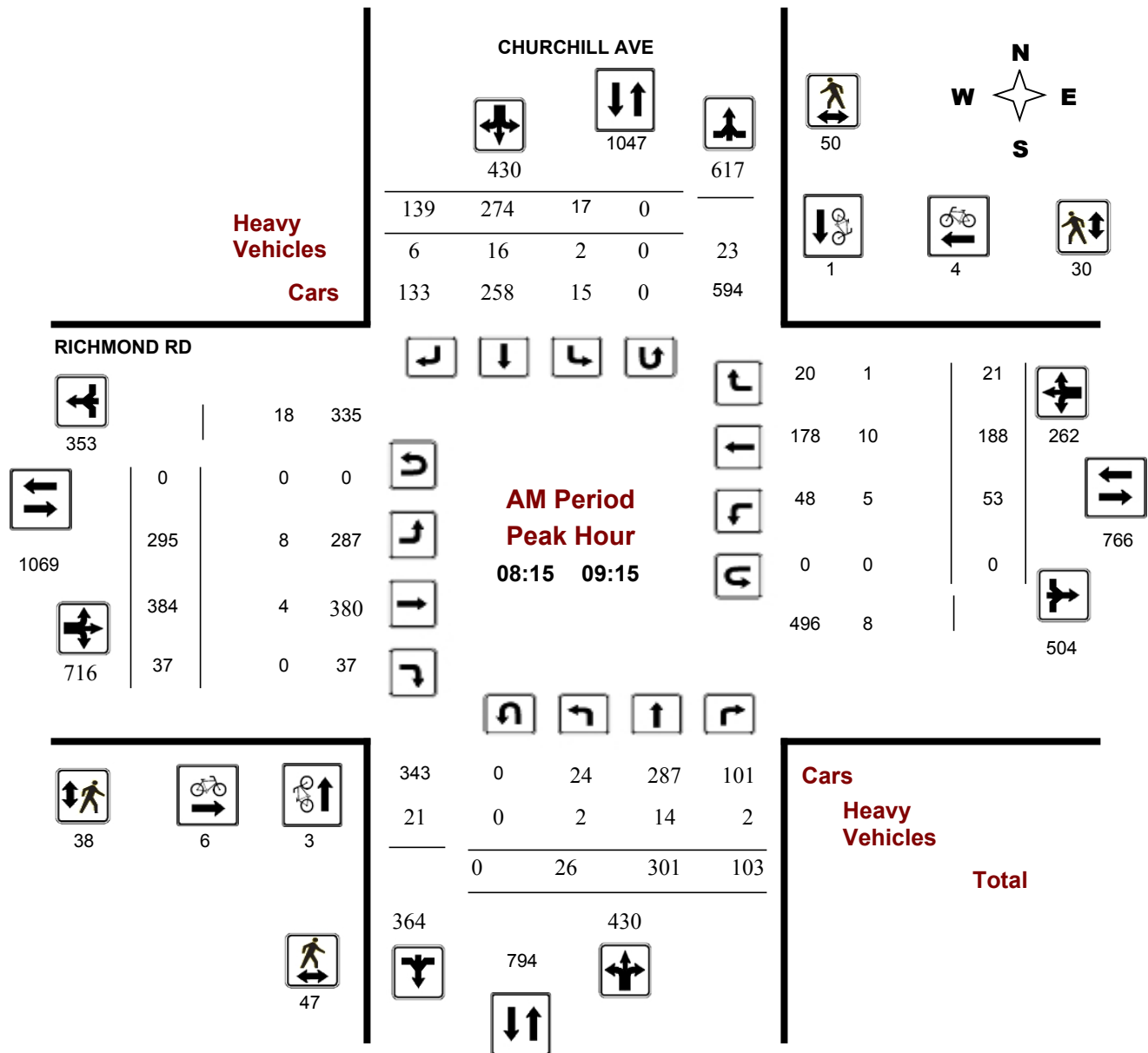
### CHURCHILL AVE @ RICHMOND RD

**Survey Date:** Wednesday, November 22, 2017

**Start Time:** 07:00

**WO No:** 37319

**Device:** Miovision



## Turning Movement Count - Peak Hour Diagram

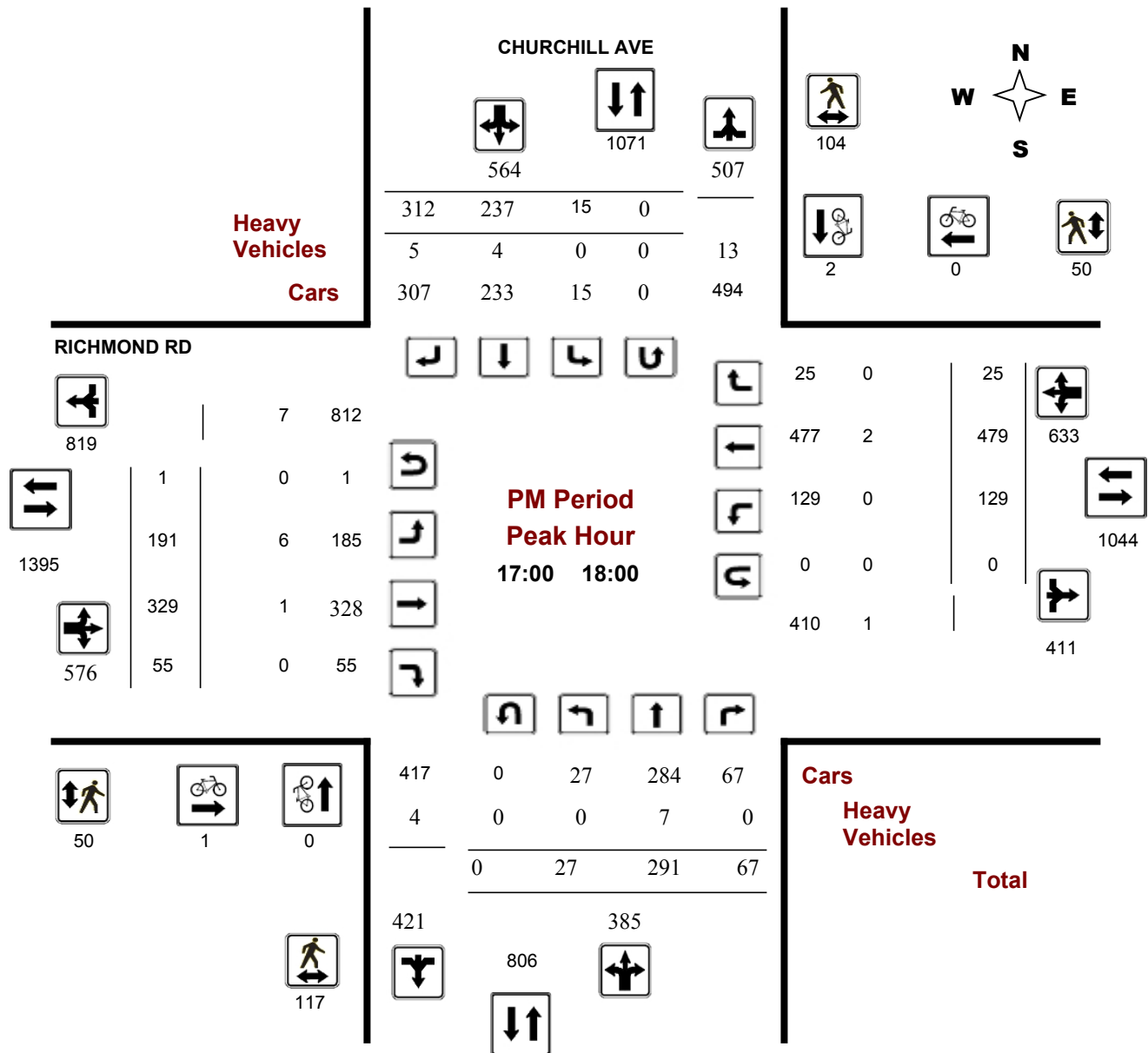
### CHURCHILL AVE @ RICHMOND RD

**Survey Date:** Wednesday, November 22, 2017

**Start Time:** 07:00

**WO No:** 37319

**Device:** Miovision



## Turning Movement Count - Peak Hour Diagram

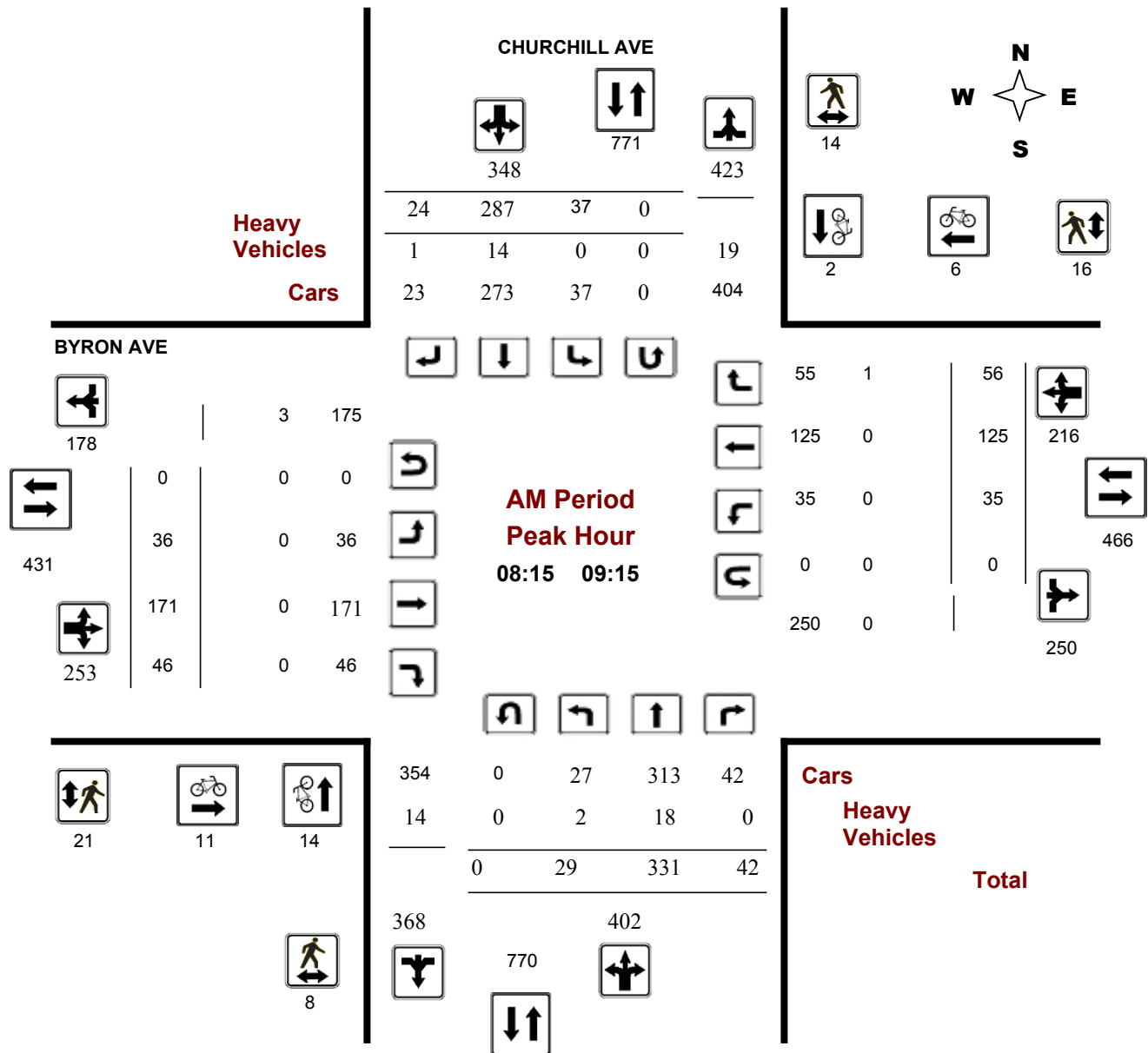
### BYRON AVE @ CHURCHILL AVE

**Survey Date:** Thursday, August 25, 2016

**Start Time:** 07:00

**WO No:** 36253

**Device:** Miovision



## Turning Movement Count - Peak Hour Diagram

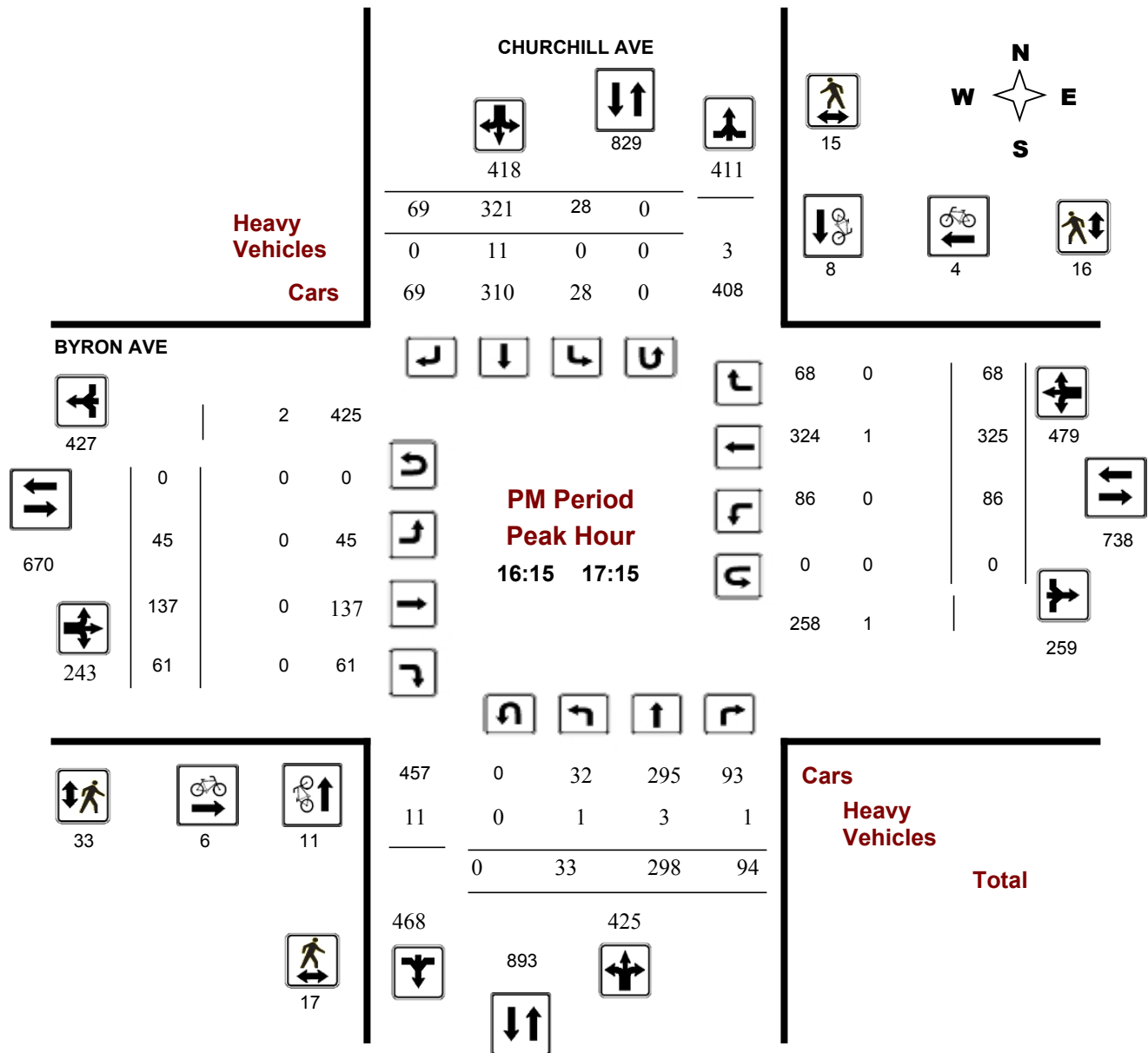
### BYRON AVE @ CHURCHILL AVE

**Survey Date:** Thursday, August 25, 2016

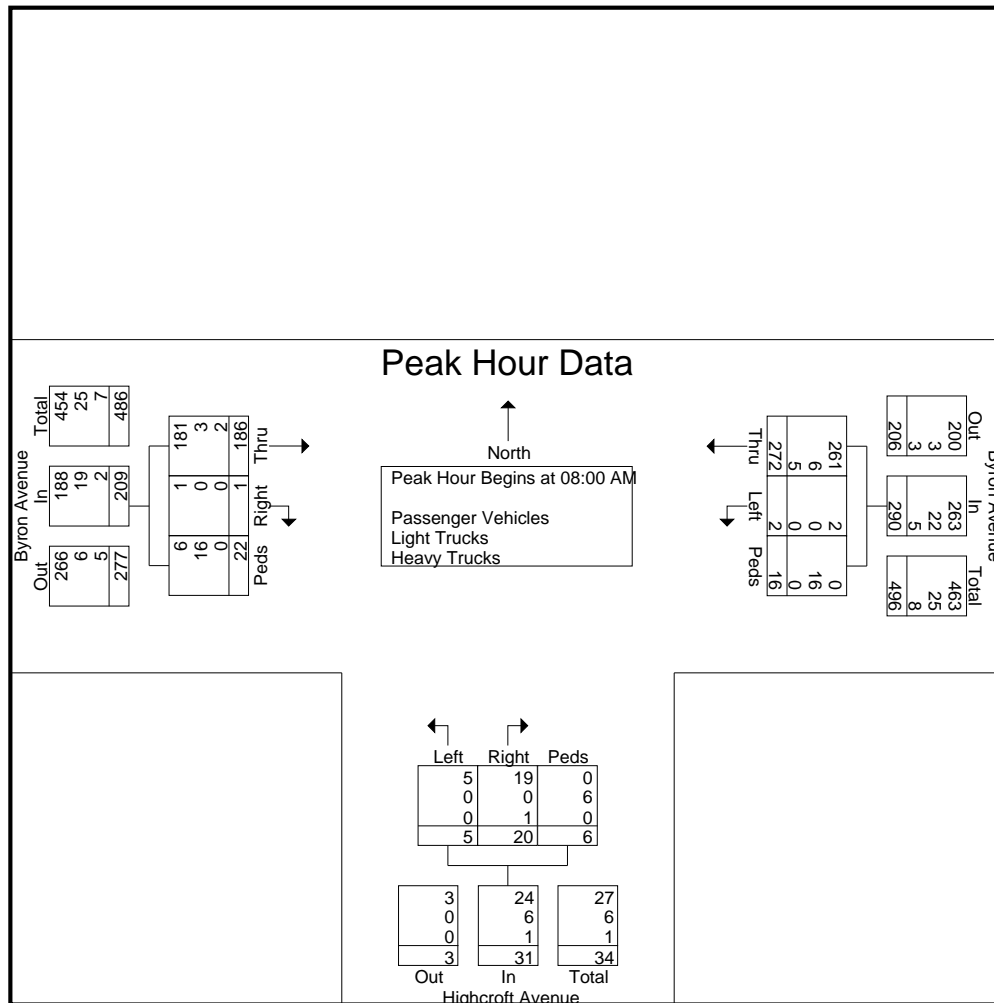
**Start Time:** 07:00

**WO No:** 36253

**Device:** Miovision

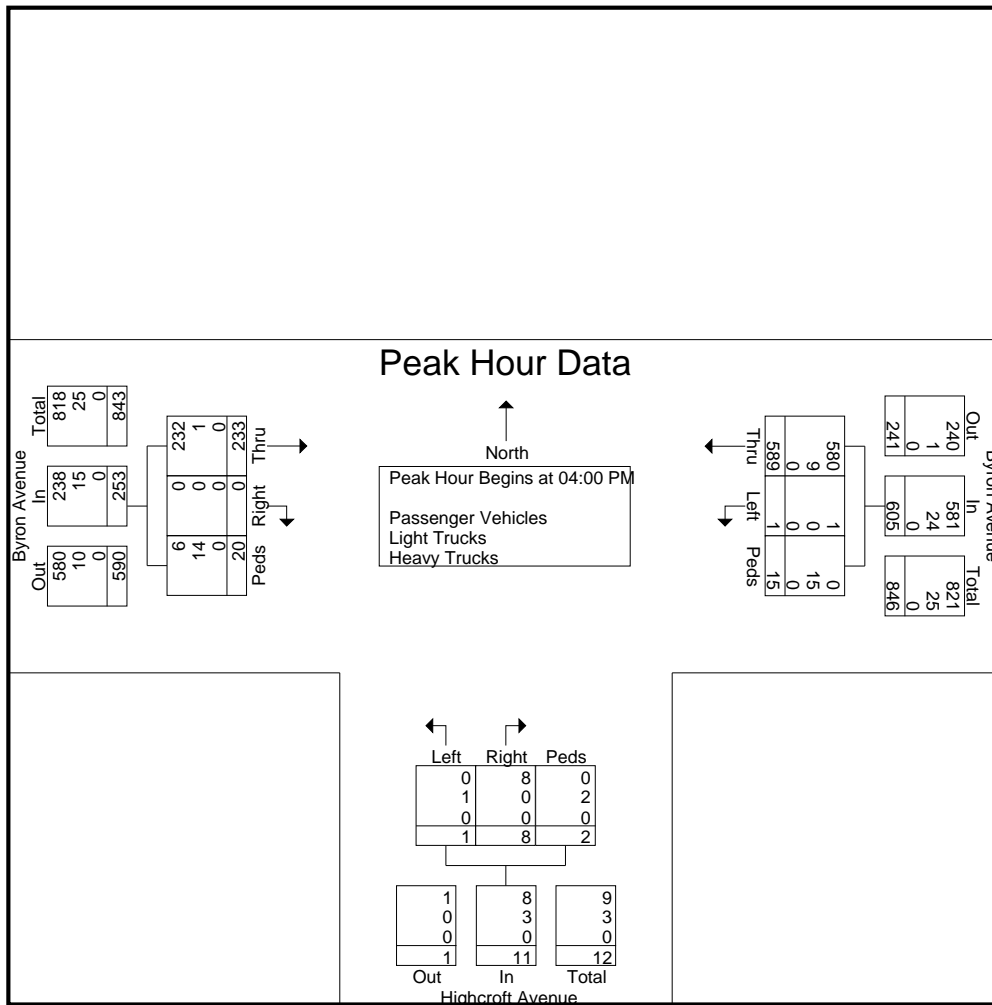


File Name : Byron\_Highcroft  
Site Code : 118024\_\_  
Start Date : 10/3/2018  
Page No : 5

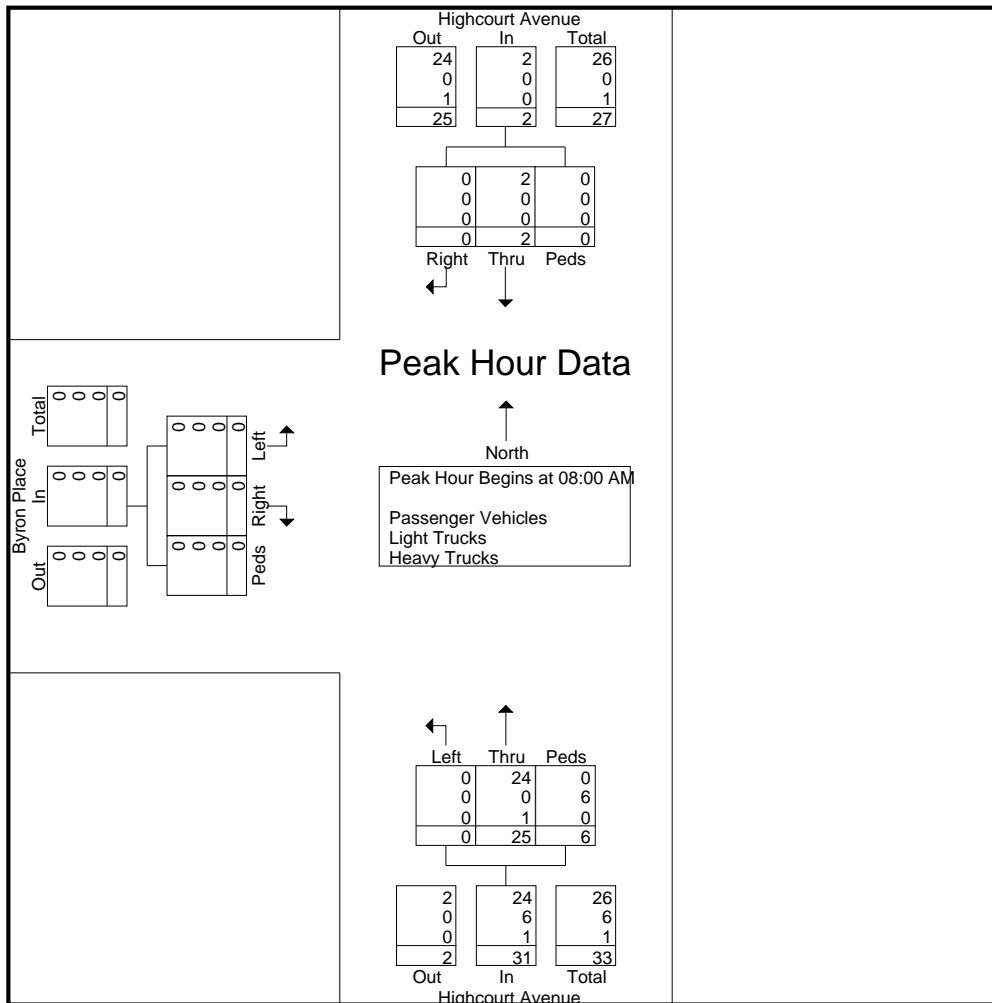




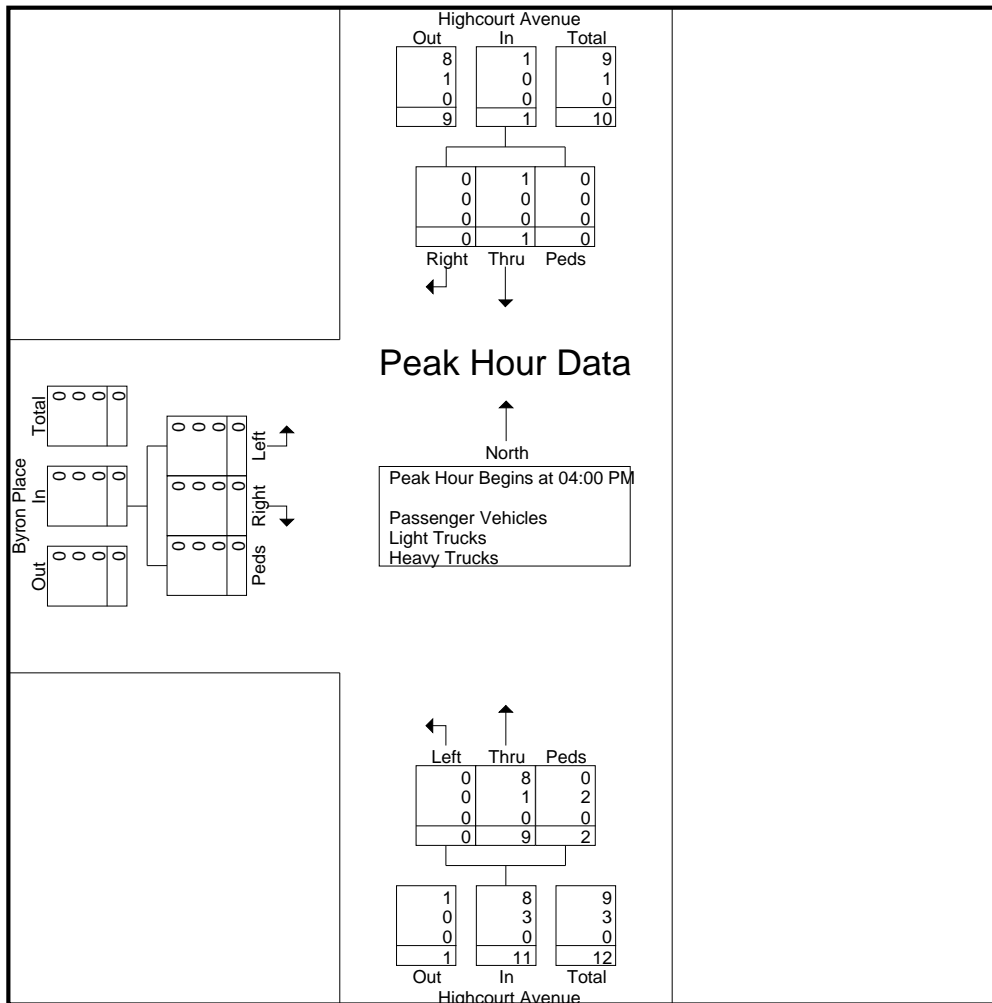
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Site Code : 118024\_\_  
Start Date : 10/3/2018  
Page No : 9



File Name : Highcroft\_ByronPL  
Site Code : 118024\_\_\_\_  
Start Date : 10/3/2018  
Page No : 5



File Name : Highcroft\_ByronPL  
Site Code : 118024\_\_\_\_  
Start Date : 10/3/2018  
Page No : 9



# Traffic Signal Timing

City of Ottawa, Transportation Services Department

## Traffic Signal Operations Unit

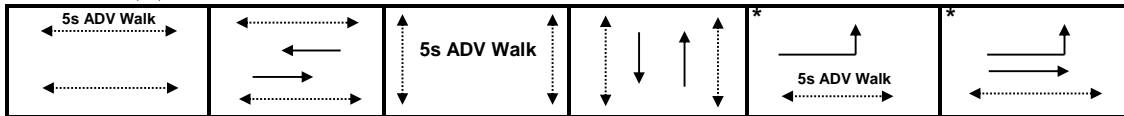
|                      |                       |                          |
|----------------------|-----------------------|--------------------------|
| <b>Intersection:</b> | <b>Main:</b> Richmond | <b>Side:</b> Churchill N |
| <b>Controller:</b>   | <b>MS-3200</b>        | <b>TSD:</b> 5229         |
| <b>Author:</b>       | Yassine Bennani       | <b>Date:</b> 24-Sep-2018 |

## Existing Timing Plans<sup>†</sup>

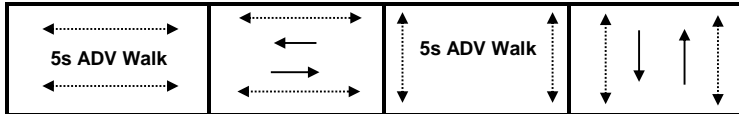
|               | Plan         |               |              |            |              | Ped Minimum Time |    |         |
|---------------|--------------|---------------|--------------|------------|--------------|------------------|----|---------|
|               | AM Peak<br>1 | Off Peak<br>2 | PM Peak<br>3 | Night<br>4 | Weekend<br>5 | Walk             | DW | A+R     |
| <b>Cycle</b>  | 80           | 75            | 90           | 65         | 75           |                  |    |         |
| <b>Offset</b> | 43           | 16            | 0            | 29         | 16           |                  |    |         |
| EB Thru       | 45           | 43            | 60           | 33         | 43           | 16               | 9  | 3.3+2.8 |
| WB Thru       | 31           | 31            | 45           | 33         | 31           | 16               | 9  | 3.3+2.8 |
| NB Thru       | 35           | 32            | 30           | 32         | 32           | 7                | 9  | 3.6+2.6 |
| SB Thru       | 35           | 32            | 30           | 32         | 32           | 7                | 9  | 3.6+2.6 |
| EB Left       | 14           | 12            | 15           | -          | 12           | -                | -  | 3.3+2.8 |

## Phasing Sequence<sup>‡</sup>

Plan: 1, 2, 3 & 5



Plan: 4



**Notes:** 1) For the east-west direction, there is a straight thru green arrow displayed during the 5 second advanced walk interval. After this 5 seconds, the green arrow changes to a green ball.

## Schedule

| Weekday |      | Saturday |      | Sunday |      |
|---------|------|----------|------|--------|------|
| Time    | Plan | Time     | Plan | Time   | Plan |
| 0:15    | 4    | 0:15     | 4    | 0:15   | 4    |
| 6:30    | 1    | 6:30     | 2    | 6:30   | 2    |
| 9:30    | 2    | 9:00     | 5    | 9:00   | 5    |
| 15:00   | 3    | 18:30    | 2    | 18:00  | 2    |
| 18:30   | 2    | 22:30    | 4    | 22:30  | 4    |
| 22:30   | 4    |          |      |        |      |

## Notes

<sup>†</sup>: Time for each direction includes amber and all red intervals

<sup>‡</sup>: Start of first phase should be used as reference point for offset

Asterisk (\*) Indicates actuated phase

(fp): Fully Protected Left Turn

◀.....▶ Pedestrian signal

Cost is \$56.50 (\$50 + HST)

# Traffic Signal Timing

City of Ottawa, Transportation Services Department

## Traffic Signal Operations Unit

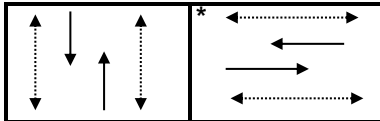
|                      |                        |                          |
|----------------------|------------------------|--------------------------|
| <b>Intersection:</b> | <b>Main:</b> Churchill | <b>Side:</b> Byron       |
| <b>Controller:</b>   | <b>ATC-3</b>           | <b>TSD:</b> 5634         |
| <b>Author:</b>       | Yassine Bennani        | <b>Date:</b> 24-Sep-2018 |

## Existing Timing Plans†

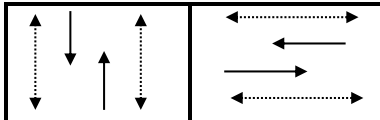
|               | Plan         |               |              |            |              | Ped Minimum Time |                 |      |    |         |
|---------------|--------------|---------------|--------------|------------|--------------|------------------|-----------------|------|----|---------|
|               | AM Peak<br>1 | Off Peak<br>2 | PM Peak<br>3 | Night<br>4 | Weekend<br>5 | AM School<br>11  | PM School<br>12 | Walk | DW | A+R     |
| <b>Cycle</b>  | 80           | 75            | 90           | 60         | 75           | 80               | 75              |      |    |         |
| <b>Offset</b> | 74           | 45            | 40           | X          | 45           | 74               | 45              |      |    |         |
| NB Thru       | 42           | 40            | 45           | 32         | 40           | 42               | 40              | 10   | 9  | 3.3+2.1 |
| SB Thru       | 42           | 40            | 45           | 32         | 40           | 42               | 40              | 10   | 9  | 3.3+2.1 |
| EB Thru       | 38           | 35            | 45           | 28         | 35           | 38               | 35              | 10   | 15 | 3.3+2.3 |
| WB Thru       | 38           | 35            | 45           | 28         | 35           | 38               | 35              | 10   | 15 | 3.3+2.3 |

## Phasing Sequence‡

Plan: 1, 2, 3, 4, 5



Plan: 11, 12



## Schedule

### Weekday

| Time  | Plan |
|-------|------|
| 0:15  | 4    |
| 6:30  | 1    |
| 7:45  | 11   |
| 8:15  | 1    |
| 9:30  | 2    |
| 14:15 | 12   |
| 15:00 | 3    |
| 18:30 | 2    |
| 22:30 | 4    |

### Saturday

| Time  | Plan |
|-------|------|
| 0:15  | 4    |
| 6:30  | 2    |
| 9:00  | 5    |
| 18:30 | 2    |
| 22:30 | 4    |

### Sunday

| Time  | Plan |
|-------|------|
| 0:15  | 4    |
| 6:30  | 2    |
| 9:00  | 5    |
| 18:00 | 2    |
| 22:30 | 4    |

## Notes

†: Time for each direction includes amber and all red intervals

‡: Start of first phase should be used as reference point for offset

Asterisk (\*) Indicates actuated phase

(fp): Fully Protected Left Turn

◀.....▶ Pedestrian signal

Cost is \$56.50 (\$50 + HST)

## **APPENDIX E**

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### Collision Records



# City Operations - Transportation Services

## Collision Details Report - Public Version

**From:** January 1, 2013 **To:** December 31, 2017

**Location:** BYRON AVE @ CHURCHILL AVE

**Traffic Control:** Traffic signal

**Total Collisions:** 8

| Date/Day/Time          | Environment | Impact Type      | Classification | Surface Cond'n       | Veh. Dir | Vehicle Manoeuver   | Vehicle type              | First Event         | No. Ped |
|------------------------|-------------|------------------|----------------|----------------------|----------|---------------------|---------------------------|---------------------|---------|
| 2014-Jul-25, Fri,15:29 | Clear       | Other            | P.D. only      | Loose sand or gravel | North    | Reversing           | Construction equipment    | Other motor vehicle |         |
|                        |             |                  |                |                      | North    | Stopped             | Pick-up truck             | Other motor vehicle |         |
| 2014-Oct-02, Thu,10:57 | Clear       | Rear end         | P.D. only      | Dry                  | South    | Going ahead         | Automobile, station wagon | Other motor vehicle |         |
|                        |             |                  |                |                      | South    | Slowing or stopping | Automobile, station wagon | Other motor vehicle |         |
| 2015-Jan-29, Thu,16:00 | Clear       | Angle            | P.D. only      | Ice                  | North    | Turning right       | Pick-up truck             | Skidding/sliding    |         |
|                        |             |                  |                |                      | West     | Stopped             | Pick-up truck             | Other motor vehicle |         |
| 2015-Jun-09, Tue,10:04 | Rain        | Rear end         | P.D. only      | Wet                  | North    | Slowing or stopping | Automobile, station wagon | Other motor vehicle |         |
|                        |             |                  |                |                      | North    | Stopped             | Automobile, station wagon | Other motor vehicle |         |
| 2016-Mar-26, Sat,12:30 | 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-Jun-11, Sat,09:49 | Rain        | Turning movement | P.D. only      | Wet                  | East     | Turning left        | Automobile, station wagon | Other motor vehicle |         |

|                        |       |                  |           |     |       |               |                           |                     |
|------------------------|-------|------------------|-----------|-----|-------|---------------|---------------------------|---------------------|
|                        |       |                  |           |     | West  | Going ahead   | Automobile, station wagon | Other motor vehicle |
|                        |       |                  |           |     | South | Stopped       | Pick-up truck             | Other motor vehicle |
| 2017-Sep-12, Tue,14:43 | Clear | Turning movement | P.D. only | Dry | West  | Turning right | Unknown                   | Cyclist             |
|                        |       |                  |           |     | West  | Going ahead   | Bicycle                   | Other motor vehicle |
| 2013-Jun-11, Tue,13:50 | Rain  | Angle            | P.D. only | Wet | South | Going ahead   | Automobile, station wagon | Other motor vehicle |
|                        |       |                  |           |     | East  | Going ahead   | Automobile, station wagon | Other motor vehicle |

**Location:** BYRON AVE @ HIGHCROFT AVE

**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 |
|------------------------|-------------|-------------|----------------|----------------|----------|-------------------|---------------------------|------------------|---------|
| 2013-Jun-27, Thu,04:16 | Clear       | SMV other   | P.D. only      | Dry            | North    | Going ahead       | Automobile, station wagon | Building or wall |         |

**Location:** CHURCHILL AVE @ RICHMOND RD

**Traffic Control:** Traffic signal

**Total Collisions:** 33

| Date/Day/Time          | Environment | Impact Type | Classification   | Surface Cond'n | Veh. Dir | Vehicle Manoeuver | Vehicle type              | First Event         | No. Ped |
|------------------------|-------------|-------------|------------------|----------------|----------|-------------------|---------------------------|---------------------|---------|
| 2014-Feb-26, Wed,14:52 | Clear       | Angle       | P.D. only        | Dry            | East     | Going ahead       | Automobile, station wagon | Other motor vehicle |         |
|                        |             |             |                  |                | South    | Going ahead       | Automobile, station wagon | Other motor vehicle |         |
| 2014-May-01, Thu,19:54 | Clear       | SMV other   | Non-fatal injury | Dry            | East     | Turning left      | Pick-up truck             | Pedestrian          | 1       |
| 2014-Jun-13, Fri,06:47 | Rain        | Angle       | P.D. only        | Wet            | East     | Going ahead       | Automobile, station wagon | Other motor vehicle |         |
|                        |             |             |                  |                | North    | Going ahead       | Pick-up truck             | Other motor vehicle |         |



|                        |       |                  |           |            |       |                                    |                           |                     |
|------------------------|-------|------------------|-----------|------------|-------|------------------------------------|---------------------------|---------------------|
| 2014-Oct-06, Mon,00:46 | Clear | Angle            | P.D. only | Dry        | South | Going ahead                        | Unknown                   | Other motor vehicle |
|                        |       |                  |           |            | East  | Going ahead                        | Automobile, station wagon | Other motor vehicle |
| 2014-Oct-20, Mon,09:40 | Clear | Sideswipe        | P.D. only | Dry        | North | Going ahead                        | Construction equipment    | Other motor vehicle |
|                        |       |                  |           |            | North | Going ahead                        | Automobile, station wagon | Other motor vehicle |
| 2015-Jan-16, Fri,10:39 | Clear | Angle            | P.D. only | Slush      | West  | Pulling away from shoulder or curb | Automobile, station wagon | Other motor vehicle |
|                        |       |                  |           |            | North | Turning left                       | Automobile, station wagon | Other motor vehicle |
| 2015-Jun-18, Thu,09:14 | Clear | Sideswipe        | P.D. only | Dry        | South | Turning right                      | Truck - tank              | Other motor vehicle |
|                        |       |                  |           |            | South | Turning right                      | Automobile, station wagon | Other motor vehicle |
| 2015-Feb-26, Thu,17:03 | Clear | Angle            | P.D. only | Wet        | East  | Going ahead                        | Automobile, station wagon | Other motor vehicle |
|                        |       |                  |           |            | South | Going ahead                        | Pick-up truck             | Other motor vehicle |
| 2015-Jan-31, Sat,20:21 | Snow  | Turning movement | P.D. only | Loose snow | East  | Turning left                       | Automobile, station wagon | Other motor vehicle |
|                        |       |                  |           |            | West  | Going ahead                        | Automobile, station wagon | Other motor vehicle |
| 2015-Apr-11, Sat,12:34 | Clear | Sideswipe        | P.D. only | Dry        | West  | Changing lanes                     | Automobile, station wagon | Other motor vehicle |
|                        |       |                  |           |            | West  | Turning left                       | Pick-up truck             | Other motor vehicle |

|                        |       |          |                  |     |       |                     |                              |                        |
|------------------------|-------|----------|------------------|-----|-------|---------------------|------------------------------|------------------------|
| 2015-Jul-24, Fri,14:25 | Clear | Rear end | P.D. only        | Dry | East  | Going ahead         | Automobile,<br>station wagon | Other motor<br>vehicle |
|                        |       |          |                  |     | East  | Stopped             | Truck and trailer            | Other motor<br>vehicle |
| 2015-Jan-25, Sun,14:02 | Clear | Rear end | Non-fatal injury | Dry | East  | Turning left        | Pick-up truck                | Other motor<br>vehicle |
|                        |       |          |                  |     | East  | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |
|                        |       |          |                  |     | East  | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |
| 2016-Jun-17, Fri,05:29 | Clear | Angle    | P.D. only        | Dry | East  | Going ahead         | Pick-up truck                | Other motor<br>vehicle |
|                        |       |          |                  |     | South | Going ahead         | Pick-up truck                | Other motor<br>vehicle |
| 2015-Nov-19, Thu,10:56 | Clear | Rear end | P.D. only        | Wet | West  | Unknown             | Unknown                      | Other motor<br>vehicle |
|                        |       |          |                  |     | West  | Stopped             | Pick-up truck                | Other motor<br>vehicle |
| 2015-Oct-03, Sat,11:00 | Clear | Rear end | P.D. only        | Dry | West  | Slowing or stopping | Pick-up truck                | Other motor<br>vehicle |
|                        |       |          |                  |     | West  | Stopped             | Pick-up truck                | Other motor<br>vehicle |
| 2016-Jan-04, Mon,12:08 | Clear | Rear end | P.D. only        | Wet | South | Changing lanes      | Pick-up truck                | Other motor<br>vehicle |
|                        |       |          |                  |     | South | Turning right       | Automobile,<br>station wagon | Other motor<br>vehicle |
| 2016-Aug-07, Sun,12:12 | Clear | Rear end | P.D. only        | Dry | South | Slowing or stopping | Automobile,<br>station wagon | Other motor<br>vehicle |
|                        |       |          |                  |     | South | Stopped             | Pick-up truck                | Other motor<br>vehicle |

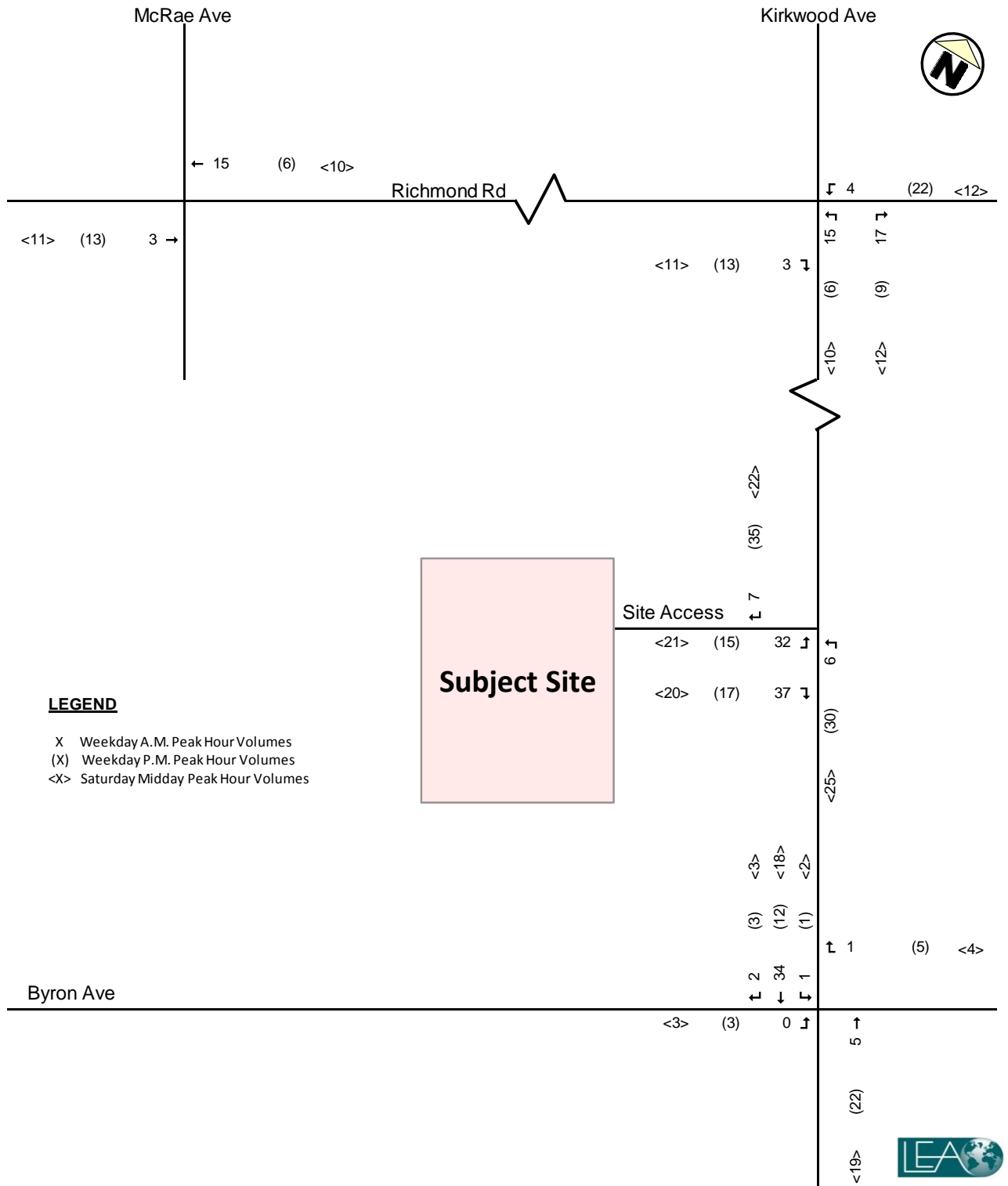
|                        |       |                           |                  |            |         |                     |                              |                        |   |
|------------------------|-------|---------------------------|------------------|------------|---------|---------------------|------------------------------|------------------------|---|
| 2016-Jun-02, Thu,14:22 | Clear | SMV other                 | Non-fatal injury | Dry        | South   | Turning right       | Automobile,<br>station wagon | Pedestrian             | 1 |
| 2017-Sep-06, Wed,00:00 | Clear | SMV unattended<br>vehicle | P.D. only        | Dry        | Unknown | Unknown             | Unknown                      | Unattended<br>vehicle  |   |
| 2017-Jan-28, Sat,15:02 | Snow  | Rear end                  | Non-fatal injury | Wet        | East    | Going ahead         | Automobile,<br>station wagon | Other motor<br>vehicle | 1 |
|                        |       |                           |                  |            | East    | Stopped             | Automobile,<br>station wagon | Other motor<br>vehicle |   |
|                        |       |                           |                  |            | West    | Stopped             | Automobile,<br>station wagon | Other motor<br>vehicle |   |
|                        |       |                           |                  |            | West    | Stopped             | Automobile,<br>station wagon | Other motor<br>vehicle |   |
| 2016-Dec-31, Sat,12:01 | Snow  | SMV other                 | Non-fatal injury | Loose snow | East    | Turning left        | Automobile,<br>station wagon | Pedestrian             | 1 |
| 2016-Aug-13, Sat,00:00 | Clear | SMV unattended<br>vehicle | P.D. only        | Dry        | North   | Unknown             | Unknown                      | Unattended<br>vehicle  |   |
| 2016-Dec-09, Fri,08:40 | Clear | Rear end                  | P.D. only        | Ice        | East    | Slowing or stopping | Automobile,<br>station wagon | Other motor<br>vehicle |   |
|                        |       |                           |                  |            | East    | Stopped             | Automobile,<br>station wagon | Other motor<br>vehicle |   |
| 2017-Sep-26, Tue,19:08 | Clear | Turning movement          | P.D. only        | Dry        | North   | Going ahead         | Pick-up truck                | Other motor<br>vehicle |   |
|                        |       |                           |                  |            | South   | Turning left        | Automobile,<br>station wagon | Other motor<br>vehicle |   |
| 2013-Jan-17, Thu,16:33 | Clear | SMV unattended<br>vehicle | P.D. only        | Dry        | South   | Turning right       | Municipal transit<br>bus     | Unattended<br>vehicle  |   |
| 2013-Feb-16, Sat,10:33 | Clear | SMV other                 | Non-fatal injury | Dry        | North   | Turning right       | Municipal transit<br>bus     | Pedestrian             | 1 |

|                        |       |                        |           |     |       |                                    |                           |                     |
|------------------------|-------|------------------------|-----------|-----|-------|------------------------------------|---------------------------|---------------------|
| 2013-Apr-06, Sat,11:44 | Clear | Rear end               | P.D. only | Dry | East  | Going ahead                        | Unknown                   | Other motor vehicle |
|                        |       |                        |           |     | East  | Going ahead                        | Automobile, station wagon | Other motor vehicle |
| 2013-Jun-13, Thu,13:00 | Clear | Angle                  | P.D. only | Dry | South | Turning right                      | Automobile, station wagon | Other motor vehicle |
|                        |       |                        |           |     | East  | Turning left                       | Automobile, station wagon | Other motor vehicle |
| 2013-Jun-17, Mon,18:52 | Clear | Sideswipe              | P.D. only | Dry | East  | Merging                            | Automobile, station wagon | Other motor vehicle |
|                        |       |                        |           |     | East  | Turning left                       | Municipal transit bus     | Other motor vehicle |
| 2013-Jun-13, Thu,14:30 | Clear | Rear end               | P.D. only | Dry | South | Slowing or stopping                | Pick-up truck             | Other motor vehicle |
|                        |       |                        |           |     | South | Stopped                            | Automobile, station wagon | Other motor vehicle |
| 2013-Jul-28, Sun,12:50 | Clear | SMV unattended vehicle | P.D. only | Dry | South | Turning right                      | Municipal transit bus     | Unattended vehicle  |
| 2013-Aug-28, Wed,15:34 | Clear | Sideswipe              | P.D. only | Dry | South | Merging                            | Pick-up truck             | Other motor vehicle |
|                        |       |                        |           |     | South | Going ahead                        | Pick-up truck             | Other motor vehicle |
| 2013-Sep-24, Tue,11:51 | Clear | Sideswipe              | P.D. only | Dry | East  | Pulling away from shoulder or curb | Automobile, station wagon | Other motor vehicle |
|                        |       |                        |           |     | East  | Going ahead                        | Automobile, station wagon | Other motor vehicle |

## **APPENDIX F**

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Relevant Excerpts from Other Reports



**Figure 3: Site Trips**



## **APPENDIX G**

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### Functional Design of Roadway Modifications

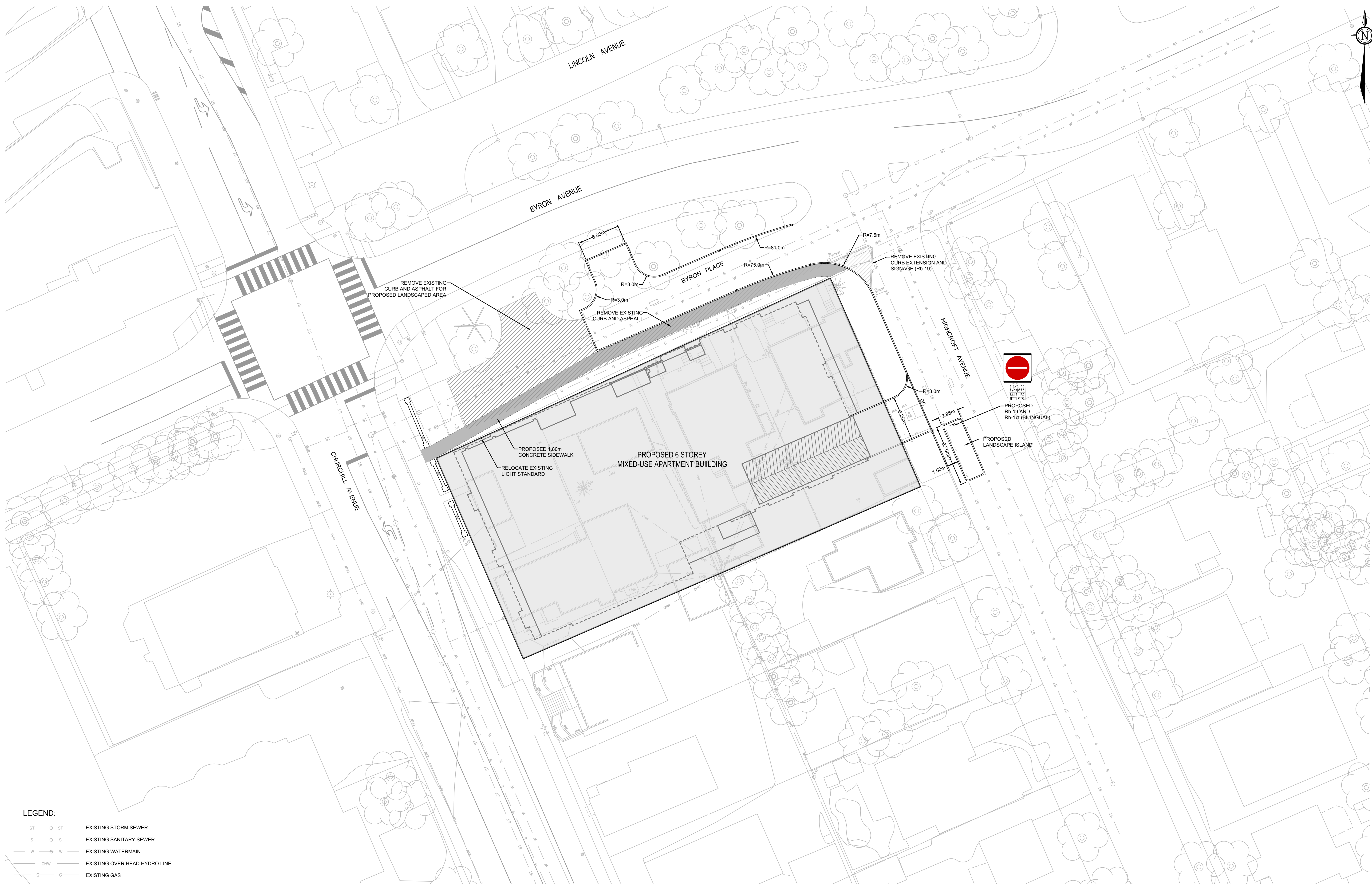


C:\temp\AcPublish\_9944\118024-FD.dwg, 118024-FD, Apr 04, 2019, 4:02pm, rmller

NOTE:  
THE POSITION OF ALL POLE LINES, CONDUITS,  
WATERMAINS, SEWERS AND OTHER  
UNDERGROUND AND OVERGROUND UTILITIES AND  
STRUCTURES IS NOT NECESSARILY SHOWN ON  
THE CONTRACT DRAWINGS, AND WHERE SHOWN,  
THE ACCURACY OF THE POSITION OF SUCH  
UTILITIES AND STRUCTURES IS NOT GUARANTEED.  
BEFORE STARTING WORK, DETERMINE THE EXACT  
LOCATION OF ALL SUCH UTILITIES AND  
STRUCTURES AND ASSUME ALL LIABILITY FOR  
DAMAGE TO THEM.

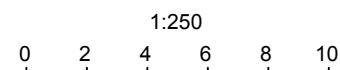
LEGEND:

- ST — ST — EXISTING STORM SEWER  
— S — S — EXISTING SANITARY SEWER  
— W — W — EXISTING WATERMAIN  
— OHW — EXISTING OVER HEAD HYDRO LINE  
— G — G — EXISTING GAS



SCALE

1:250



DESIGN

RCH

CHECKED

BJB

DRAWN

RCH

CHECKED

BJB

APPROVED

JLL

FOR REVIEW ONLY

**NOVATECH**

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Suite 200, 240 Michael Cowpland Drive  
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643  
Facsimile (613) 254-5867  
Website www.novatech-eng.com

LOCATION  
CITY of OTTAWA  
BYRON PLACE AT HIGHCROFT AVENUE

DRAWING NAME  
**FUNCTIONAL DESIGN**

PROJECT No.  
118024

REV  
REV # 1

DRAWING No.  
118024-FD

PLANNING - 04/04/2019 - 04/04/2019



## **APPENDIX H**

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### Transportation Demand Management Checklists

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

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

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

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

| TDM-supportive design & infrastructure measures:<br><i>Residential developments</i> |   | Check if completed &<br>add descriptions, explanations<br>or plan/drawing references              |
|---|---|---|
| <b>2. WALKING &amp; CYCLING: END-OF-TRIP FACILITIES</b>                             |   |   |
| <b>2.1 Bicycle parking</b>  |   |   |
| REQUIRED  | 2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible ( <i>see Official Plan policy 4.3.6</i> )   | <input checked="" type="checkbox"/>   |
| REQUIRED  | 2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas ( <i>see Zoning By-law Section 111</i> )  | <input checked="" type="checkbox"/>   |
| REQUIRED  | 2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored ( <i>see Zoning By-law Section 111</i> )  | <input checked="" type="checkbox"/>   |
| BASIC   | 2.1.4 Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists  | <input type="checkbox"/>  |
| <b>2.2 Secure bicycle parking</b>   |   |   |
| REQUIRED  | 2.2.1 Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers ( <i>see Zoning By-law Section 111</i> ) | <input checked="" type="checkbox"/> Not Applicable (Less than 50 bicycle parking spaces required) |
| BETTER  | 2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments   | <input type="checkbox"/>  |
| <b>2.3 Bicycle repair station</b>   |   |   |
| BETTER  | 2.3.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)  | <input type="checkbox"/>  |
| <b>3. TRANSIT</b>   |   |   |
| <b>3.1 Customer amenities</b>   |   |   |
| BASIC   | 3.1.1 Provide shelters, lighting and benches at any on-site transit stops   | <input type="checkbox"/>  |
| BASIC   | 3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter   | <input type="checkbox"/>  |
| BETTER  | 3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building   | <input type="checkbox"/>  |

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

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

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

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

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



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

## **APPENDIX I**

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### Segment MMLOS Analysis

**Pedestrian Level of Service (PLOS)**

| Sidewalk Width                      | Boulevard Width | Avg. Daily Curb Lane Traffic Volume | Presence of On-Street Parking | Operating Speed | Segment PLOS |
|-------------------------------------|-----------------|-------------------------------------|-------------------------------|-----------------|--------------|
| <b>Churchill Avenue (East Side)</b> |                 |                                     |                               |                 |              |
| 2.0m                                | >2.0m           | >3,000 vpd                          | No                            | 60 km/hr        | C            |
| <b>Churchill Avenue (West Side)</b> |                 |                                     |                               |                 |              |
| 2.0m                                | >2.0m           | >3,000 vpd                          | Yes                           | 60 km/hr        | B            |
| <b>Byron Avenue (North Side)</b>    |                 |                                     |                               |                 |              |
| 2.0m                                | None            | >3,000 vpd                          | No                            | 60 km/hr        | E            |
| <b>Byron Avenue (South Side)</b>    |                 |                                     |                               |                 |              |
| 1.8m                                | None            | <3,000 vpd                          | No                            | 60 km/hr        | C            |

**Bicycle Level of Service (BLOS)**

| Road Class              | Bike Route | Type of Bikeway    | Travel Lanes | Centerline Markings | Operating Speed | Segment BLOS |
|-------------------------|------------|--------------------|--------------|---------------------|-----------------|--------------|
| <b>Churchill Avenue</b> |            |                    |              |                     |                 |              |
| Major Collector         | Spine      | Separated Facility | 2            | Yes                 | 60 km/hr        | A            |
| <b>Byron Avenue</b>     |            |                    |              |                     |                 |              |
| Collector               | Local      | Mixed Traffic      | 2            | Yes                 | 60 km/hr        | F            |

**Transit Level of Service (TLOS)**

| Facility Type    | Level/Exposure to Congestion Delay, Friction and Incidents |          |                    | Segment TLOS |
|------------------|--|----------|--------------------|--------------|
|                  | Congestion   | Friction | Incident Potential |              |
| Churchill Avenue |  |          |                    |              |
| Mixed Traffic    | Yes  | High     | High               | F            |
| Byron Avenue     |  |          |                    |              |
| Mixed Traffic    | Yes  | Low      | Medium             | D            |

**Truck Level of Service (TkLOS)**

| Curb Lane Width         | Number of Travel Lanes<br>(Per Direction) | Segment TkLOS |
|-------------------------|---|---------------|
| <b>Churchill Avenue</b> |   |               |
| >3.7m                   | 1   | B             |
| <b>Byron Avenue</b>     |   |               |
| >3.7m                   | 1   | B             |

**Auto LOS**

| Direction        | Directional Capacity <sup>1</sup> | Traffic Volumes |         | V/C Ratio and LOS |     |         |     | Auto LOS |
|------------------|-----------------------------------|-----------------|---------|-------------------|-----|---------|-----|----------|
|                  |                                   | AM Peak         | PM Peak | AM Peak           |     | PM Peak |     |          |
|                  |                                   |                 |         | v/c               | LOS | v/c     | LOS |          |
| Churchill Avenue |                                   |                 |         |                   |     |         |     |          |
| NB               | 600vph                            | 402             | 425     | 0.67              | B   | 0.71    | C   | C        |
| SB               | 600vph                            | 373             | 477     | 0.62              | B   | 0.80    | C   |          |
| Byron Avenue     |                                   |                 |         |                   |     |         |     |          |
| EB               | 600vph                            | 250             | 259     | 0.41              | A   | 0.43    | A   | D        |
| WB               | 600vph                            | 246             | 530     | 0.41              | A   | 0.88    | D   |          |

1. Typical lane capacity based on the City's guidelines for the TRANS long-range transportation model

## Segment MMLOS Summary

| Segment    |  | Churchill Avenue East | Avenue West | Byron Avenue North | Avenue South |
|------------|--|-----------------------|-------------|--------------------|--------------|
| Pedestrian | Sidewalk Width                         | 2.0m                  | 2.0m        | 2.0m               | 2.0m         |
|            | Boulevard Width                        | >2.0m                 | >2.0m       | None               | None         |
|            | Average Daily Curb Lane Traffic Volume | >3000vpd              | >3000vpd    | >3000vpd           | <3000vpd     |
|            | On-Street Parking                      | No                    | Yes         | No                 | No           |
|            | Operating Speed                        | 60 km/h               | 60 km/h     | 60 km/hr           | 60 km/hr     |
|            | Level of Service                       | C                     | B           | E                  | C            |
|            | Target                                 | C                     |             |                    |              |
| Cyclist    | Road Classification                    | Major Collector       |             | Collector          |              |
|            | Bike Route Classification              | Spine                 |             | Local              |              |
|            | Type of Bikeway                        | Separated Facility    |             | Mixed Traffic      |              |
|            | Travel Lanes                           | 2                     |             | 2                  |              |
|            | Centerline Markings                    | Yes                   |             | Yes                |              |
|            | Operating Speed                        | 60 km/h               |             | 60 km/hr           |              |
|            | Level of Service                       | A                     |             | F                  |              |
|            | Target                                 | C                     |             | B                  |              |
| Transit    | Facility Type                          | Mixed Traffic         |             | Mixed Traffic      |              |
|            | Friction/Congestion/Incident Potential | Frequent              |             | Limited            |              |
|            | Level of Service                       | F                     |             | D                  |              |
|            | Target                                 | -                     |             |                    |              |
| Truck      | Lane Width                             | >3.7m                 |             | >3.7m              |              |
|            | Travel Lanes (per direction)           | 1                     |             | 1                  |              |
|            | Level of Service                       | B                     |             | B                  |              |
|            | Target                                 | D                     |             | -                  |              |
| Auto       | Volume                                 | 477 vph               |             | 530 vph            |              |
|            | Capacity                               | 600 vph               |             | 600 vph            |              |
|            | Volume to Capacity Ratio               | 0.80                  |             | 0.88               |              |
|            | Level of Service                       | C                     |             | D                  |              |
|            | Target                                 | D                     |             |                    |              |

## STEP 1 of 3 Desirable Cycling Facility Pre-selection Nomograph

Source: MMM, 2013

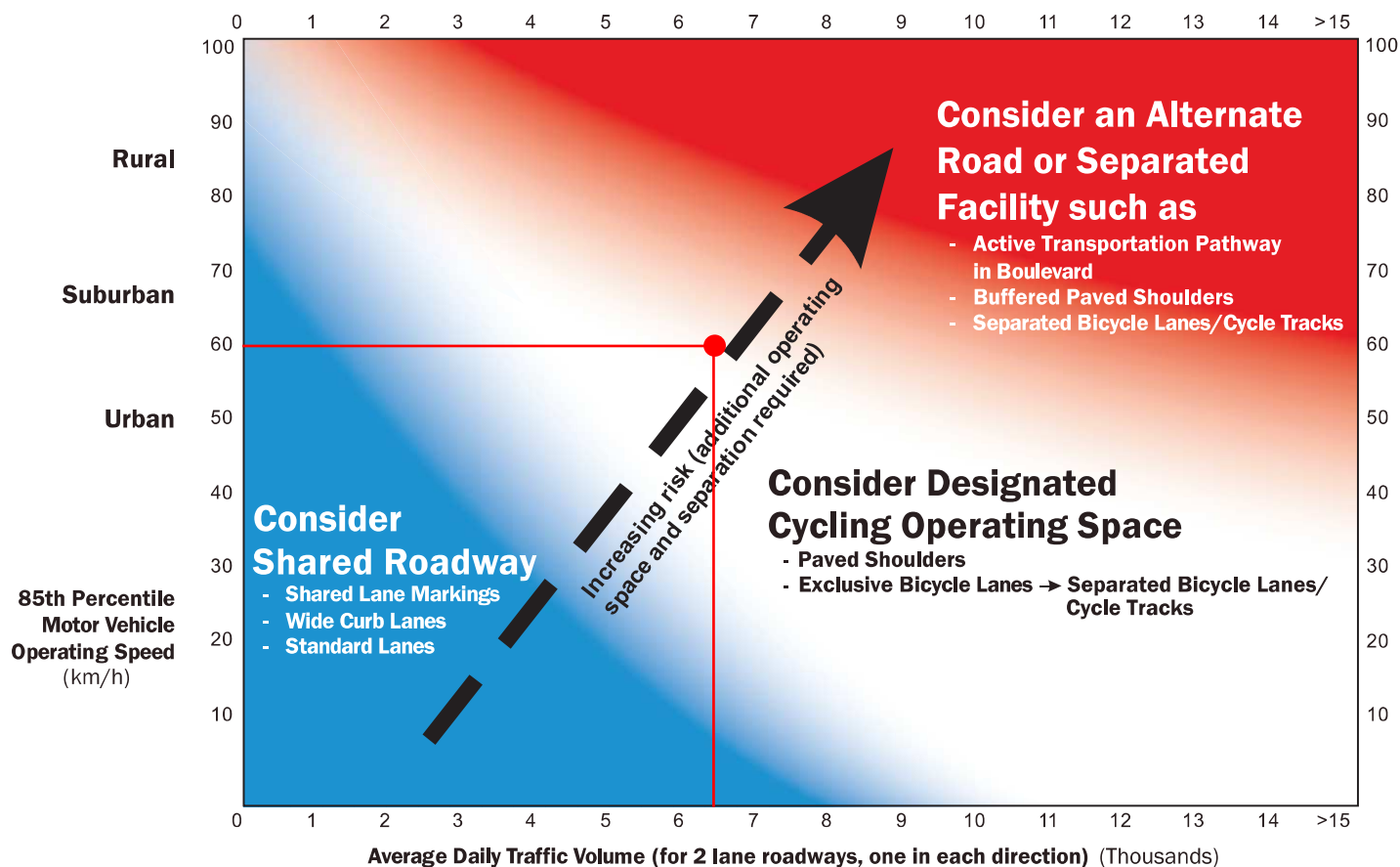


Figure 3.3 – Desirable Bicycle Facility Pre-Selection Nomograph

Footnotes: - This nomograph is the first of a three step bicycle facility selection process, and should not be used by itself as the justification for facility selection (see Steps 2 and 3). The nomograph simply helps practitioners pre-select a desirable cycling facility type, however the context of the situation governs the final decision.

- The nomograph has been adapted for the North American context and is based on international examples and research for two lane roadways. It is, however, still applicable for multi-lane roadways. For these situations, designers should consider the operating speed, total combined traffic volume and traffic mix of the vehicles traveling in the lanes immediately adjacent to the cycling facilities.

- Consider a Separated Facility or an Alternate Road for roadways with an AADT greater than 15,000 vehicles and an operating speed of greater than 50 km/h.

- For rural and suburban locations this nomograph assumes good sightlines are provided for all road users. In urban areas, there are typically more frequent conflict points at driveways, midblock crossings and intersections (especially on multi-lane roads), as well as on road segments with on-street parking. This needs to be considered when assessing risk exposure in urban environments since it will influence the selection of a suitable facility type.

## **APPENDIX J**



















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### Synchro Analysis Reports

3: Churchill Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place













Existing Traffic

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)       | 36  | 171   | 46  | 40  | 142   | 64  | 29  | 331   | 42  | 37  | 287   | 24  |
| Future Volume (vph)        | 36  | 171   | 46  | 40  | 142   | 64  | 29  | 331   | 42  | 37  | 287   | 24  |
| 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   | 15.0  |   | 0.0   | 15.0  |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)           | 7.6   |   |   | 7.6   |   |   | 25.0  |   |   | 25.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            |   | 0.99  |   |   | 0.99  |   | 0.98  | 0.99  |   | 0.98  | 0.99  |   |
| Frt                        |   | 0.975   |   |   | 0.965   |   |   | 0.983   |   |   | 0.988   |   |
| Flt Protected              |   | 0.993   |   |   | 0.992   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1748  | 0   | 0   | 1712  | 0   | 1616  | 1701  | 0   | 1729  | 1705  | 0   |
| Flt Permitted              |   | 0.881   |   |   | 0.850   |   | 0.535   |   |   | 0.484   |   |   |
| Satd. Flow (perm)          | 0   | 1548  | 0   | 0   | 1465  | 0   | 888   | 1701  | 0   | 868   | 1705  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 17  |   |   | 27  |   |   | 11  |   |   | 7   |   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |   | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 207.2   |   |   | 85.0  |   |   | 153.8   |   |   | 123.1   |   |
| Travel Time (s)            |   | 14.9  |   |   | 6.1   |   |   | 11.1  |   |   | 8.9   |   |
| Confl. Peds. (#/hr)        | 14  |   | 8   | 8   |   | 14  | 21  |   | 16  | 16  |   | 21  |
| Confl. Bikes (#/hr)        |   |   | 11  |   |   | 6   |   |   | 14  |   |   | 6   |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Heavy Vehicles (%)         | 0%  | 0%  | 0%  | 0%  | 0%  | 2%  | 7%  | 5%  | 0%  | 0%  | 5%  | 4%  |
| Adj. Flow (vph)            | 40  | 190   | 51  | 44  | 158   | 71  | 32  | 368   | 47  | 41  | 319   | 27  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 281   | 0   | 0   | 273   | 0   | 32  | 415   | 0   | 41  | 346   | 0   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 0.0   |   |   | 0.0   |   |   | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   |
| Detector 1 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Turn Type                  | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   |
| Protected Phases           |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Detector Phase             | 4   | 4   |   | 8   | 8   |   | 2   | 2   |   | 6   | 6   |   |
| Switch Phase               |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)        | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   |
| Minimum Split (s)          | 30.6  | 30.6  |   | 30.6  | 30.6  |   | 25.5  | 25.5  |   | 25.5  | 25.5  |   |
| Total Split (s)            | 38.0  | 38.0  |   | 38.0  | 38.0  |   | 42.0  | 42.0  |   | 42.0  | 42.0  |   |
| Total Split (%)            | 47.5%   | 47.5%   |   | 47.5%   | 47.5%   |   | 52.5%   | 52.5%   |   | 52.5%   | 52.5%   |   |
| Maximum Green (s)          | 32.4  | 32.4  |   | 32.4  | 32.4  |   | 36.6  | 36.6  |   | 36.6  | 36.6  |   |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   |



3: Churchill Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
Existing Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.3   | 2.3   |   | 2.3   | 2.3   |   | 2.1  | 2.1   |   | 2.1   | 2.1   |   |
| Lost Time Adjust (s)    |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Lost Time (s)     |   | 5.6   |   |   | 5.6   |   | 5.4  | 5.4   |   | 5.4   | 5.4   |   |
| 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             | None  | None  |   | None  | None  |   | C-Max  | C-Max   |   | C-Max   | C-Max   |   |
| Walk Time (s)           | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  |   | 10.0  | 10.0  |   |
| Flash Dont Walk (s)     | 15.0  | 15.0  |   | 15.0  | 15.0  |   | 9.0  | 9.0   |   | 9.0   | 9.0   |   |
| Pedestrian Calls (#/hr) | 0   | 0   |   | 0   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Act Effct Green (s)     |   | 18.6  |   |   | 18.6  |   | 50.4   | 50.4  |   | 50.4  | 50.4  |   |
| Actuated g/C Ratio      |   | 0.23  |   |   | 0.23  |   | 0.63   | 0.63  |   | 0.63  | 0.63  |   |
| v/c Ratio               |   | 0.75  |   |   | 0.75  |   | 0.06   | 0.39  |   | 0.08  | 0.32  |   |
| Control Delay           |   | 39.0  |   |   | 38.3  |   | 7.9  | 9.5   |   | 8.0   | 8.9   |   |
| Queue Delay             |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Delay             |   | 39.0  |   |   | 38.3  |   | 7.9  | 9.5   |   | 8.0   | 8.9   |   |
| LOS                     |   | D   |   |   | D   |   | A  | A   |   | A   | A   |   |
| Approach Delay          |   | 39.0  |   |   | 38.3  |   |  | 9.4   |   |   | 8.8   |   |
| Approach LOS            |   | D   |   |   | D   |   |  | A   |   |   | A   |   |
| Queue Length 50th (m)   |   | 37.4  |   |   | 34.9  |   | 1.7  | 26.6  |   | 2.2   | 21.2  |   |
| Queue Length 95th (m)   |   | 55.7  |   |   | 53.6  |   | 6.2  | 55.5  |   | 7.5   | 45.0  |   |
| Internal Link Dist (m)  |   | 183.2   |   |   | 61.0  |   |  | 129.8   |   |   | 99.1  |   |
| Turn Bay Length (m)     |   |   |   |   |   |   | 15.0   |   |   | 15.0  |   |   |
| Base Capacity (vph)     |   | 637   |   |   | 609   |   | 559  | 1074  |   | 546   | 1075  |   |
| 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       |   | 0.44  |   |   | 0.45  |   | 0.06   | 0.39  |   | 0.08  | 0.32  |   |

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 74 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 20.9

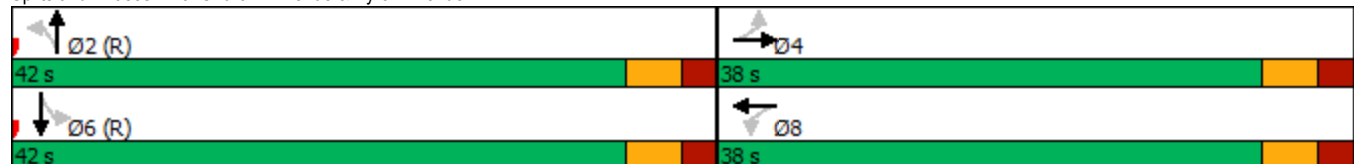
Intersection LOS: C

Intersection Capacity Utilization 62.2%

ICU Level of Service B

Analysis Period (min) 15





















Splits and Phases: 3: Churchill Avenue & Byron Avenue



6: Churchill Avenue & Richmond Rd  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place

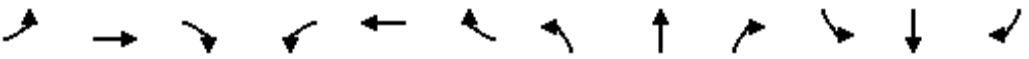
Existing Traffic

|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |  |  |   |  |  |   |  |   |  |   |  |  |
| Traffic Volume (vph)       | 295   | 384   | 37  | 53  | 188   | 21  | 26   | 301   | 103   | 17  | 274   | 139   |
| Future Volume (vph)        | 295   | 384   | 37  | 53  | 188   | 21  | 26   | 301   | 103   | 17  | 274   | 139   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (m)         | 30.0  |   | 0.0   | 25.0  |   | 0.0   | 15.0   |   | 15.0  | 15.0  |   | 15.0  |
| Storage Lanes              | 1   |   | 0   | 1   |   | 0   | 0  |   | 1   | 0   |   | 1   |
| Taper Length (m)           | 45.0  |   |   | 30.0  |   |   | 15.0   |   |   | 15.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            | 0.95  | 0.99  |   | 0.96  | 0.99  |   |  | 1.00  | 0.90  |   | 1.00  | 0.89  |
| Frt                        |   | 0.987   |   |   | 0.985   |   |  |   | 0.850   |   |   | 0.850   |
| Flt Protected              | 0.950   |   |   | 0.950   |   |   |  | 0.996   |   |   | 0.997   |   |
| Satd. Flow (prot)          | 1679  | 1765  | 0   | 1586  | 1690  | 0   | 0  | 1722  | 1517  | 0   | 1706  | 1488  |
| Flt Permitted              | 0.374   |   |   | 0.391   |   |   |  | 0.952   |   |   | 0.966   |   |
| Satd. Flow (perm)          | 629   | 1765  | 0   | 628   | 1690  | 0   | 0  | 1640  | 1369  | 0   | 1650  | 1317  |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 7   |   |   | 7   |   |  |   | 180   |   |   | 180   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |  | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 135.1   |   |   | 164.7   |   |  | 123.1   |   |   | 131.3   |   |
| Travel Time (s)            |   | 9.7   |   |   | 11.9  |   |  | 8.9   |   |   | 9.5   |   |
| Confl. Peds. (#/hr)        | 50  |   | 47  | 47  |   | 50  | 38   |   | 30  | 30  |   | 38  |
| Confl. Bikes (#/hr)        |   |   | 6   |   |   | 4   |  |   | 3   |   |   | 1   |
| 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%  | 1%  | 0%  | 9%  | 5%  | 5%  | 8%   | 5%  | 2%  | 12%   | 6%  | 4%  |
| Adj. Flow (vph)            | 328   | 427   | 41  | 59  | 209   | 23  | 29   | 334   | 114   | 19  | 304   | 154   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 328   | 468   | 0   | 59  | 232   | 0   | 0  | 363   | 114   | 0   | 323   | 154   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No   | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left   | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 3.7   |   |   | 3.7   |   |  | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |  | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06   | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24   |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1  | 2   | 1   | 1   | 2   | 1   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left   | Thru  | Right   | Left  | Thru  | Right   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1  | 30.5  | 6.1   | 6.1   | 30.5  | 6.1   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1  | 1.8   | 6.1   | 6.1   | 1.8   | 6.1   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex  | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   |
| Detector 1 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |  | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |  | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |  | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Turn Type                  | pm+pt   | NA  |   | Perm  | NA  |   | Perm   | NA  | Perm  | Perm  | NA  | Perm  |
| Protected Phases           | 7   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2  |   | 2   | 6   |   | 6   |
| Detector Phase             | 7   | 4   |   | 8   | 8   |   | 2  | 2   | 2   | 6   | 6   | 6   |
| Switch Phase               |   |   |   |   |   |   |  |   |   |   |   |   |
| Minimum Initial (s)        | 5.0   | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  | 10.0  | 10.0  | 10.0  | 10.0  |
| Minimum Split (s)          | 11.1  | 31.1  |   | 31.1  | 31.1  |   | 24.2   | 24.2  | 24.2  | 24.2  | 24.2  | 24.2  |
| Total Split (s)            | 14.0  | 40.1  |   | 31.1  | 31.1  |   | 30.0   | 30.0  | 30.0  | 30.0  | 30.0  | 30.0  |
| Total Split (%)            | 17.5%   | 50.1%   |   | 38.8%   | 38.8%   |   | 37.5%  | 37.5%   | 37.5%   | 37.5%   | 37.5%   | 37.5%   |
| Maximum Green (s)          | 7.9   | 34.0  |   | 25.0  | 25.0  |   | 23.8   | 23.8  | 23.8  | 23.8  | 23.8  | 23.8  |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.6  | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |

| Lane Group                 | Ø1  | Ø3  | Ø5  |
|----------------------------|-----|-----|-----|
| Lane Configurations        |     |     |     |
| Traffic Volume (vph)       |     |     |     |
| Future Volume (vph)        |     |     |     |
| Ideal Flow (vphpl)         |     |     |     |
| Storage Length (m)         |     |     |     |
| Storage Lanes              |     |     |     |
| Taper Length (m)           |     |     |     |
| Lane Util. Factor          |     |     |     |
| Ped Bike Factor            |     |     |     |
| Frt                        |     |     |     |
| Flt Protected              |     |     |     |
| Satd. Flow (prot)          |     |     |     |
| Flt Permitted              |     |     |     |
| Satd. Flow (perm)          |     |     |     |
| Right Turn on Red          |     |     |     |
| Satd. Flow (RTOR)          |     |     |     |
| Link Speed (k/h)           |     |     |     |
| Link Distance (m)          |     |     |     |
| Travel Time (s)            |     |     |     |
| Confl. Peds. (#/hr)        |     |     |     |
| Confl. Bikes (#/hr)        |     |     |     |
| Peak Hour Factor           |     |     |     |
| Heavy Vehicles (%)         |     |     |     |
| Adj. Flow (vph)            |     |     |     |
| Shared Lane Traffic (%)    |     |     |     |
| Lane Group Flow (vph)      |     |     |     |
| Enter Blocked Intersection |     |     |     |
| Lane Alignment             |     |     |     |
| Median Width(m)            |     |     |     |
| Link Offset(m)             |     |     |     |
| Crosswalk Width(m)         |     |     |     |
| Two way Left Turn Lane     |     |     |     |
| Headway Factor             |     |     |     |
| Turning Speed (k/h)        |     |     |     |
| Number of Detectors        |     |     |     |
| Detector Template          |     |     |     |
| Leading Detector (m)       |     |     |     |
| Trailing Detector (m)      |     |     |     |
| Detector 1 Position(m)     |     |     |     |
| Detector 1 Size(m)         |     |     |     |
| Detector 1 Type            |     |     |     |
| Detector 1 Channel         |     |     |     |
| Detector 1 Extend (s)      |     |     |     |
| Detector 1 Queue (s)       |     |     |     |
| Detector 1 Delay (s)       |     |     |     |
| Detector 2 Position(m)     |     |     |     |
| Detector 2 Size(m)         |     |     |     |
| Detector 2 Type            |     |     |     |
| Detector 2 Channel         |     |     |     |
| Detector 2 Extend (s)      |     |     |     |
| Turn Type                  |     |     |     |
| Protected Phases           | 1   | 3   | 5   |
| Permitted Phases           |     |     |     |
| Detector Phase             |     |     |     |
| Switch Phase               |     |     |     |
| Minimum Initial (s)        | 3.0 | 3.0 | 3.0 |
| Minimum Split (s)          | 5.0 | 5.0 | 5.0 |
| Total Split (s)            | 5.0 | 5.0 | 5.0 |
| Total Split (%)            | 6%  | 6%  | 6%  |
| Maximum Green (s)          | 3.0 | 3.0 | 3.0 |
| Yellow Time (s)            | 2.0 | 2.0 | 2.0 |

6: Churchill Avenue & Richmond Rd  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
Existing Traffic

|                         |  |       |     |      |       |     |       |       |       |       |       |       |
|-------------------------|--|-------|-----|------|-------|-----|-------|-------|-------|-------|-------|-------|
| Lane Group              | EBL  | EBT   | EBR | WBL  | WBT   | WBR | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.8  | 2.8   |     | 2.8  | 2.8   |     | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   |
| Lost Time Adjust (s)    | 0.0  | 0.0   |     | 0.0  | 0.0   |     |       | 0.0   | 0.0   |       | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.1  | 6.1   |     | 6.1  | 6.1   |     |       | 6.2   | 6.2   |       | 6.2   | 6.2   |
| Lead/Lag                | Lead   | Lag   |     | Lag  | Lag   |     | Lag   | Lag   | Lag   | Lag   | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes  | Yes   |     | Yes  | Yes   |     | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0  | 3.0   |     | 3.0  | 3.0   |     | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None   | None  |     | None | None  |     | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max |
| Walk Time (s)           |  | 16.0  |     | 16.0 | 16.0  |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     |  | 9.0   |     | 9.0  | 9.0   |     | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   |
| Pedestrian Calls (#/hr) |  | 15    |     | 15   | 15    |     | 15    | 15    | 15    | 15    | 15    | 15    |
| Act Effct Green (s)     | 31.6   | 26.6  |     | 17.6 | 17.6  |     |       | 29.2  | 29.2  |       | 29.2  | 29.2  |
| Actuated g/C Ratio      | 0.39   | 0.33  |     | 0.22 | 0.22  |     |       | 0.36  | 0.36  |       | 0.36  | 0.36  |
| v/c Ratio               | 0.93   | 0.79  |     | 0.43 | 0.62  |     |       | 0.61  | 0.19  |       | 0.54  | 0.26  |
| Control Delay           | 55.1   | 33.8  |     | 34.7 | 33.6  |     |       | 28.0  | 1.6   |       | 25.8  | 3.7   |
| Queue Delay             | 0.0  | 0.0   |     | 0.0  | 0.0   |     |       | 0.0   | 0.0   |       | 0.0   | 0.0   |
| Total Delay             | 55.1   | 33.8  |     | 34.7 | 33.6  |     |       | 28.0  | 1.6   |       | 25.8  | 3.7   |
| LOS                     | E  | C     |     | C    | C     |     |       | C     | A     |       | C     | A     |
| Approach Delay          |  | 42.5  |     |      | 33.8  |     |       | 21.7  |       |       | 18.7  |       |
| Approach LOS            |  | D     |     |      | C     |     |       | C     |       |       | B     |       |
| Queue Length 50th (m)   | 36.7   | 63.0  |     | 7.8  | 31.1  |     |       | 44.6  | 0.0   |       | 38.4  | 0.0   |
| Queue Length 95th (m)   | #62.2  | 83.2  |     | 17.0 | 46.4  |     |       | #87.6 | 3.2   |       | 69.6  | 9.3   |
| Internal Link Dist (m)  |  | 111.1 |     |      | 140.7 |     |       | 99.1  |       |       | 107.3 |       |
| Turn Bay Length (m)     | 30.0   |       |     | 25.0 |       |     |       |       | 15.0  |       |       | 15.0  |
| Base Capacity (vph)     | 351  | 753   |     | 196  | 532   |     |       | 598   | 613   |       | 602   | 594   |
| Starvation Cap Reductn  | 0  | 0     |     | 0    | 0     |     |       | 0     | 0     |       | 0     | 0     |
| Spillback Cap Reductn   | 0  | 0     |     | 0    | 0     |     |       | 0     | 0     |       | 0     | 0     |
| Storage Cap Reductn     | 0  | 0     |     | 0    | 0     |     |       | 0     | 0     |       | 0     | 0     |
| Reduced v/c Ratio       | 0.93   | 0.62  |     | 0.30 | 0.44  |     |       | 0.61  | 0.19  |       | 0.54  | 0.26  |

Intersection Summary

Area Type: Other

Cycle Length: 80.1

Actuated Cycle Length: 80.1

Offset: 43 (54%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 30.8

Intersection LOS: C

Intersection Capacity Utilization 91.2%

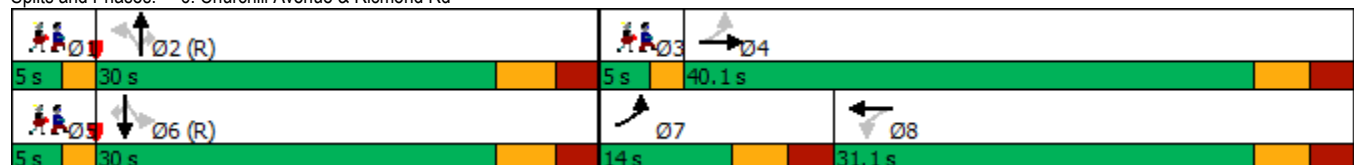
ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.










Splits and Phases: 6: Churchill Avenue & Richmond Rd



| Lane Group              | Ø1   | Ø3   | Ø5   |
|-------------------------|------|------|------|
| All-Red Time (s)        | 0.0  | 0.0  | 0.0  |
| Lost Time Adjust (s)    |      |      |      |
| Total Lost Time (s)     |      |      |      |
| Lead/Lag                | Lead | Lead | Lead |
| Lead-Lag Optimize?      | Yes  | Yes  | Yes  |
| Vehicle Extension (s)   | 3.0  | 3.0  | 3.0  |
| Recall Mode             | Min  | Min  | Min  |
| Walk Time (s)           |      |      |      |
| Flash Dont Walk (s)     |      |      |      |
| Pedestrian Calls (#/hr) |      |      |      |
| Act Effct Green (s)     |      |      |      |
| Actuated g/C Ratio      |      |      |      |
| v/c Ratio               |      |      |      |
| Control Delay           |      |      |      |
| Queue Delay             |      |      |      |
| Total Delay             |      |      |      |
| LOS                     |      |      |      |
| Approach Delay          |      |      |      |
| Approach LOS            |      |      |      |
| Queue Length 50th (m)   |      |      |      |
| Queue Length 95th (m)   |      |      |      |
| Internal Link Dist (m)  |      |      |      |
| Turn Bay Length (m)     |      |      |      |
| Base Capacity (vph)     |      |      |      |
| Starvation Cap Reductn  |      |      |      |
| Spillback Cap Reductn   |      |      |      |
| Storage Cap Reductn     |      |      |      |
| Reduced v/c Ratio       |      |      |      |
| Intersection Summary    |      |      |      |

9: Highcroft Avenue & Byron Avenue  
AM Peak



















433-435 Churchill Avenue and 468-472 Byron Place  
Existing Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 225   | 1   | 2   | 272   | 5   | 20  |
| Future Volume (Veh/h)             | 225   | 1   | 2   | 272   | 5   | 20  |
| Sign Control                      | Free  |   |   | Free  | Stop  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Hourly flow rate (vph)            | 250   | 1   | 2   | 302   | 6   | 22  |
| Pedestrians                       |   |   |   |   | 10  |   |
| Lane Width (m)                    |   |   |   |   | 3.7   |   |
| Walking Speed (m/s)               |   |   |   |   | 1.1   |   |
| Percent Blockage                  |   |   |   |   | 1   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 85  |   |   |   |   |   |
| pX, platoon unblocked             |   |   | 0.93  |   | 0.93  | 0.93  |
| vC, conflicting volume            |   |   | 261   |   | 566   | 260   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                |   |   | 164   |   | 493   | 163   |
| tC, single (s)                    |   |   | 4.1   |   | 6.4   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            |   |   | 2.2   |   | 3.5   | 3.3   |
| p0 queue free %                   |   |   | 100   |   | 99  | 97  |
| cM capacity (veh/h)               |   |   | 1310  |   | 494   | 814   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  |   |   |   |
| Volume Total                      | 251   | 304   | 28  |   |   |   |
| Volume Left                       | 0   | 2   | 6   |   |   |   |
| Volume Right                      | 1   | 0   | 22  |   |   |   |
| cSH                               | 1700  | 1310  | 715   |   |   |   |
| Volume to Capacity                | 0.15  | 0.00  | 0.04  |   |   |   |
| Queue Length 95th (m)             | 0.0   | 0.0   | 0.9   |   |   |   |
| Control Delay (s)                 | 0.0   | 0.1   | 10.2  |   |   |   |
| Lane LOS                          |   | A   | B   |   |   |   |
| Approach Delay (s)                | 0.0   | 0.1   | 10.2  |   |   |   |
| Approach LOS                      |   |   | B   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.5   |   |   |   |
| Intersection Capacity Utilization |   |   | 26.8%   | ICU Level of Service  | A   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

3: Churchill Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

Existing Traffic

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)       | 45  | 137   | 61  | 95  | 360   | 75  | 33  | 298   | 94  | 28  | 321   | 69  |
| Future Volume (vph)        | 45  | 137   | 61  | 95  | 360   | 75  | 33  | 298   | 94  | 28  | 321   | 69  |
| 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   | 15.0  |   | 0.0   | 15.0  |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)           | 7.6   |   |   | 7.6   |   |   | 25.0  |   |   | 25.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            |   | 0.99  |   |   | 0.99  |   | 0.98  | 0.98  |   | 0.99  | 0.99  |   |
| Frt                        |   | 0.966   |   |   | 0.981   |   |   | 0.964   |   |   | 0.973   |   |
| Flt Protected              |   | 0.991   |   |   | 0.991   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1723  | 0   | 0   | 1752  | 0   | 1616  | 1663  | 0   | 1729  | 1667  | 0   |
| Flt Permitted              |   | 0.816   |   |   | 0.874   |   | 0.391   |   |   | 0.390   |   |   |
| Satd. Flow (perm)          | 0   | 1417  | 0   | 0   | 1543  | 0   | 652   | 1663  | 0   | 699   | 1667  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 24  |   |   | 12  |   |   | 22  |   |   | 15  |   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |   | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 207.2   |   |   | 85.0  |   |   | 153.8   |   |   | 123.1   |   |
| Travel Time (s)            |   | 14.9  |   |   | 6.1   |   |   | 11.1  |   |   | 8.9   |   |
| Confl. Peds. (#/hr)        | 14  |   | 8   | 8   |   | 14  | 21  |   | 16  | 16  |   | 21  |
| Confl. Bikes (#/hr)        |   |   | 11  |   |   | 6   |   |   | 14  |   |   | 6   |
| Peak Hour Factor           | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Heavy Vehicles (%)         | 0%  | 0%  | 0%  | 0%  | 0%  | 2%  | 7%  | 5%  | 0%  | 0%  | 5%  | 4%  |
| Adj. Flow (vph)            | 50  | 152   | 68  | 106   | 400   | 83  | 37  | 331   | 104   | 31  | 357   | 77  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 270   | 0   | 0   | 589   | 0   | 37  | 435   | 0   | 31  | 434   | 0   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 0.0   |   |   | 0.0   |   |   | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   |
| Detector 1 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Turn Type                  | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   |
| Protected Phases           |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Detector Phase             | 4   | 4   |   | 8   | 8   |   | 2   | 2   |   | 6   | 6   |   |
| Switch Phase               |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)        | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   |
| Minimum Split (s)          | 30.6  | 30.6  |   | 30.6  | 30.6  |   | 25.5  | 25.5  |   | 25.5  | 25.5  |   |
| Total Split (s)            | 45.0  | 45.0  |   | 45.0  | 45.0  |   | 45.0  | 45.0  |   | 45.0  | 45.0  |   |
| Total Split (%)            | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   |
| Maximum Green (s)          | 39.4  | 39.4  |   | 39.4  | 39.4  |   | 39.6  | 39.6  |   | 39.6  | 39.6  |   |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   |

3: Churchill Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
Existing Traffic

| Lane Group              | EBL  | EBT   | EBR | WBL  | WBT    | WBR | NBL   | NBT   | NBR | SBL   | SBT   | SBR |
|-------------------------|------|-------|-----|------|--------|-----|-------|-------|-----|-------|-------|-----|
| All-Red Time (s)        | 2.3  | 2.3   |     | 2.3  | 2.3    |     | 2.1   | 2.1   |     | 2.1   | 2.1   |     |
| Lost Time Adjust (s)    |      | 0.0   |     |      | 0.0    |     | 0.0   | 0.0   |     | 0.0   | 0.0   |     |
| Total Lost Time (s)     |      | 5.6   |     |      | 5.6    |     | 5.4   | 5.4   |     | 5.4   | 5.4   |     |
| 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             | None | None  |     | None | None   |     | C-Max | C-Max |     | C-Max | C-Max |     |
| Walk Time (s)           | 10.0 | 10.0  |     | 10.0 | 10.0   |     | 10.0  | 10.0  |     | 10.0  | 10.0  |     |
| Flash Dont Walk (s)     | 15.0 | 15.0  |     | 15.0 | 15.0   |     | 9.0   | 9.0   |     | 9.0   | 9.0   |     |
| Pedestrian Calls (#/hr) | 0    | 0     |     | 0    | 0      |     | 0     | 0     |     | 0     | 0     |     |
| Act Effct Green (s)     |      | 36.9  |     |      | 36.9   |     | 42.1  | 42.1  |     | 42.1  | 42.1  |     |
| Actuated g/C Ratio      |      | 0.41  |     |      | 0.41   |     | 0.47  | 0.47  |     | 0.47  | 0.47  |     |
| v/c Ratio               |      | 0.45  |     |      | 0.92   |     | 0.12  | 0.55  |     | 0.09  | 0.55  |     |
| Control Delay           |      | 19.6  |     |      | 46.3   |     | 16.3  | 20.3  |     | 16.0  | 21.7  |     |
| Queue Delay             |      | 0.0   |     |      | 0.0    |     | 0.0   | 0.0   |     | 0.0   | 0.6   |     |
| Total Delay             |      | 19.6  |     |      | 46.3   |     | 16.3  | 20.3  |     | 16.0  | 22.2  |     |
| LOS                     |      | B     |     |      | D      |     | B     | C     |     | B     | C     |     |
| Approach Delay          |      | 19.6  |     |      | 46.3   |     |       | 20.0  |     |       | 21.8  |     |
| Approach LOS            |      | B     |     |      | D      |     |       | B     |     |       | C     |     |
| Queue Length 50th (m)   |      | 28.3  |     |      | 87.7   |     | 3.7   | 52.1  |     | 3.5   | 47.7  |     |
| Queue Length 95th (m)   |      | 48.4  |     |      | #150.4 |     | 9.8   | 81.5  |     | m6.2  | m63.1 |     |
| Internal Link Dist (m)  |      | 183.2 |     |      | 61.0   |     |       | 129.8 |     |       | 99.1  |     |
| Turn Bay Length (m)     |      |       |     |      |        |     | 15.0  |       |     | 15.0  |       |     |
| Base Capacity (vph)     |      | 633   |     |      | 682    |     | 304   | 790   |     | 327   | 788   |     |
| Starvation Cap Reductn  |      | 0     |     |      | 0      |     | 0     | 0     |     | 0     | 111   |     |
| Spillback Cap Reductn   |      | 0     |     |      | 0      |     | 0     | 0     |     | 0     | 0     |     |
| Storage Cap Reductn     |      | 0     |     |      | 0      |     | 0     | 0     |     | 0     | 0     |     |
| Reduced v/c Ratio       |      | 0.43  |     |      | 0.86   |     | 0.12  | 0.55  |     | 0.09  | 0.64  |     |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 40 (44%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 29.0

Intersection LOS: C

Intersection Capacity Utilization 78.6%

ICU Level of Service D

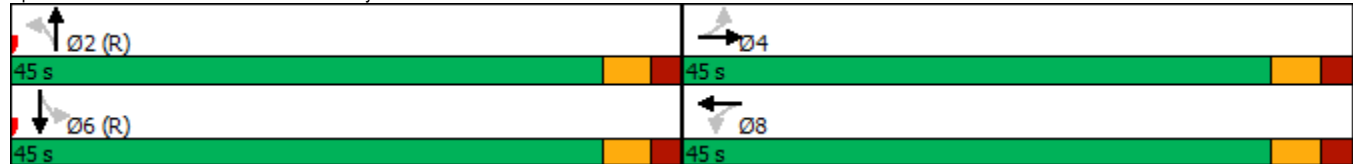
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Churchill Avenue & Byron Avenue

























6: Churchill Avenue & Richmond Rd  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

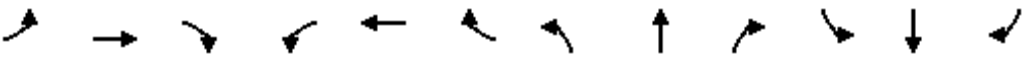
Existing Traffic

|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |  |  |   |  |  |   |  |   |  |   |  |  |
| Traffic Volume (vph)       | 191   | 329   | 55  | 129   | 479   | 25  | 27   | 291   | 67  | 15  | 237   | 312   |
| Future Volume (vph)        | 191   | 329   | 55  | 129   | 479   | 25  | 27   | 291   | 67  | 15  | 237   | 312   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (m)         | 30.0  |   | 0.0   | 25.0  |   | 0.0   | 15.0   |   | 15.0  | 15.0  |   | 15.0  |
| Storage Lanes              | 1   |   | 0   | 1   |   | 0   | 0  |   | 1   | 0   |   | 1   |
| Taper Length (m)           | 45.0  |   |   | 30.0  |   |   | 15.0   |   |   | 15.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            | 0.98  | 0.98  |   | 0.95  | 0.99  |   |  | 1.00  | 0.89  |   | 1.00  | 0.87  |
| Frt                        |   | 0.979   |   |   | 0.992   |   |  |   | 0.850   |   |   | 0.850   |
| Flt Protected              | 0.950   |   |   | 0.950   |   |   |  | 0.996   |   |   | 0.997   |   |
| Satd. Flow (prot)          | 1679  | 1740  | 0   | 1586  | 1710  | 0   | 0  | 1722  | 1517  | 0   | 1706  | 1488  |
| Flt Permitted              | 0.170   |   |   | 0.514   |   |   |  | 0.871   |   |   | 0.821   |   |
| Satd. Flow (perm)          | 294   | 1740  | 0   | 818   | 1710  | 0   | 0  | 1499  | 1354  | 0   | 1402  | 1300  |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 15  |   |   | 4   |   |  |   | 160   |   |   | 186   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |  | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 135.1   |   |   | 164.7   |   |  | 123.1   |   |   | 131.3   |   |
| Travel Time (s)            |   | 9.7   |   |   | 11.9  |   |  | 8.9   |   |   | 9.5   |   |
| Confl. Peds. (#/hr)        | 50  |   | 47  | 47  |   | 50  | 38   |   | 30  | 30  |   | 38  |
| Confl. Bikes (#/hr)        |   |   | 6   |   |   | 4   |  |   | 3   |   |   | 1   |
| 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%  | 1%  | 0%  | 9%  | 5%  | 5%  | 8%   | 5%  | 2%  | 12%   | 6%  | 4%  |
| Adj. Flow (vph)            | 212   | 366   | 61  | 143   | 532   | 28  | 30   | 323   | 74  | 17  | 263   | 347   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 212   | 427   | 0   | 143   | 560   | 0   | 0  | 353   | 74  | 0   | 280   | 347   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No   | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left   | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 3.7   |   |   | 3.7   |   |  | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |  | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06   | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24   |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1  | 2   | 1   | 1   | 2   | 1   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left   | Thru  | Right   | Left  | Thru  | Right   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1  | 30.5  | 6.1   | 6.1   | 30.5  | 6.1   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1  | 1.8   | 6.1   | 6.1   | 1.8   | 6.1   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex  | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   |
| Detector 1 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |  | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |  | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |  | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Turn Type                  | pm+pt   | NA  |   | Perm  | NA  |   | Perm   | NA  | Perm  | Perm  | NA  | Perm  |
| Protected Phases           | 7   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2  |   | 2   | 6   |   | 6   |
| Detector Phase             | 7   | 4   |   | 8   | 8   |   | 2  | 2   | 2   | 6   | 6   | 6   |
| Switch Phase               |   |   |   |   |   |   |  |   |   |   |   |   |
| Minimum Initial (s)        | 5.0   | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  | 10.0  | 10.0  | 10.0  | 10.0  |
| Minimum Split (s)          | 11.1  | 31.1  |   | 31.1  | 31.1  |   | 24.2   | 24.2  | 24.2  | 24.2  | 24.2  | 24.2  |
| Total Split (s)            | 15.0  | 55.0  |   | 45.0  | 45.0  |   | 25.0   | 25.0  | 25.0  | 25.0  | 25.0  | 25.0  |
| Total Split (%)            | 16.7%   | 61.1%   |   | 50.0%   | 50.0%   |   | 27.8%  | 27.8%   | 27.8%   | 27.8%   | 27.8%   | 27.8%   |
| Maximum Green (s)          | 8.9   | 48.9  |   | 38.9  | 38.9  |   | 18.8   | 18.8  | 18.8  | 18.8  | 18.8  | 18.8  |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.6  | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |

| Lane Group                 | Ø1  | Ø3  | Ø5  |
|----------------------------|-----|-----|-----|
| Lane Configurations        |     |     |     |
| Traffic Volume (vph)       |     |     |     |
| Future Volume (vph)        |     |     |     |
| Ideal Flow (vphpl)         |     |     |     |
| Storage Length (m)         |     |     |     |
| Storage Lanes              |     |     |     |
| Taper Length (m)           |     |     |     |
| Lane Util. Factor          |     |     |     |
| Ped Bike Factor            |     |     |     |
| Frt                        |     |     |     |
| Flt Protected              |     |     |     |
| Satd. Flow (prot)          |     |     |     |
| Flt Permitted              |     |     |     |
| Satd. Flow (perm)          |     |     |     |
| Right Turn on Red          |     |     |     |
| Satd. Flow (RTOR)          |     |     |     |
| Link Speed (k/h)           |     |     |     |
| Link Distance (m)          |     |     |     |
| Travel Time (s)            |     |     |     |
| Confl. Peds. (#/hr)        |     |     |     |
| Confl. Bikes (#/hr)        |     |     |     |
| Peak Hour Factor           |     |     |     |
| Heavy Vehicles (%)         |     |     |     |
| Adj. Flow (vph)            |     |     |     |
| Shared Lane Traffic (%)    |     |     |     |
| Lane Group Flow (vph)      |     |     |     |
| Enter Blocked Intersection |     |     |     |
| Lane Alignment             |     |     |     |
| Median Width(m)            |     |     |     |
| Link Offset(m)             |     |     |     |
| Crosswalk Width(m)         |     |     |     |
| Two way Left Turn Lane     |     |     |     |
| Headway Factor             |     |     |     |
| Turning Speed (k/h)        |     |     |     |
| Number of Detectors        |     |     |     |
| Detector Template          |     |     |     |
| Leading Detector (m)       |     |     |     |
| Trailing Detector (m)      |     |     |     |
| Detector 1 Position(m)     |     |     |     |
| Detector 1 Size(m)         |     |     |     |
| Detector 1 Type            |     |     |     |
| Detector 1 Channel         |     |     |     |
| Detector 1 Extend (s)      |     |     |     |
| Detector 1 Queue (s)       |     |     |     |
| Detector 1 Delay (s)       |     |     |     |
| Detector 2 Position(m)     |     |     |     |
| Detector 2 Size(m)         |     |     |     |
| Detector 2 Type            |     |     |     |
| Detector 2 Channel         |     |     |     |
| Detector 2 Extend (s)      |     |     |     |
| Turn Type                  |     |     |     |
| Protected Phases           | 1   | 3   | 5   |
| Permitted Phases           |     |     |     |
| Detector Phase             |     |     |     |
| Switch Phase               |     |     |     |
| Minimum Initial (s)        | 3.0 | 3.0 | 3.0 |
| Minimum Split (s)          | 5.0 | 5.0 | 5.0 |
| Total Split (s)            | 5.0 | 5.0 | 5.0 |
| Total Split (%)            | 6%  | 6%  | 6%  |
| Maximum Green (s)          | 3.0 | 3.0 | 3.0 |
| Yellow Time (s)            | 2.0 | 2.0 | 2.0 |

6: Churchill Avenue & Richmond Rd  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
Existing Traffic

|                         |  |       |     |      |       |     |       |         |       |       |       |       |
|-------------------------|--|-------|-----|------|-------|-----|-------|---------|-------|-------|-------|-------|
| Lane Group              | EBL  | EBT   | EBR | WBL  | WBT   | WBR | NBL   | NBT     | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.8  | 2.8   |     | 2.8  | 2.8   |     | 2.6   | 2.6     | 2.6   | 2.6   | 2.6   | 2.6   |
| Lost Time Adjust (s)    | 0.0  | 0.0   |     | 0.0  | 0.0   |     |       | 0.0     | 0.0   |       | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.1  | 6.1   |     | 6.1  | 6.1   |     |       | 6.2     | 6.2   |       | 6.2   | 6.2   |
| Lead/Lag                | Lead   | Lag   |     | Lag  | Lag   |     | Lag   | Lag     | Lag   | Lag   | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes  | Yes   |     | Yes  | Yes   |     | Yes   | Yes     | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0  | 3.0   |     | 3.0  | 3.0   |     | 3.0   | 3.0     | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None   | None  |     | None | None  |     | C-Max | C-Max   | C-Max | C-Max | C-Max | C-Max |
| Walk Time (s)           |  | 16.0  |     | 16.0 | 16.0  |     | 7.0   | 7.0     | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     |  | 9.0   |     | 9.0  | 9.0   |     | 9.0   | 9.0     | 9.0   | 9.0   | 9.0   | 9.0   |
| Pedestrian Calls (#/hr) |  | 15    |     | 15   | 15    |     | 15    | 15      | 15    | 15    | 15    | 15    |
| Act Effct Green (s)     | 49.2   | 44.2  |     | 34.2 | 34.2  |     |       | 22.0    | 22.0  |       | 22.0  | 22.0  |
| Actuated g/C Ratio      | 0.55   | 0.49  |     | 0.38 | 0.38  |     |       | 0.24    | 0.24  |       | 0.24  | 0.24  |
| v/c Ratio               | 0.71   | 0.50  |     | 0.46 | 0.86  |     |       | 0.96    | 0.16  |       | 0.82  | 0.76  |
| Control Delay           | 24.9   | 16.3  |     | 25.1 | 39.1  |     |       | 72.2    | 4.7   |       | 55.2  | 27.9  |
| Queue Delay             | 0.0  | 0.0   |     | 0.0  | 0.0   |     |       | 0.0     | 0.0   |       | 0.0   | 0.0   |
| Total Delay             | 24.9   | 16.3  |     | 25.1 | 39.1  |     |       | 72.2    | 4.7   |       | 55.2  | 27.9  |
| LOS                     | C  | B     |     | C    | D     |     |       | E       | A     |       | E     | C     |
| Approach Delay          |  | 19.1  |     |      | 36.2  |     |       | 60.5    |       |       | 40.1  |       |
| Approach LOS            |  | B     |     |      | D     |     |       | E       |       |       | D     |       |
| Queue Length 50th (m)   | 16.9   | 43.5  |     | 17.5 | 83.6  |     |       | ~71.9   | 1.0   |       | 47.9  | 26.9  |
| Queue Length 95th (m)   | #28.6  | 62.2  |     | 32.4 | 119.2 |     |       | m#119.2 | m4.5  |       | #95.4 | #73.5 |
| Internal Link Dist (m)  |  | 111.1 |     |      | 140.7 |     |       | 99.1    |       |       | 107.3 |       |
| Turn Bay Length (m)     | 30.0   |       |     | 25.0 |       |     |       |         | 15.0  |       |       | 15.0  |
| Base Capacity (vph)     | 297  | 952   |     | 353  | 741   |     |       | 366     | 452   |       | 342   | 458   |
| Starvation Cap Reductn  | 0  | 0     |     | 0    | 0     |     |       | 0       | 0     |       | 0     | 0     |
| Spillback Cap Reductn   | 0  | 0     |     | 0    | 0     |     |       | 0       | 0     |       | 0     | 0     |
| Storage Cap Reductn     | 0  | 0     |     | 0    | 0     |     |       | 0       | 0     |       | 0     | 0     |
| Reduced v/c Ratio       | 0.71   | 0.45  |     | 0.41 | 0.76  |     |       | 0.96    | 0.16  |       | 0.82  | 0.76  |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 37.0

Intersection LOS: D

Intersection Capacity Utilization 91.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

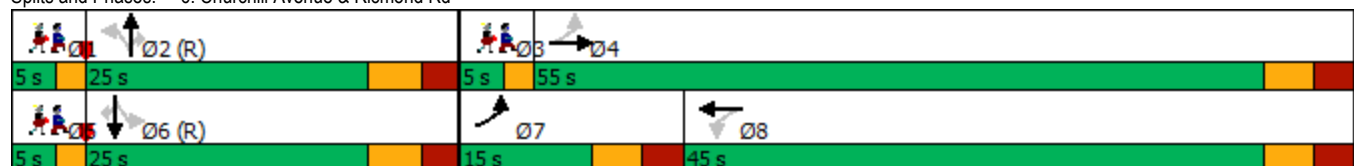
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.










Splits and Phases: 6: Churchill Avenue & Richmond Rd



| Lane Group              | Ø1   | Ø3   | Ø5   |
|-------------------------|------|------|------|
| All-Red Time (s)        | 0.0  | 0.0  | 0.0  |
| Lost Time Adjust (s)    |      |      |      |
| Total Lost Time (s)     |      |      |      |
| Lead/Lag                | Lead | Lead | Lead |
| Lead-Lag Optimize?      | Yes  | Yes  | Yes  |
| Vehicle Extension (s)   | 3.0  | 3.0  | 3.0  |
| Recall Mode             | Min  | Min  | Min  |
| Walk Time (s)           |      |      |      |
| Flash Dont Walk (s)     |      |      |      |
| Pedestrian Calls (#/hr) |      |      |      |
| Act Effct Green (s)     |      |      |      |
| Actuated g/C Ratio      |      |      |      |
| v/c Ratio               |      |      |      |
| Control Delay           |      |      |      |
| Queue Delay             |      |      |      |
| Total Delay             |      |      |      |
| LOS                     |      |      |      |
| Approach Delay          |      |      |      |
| Approach LOS            |      |      |      |
| Queue Length 50th (m)   |      |      |      |
| Queue Length 95th (m)   |      |      |      |
| Internal Link Dist (m)  |      |      |      |
| Turn Bay Length (m)     |      |      |      |
| Base Capacity (vph)     |      |      |      |
| Starvation Cap Reductn  |      |      |      |
| Spillback Cap Reductn   |      |      |      |
| Storage Cap Reductn     |      |      |      |
| Reduced v/c Ratio       |      |      |      |
| Intersection Summary    |      |      |      |



















9: Highcroft Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
Existing Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 233   | 0   | 1   | 589   | 1   | 8   |
| Future Volume (Veh/h)             | 233   | 0   | 1   | 589   | 1   | 8   |
| Sign Control                      | Free  |   |   | Free  | Stop  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  | 0.90  |
| Hourly flow rate (vph)            | 259   | 0   | 1   | 654   | 1   | 9   |
| Pedestrians                       |   |   |   |   | 10  |   |
| Lane Width (m)                    |   |   |   |   | 3.7   |   |
| Walking Speed (m/s)               |   |   |   |   | 1.1   |   |
| Percent Blockage                  |   |   |   |   | 1   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 85  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |
| vC, conflicting volume            |   |   | 269   |   | 925   | 269   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                |   |   | 269   |   | 925   | 269   |
| tC, single (s)                    |   |   | 4.1   |   | 6.4   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            |   |   | 2.2   |   | 3.5   | 3.3   |
| p0 queue free %                   |   |   | 100   |   | 100   | 99  |
| cM capacity (veh/h)               |   |   | 1294  |   | 298   | 767   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  |   |   |   |
| Volume Total                      | 259   | 655   | 10  |   |   |   |
| Volume Left                       | 0   | 1   | 1   |   |   |   |
| Volume Right                      | 0   | 0   | 9   |   |   |   |
| cSH                               | 1700  | 1294  | 663   |   |   |   |
| Volume to Capacity                | 0.15  | 0.00  | 0.02  |   |   |   |
| Queue Length 95th (m)             | 0.0   | 0.0   | 0.3   |   |   |   |
| Control Delay (s)                 | 0.0   | 0.0   | 10.5  |   |   |   |
| Lane LOS                          |   | A   | B   |   |   |   |
| Approach Delay (s)                | 0.0   | 0.0   | 10.5  |   |   |   |
| Approach LOS                      |   |   | B   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.1   |   |   |   |
| Intersection Capacity Utilization |   |   | 43.6%   | ICU Level of Service  |   | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |













3: Churchill Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)       | 36  | 171   | 46  | 40  | 142   | 64  | 29  | 331   | 42  | 37  | 287   | 24  |
| Future Volume (vph)        | 36  | 171   | 46  | 40  | 142   | 64  | 29  | 331   | 42  | 37  | 287   | 24  |
| 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   | 15.0  |   | 0.0   | 15.0  |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)           | 7.6   |   |   | 7.6   |   |   | 25.0  |   |   | 25.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            |   | 0.99  |   |   | 0.99  |   | 0.97  | 0.99  |   | 0.98  | 0.99  |   |
| Frt                        |   | 0.975   |   |   | 0.965   |   |   | 0.983   |   |   | 0.988   |   |
| Flt Protected              |   | 0.993   |   |   | 0.992   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1748  | 0   | 0   | 1712  | 0   | 1616  | 1701  | 0   | 1729  | 1705  | 0   |
| Flt Permitted              |   | 0.889   |   |   | 0.857   |   | 0.566   |   |   | 0.519   |   |   |
| Satd. Flow (perm)          | 0   | 1562  | 0   | 0   | 1477  | 0   | 938   | 1701  | 0   | 929   | 1705  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 17  |   |   | 27  |   |   | 11  |   |   | 7   |   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |   | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 207.2   |   |   | 85.0  |   |   | 153.8   |   |   | 123.1   |   |
| Travel Time (s)            |   | 14.9  |   |   | 6.1   |   |   | 11.1  |   |   | 8.9   |   |
| Confl. Peds. (#/hr)        | 14  |   | 8   | 8   |   | 14  | 21  |   | 16  | 16  |   | 21  |
| Confl. Bikes (#/hr)        |   |   | 11  |   |   | 6   |   |   | 14  |   |   | 6   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 0%  | 0%  | 0%  | 0%  | 0%  | 2%  | 7%  | 5%  | 0%  | 0%  | 5%  | 4%  |
| Adj. Flow (vph)            | 36  | 171   | 46  | 40  | 142   | 64  | 29  | 331   | 42  | 37  | 287   | 24  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 253   | 0   | 0   | 246   | 0   | 29  | 373   | 0   | 37  | 311   | 0   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 0.0   |   |   | 0.0   |   |   | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   |
| Detector 1 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Turn Type                  | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   |
| Protected Phases           |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Detector Phase             | 4   | 4   |   | 8   | 8   |   | 2   | 2   |   | 6   | 6   |   |
| Switch Phase               |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)        | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   |
| Minimum Split (s)          | 30.6  | 30.6  |   | 30.6  | 30.6  |   | 25.5  | 25.5  |   | 25.5  | 25.5  |   |
| Total Split (s)            | 38.0  | 38.0  |   | 38.0  | 38.0  |   | 42.0  | 42.0  |   | 42.0  | 42.0  |   |
| Total Split (%)            | 47.5%   | 47.5%   |   | 47.5%   | 47.5%   |   | 52.5%   | 52.5%   |   | 52.5%   | 52.5%   |   |
| Maximum Green (s)          | 32.4  | 32.4  |   | 32.4  | 32.4  |   | 36.6  | 36.6  |   | 36.6  | 36.6  |   |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   |

3: Churchill Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.3   | 2.3   |   | 2.3   | 2.3   |   | 2.1  | 2.1   |   | 2.1   | 2.1   |   |
| Lost Time Adjust (s)    |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Lost Time (s)     |   | 5.6   |   |   | 5.6   |   | 5.4  | 5.4   |   | 5.4   | 5.4   |   |
| 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             | None  | None  |   | None  | None  |   | C-Max  | C-Max   |   | C-Max   | C-Max   |   |
| Walk Time (s)           | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  |   | 10.0  | 10.0  |   |
| Flash Dont Walk (s)     | 15.0  | 15.0  |   | 15.0  | 15.0  |   | 9.0  | 9.0   |   | 9.0   | 9.0   |   |
| Pedestrian Calls (#/hr) | 0   | 0   |   | 0   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Act Effct Green (s)     |   | 17.1  |   |   | 17.1  |   | 51.9   | 51.9  |   | 51.9  | 51.9  |   |
| Actuated g/C Ratio      |   | 0.21  |   |   | 0.21  |   | 0.65   | 0.65  |   | 0.65  | 0.65  |   |
| v/c Ratio               |   | 0.73  |   |   | 0.73  |   | 0.05   | 0.34  |   | 0.06  | 0.28  |   |
| Control Delay           |   | 38.9  |   |   | 38.1  |   | 7.0  | 8.2   |   | 7.1   | 7.7   |   |
| Queue Delay             |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Delay             |   | 38.9  |   |   | 38.1  |   | 7.0  | 8.2   |   | 7.1   | 7.7   |   |
| LOS                     |   | D   |   |   | D   |   | A  | A   |   | A   | A   |   |
| Approach Delay          |   | 38.9  |   |   | 38.1  |   |  | 8.1   |   |   | 7.6   |   |
| Approach LOS            |   | D   |   |   | D   |   |  | A   |   |   | A   |   |
| Queue Length 50th (m)   |   | 33.5  |   |   | 31.1  |   | 1.4  | 21.5  |   | 1.8   | 17.4  |   |
| Queue Length 95th (m)   |   | 51.5  |   |   | 49.2  |   | 5.3  | 45.5  |   | 6.4   | 37.3  |   |
| Internal Link Dist (m)  |   | 183.2   |   |   | 61.0  |   |  | 129.8   |   |   | 99.1  |   |
| Turn Bay Length (m)     |   |   |   |   |   |   | 15.0   |   |   | 15.0  |   |   |
| Base Capacity (vph)     |   | 642   |   |   | 614   |   | 608  | 1106  |   | 602   | 1108  |   |
| 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       |   | 0.39  |   |   | 0.40  |   | 0.05   | 0.34  |   | 0.06  | 0.28  |   |

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 74 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 20.1

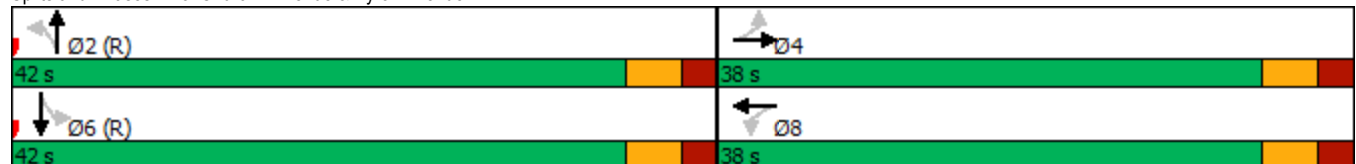
Intersection LOS: C

Intersection Capacity Utilization 62.2%

ICU Level of Service B





















Analysis Period (min) 15

Splits and Phases: 3: Churchill Avenue & Byron Avenue



6: Churchill Avenue & Richmond Rd  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic













|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |  |  |   |  |  |   |  |  |  |   |  |  |
| Traffic Volume (vph)       | 295   | 387   | 37  | 53  | 203   | 21  | 26   | 301   | 103   | 17  | 274   | 139   |
| Future Volume (vph)        | 295   | 387   | 37  | 53  | 203   | 21  | 26   | 301   | 103   | 17  | 274   | 139   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (m)         | 30.0  |   | 0.0   | 25.0  |   | 0.0   | 15.0   |   | 15.0  | 15.0  |   | 15.0  |
| Storage Lanes              | 1   |   | 0   | 1   |   | 0   | 0  |   | 1   | 0   |   | 1   |
| Taper Length (m)           | 45.0  |   |   | 30.0  |   |   | 15.0   |   |   | 15.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            | 0.95  | 0.99  |   | 0.96  | 0.99  |   |  | 1.00  | 0.90  |   | 1.00  | 0.89  |
| Frt                        |   | 0.987   |   |   | 0.986   |   |  |   | 0.850   |   |   | 0.850   |
| Flt Protected              | 0.950   |   |   | 0.950   |   |   |  | 0.996   |   |   | 0.997   |   |
| Satd. Flow (prot)          | 1679  | 1765  | 0   | 1586  | 1693  | 0   | 0  | 1722  | 1517  | 0   | 1706  | 1488  |
| Flt Permitted              | 0.373   |   |   | 0.462   |   |   |  | 0.957   |   |   | 0.970   |   |
| Satd. Flow (perm)          | 626   | 1765  | 0   | 739   | 1693  | 0   | 0  | 1648  | 1369  | 0   | 1656  | 1317  |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 7   |   |   | 7   |   |  |   | 180   |   |   | 180   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |  | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 135.1   |   |   | 164.7   |   |  | 123.1   |   |   | 131.3   |   |
| Travel Time (s)            |   | 9.7   |   |   | 11.9  |   |  | 8.9   |   |   | 9.5   |   |
| Confl. Peds. (#/hr)        | 50  |   | 47  | 47  |   | 50  | 38   |   | 30  | 30  |   | 38  |
| Confl. Bikes (#/hr)        |   |   | 6   |   |   | 4   |  |   | 3   |   |   | 1   |
| 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%  | 1%  | 0%  | 9%  | 5%  | 5%  | 8%   | 5%  | 2%  | 12%   | 6%  | 4%  |
| Adj. Flow (vph)            | 295   | 387   | 37  | 53  | 203   | 21  | 26   | 301   | 103   | 17  | 274   | 139   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 295   | 424   | 0   | 53  | 224   | 0   | 0  | 327   | 103   | 0   | 291   | 139   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No   | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left   | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 3.7   |   |   | 3.7   |   |  | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |  | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06   | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24   |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1  | 2   | 1   | 1   | 2   | 1   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left   | Thru  | Right   | Left  | Thru  | Right   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1  | 30.5  | 6.1   | 6.1   | 30.5  | 6.1   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1  | 1.8   | 6.1   | 6.1   | 1.8   | 6.1   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex  | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   |
| Detector 1 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |  | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |  | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |  | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Turn Type                  | pm+pt   | NA  |   | Perm  | NA  |   | Perm   | NA  | Perm  | Perm  | NA  | Perm  |
| Protected Phases           | 7   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2  |   | 2   | 6   |   | 6   |
| Detector Phase             | 7   | 4   |   | 8   | 8   |   | 2  | 2   | 2   | 6   | 6   | 6   |
| Switch Phase               |   |   |   |   |   |   |  |   |   |   |   |   |
| Minimum Initial (s)        | 5.0   | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  | 10.0  | 10.0  | 10.0  | 10.0  |
| Minimum Split (s)          | 11.1  | 31.1  |   | 31.1  | 31.1  |   | 24.2   | 24.2  | 24.2  | 24.2  | 24.2  | 24.2  |
| Total Split (s)            | 14.0  | 40.1  |   | 31.1  | 31.1  |   | 30.0   | 30.0  | 30.0  | 30.0  | 30.0  | 30.0  |
| Total Split (%)            | 17.5%   | 50.1%   |   | 38.8%   | 38.8%   |   | 37.5%  | 37.5%   | 37.5%   | 37.5%   | 37.5%   | 37.5%   |
| Maximum Green (s)          | 7.9   | 34.0  |   | 25.0  | 25.0  |   | 23.8   | 23.8  | 23.8  | 23.8  | 23.8  | 23.8  |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.6  | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |



| Lane Group                 | Ø1  | Ø3  | Ø5  |
|----------------------------|-----|-----|-----|
| Lane Configurations        |     |     |     |
| Traffic Volume (vph)       |     |     |     |
| Future Volume (vph)        |     |     |     |
| Ideal Flow (vphpl)         |     |     |     |
| Storage Length (m)         |     |     |     |
| Storage Lanes              |     |     |     |
| Taper Length (m)           |     |     |     |
| Lane Util. Factor          |     |     |     |
| Ped Bike Factor            |     |     |     |
| Frt                        |     |     |     |
| Flt Protected              |     |     |     |
| Satd. Flow (prot)          |     |     |     |
| Flt Permitted              |     |     |     |
| Satd. Flow (perm)          |     |     |     |
| Right Turn on Red          |     |     |     |
| Satd. Flow (RTOR)          |     |     |     |
| Link Speed (k/h)           |     |     |     |
| Link Distance (m)          |     |     |     |
| Travel Time (s)            |     |     |     |
| Confl. Peds. (#/hr)        |     |     |     |
| Confl. Bikes (#/hr)        |     |     |     |
| Peak Hour Factor           |     |     |     |
| Heavy Vehicles (%)         |     |     |     |
| Adj. Flow (vph)            |     |     |     |
| Shared Lane Traffic (%)    |     |     |     |
| Lane Group Flow (vph)      |     |     |     |
| Enter Blocked Intersection |     |     |     |
| Lane Alignment             |     |     |     |
| Median Width(m)            |     |     |     |
| Link Offset(m)             |     |     |     |
| Crosswalk Width(m)         |     |     |     |
| Two way Left Turn Lane     |     |     |     |
| Headway Factor             |     |     |     |
| Turning Speed (k/h)        |     |     |     |
| Number of Detectors        |     |     |     |
| Detector Template          |     |     |     |
| Leading Detector (m)       |     |     |     |
| Trailing Detector (m)      |     |     |     |
| Detector 1 Position(m)     |     |     |     |
| Detector 1 Size(m)         |     |     |     |
| Detector 1 Type            |     |     |     |
| Detector 1 Channel         |     |     |     |
| Detector 1 Extend (s)      |     |     |     |
| Detector 1 Queue (s)       |     |     |     |
| Detector 1 Delay (s)       |     |     |     |
| Detector 2 Position(m)     |     |     |     |
| Detector 2 Size(m)         |     |     |     |
| Detector 2 Type            |     |     |     |
| Detector 2 Channel         |     |     |     |
| Detector 2 Extend (s)      |     |     |     |
| Turn Type                  |     |     |     |
| Protected Phases           | 1   | 3   | 5   |
| Permitted Phases           |     |     |     |
| Detector Phase             |     |     |     |
| Switch Phase               |     |     |     |
| Minimum Initial (s)        | 3.0 | 3.0 | 3.0 |
| Minimum Split (s)          | 5.0 | 5.0 | 5.0 |
| Total Split (s)            | 5.0 | 5.0 | 5.0 |
| Total Split (%)            | 6%  | 6%  | 6%  |
| Maximum Green (s)          | 3.0 | 3.0 | 3.0 |
| Yellow Time (s)            | 2.0 | 2.0 | 2.0 |

6: Churchill Avenue & Richmond Rd  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.8   | 2.8   |   | 2.8   | 2.8   |   | 2.6  | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   |
| Lost Time Adjust (s)    | 0.0   | 0.0   |   | 0.0   | 0.0   |   |  | 0.0   | 0.0   |   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.1   | 6.1   |   | 6.1   | 6.1   |   |  | 6.2   | 6.2   |   | 6.2   | 6.2   |
| Lead/Lag                | Lead  | Lag   |   | Lag   | Lag   |   | Lag  | Lag   | Lag   | Lag   | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   |   | Yes   | Yes   |   | Yes  | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   |   | 3.0   | 3.0   |   | 3.0  | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  |   | None  | None  |   | C-Max  | C-Max   | C-Max   | C-Max   | C-Max   | C-Max   |
| Walk Time (s)           |   | 16.0  |   | 16.0  | 16.0  |   | 7.0  | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     |   | 9.0   |   | 9.0   | 9.0   |   | 9.0  | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   |
| Pedestrian Calls (#/hr) |   | 15  |   | 15  | 15  |   | 15   | 15  | 15  | 15  | 15  | 15  |
| Act Effct Green (s)     | 30.6  | 25.6  |   | 16.6  | 16.6  |   |  | 30.2  | 30.2  |   | 30.2  | 30.2  |
| Actuated g/C Ratio      | 0.38  | 0.32  |   | 0.21  | 0.21  |   |  | 0.38  | 0.38  |   | 0.38  | 0.38  |
| v/c Ratio               | 0.86  | 0.75  |   | 0.35  | 0.63  |   |  | 0.53  | 0.16  |   | 0.47  | 0.23  |
| Control Delay           | 43.6  | 31.8  |   | 31.2  | 34.9  |   |  | 24.8  | 1.0   |   | 23.5  | 2.7   |
| Queue Delay             | 0.0   | 0.0   |   | 0.0   | 0.0   |   |  | 0.0   | 0.0   |   | 0.0   | 0.0   |
| Total Delay             | 43.6  | 31.8  |   | 31.2  | 34.9  |   |  | 24.8  | 1.0   |   | 23.5  | 2.7   |
| LOS                     | D   | C   |   | C   | C   |   |  | C   | A   |   | C   | A   |
| Approach Delay          |   | 36.6  |   |   | 34.2  |   |  | 19.1  |   |   | 16.8  |   |
| Approach LOS            |   | D   |   |   | C   |   |  | B   |   |   | B   |   |
| Queue Length 50th (m)   | 33.7  | 57.2  |   | 7.0   | 30.8  |   |  | 37.4  | 0.0   |   | 32.4  | 0.0   |
| Queue Length 95th (m)   | #49.0   | 73.4  |   | 14.9  | 44.8  |   |  | 70.5  | 1.5   |   | 61.9  | 6.9   |
| Internal Link Dist (m)  |   | 111.1   |   |   | 140.7   |   |  | 99.1  |   |   | 107.3   |   |
| Turn Bay Length (m)     | 30.0  |   |   | 25.0  |   |   |  |   | 15.0  |   |   | 15.0  |
| Base Capacity (vph)     | 343   | 753   |   | 230   | 533   |   |  | 620   | 627   |   | 623   | 608   |
| Starvation Cap Reductn  | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Spillback Cap Reductn   | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Storage Cap Reductn     | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Reduced v/c Ratio       | 0.86  | 0.56  |   | 0.23  | 0.42  |   |  | 0.53  | 0.16  |   | 0.47  | 0.23  |

Intersection Summary

Area Type: Other

Cycle Length: 80.1

Actuated Cycle Length: 80.1

Offset: 43 (54%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 27.6

Intersection LOS: C

Intersection Capacity Utilization 91.4%

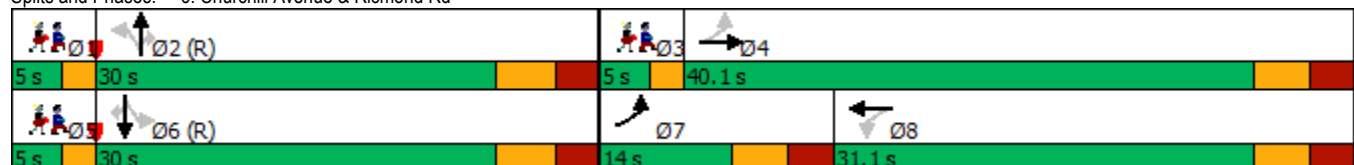
ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.










Splits and Phases: 6: Churchill Avenue & Richmond Rd



| Lane Group              | Ø1   | Ø3   | Ø5   |
|-------------------------|------|------|------|
| All-Red Time (s)        | 0.0  | 0.0  | 0.0  |
| Lost Time Adjust (s)    |      |      |      |
| Total Lost Time (s)     |      |      |      |
| Lead/Lag                | Lead | Lead | Lead |
| Lead-Lag Optimize?      | Yes  | Yes  | Yes  |
| Vehicle Extension (s)   | 3.0  | 3.0  | 3.0  |
| Recall Mode             | Min  | Min  | Min  |
| Walk Time (s)           |      |      |      |
| Flash Dont Walk (s)     |      |      |      |
| Pedestrian Calls (#/hr) |      |      |      |
| Act Effct Green (s)     |      |      |      |
| Actuated g/C Ratio      |      |      |      |
| v/c Ratio               |      |      |      |
| Control Delay           |      |      |      |
| Queue Delay             |      |      |      |
| Total Delay             |      |      |      |
| LOS                     |      |      |      |
| Approach Delay          |      |      |      |
| Approach LOS            |      |      |      |
| Queue Length 50th (m)   |      |      |      |
| Queue Length 95th (m)   |      |      |      |
| Internal Link Dist (m)  |      |      |      |
| Turn Bay Length (m)     |      |      |      |
| Base Capacity (vph)     |      |      |      |
| Starvation Cap Reductn  |      |      |      |
| Spillback Cap Reductn   |      |      |      |
| Storage Cap Reductn     |      |      |      |
| Reduced v/c Ratio       |      |      |      |
| Intersection Summary    |      |      |      |



















9: Highcroft Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 225   | 1   | 2   | 272   | 5   | 20  |
| Future Volume (Veh/h)             | 225   | 1   | 2   | 272   | 5   | 20  |
| Sign Control                      | Free  |   |   | Free  | Stop  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 225   | 1   | 2   | 272   | 5   | 20  |
| Pedestrians                       |   |   |   |   | 10  |   |
| Lane Width (m)                    |   |   |   |   | 3.7   |   |
| Walking Speed (m/s)               |   |   |   |   | 1.1   |   |
| Percent Blockage                  |   |   |   |   | 1   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 85  |   |   |   |   |   |
| pX, platoon unblocked             |   |   | 0.94  |   | 0.94  | 0.94  |
| vC, conflicting volume            |   |   | 236   |   | 512   | 236   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                |   |   | 157   |   | 449   | 156   |
| tC, single (s)                    |   |   | 4.1   |   | 6.4   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            |   |   | 2.2   |   | 3.5   | 3.3   |
| p0 queue free %                   |   |   | 100   |   | 99  | 98  |
| cM capacity (veh/h)               |   |   | 1338  |   | 531   | 834   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  |   |   |   |
| Volume Total                      | 226   | 274   | 25  |   |   |   |
| Volume Left                       | 0   | 2   | 5   |   |   |   |
| Volume Right                      | 1   | 0   | 20  |   |   |   |
| cSH                               | 1700  | 1338  | 749   |   |   |   |
| Volume to Capacity                | 0.13  | 0.00  | 0.03  |   |   |   |
| Queue Length 95th (m)             | 0.0   | 0.0   | 0.8   |   |   |   |
| Control Delay (s)                 | 0.0   | 0.1   | 10.0  |   |   |   |
| Lane LOS                          |   | A   | A   |   |   |   |
| Approach Delay (s)                | 0.0   | 0.1   | 10.0  |   |   |   |
| Approach LOS                      |   |   | A   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.5   |   |   |   |
| Intersection Capacity Utilization |   |   | 26.8%   | ICU Level of Service  | A   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

3: Churchill Avenue & Byron Avenue  
PM Peak













433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)       | 45  | 137   | 61  | 95  | 360   | 75  | 33  | 298   | 94  | 28  | 321   | 69  |
| Future Volume (vph)        | 45  | 137   | 61  | 95  | 360   | 75  | 33  | 298   | 94  | 28  | 321   | 69  |
| 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   | 15.0  |   | 0.0   | 15.0  |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)           | 7.6   |   |   | 7.6   |   |   | 25.0  |   |   | 25.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            |   | 0.99  |   |   | 0.99  |   | 0.98  | 0.98  |   | 0.98  | 0.99  |   |
| Frt                        |   | 0.966   |   |   | 0.981   |   |   | 0.964   |   |   | 0.973   |   |
| Flt Protected              |   | 0.991   |   |   | 0.991   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1723  | 0   | 0   | 1752  | 0   | 1616  | 1662  | 0   | 1729  | 1667  | 0   |
| Flt Permitted              |   | 0.831   |   |   | 0.886   |   | 0.446   |   |   | 0.444   |   |   |
| Satd. Flow (perm)          | 0   | 1443  | 0   | 0   | 1564  | 0   | 742   | 1662  | 0   | 794   | 1667  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 24  |   |   | 12  |   |   | 23  |   |   | 15  |   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |   | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 207.2   |   |   | 85.0  |   |   | 153.8   |   |   | 123.1   |   |
| Travel Time (s)            |   | 14.9  |   |   | 6.1   |   |   | 11.1  |   |   | 8.9   |   |
| Confl. Peds. (#/hr)        | 14  |   | 8   | 8   |   | 14  | 21  |   | 16  | 16  |   | 21  |
| Confl. Bikes (#/hr)        |   |   | 11  |   |   | 6   |   |   | 14  |   |   | 6   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 0%  | 0%  | 0%  | 0%  | 0%  | 2%  | 7%  | 5%  | 0%  | 0%  | 5%  | 4%  |
| Adj. Flow (vph)            | 45  | 137   | 61  | 95  | 360   | 75  | 33  | 298   | 94  | 28  | 321   | 69  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 243   | 0   | 0   | 530   | 0   | 33  | 392   | 0   | 28  | 390   | 0   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 0.0   |   |   | 0.0   |   |   | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   |
| Detector 1 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Turn Type                  | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   |
| Protected Phases           |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Detector Phase             | 4   | 4   |   | 8   | 8   |   | 2   | 2   |   | 6   | 6   |   |
| Switch Phase               |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)        | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   |
| Minimum Split (s)          | 30.6  | 30.6  |   | 30.6  | 30.6  |   | 25.5  | 25.5  |   | 25.5  | 25.5  |   |
| Total Split (s)            | 45.0  | 45.0  |   | 45.0  | 45.0  |   | 45.0  | 45.0  |   | 45.0  | 45.0  |   |
| Total Split (%)            | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   |
| Maximum Green (s)          | 39.4  | 39.4  |   | 39.4  | 39.4  |   | 39.6  | 39.6  |   | 39.6  | 39.6  |   |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   |

3: Churchill Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

2020 and 2025 Background Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.3   | 2.3   |   | 2.3   | 2.3   |   | 2.1  | 2.1   |   | 2.1   | 2.1   |   |
| Lost Time Adjust (s)    |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Lost Time (s)     |   | 5.6   |   |   | 5.6   |   | 5.4  | 5.4   |   | 5.4   | 5.4   |   |
| 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             | None  | None  |   | None  | None  |   | C-Max  | C-Max   |   | C-Max   | C-Max   |   |
| Walk Time (s)           | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  |   | 10.0  | 10.0  |   |
| Flash Dont Walk (s)     | 15.0  | 15.0  |   | 15.0  | 15.0  |   | 9.0  | 9.0   |   | 9.0   | 9.0   |   |
| Pedestrian Calls (#/hr) | 0   | 0   |   | 0   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Act Effct Green (s)     |   | 34.4  |   |   | 34.4  |   | 44.6   | 44.6  |   | 44.6  | 44.6  |   |
| Actuated g/C Ratio      |   | 0.38  |   |   | 0.38  |   | 0.50   | 0.50  |   | 0.50  | 0.50  |   |
| v/c Ratio               |   | 0.43  |   |   | 0.88  |   | 0.09   | 0.47  |   | 0.07  | 0.47  |   |
| Control Delay           |   | 19.9  |   |   | 41.5  |   | 15.1   | 17.6  |   | 15.6  | 20.0  |   |
| Queue Delay             |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.4   |   |
| Total Delay             |   | 19.9  |   |   | 41.5  |   | 15.1   | 17.6  |   | 15.6  | 20.4  |   |
| LOS                     |   | B   |   |   | D   |   | B  | B   |   | B   | C   |   |
| Approach Delay          |   | 19.9  |   |   | 41.5  |   |  | 17.4  |   |   | 20.0  |   |
| Approach LOS            |   | B   |   |   | D   |   |  | B   |   |   | C   |   |
| Queue Length 50th (m)   |   | 26.2  |   |   | 78.9  |   | 3.0  | 41.7  |   | 3.1   | 41.6  |   |
| Queue Length 95th (m)   |   | 42.6  |   |   | #115.5  |   | 8.9  | 70.9  |   | m6.8  | 60.5  |   |
| Internal Link Dist (m)  |   | 183.2   |   |   | 61.0  |   |  | 129.8   |   |   | 99.1  |   |
| Turn Bay Length (m)     |   |   |   |   |   |   | 15.0   |   |   | 15.0  |   |   |
| Base Capacity (vph)     |   | 645   |   |   | 691   |   | 367  | 835   |   | 393   | 834   |   |
| Starvation Cap Reductn  |   | 0   |   |   | 0   |   | 0  | 0   |   | 0   | 134   |   |
| Spillback Cap Reductn   |   | 0   |   |   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Storage Cap Reductn     |   | 0   |   |   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Reduced v/c Ratio       |   | 0.38  |   |   | 0.77  |   | 0.09   | 0.47  |   | 0.07  | 0.56  |   |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 40 (44%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 26.4

Intersection LOS: C

Intersection Capacity Utilization 78.6%

ICU Level of Service D

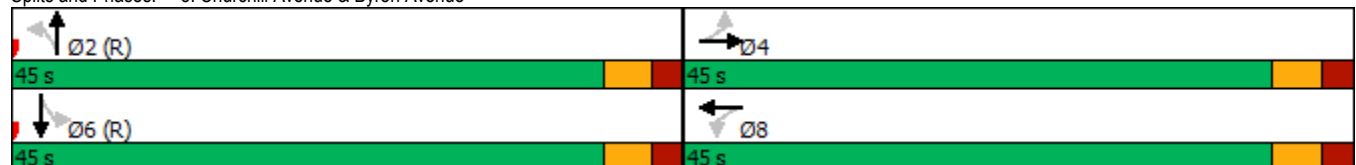
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.





















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Churchill Avenue & Byron Avenue



6: Churchill Avenue & Richmond Rd  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |  |  |   |  |  |   |  |  |  |   |  |  |
| Traffic Volume (vph)       | 191   | 342   | 55  | 129   | 485   | 25  | 27   | 291   | 67  | 15  | 237   | 312   |
| Future Volume (vph)        | 191   | 342   | 55  | 129   | 485   | 25  | 27   | 291   | 67  | 15  | 237   | 312   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (m)         | 30.0  |   | 0.0   | 25.0  |   | 0.0   | 15.0   |   | 15.0  | 15.0  |   | 15.0  |
| Storage Lanes              | 1   |   | 0   | 1   |   | 0   | 0  |   | 1   | 0   |   | 1   |
| Taper Length (m)           | 45.0  |   |   | 30.0  |   |   | 15.0   |   |   | 15.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            | 0.97  | 0.99  |   | 0.95  | 0.99  |   |  | 0.99  | 0.89  |   | 1.00  | 0.87  |
| Frt                        |   | 0.979   |   |   | 0.993   |   |  |   | 0.850   |   |   | 0.850   |
| Flt Protected              | 0.950   |   |   | 0.950   |   |   |  | 0.996   |   |   | 0.997   |   |
| Satd. Flow (prot)          | 1679  | 1740  | 0   | 1586  | 1712  | 0   | 0  | 1722  | 1517  | 0   | 1706  | 1488  |
| Flt Permitted              | 0.193   |   |   | 0.528   |   |   |  | 0.953   |   |   | 0.967   |   |
| Satd. Flow (perm)          | 332   | 1740  | 0   | 839   | 1712  | 0   | 0  | 1639  | 1354  | 0   | 1651  | 1300  |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 14  |   |   | 4   |   |  |   | 160   |   |   | 186   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |  | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 135.1   |   |   | 164.7   |   |  | 123.1   |   |   | 131.3   |   |
| Travel Time (s)            |   | 9.7   |   |   | 11.9  |   |  | 8.9   |   |   | 9.5   |   |
| Confl. Peds. (#/hr)        | 50  |   | 47  | 47  |   | 50  | 38   |   | 30  | 30  |   | 38  |
| Confl. Bikes (#/hr)        |   |   | 6   |   |   | 4   |  |   | 3   |   |   | 1   |
| 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%  | 1%  | 0%  | 9%  | 5%  | 5%  | 8%   | 5%  | 2%  | 12%   | 6%  | 4%  |
| Adj. Flow (vph)            | 191   | 342   | 55  | 129   | 485   | 25  | 27   | 291   | 67  | 15  | 237   | 312   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 191   | 397   | 0   | 129   | 510   | 0   | 0  | 318   | 67  | 0   | 252   | 312   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No   | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left   | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 3.7   |   |   | 3.7   |   |  | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |  | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06   | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24   |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1  | 2   | 1   | 1   | 2   | 1   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left   | Thru  | Right   | Left  | Thru  | Right   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1  | 30.5  | 6.1   | 6.1   | 30.5  | 6.1   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1  | 1.8   | 6.1   | 6.1   | 1.8   | 6.1   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex  | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   |
| Detector 1 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |  | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |  | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |  | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Turn Type                  | pm+pt   | NA  |   | Perm  | NA  |   | Perm   | NA  | Perm  | Perm  | NA  | Perm  |
| Protected Phases           | 7   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2  |   | 2   | 6   |   | 6   |
| Detector Phase             | 7   | 4   |   | 8   | 8   |   | 2  | 2   | 2   | 6   | 6   | 6   |
| Switch Phase               |   |   |   |   |   |   |  |   |   |   |   |   |
| Minimum Initial (s)        | 5.0   | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  | 10.0  | 10.0  | 10.0  | 10.0  |
| Minimum Split (s)          | 11.1  | 31.1  |   | 31.1  | 31.1  |   | 24.2   | 24.2  | 24.2  | 24.2  | 24.2  | 24.2  |
| Total Split (s)            | 15.0  | 55.0  |   | 45.0  | 45.0  |   | 25.0   | 25.0  | 25.0  | 25.0  | 25.0  | 25.0  |
| Total Split (%)            | 16.7%   | 61.1%   |   | 50.0%   | 50.0%   |   | 27.8%  | 27.8%   | 27.8%   | 27.8%   | 27.8%   | 27.8%   |
| Maximum Green (s)          | 8.9   | 48.9  |   | 38.9  | 38.9  |   | 18.8   | 18.8  | 18.8  | 18.8  | 18.8  | 18.8  |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.6  | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |













| Lane Group                 | Ø1  | Ø3  | Ø5  |
|----------------------------|-----|-----|-----|
| Lane Configurations        |     |     |     |
| Traffic Volume (vph)       |     |     |     |
| Future Volume (vph)        |     |     |     |
| Ideal Flow (vphpl)         |     |     |     |
| Storage Length (m)         |     |     |     |
| Storage Lanes              |     |     |     |
| Taper Length (m)           |     |     |     |
| Lane Util. Factor          |     |     |     |
| Ped Bike Factor            |     |     |     |
| Frt                        |     |     |     |
| Flt Protected              |     |     |     |
| Satd. Flow (prot)          |     |     |     |
| Flt Permitted              |     |     |     |
| Satd. Flow (perm)          |     |     |     |
| Right Turn on Red          |     |     |     |
| Satd. Flow (RTOR)          |     |     |     |
| Link Speed (k/h)           |     |     |     |
| Link Distance (m)          |     |     |     |
| Travel Time (s)            |     |     |     |
| Confl. Peds. (#/hr)        |     |     |     |
| Confl. Bikes (#/hr)        |     |     |     |
| Peak Hour Factor           |     |     |     |
| Heavy Vehicles (%)         |     |     |     |
| Adj. Flow (vph)            |     |     |     |
| Shared Lane Traffic (%)    |     |     |     |
| Lane Group Flow (vph)      |     |     |     |
| Enter Blocked Intersection |     |     |     |
| Lane Alignment             |     |     |     |
| Median Width(m)            |     |     |     |
| Link Offset(m)             |     |     |     |
| Crosswalk Width(m)         |     |     |     |
| Two way Left Turn Lane     |     |     |     |
| Headway Factor             |     |     |     |
| Turning Speed (k/h)        |     |     |     |
| Number of Detectors        |     |     |     |
| Detector Template          |     |     |     |
| Leading Detector (m)       |     |     |     |
| Trailing Detector (m)      |     |     |     |
| Detector 1 Position(m)     |     |     |     |
| Detector 1 Size(m)         |     |     |     |
| Detector 1 Type            |     |     |     |
| Detector 1 Channel         |     |     |     |
| Detector 1 Extend (s)      |     |     |     |
| Detector 1 Queue (s)       |     |     |     |
| Detector 1 Delay (s)       |     |     |     |
| Detector 2 Position(m)     |     |     |     |
| Detector 2 Size(m)         |     |     |     |
| Detector 2 Type            |     |     |     |
| Detector 2 Channel         |     |     |     |
| Detector 2 Extend (s)      |     |     |     |
| Turn Type                  |     |     |     |
| Protected Phases           | 1   | 3   | 5   |
| Permitted Phases           |     |     |     |
| Detector Phase             |     |     |     |
| Switch Phase               |     |     |     |
| Minimum Initial (s)        | 3.0 | 3.0 | 3.0 |
| Minimum Split (s)          | 5.0 | 5.0 | 5.0 |
| Total Split (s)            | 5.0 | 5.0 | 5.0 |
| Total Split (%)            | 6%  | 6%  | 6%  |
| Maximum Green (s)          | 3.0 | 3.0 | 3.0 |
| Yellow Time (s)            | 2.0 | 2.0 | 2.0 |



6: Churchill Avenue & Richmond Rd  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

2020 and 2025 Background Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.8   | 2.8   |   | 2.8   | 2.8   |   | 2.6  | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   |
| Lost Time Adjust (s)    | 0.0   | 0.0   |   | 0.0   | 0.0   |   |  | 0.0   | 0.0   |   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.1   | 6.1   |   | 6.1   | 6.1   |   |  | 6.2   | 6.2   |   | 6.2   | 6.2   |
| Lead/Lag                | Lead  | Lag   |   | Lag   | Lag   |   | Lag  | Lag   | Lag   | Lag   | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   |   | Yes   | Yes   |   | Yes  | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   |   | 3.0   | 3.0   |   | 3.0  | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  |   | None  | None  |   | C-Max  | C-Max   | C-Max   | C-Max   | C-Max   | C-Max   |
| Walk Time (s)           |   | 16.0  |   | 16.0  | 16.0  |   | 7.0  | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     |   | 9.0   |   | 9.0   | 9.0   |   | 9.0  | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   |
| Pedestrian Calls (#/hr) |   | 15  |   | 15  | 15  |   | 15   | 15  | 15  | 15  | 15  | 15  |
| Act Effct Green (s)     | 47.3  | 42.3  |   | 32.3  | 32.3  |   |  | 23.6  | 23.6  |   | 23.6  | 23.6  |
| Actuated g/C Ratio      | 0.53  | 0.47  |   | 0.36  | 0.36  |   |  | 0.26  | 0.26  |   | 0.26  | 0.26  |
| v/c Ratio               | 0.62  | 0.48  |   | 0.43  | 0.83  |   |  | 0.74  | 0.14  |   | 0.58  | 0.65  |
| Control Delay           | 19.7  | 17.0  |   | 25.2  | 37.7  |   |  | 44.6  | 4.3   |   | 37.6  | 20.9  |
| Queue Delay             | 0.0   | 0.0   |   | 0.0   | 0.0   |   |  | 0.0   | 0.0   |   | 0.0   | 0.0   |
| Total Delay             | 19.7  | 17.0  |   | 25.2  | 37.7  |   |  | 44.6  | 4.3   |   | 37.6  | 20.9  |
| LOS                     | B   | B   |   | C   | D   |   |  | D   | A   |   | D   | C   |
| Approach Delay          |   | 17.9  |   |   | 35.2  |   |  | 37.6  |   |   | 28.4  |   |
| Approach LOS            |   | B   |   |   | D   |   |  | D   |   |   | C   |   |
| Queue Length 50th (m)   | 16.3  | 42.6  |   | 16.4  | 77.3  |   |  | 51.6  | 0.7   |   | 38.9  | 18.7  |
| Queue Length 95th (m)   | 23.4  | 57.0  |   | 28.8  | 104.3   |   |  | m#101.7   | m4.9  |   | #73.6   | #58.2   |
| Internal Link Dist (m)  |   | 111.1   |   |   | 140.7   |   |  | 99.1  |   |   | 107.3   |   |
| Turn Bay Length (m)     | 30.0  |   |   | 25.0  |   |   |  |   | 15.0  |   |   | 15.0  |
| Base Capacity (vph)     | 307   | 951   |   | 362   | 742   |   |  | 429   | 472   |   | 432   | 477   |
| Starvation Cap Reductn  | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Spillback Cap Reductn   | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Storage Cap Reductn     | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Reduced v/c Ratio       | 0.62  | 0.42  |   | 0.36  | 0.69  |   |  | 0.74  | 0.14  |   | 0.58  | 0.65  |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 29.2

Intersection LOS: C

Intersection Capacity Utilization 92.2%

ICU Level of Service F

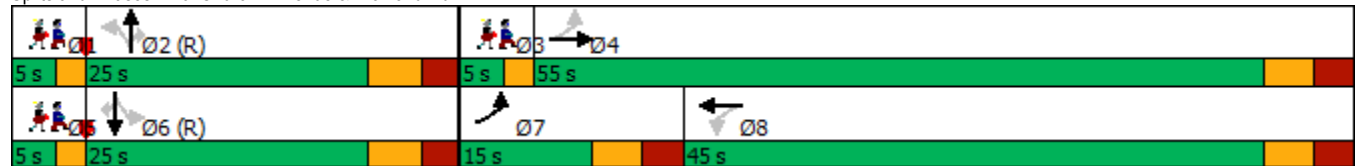
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.










Splits and Phases: 6: Churchill Avenue & Richmond Rd



| Lane Group              | Ø1   | Ø3   | Ø5   |
|-------------------------|------|------|------|
| All-Red Time (s)        | 0.0  | 0.0  | 0.0  |
| Lost Time Adjust (s)    |      |      |      |
| Total Lost Time (s)     |      |      |      |
| Lead/Lag                | Lead | Lead | Lead |
| Lead-Lag Optimize?      | Yes  | Yes  | Yes  |
| Vehicle Extension (s)   | 3.0  | 3.0  | 3.0  |
| Recall Mode             | Min  | Min  | Min  |
| Walk Time (s)           |      |      |      |
| Flash Dont Walk (s)     |      |      |      |
| Pedestrian Calls (#/hr) |      |      |      |
| Act Effct Green (s)     |      |      |      |
| Actuated g/C Ratio      |      |      |      |
| v/c Ratio               |      |      |      |
| Control Delay           |      |      |      |
| Queue Delay             |      |      |      |
| Total Delay             |      |      |      |
| LOS                     |      |      |      |
| Approach Delay          |      |      |      |
| Approach LOS            |      |      |      |
| Queue Length 50th (m)   |      |      |      |
| Queue Length 95th (m)   |      |      |      |
| Internal Link Dist (m)  |      |      |      |
| Turn Bay Length (m)     |      |      |      |
| Base Capacity (vph)     |      |      |      |
| Starvation Cap Reductn  |      |      |      |
| Spillback Cap Reductn   |      |      |      |
| Storage Cap Reductn     |      |      |      |
| Reduced v/c Ratio       |      |      |      |
| Intersection Summary    |      |      |      |



















9: Highcroft Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 233   | 0   | 1   | 589   | 1   | 8   |
| Future Volume (Veh/h)             | 233   | 0   | 1   | 589   | 1   | 8   |
| Sign Control                      | Free  |   |   | Free  | Stop  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 233   | 0   | 1   | 589   | 1   | 8   |
| Pedestrians                       |   |   |   |   | 10  |   |
| Lane Width (m)                    |   |   |   |   | 3.7   |   |
| Walking Speed (m/s)               |   |   |   |   | 1.1   |   |
| Percent Blockage                  |   |   |   |   | 1   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 85  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |
| vC, conflicting volume            |   |   | 243   |   | 834   | 243   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                |   |   | 243   |   | 834   | 243   |
| tC, single (s)                    |   |   | 4.1   |   | 6.4   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            |   |   | 2.2   |   | 3.5   | 3.3   |
| p0 queue free %                   |   |   | 100   |   | 100   | 99  |
| cM capacity (veh/h)               |   |   | 1323  |   | 337   | 793   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  |   |   |   |
| Volume Total                      | 233   | 590   | 9   |   |   |   |
| Volume Left                       | 0   | 1   | 1   |   |   |   |
| Volume Right                      | 0   | 0   | 8   |   |   |   |
| cSH                               | 1700  | 1323  | 690   |   |   |   |
| Volume to Capacity                | 0.14  | 0.00  | 0.01  |   |   |   |
| Queue Length 95th (m)             | 0.0   | 0.0   | 0.3   |   |   |   |
| Control Delay (s)                 | 0.0   | 0.0   | 10.3  |   |   |   |
| Lane LOS                          |   | A   | B   |   |   |   |
| Approach Delay (s)                | 0.0   | 0.0   | 10.3  |   |   |   |
| Approach LOS                      |   |   | B   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.1   |   |   |   |
| Intersection Capacity Utilization |   |   | 43.6%   | ICU Level of Service  |   | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |













3: Churchill Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)       | 36  | 172   | 46  | 43  | 146   | 69  | 29  | 331   | 43  | 40  | 287   | 24  |
| Future Volume (vph)        | 36  | 172   | 46  | 43  | 146   | 69  | 29  | 331   | 43  | 40  | 287   | 24  |
| 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   | 15.0  |   | 0.0   | 15.0  |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)           | 7.6   |   |   | 7.6   |   |   | 25.0  |   |   | 25.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            |   | 0.99  |   |   | 0.99  |   | 0.97  | 0.99  |   | 0.98  | 0.99  |   |
| Frt                        |   | 0.976   |   |   | 0.964   |   |   | 0.983   |   |   | 0.988   |   |
| Flt Protected              |   | 0.993   |   |   | 0.992   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1750  | 0   | 0   | 1709  | 0   | 1616  | 1701  | 0   | 1729  | 1705  | 0   |
| Flt Permitted              |   | 0.885   |   |   | 0.851   |   | 0.565   |   |   | 0.518   |   |   |
| Satd. Flow (perm)          | 0   | 1557  | 0   | 0   | 1464  | 0   | 936   | 1701  | 0   | 927   | 1705  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 17  |   |   | 28  |   |   | 11  |   |   | 7   |   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |   | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 207.2   |   |   | 85.0  |   |   | 153.8   |   |   | 123.1   |   |
| Travel Time (s)            |   | 14.9  |   |   | 6.1   |   |   | 11.1  |   |   | 8.9   |   |
| Confl. Peds. (#/hr)        | 14  |   | 8   | 8   |   | 14  | 21  |   | 16  | 16  |   | 21  |
| Confl. Bikes (#/hr)        |   |   | 11  |   |   | 6   |   |   | 14  |   |   | 6   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 0%  | 0%  | 0%  | 0%  | 0%  | 2%  | 7%  | 5%  | 0%  | 0%  | 5%  | 4%  |
| Adj. Flow (vph)            | 36  | 172   | 46  | 43  | 146   | 69  | 29  | 331   | 43  | 40  | 287   | 24  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 254   | 0   | 0   | 258   | 0   | 29  | 374   | 0   | 40  | 311   | 0   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 0.0   |   |   | 0.0   |   |   | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   |
| Detector 1 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Turn Type                  | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   |
| Protected Phases           |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Detector Phase             | 4   | 4   |   | 8   | 8   |   | 2   | 2   |   | 6   | 6   |   |
| Switch Phase               |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)        | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   |
| Minimum Split (s)          | 30.6  | 30.6  |   | 30.6  | 30.6  |   | 25.5  | 25.5  |   | 25.5  | 25.5  |   |
| Total Split (s)            | 38.0  | 38.0  |   | 38.0  | 38.0  |   | 42.0  | 42.0  |   | 42.0  | 42.0  |   |
| Total Split (%)            | 47.5%   | 47.5%   |   | 47.5%   | 47.5%   |   | 52.5%   | 52.5%   |   | 52.5%   | 52.5%   |   |
| Maximum Green (s)          | 32.4  | 32.4  |   | 32.4  | 32.4  |   | 36.6  | 36.6  |   | 36.6  | 36.6  |   |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   |

3: Churchill Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.3   | 2.3   |   | 2.3   | 2.3   |   | 2.1  | 2.1   |   | 2.1   | 2.1   |   |
| Lost Time Adjust (s)    |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Lost Time (s)     |   | 5.6   |   |   | 5.6   |   | 5.4  | 5.4   |   | 5.4   | 5.4   |   |
| 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             | None  | None  |   | None  | None  |   | C-Max  | C-Max   |   | C-Max   | C-Max   |   |
| Walk Time (s)           | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  |   | 10.0  | 10.0  |   |
| Flash Dont Walk (s)     | 15.0  | 15.0  |   | 15.0  | 15.0  |   | 9.0  | 9.0   |   | 9.0   | 9.0   |   |
| Pedestrian Calls (#/hr) | 0   | 0   |   | 0   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Act Effct Green (s)     |   | 17.4  |   |   | 17.4  |   | 51.6   | 51.6  |   | 51.6  | 51.6  |   |
| Actuated g/C Ratio      |   | 0.22  |   |   | 0.22  |   | 0.64   | 0.64  |   | 0.64  | 0.64  |   |
| v/c Ratio               |   | 0.72  |   |   | 0.76  |   | 0.05   | 0.34  |   | 0.07  | 0.28  |   |
| Control Delay           |   | 38.2  |   |   | 39.7  |   | 7.3  | 8.4   |   | 7.3   | 7.9   |   |
| Queue Delay             |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Delay             |   | 38.2  |   |   | 39.7  |   | 7.3  | 8.4   |   | 7.3   | 7.9   |   |
| LOS                     |   | D   |   |   | D   |   | A  | A   |   | A   | A   |   |
| Approach Delay          |   | 38.2  |   |   | 39.7  |   |  | 8.3   |   |   | 7.8   |   |
| Approach LOS            |   | D   |   |   | D   |   |  | A   |   |   | A   |   |
| Queue Length 50th (m)   |   | 33.6  |   |   | 32.9  |   | 1.4  | 21.8  |   | 2.0   | 17.5  |   |
| Queue Length 95th (m)   |   | 50.9  |   |   | 51.2  |   | 5.4  | 46.8  |   | 7.0   | 38.1  |   |
| Internal Link Dist (m)  |   | 183.2   |   |   | 61.0  |   |  | 129.8   |   |   | 99.1  |   |
| Turn Bay Length (m)     |   |   |   |   |   |   | 15.0   |   |   | 15.0  |   |   |
| Base Capacity (vph)     |   | 640   |   |   | 609   |   | 603  | 1100  |   | 597   | 1101  |   |
| 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       |   | 0.40  |   |   | 0.42  |   | 0.05   | 0.34  |   | 0.07  | 0.28  |   |

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 74 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 20.6

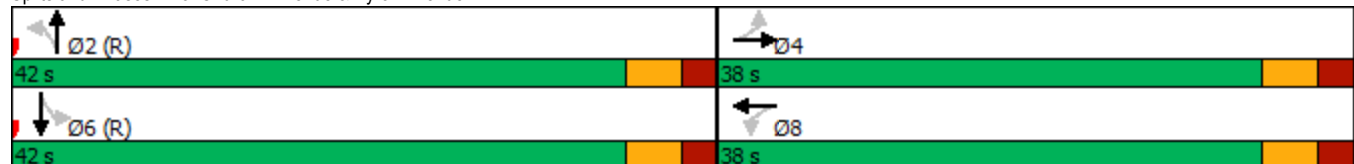
Intersection LOS: C

Intersection Capacity Utilization 64.9%

ICU Level of Service C





















Analysis Period (min) 15

Splits and Phases: 3: Churchill Avenue & Byron Avenue



6: Churchill Avenue & Richmond Rd  
AM Peak

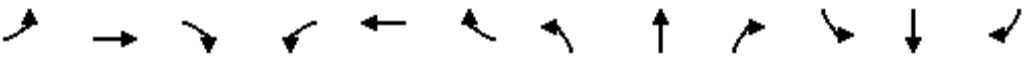
433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |  |  |   |  |  |   |  |  |  |   |  |  |
| Traffic Volume (vph)       | 295   | 387   | 38  | 53  | 203   | 21  | 28   | 304   | 103   | 17  | 276   | 139   |
| Future Volume (vph)        | 295   | 387   | 38  | 53  | 203   | 21  | 28   | 304   | 103   | 17  | 276   | 139   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (m)         | 30.0  |   | 0.0   | 25.0  |   | 0.0   | 15.0   |   | 15.0  | 15.0  |   | 15.0  |
| Storage Lanes              | 1   |   | 0   | 1   |   | 0   | 0  |   | 1   | 0   |   | 1   |
| Taper Length (m)           | 45.0  |   |   | 30.0  |   |   | 15.0   |   |   | 15.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            | 0.95  | 0.99  |   | 0.96  | 0.99  |   |  | 1.00  | 0.90  |   | 1.00  | 0.89  |
| Frt                        |   | 0.987   |   |   | 0.986   |   |  |   | 0.850   |   |   | 0.850   |
| Flt Protected              | 0.950   |   |   | 0.950   |   |   |  | 0.996   |   |   | 0.997   |   |
| Satd. Flow (prot)          | 1679  | 1764  | 0   | 1586  | 1693  | 0   | 0  | 1722  | 1517  | 0   | 1706  | 1488  |
| Flt Permitted              | 0.374   |   |   | 0.462   |   |   |  | 0.954   |   |   | 0.970   |   |
| Satd. Flow (perm)          | 628   | 1764  | 0   | 739   | 1693  | 0   | 0  | 1642  | 1369  | 0   | 1656  | 1317  |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 8   |   |   | 7   |   |  |   | 180   |   |   | 180   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |  | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 135.1   |   |   | 164.7   |   |  | 123.1   |   |   | 131.3   |   |
| Travel Time (s)            |   | 9.7   |   |   | 11.9  |   |  | 8.9   |   |   | 9.5   |   |
| Confl. Peds. (#/hr)        | 50  |   | 47  | 47  |   | 50  | 38   |   | 30  | 30  |   | 38  |
| Confl. Bikes (#/hr)        |   |   | 6   |   |   | 4   |  |   | 3   |   |   | 1   |
| 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%  | 1%  | 0%  | 9%  | 5%  | 5%  | 8%   | 5%  | 2%  | 12%   | 6%  | 4%  |
| Adj. Flow (vph)            | 295   | 387   | 38  | 53  | 203   | 21  | 28   | 304   | 103   | 17  | 276   | 139   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 295   | 425   | 0   | 53  | 224   | 0   | 0  | 332   | 103   | 0   | 293   | 139   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No   | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left   | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 3.7   |   |   | 3.7   |   |  | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |  | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06   | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24   |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1  | 2   | 1   | 1   | 2   | 1   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left   | Thru  | Right   | Left  | Thru  | Right   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1  | 30.5  | 6.1   | 6.1   | 30.5  | 6.1   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1  | 1.8   | 6.1   | 6.1   | 1.8   | 6.1   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex  | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   |
| Detector 1 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |  | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |  | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |  | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Turn Type                  | pm+pt   | NA  |   | Perm  | NA  |   | Perm   | NA  | Perm  | Perm  | NA  | Perm  |
| Protected Phases           | 7   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2  |   | 2   | 6   |   | 6   |
| Detector Phase             | 7   | 4   |   | 8   | 8   |   | 2  | 2   | 2   | 6   | 6   | 6   |
| Switch Phase               |   |   |   |   |   |   |  |   |   |   |   |   |
| Minimum Initial (s)        | 5.0   | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  | 10.0  | 10.0  | 10.0  | 10.0  |
| Minimum Split (s)          | 11.1  | 31.1  |   | 31.1  | 31.1  |   | 24.2   | 24.2  | 24.2  | 24.2  | 24.2  | 24.2  |
| Total Split (s)            | 14.0  | 40.1  |   | 31.1  | 31.1  |   | 30.0   | 30.0  | 30.0  | 30.0  | 30.0  | 30.0  |
| Total Split (%)            | 17.5%   | 50.1%   |   | 38.8%   | 38.8%   |   | 37.5%  | 37.5%   | 37.5%   | 37.5%   | 37.5%   | 37.5%   |
| Maximum Green (s)          | 7.9   | 34.0  |   | 25.0  | 25.0  |   | 23.8   | 23.8  | 23.8  | 23.8  | 23.8  | 23.8  |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.6  | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |

| Lane Group                 | Ø1  | Ø3  | Ø5  |
|----------------------------|-----|-----|-----|
| Lane Configurations        |     |     |     |
| Traffic Volume (vph)       |     |     |     |
| Future Volume (vph)        |     |     |     |
| Ideal Flow (vphpl)         |     |     |     |
| Storage Length (m)         |     |     |     |
| Storage Lanes              |     |     |     |
| Taper Length (m)           |     |     |     |
| Lane Util. Factor          |     |     |     |
| Ped Bike Factor            |     |     |     |
| Frt                        |     |     |     |
| Flt Protected              |     |     |     |
| Satd. Flow (prot)          |     |     |     |
| Flt Permitted              |     |     |     |
| Satd. Flow (perm)          |     |     |     |
| Right Turn on Red          |     |     |     |
| Satd. Flow (RTOR)          |     |     |     |
| Link Speed (k/h)           |     |     |     |
| Link Distance (m)          |     |     |     |
| Travel Time (s)            |     |     |     |
| Confl. Peds. (#/hr)        |     |     |     |
| Confl. Bikes (#/hr)        |     |     |     |
| Peak Hour Factor           |     |     |     |
| Heavy Vehicles (%)         |     |     |     |
| Adj. Flow (vph)            |     |     |     |
| Shared Lane Traffic (%)    |     |     |     |
| Lane Group Flow (vph)      |     |     |     |
| Enter Blocked Intersection |     |     |     |
| Lane Alignment             |     |     |     |
| Median Width(m)            |     |     |     |
| Link Offset(m)             |     |     |     |
| Crosswalk Width(m)         |     |     |     |
| Two way Left Turn Lane     |     |     |     |
| Headway Factor             |     |     |     |
| Turning Speed (k/h)        |     |     |     |
| Number of Detectors        |     |     |     |
| Detector Template          |     |     |     |
| Leading Detector (m)       |     |     |     |
| Trailing Detector (m)      |     |     |     |
| Detector 1 Position(m)     |     |     |     |
| Detector 1 Size(m)         |     |     |     |
| Detector 1 Type            |     |     |     |
| Detector 1 Channel         |     |     |     |
| Detector 1 Extend (s)      |     |     |     |
| Detector 1 Queue (s)       |     |     |     |
| Detector 1 Delay (s)       |     |     |     |
| Detector 2 Position(m)     |     |     |     |
| Detector 2 Size(m)         |     |     |     |
| Detector 2 Type            |     |     |     |
| Detector 2 Channel         |     |     |     |
| Detector 2 Extend (s)      |     |     |     |
| Turn Type                  |     |     |     |
| Protected Phases           | 1   | 3   | 5   |
| Permitted Phases           |     |     |     |
| Detector Phase             |     |     |     |
| Switch Phase               |     |     |     |
| Minimum Initial (s)        | 3.0 | 3.0 | 3.0 |
| Minimum Split (s)          | 5.0 | 5.0 | 5.0 |
| Total Split (s)            | 5.0 | 5.0 | 5.0 |
| Total Split (%)            | 6%  | 6%  | 6%  |
| Maximum Green (s)          | 3.0 | 3.0 | 3.0 |
| Yellow Time (s)            | 2.0 | 2.0 | 2.0 |

6: Churchill Avenue & Richmond Rd  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                         |  |       |     |      |       |     |       |       |       |       |       |       |
|-------------------------|--|-------|-----|------|-------|-----|-------|-------|-------|-------|-------|-------|
| Lane Group              | EBL  | EBT   | EBR | WBL  | WBT   | WBR | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.8  | 2.8   |     | 2.8  | 2.8   |     | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   |
| Lost Time Adjust (s)    | 0.0  | 0.0   |     | 0.0  | 0.0   |     |       | 0.0   | 0.0   |       | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.1  | 6.1   |     | 6.1  | 6.1   |     |       | 6.2   | 6.2   |       | 6.2   | 6.2   |
| Lead/Lag                | Lead   | Lag   |     | Lag  | Lag   |     | Lag   | Lag   | Lag   | Lag   | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes  | Yes   |     | Yes  | Yes   |     | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0  | 3.0   |     | 3.0  | 3.0   |     | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None   | None  |     | None | None  |     | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max |
| Walk Time (s)           |  | 16.0  |     | 16.0 | 16.0  |     | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     |  | 9.0   |     | 9.0  | 9.0   |     | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   |
| Pedestrian Calls (#/hr) |  | 15    |     | 15   | 15    |     | 15    | 15    | 15    | 15    | 15    | 15    |
| Act Effct Green (s)     | 30.7   | 25.7  |     | 16.7 | 16.7  |     |       | 30.1  | 30.1  |       | 30.1  | 30.1  |
| Actuated g/C Ratio      | 0.38   | 0.32  |     | 0.21 | 0.21  |     |       | 0.38  | 0.38  |       | 0.38  | 0.38  |
| v/c Ratio               | 0.86   | 0.75  |     | 0.35 | 0.63  |     |       | 0.54  | 0.16  |       | 0.47  | 0.23  |
| Control Delay           | 43.2   | 31.7  |     | 31.2 | 34.9  |     |       | 25.1  | 1.0   |       | 23.6  | 2.7   |
| Queue Delay             | 0.0  | 0.0   |     | 0.0  | 0.0   |     |       | 0.0   | 0.0   |       | 0.0   | 0.0   |
| Total Delay             | 43.2   | 31.7  |     | 31.2 | 34.9  |     |       | 25.1  | 1.0   |       | 23.6  | 2.7   |
| LOS                     | D  | C     |     | C    | C     |     |       | C     | A     |       | C     | A     |
| Approach Delay          |  | 36.4  |     |      | 34.2  |     |       | 19.4  |       |       | 16.9  |       |
| Approach LOS            |  | D     |     |      | C     |     |       | B     |       |       | B     |       |
| Queue Length 50th (m)   | 33.7   | 57.3  |     | 7.0  | 30.8  |     |       | 38.2  | 0.0   |       | 32.6  | 0.0   |
| Queue Length 95th (m)   | #48.9  | 73.4  |     | 14.9 | 44.8  |     |       | 72.0  | 1.5   |       | 62.4  | 6.9   |
| Internal Link Dist (m)  |  | 111.1 |     |      | 140.7 |     |       | 99.1  |       |       | 107.3 |       |
| Turn Bay Length (m)     | 30.0   |       |     | 25.0 |       |     |       |       | 15.0  |       |       | 15.0  |
| Base Capacity (vph)     | 344  | 753   |     | 230  | 533   |     |       | 617   | 627   |       | 623   | 607   |
| Starvation Cap Reductn  | 0  | 0     |     | 0    | 0     |     |       | 0     | 0     |       | 0     | 0     |
| Spillback Cap Reductn   | 0  | 0     |     | 0    | 0     |     |       | 0     | 0     |       | 0     | 0     |
| Storage Cap Reductn     | 0  | 0     |     | 0    | 0     |     |       | 0     | 0     |       | 0     | 0     |
| Reduced v/c Ratio       | 0.86   | 0.56  |     | 0.23 | 0.42  |     |       | 0.54  | 0.16  |       | 0.47  | 0.23  |

Intersection Summary

Area Type: Other

Cycle Length: 80.1

Actuated Cycle Length: 80.1

Offset: 43 (54%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 27.6

Intersection LOS: C

Intersection Capacity Utilization 92.0%

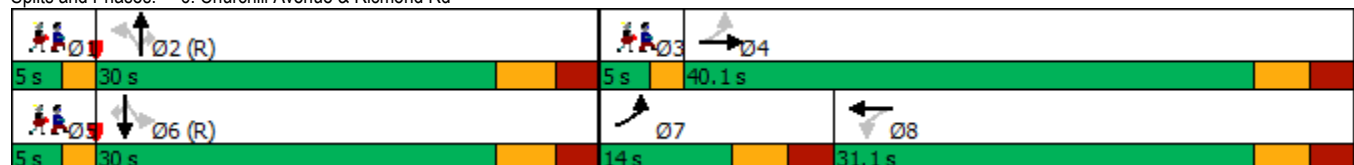
ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: Churchill Avenue & Richmond Rd














| Lane Group              | Ø1   | Ø3   | Ø5   |
|-------------------------|------|------|------|
| All-Red Time (s)        | 0.0  | 0.0  | 0.0  |
| Lost Time Adjust (s)    |      |      |      |
| Total Lost Time (s)     |      |      |      |
| Lead/Lag                | Lead | Lead | Lead |
| Lead-Lag Optimize?      | Yes  | Yes  | Yes  |
| Vehicle Extension (s)   | 3.0  | 3.0  | 3.0  |
| Recall Mode             | Min  | Min  | Min  |
| Walk Time (s)           |      |      |      |
| Flash Dont Walk (s)     |      |      |      |
| Pedestrian Calls (#/hr) |      |      |      |
| Act Effct Green (s)     |      |      |      |
| Actuated g/C Ratio      |      |      |      |
| v/c Ratio               |      |      |      |
| Control Delay           |      |      |      |
| Queue Delay             |      |      |      |
| Total Delay             |      |      |      |
| LOS                     |      |      |      |
| Approach Delay          |      |      |      |
| Approach LOS            |      |      |      |
| Queue Length 50th (m)   |      |      |      |
| Queue Length 95th (m)   |      |      |      |
| Internal Link Dist (m)  |      |      |      |
| Turn Bay Length (m)     |      |      |      |
| Base Capacity (vph)     |      |      |      |
| Starvation Cap Reductn  |      |      |      |
| Spillback Cap Reductn   |      |      |      |
| Storage Cap Reductn     |      |      |      |
| Reduced v/c Ratio       |      |      |      |
| Intersection Summary    |      |      |      |










9: Highcroft Avenue & Byron Avenue  
AM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 225   | 6   | 4   | 272   | 17  | 26  |
| Future Volume (Veh/h)             | 225   | 6   | 4   | 272   | 17  | 26  |
| Sign Control                      | Free  |   |   | Free  | Stop  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 225   | 6   | 4   | 272   | 17  | 26  |
| Pedestrians                       |   |   |   |   | 10  |   |
| Lane Width (m)                    |   |   |   |   | 3.7   |   |
| Walking Speed (m/s)               |   |   |   |   | 1.1   |   |
| Percent Blockage                  |   |   |   |   | 1   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 85  |   |   |   |   |   |
| pX, platoon unblocked             |   |   | 0.94  |   | 0.94  | 0.94  |
| vC, conflicting volume            |   |   | 241   |   | 518   | 238   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                |   |   | 159   |   | 454   | 156   |
| tC, single (s)                    |   |   | 4.1   |   | 6.4   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            |   |   | 2.2   |   | 3.5   | 3.3   |
| p0 queue free %                   |   |   | 100   |   | 97  | 97  |
| cM capacity (veh/h)               |   |   | 1333  |   | 526   | 832   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  |   |   |   |
| Volume Total                      | 231   | 276   | 43  |   |   |   |
| Volume Left                       | 0   | 4   | 17  |   |   |   |
| Volume Right                      | 6   | 0   | 26  |   |   |   |
| cSH                               | 1700  | 1333  | 677   |   |   |   |
| Volume to Capacity                | 0.14  | 0.00  | 0.06  |   |   |   |
| Queue Length 95th (m)             | 0.0   | 0.1   | 1.5   |   |   |   |
| Control Delay (s)                 | 0.0   | 0.1   | 10.7  |   |   |   |
| Lane LOS                          |   | A   | B   |   |   |   |
| Approach Delay (s)                | 0.0   | 0.1   | 10.7  |   |   |   |
| Approach LOS                      |   |   | B   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.9   |   |   |   |
| Intersection Capacity Utilization |   |   | 28.5%   | ICU Level of Service  |   | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

11: Highcroft Avenue & Access  
AM Peak



















433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Background Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 18  | 0   | 0   | 25  | 2   | 7   |
| Future Volume (Veh/h)             | 18  | 0   | 0   | 25  | 2   | 7   |
| Sign Control                      | Stop  |   |   | Free  | Free  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 18  | 0   | 0   | 25  | 2   | 7   |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       |   |   |   | None  | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |
| vC, conflicting volume            | 30  | 6   | 9   |   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 30  | 6   | 9   |   |   |   |
| tC, single (s)                    | 6.4   | 6.2   | 4.1   |   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 3.3   | 2.2   |   |   |   |
| p0 queue free %                   | 98  | 100   | 100   |   |   |   |
| cM capacity (veh/h)               | 984   | 1077  | 1611  |   |   |   |
| Direction, Lane #                 | EB 1  | NB 1  | SB 1  |   |   |   |
| Volume Total                      | 18  | 25  | 9   |   |   |   |
| Volume Left                       | 18  | 0   | 0   |   |   |   |
| Volume Right                      | 0   | 0   | 7   |   |   |   |
| cSH                               | 984   | 1611  | 1700  |   |   |   |
| Volume to Capacity                | 0.02  | 0.00  | 0.01  |   |   |   |
| Queue Length 95th (m)             | 0.4   | 0.0   | 0.0   |   |   |   |
| Control Delay (s)                 | 8.7   | 0.0   | 0.0   |   |   |   |
| Lane LOS                          | A   |   |   |   |   |   |
| Approach Delay (s)                | 8.7   | 0.0   | 0.0   |   |   |   |
| Approach LOS                      | A   |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Average Delay                     |   |   | 3.0   |   |   |   |
| Intersection Capacity Utilization |   | 13.3%   |   | ICU Level of Service  |   | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

3: Churchill Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place













2020 and 2025 Total Traffic

|                            |  |  |  |  |  |  |   |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |   |  |   |   |  |   |  |  |   |  |  |   |
| Traffic Volume (vph)       | 45  | 141   | 61  | 97  | 362   | 79  | 33  | 298   | 97  | 34  | 321   | 69  |
| Future Volume (vph)        | 45  | 141   | 61  | 97  | 362   | 79  | 33  | 298   | 97  | 34  | 321   | 69  |
| 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   | 15.0  |   | 0.0   | 15.0  |   | 0.0   |
| Storage Lanes              | 0   |   | 0   | 0   |   | 0   | 1   |   | 0   | 1   |   | 0   |
| Taper Length (m)           | 7.6   |   |   | 7.6   |   |   | 25.0  |   |   | 25.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            |   | 0.99  |   |   | 0.99  |   | 0.98  | 0.98  |   | 0.98  | 0.99  |   |
| Frt                        |   | 0.967   |   |   | 0.980   |   |   | 0.963   |   |   | 0.973   |   |
| Flt Protected              |   | 0.991   |   |   | 0.991   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)          | 0   | 1725  | 0   | 0   | 1750  | 0   | 1616  | 1661  | 0   | 1729  | 1667  | 0   |
| Flt Permitted              |   | 0.832   |   |   | 0.883   |   | 0.444   |   |   | 0.440   |   |   |
| Satd. Flow (perm)          | 0   | 1446  | 0   | 0   | 1556  | 0   | 738   | 1661  | 0   | 787   | 1667  | 0   |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 23  |   |   | 12  |   |   | 23  |   |   | 15  |   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |   | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 207.2   |   |   | 85.0  |   |   | 153.8   |   |   | 123.1   |   |
| Travel Time (s)            |   | 14.9  |   |   | 6.1   |   |   | 11.1  |   |   | 8.9   |   |
| Confl. Peds. (#/hr)        | 14  |   | 8   | 8   |   | 14  | 21  |   | 16  | 16  |   | 21  |
| Confl. Bikes (#/hr)        |   |   | 11  |   |   | 6   |   |   | 14  |   |   | 6   |
| Peak Hour Factor           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Heavy Vehicles (%)         | 0%  | 0%  | 0%  | 0%  | 0%  | 2%  | 7%  | 5%  | 0%  | 0%  | 5%  | 4%  |
| Adj. Flow (vph)            | 45  | 141   | 61  | 97  | 362   | 79  | 33  | 298   | 97  | 34  | 321   | 69  |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)      | 0   | 247   | 0   | 0   | 538   | 0   | 33  | 395   | 0   | 34  | 390   | 0   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 0.0   |   |   | 0.0   |   |   | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |   |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   | 1   | 2   |   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   | Left  | Thru  |   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1   | 30.5  |   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1   | 1.8   |   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   |
| Detector 1 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |   |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |   | 0.0   |   |
| Turn Type                  | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   | Perm  | NA  |   |
| Protected Phases           |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Detector Phase             | 4   | 4   |   | 8   | 8   |   | 2   | 2   |   | 6   | 6   |   |
| Switch Phase               |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)        | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0  | 10.0  |   |
| Minimum Split (s)          | 30.6  | 30.6  |   | 30.6  | 30.6  |   | 25.5  | 25.5  |   | 25.5  | 25.5  |   |
| Total Split (s)            | 45.0  | 45.0  |   | 45.0  | 45.0  |   | 45.0  | 45.0  |   | 45.0  | 45.0  |   |
| Total Split (%)            | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   | 50.0%   | 50.0%   |   |
| Maximum Green (s)          | 39.4  | 39.4  |   | 39.4  | 39.4  |   | 39.6  | 39.6  |   | 39.6  | 39.6  |   |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.3   | 3.3   |   |

3: Churchill Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

2020 and 2025 Total Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.3   | 2.3   |   | 2.3   | 2.3   |   | 2.1  | 2.1   |   | 2.1   | 2.1   |   |
| Lost Time Adjust (s)    |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.0   |   |
| Total Lost Time (s)     |   | 5.6   |   |   | 5.6   |   | 5.4  | 5.4   |   | 5.4   | 5.4   |   |
| 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             | None  | None  |   | None  | None  |   | C-Max  | C-Max   |   | C-Max   | C-Max   |   |
| Walk Time (s)           | 10.0  | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  |   | 10.0  | 10.0  |   |
| Flash Dont Walk (s)     | 15.0  | 15.0  |   | 15.0  | 15.0  |   | 9.0  | 9.0   |   | 9.0   | 9.0   |   |
| Pedestrian Calls (#/hr) | 0   | 0   |   | 0   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Act Effct Green (s)     |   | 34.7  |   |   | 34.7  |   | 44.3   | 44.3  |   | 44.3  | 44.3  |   |
| Actuated g/C Ratio      |   | 0.39  |   |   | 0.39  |   | 0.49   | 0.49  |   | 0.49  | 0.49  |   |
| v/c Ratio               |   | 0.43  |   |   | 0.89  |   | 0.09   | 0.48  |   | 0.09  | 0.47  |   |
| Control Delay           |   | 19.9  |   |   | 42.3  |   | 15.2   | 17.9  |   | 15.9  | 20.2  |   |
| Queue Delay             |   | 0.0   |   |   | 0.0   |   | 0.0  | 0.0   |   | 0.0   | 0.4   |   |
| Total Delay             |   | 19.9  |   |   | 42.3  |   | 15.2   | 17.9  |   | 15.9  | 20.6  |   |
| LOS                     |   | B   |   |   | D   |   | B  | B   |   | B   | C   |   |
| Approach Delay          |   | 19.9  |   |   | 42.3  |   |  | 17.7  |   |   | 20.3  |   |
| Approach LOS            |   | B   |   |   | D   |   |  | B   |   |   | C   |   |
| Queue Length 50th (m)   |   | 26.6  |   |   | 79.9  |   | 3.1  | 42.7  |   | 3.7   | 41.8  |   |
| Queue Length 95th (m)   |   | 43.6  |   |   | #122.5  |   | 8.9  | 71.8  |   | m8.0  | 60.9  |   |
| Internal Link Dist (m)  |   | 183.2   |   |   | 61.0  |   |  | 129.8   |   |   | 99.1  |   |
| Turn Bay Length (m)     |   |   |   |   |   |   | 15.0   |   |   | 15.0  |   |   |
| Base Capacity (vph)     |   | 645   |   |   | 687   |   | 362  | 828   |   | 387   | 827   |   |
| Starvation Cap Reductn  |   | 0   |   |   | 0   |   | 0  | 0   |   | 0   | 132   |   |
| Spillback Cap Reductn   |   | 0   |   |   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Storage Cap Reductn     |   | 0   |   |   | 0   |   | 0  | 0   |   | 0   | 0   |   |
| Reduced v/c Ratio       |   | 0.38  |   |   | 0.78  |   | 0.09   | 0.48  |   | 0.09  | 0.56  |   |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 40 (44%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 26.8

Intersection LOS: C

Intersection Capacity Utilization 80.4%

ICU Level of Service D





Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.





















Splits and Phases: 3: Churchill Avenue & Byron Avenue

|  |  |
|--|--|
|  Ø2 (R) |  Ø4 |
| 45 s   | 45 s   |
|  Ø6 (R) |  Ø8 |
| 45 s   | 45 s   |

6: Churchill Avenue & Richmond Rd  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

2020 and 2025 Total Traffic













|                            |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group                 | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations        |  |  |   |  |  |   |  |  |  |   |  |  |
| Traffic Volume (vph)       | 191   | 342   | 57  | 129   | 485   | 25  | 28   | 294   | 67  | 15  | 241   | 312   |
| Future Volume (vph)        | 191   | 342   | 57  | 129   | 485   | 25  | 28   | 294   | 67  | 15  | 241   | 312   |
| Ideal Flow (vphpl)         | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (m)         | 30.0  |   | 0.0   | 25.0  |   | 0.0   | 15.0   |   | 15.0  | 15.0  |   | 15.0  |
| Storage Lanes              | 1   |   | 0   | 1   |   | 0   | 0  |   | 1   | 0   |   | 1   |
| Taper Length (m)           | 45.0  |   |   | 30.0  |   |   | 15.0   |   |   | 15.0  |   |   |
| Lane Util. 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  |
| Ped Bike Factor            | 0.97  | 0.98  |   | 0.95  | 0.99  |   |  | 0.99  | 0.89  |   | 1.00  | 0.87  |
| Frt                        |   | 0.979   |   |   | 0.993   |   |  |   | 0.850   |   |   | 0.850   |
| Flt Protected              | 0.950   |   |   | 0.950   |   |   |  | 0.996   |   |   | 0.997   |   |
| Satd. Flow (prot)          | 1679  | 1740  | 0   | 1586  | 1712  | 0   | 0  | 1722  | 1517  | 0   | 1706  | 1488  |
| Flt Permitted              | 0.193   |   |   | 0.527   |   |   |  | 0.951   |   |   | 0.967   |   |
| Satd. Flow (perm)          | 332   | 1740  | 0   | 837   | 1712  | 0   | 0  | 1635  | 1354  | 0   | 1651  | 1300  |
| Right Turn on Red          |   |   | Yes   |   |   | Yes   |  |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)          |   | 15  |   |   | 4   |   |  |   | 160   |   |   | 183   |
| Link Speed (k/h)           |   | 50  |   |   | 50  |   |  | 50  |   |   | 50  |   |
| Link Distance (m)          |   | 135.1   |   |   | 164.7   |   |  | 123.1   |   |   | 131.3   |   |
| Travel Time (s)            |   | 9.7   |   |   | 11.9  |   |  | 8.9   |   |   | 9.5   |   |
| Confl. Peds. (#/hr)        | 50  |   | 47  | 47  |   | 50  | 38   |   | 30  | 30  |   | 38  |
| Confl. Bikes (#/hr)        |   |   | 6   |   |   | 4   |  |   | 3   |   |   | 1   |
| 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%  | 1%  | 0%  | 9%  | 5%  | 5%  | 8%   | 5%  | 2%  | 12%   | 6%  | 4%  |
| Adj. Flow (vph)            | 191   | 342   | 57  | 129   | 485   | 25  | 28   | 294   | 67  | 15  | 241   | 312   |
| Shared Lane Traffic (%)    |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Group Flow (vph)      | 191   | 399   | 0   | 129   | 510   | 0   | 0  | 322   | 67  | 0   | 256   | 312   |
| Enter Blocked Intersection | No  | No  | No  | No  | No  | No  | No   | No  | No  | No  | No  | No  |
| Lane Alignment             | Left  | Left  | Right   | Left  | Left  | Right   | Left   | Left  | Right   | Left  | Left  | Right   |
| Median Width(m)            |   | 3.7   |   |   | 3.7   |   |  | 3.7   |   |   | 3.7   |   |
| Link Offset(m)             |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Crosswalk Width(m)         |   | 4.9   |   |   | 4.9   |   |  | 4.9   |   |   | 4.9   |   |
| Two way Left Turn Lane     |   |   |   |   |   |   |  |   |   |   |   |   |
| Headway Factor             | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  | 1.06   | 1.06  | 1.06  | 1.06  | 1.06  | 1.06  |
| Turning Speed (k/h)        | 24  |   | 14  | 24  |   | 14  | 24   |   | 14  | 24  |   | 14  |
| Number of Detectors        | 1   | 2   |   | 1   | 2   |   | 1  | 2   | 1   | 1   | 2   | 1   |
| Detector Template          | Left  | Thru  |   | Left  | Thru  |   | Left   | Thru  | Right   | Left  | Thru  | Right   |
| Leading Detector (m)       | 6.1   | 30.5  |   | 6.1   | 30.5  |   | 6.1  | 30.5  | 6.1   | 6.1   | 30.5  | 6.1   |
| Trailing Detector (m)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Position(m)     | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Size(m)         | 6.1   | 1.8   |   | 6.1   | 1.8   |   | 6.1  | 1.8   | 6.1   | 6.1   | 1.8   | 6.1   |
| Detector 1 Type            | CI+Ex   | CI+Ex   |   | CI+Ex   | CI+Ex   |   | CI+Ex  | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   | CI+Ex   |
| Detector 1 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 1 Extend (s)      | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Queue (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 1 Delay (s)       | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Detector 2 Position(m)     |   | 28.7  |   |   | 28.7  |   |  | 28.7  |   |   | 28.7  |   |
| Detector 2 Size(m)         |   | 1.8   |   |   | 1.8   |   |  | 1.8   |   |   | 1.8   |   |
| Detector 2 Type            |   | CI+Ex   |   |   | CI+Ex   |   |  | CI+Ex   |   |   | CI+Ex   |   |
| Detector 2 Channel         |   |   |   |   |   |   |  |   |   |   |   |   |
| Detector 2 Extend (s)      |   | 0.0   |   |   | 0.0   |   |  | 0.0   |   |   | 0.0   |   |
| Turn Type                  | pm+pt   | NA  |   | Perm  | NA  |   | Perm   | NA  | Perm  | Perm  | NA  | Perm  |
| Protected Phases           | 7   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases           | 4   |   |   | 8   |   |   | 2  |   | 2   | 6   |   | 6   |
| Detector Phase             | 7   | 4   |   | 8   | 8   |   | 2  | 2   | 2   | 6   | 6   | 6   |
| Switch Phase               |   |   |   |   |   |   |  |   |   |   |   |   |
| Minimum Initial (s)        | 5.0   | 10.0  |   | 10.0  | 10.0  |   | 10.0   | 10.0  | 10.0  | 10.0  | 10.0  | 10.0  |
| Minimum Split (s)          | 11.1  | 31.1  |   | 31.1  | 31.1  |   | 24.2   | 24.2  | 24.2  | 24.2  | 24.2  | 24.2  |
| Total Split (s)            | 15.0  | 55.0  |   | 45.0  | 45.0  |   | 25.0   | 25.0  | 25.0  | 25.0  | 25.0  | 25.0  |
| Total Split (%)            | 16.7%   | 61.1%   |   | 50.0%   | 50.0%   |   | 27.8%  | 27.8%   | 27.8%   | 27.8%   | 27.8%   | 27.8%   |
| Maximum Green (s)          | 8.9   | 48.9  |   | 38.9  | 38.9  |   | 18.8   | 18.8  | 18.8  | 18.8  | 18.8  | 18.8  |
| Yellow Time (s)            | 3.3   | 3.3   |   | 3.3   | 3.3   |   | 3.6  | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |

| Lane Group                 | Ø1  | Ø3  | Ø5  |
|----------------------------|-----|-----|-----|
| Lane Configurations        |     |     |     |
| Traffic Volume (vph)       |     |     |     |
| Future Volume (vph)        |     |     |     |
| Ideal Flow (vphpl)         |     |     |     |
| Storage Length (m)         |     |     |     |
| Storage Lanes              |     |     |     |
| Taper Length (m)           |     |     |     |
| Lane Util. Factor          |     |     |     |
| Ped Bike Factor            |     |     |     |
| Frt                        |     |     |     |
| Flt Protected              |     |     |     |
| Satd. Flow (prot)          |     |     |     |
| Flt Permitted              |     |     |     |
| Satd. Flow (perm)          |     |     |     |
| Right Turn on Red          |     |     |     |
| Satd. Flow (RTOR)          |     |     |     |
| Link Speed (k/h)           |     |     |     |
| Link Distance (m)          |     |     |     |
| Travel Time (s)            |     |     |     |
| Confl. Peds. (#/hr)        |     |     |     |
| Confl. Bikes (#/hr)        |     |     |     |
| Peak Hour Factor           |     |     |     |
| Heavy Vehicles (%)         |     |     |     |
| Adj. Flow (vph)            |     |     |     |
| Shared Lane Traffic (%)    |     |     |     |
| Lane Group Flow (vph)      |     |     |     |
| Enter Blocked Intersection |     |     |     |
| Lane Alignment             |     |     |     |
| Median Width(m)            |     |     |     |
| Link Offset(m)             |     |     |     |
| Crosswalk Width(m)         |     |     |     |
| Two way Left Turn Lane     |     |     |     |
| Headway Factor             |     |     |     |
| Turning Speed (k/h)        |     |     |     |
| Number of Detectors        |     |     |     |
| Detector Template          |     |     |     |
| Leading Detector (m)       |     |     |     |
| Trailing Detector (m)      |     |     |     |
| Detector 1 Position(m)     |     |     |     |
| Detector 1 Size(m)         |     |     |     |
| Detector 1 Type            |     |     |     |
| Detector 1 Channel         |     |     |     |
| Detector 1 Extend (s)      |     |     |     |
| Detector 1 Queue (s)       |     |     |     |
| Detector 1 Delay (s)       |     |     |     |
| Detector 2 Position(m)     |     |     |     |
| Detector 2 Size(m)         |     |     |     |
| Detector 2 Type            |     |     |     |
| Detector 2 Channel         |     |     |     |
| Detector 2 Extend (s)      |     |     |     |
| Turn Type                  |     |     |     |
| Protected Phases           | 1   | 3   | 5   |
| Permitted Phases           |     |     |     |
| Detector Phase             |     |     |     |
| Switch Phase               |     |     |     |
| Minimum Initial (s)        | 3.0 | 3.0 | 3.0 |
| Minimum Split (s)          | 5.0 | 5.0 | 5.0 |
| Total Split (s)            | 5.0 | 5.0 | 5.0 |
| Total Split (%)            | 6%  | 6%  | 6%  |
| Maximum Green (s)          | 3.0 | 3.0 | 3.0 |
| Yellow Time (s)            | 2.0 | 2.0 | 2.0 |

6: Churchill Avenue & Richmond Rd  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place

2020 and 2025 Total Traffic

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| All-Red Time (s)        | 2.8   | 2.8   |   | 2.8   | 2.8   |   | 2.6  | 2.6   | 2.6   | 2.6   | 2.6   | 2.6   |
| Lost Time Adjust (s)    | 0.0   | 0.0   |   | 0.0   | 0.0   |   |  | 0.0   | 0.0   |   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.1   | 6.1   |   | 6.1   | 6.1   |   |  | 6.2   | 6.2   |   | 6.2   | 6.2   |
| Lead/Lag                | Lead  | Lag   |   | Lag   | Lag   |   | Lag  | Lag   | Lag   | Lag   | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   |   | Yes   | Yes   |   | Yes  | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   |   | 3.0   | 3.0   |   | 3.0  | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  |   | None  | None  |   | C-Max  | C-Max   | C-Max   | C-Max   | C-Max   | C-Max   |
| Walk Time (s)           |   | 16.0  |   | 16.0  | 16.0  |   | 7.0  | 7.0   | 7.0   | 7.0   | 7.0   | 7.0   |
| Flash Dont Walk (s)     |   | 9.0   |   | 9.0   | 9.0   |   | 9.0  | 9.0   | 9.0   | 9.0   | 9.0   | 9.0   |
| Pedestrian Calls (#/hr) |   | 15  |   | 15  | 15  |   | 15   | 15  | 15  | 15  | 15  | 15  |
| Act Effct Green (s)     | 47.3  | 42.3  |   | 32.3  | 32.3  |   |  | 23.6  | 23.6  |   | 23.6  | 23.6  |
| Actuated g/C Ratio      | 0.53  | 0.47  |   | 0.36  | 0.36  |   |  | 0.26  | 0.26  |   | 0.26  | 0.26  |
| v/c Ratio               | 0.62  | 0.48  |   | 0.43  | 0.83  |   |  | 0.75  | 0.14  |   | 0.59  | 0.66  |
| Control Delay           | 19.7  | 17.0  |   | 25.2  | 37.7  |   |  | 45.2  | 4.2   |   | 37.9  | 21.3  |
| Queue Delay             | 0.0   | 0.0   |   | 0.0   | 0.0   |   |  | 0.0   | 0.0   |   | 0.0   | 0.0   |
| Total Delay             | 19.7  | 17.0  |   | 25.2  | 37.7  |   |  | 45.2  | 4.2   |   | 37.9  | 21.3  |
| LOS                     | B   | B   |   | C   | D   |   |  | D   | A   |   | D   | C   |
| Approach Delay          |   | 17.9  |   |   | 35.2  |   |  | 38.1  |   |   | 28.8  |   |
| Approach LOS            |   | B   |   |   | D   |   |  | D   |   |   | C   |   |
| Queue Length 50th (m)   | 16.3  | 42.7  |   | 16.4  | 77.3  |   |  | 52.3  | 0.7   |   | 39.7  | 19.2  |
| Queue Length 95th (m)   | 23.4  | 57.1  |   | 28.8  | 104.3   |   |  | m#102.6   | m4.7  |   | #75.4   | #59.2   |
| Internal Link Dist (m)  |   | 111.1   |   |   | 140.7   |   |  | 99.1  |   |   | 107.3   |   |
| Turn Bay Length (m)     | 30.0  |   |   | 25.0  |   |   |  |   | 15.0  |   |   | 15.0  |
| Base Capacity (vph)     | 307   | 952   |   | 361   | 742   |   |  | 427   | 472   |   | 432   | 475   |
| Starvation Cap Reductn  | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Spillback Cap Reductn   | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Storage Cap Reductn     | 0   | 0   |   | 0   | 0   |   |  | 0   | 0   |   | 0   | 0   |
| Reduced v/c Ratio       | 0.62  | 0.42  |   | 0.36  | 0.69  |   |  | 0.75  | 0.14  |   | 0.59  | 0.66  |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 29.4

Intersection LOS: C

Intersection Capacity Utilization 92.6%

ICU Level of Service F

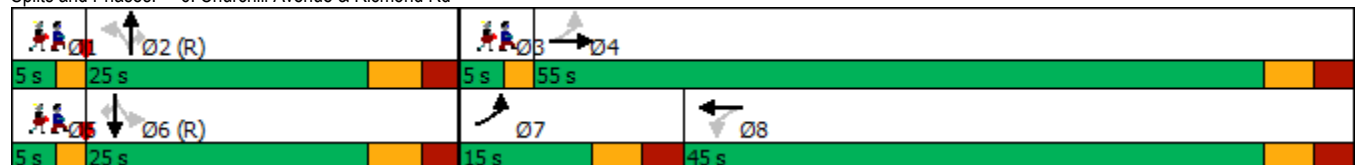
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Churchill Avenue & Richmond Rd














| Lane Group              | Ø1   | Ø3   | Ø5   |
|-------------------------|------|------|------|
| All-Red Time (s)        | 0.0  | 0.0  | 0.0  |
| Lost Time Adjust (s)    |      |      |      |
| Total Lost Time (s)     |      |      |      |
| Lead/Lag                | Lead | Lead | Lead |
| Lead-Lag Optimize?      | Yes  | Yes  | Yes  |
| Vehicle Extension (s)   | 3.0  | 3.0  | 3.0  |
| Recall Mode             | Min  | Min  | Min  |
| Walk Time (s)           |      |      |      |
| Flash Dont Walk (s)     |      |      |      |
| Pedestrian Calls (#/hr) |      |      |      |
| Act Effct Green (s)     |      |      |      |
| Actuated g/C Ratio      |      |      |      |
| v/c Ratio               |      |      |      |
| Control Delay           |      |      |      |
| Queue Delay             |      |      |      |
| Total Delay             |      |      |      |
| LOS                     |      |      |      |
| Approach Delay          |      |      |      |
| Approach LOS            |      |      |      |
| Queue Length 50th (m)   |      |      |      |
| Queue Length 95th (m)   |      |      |      |
| Internal Link Dist (m)  |      |      |      |
| Turn Bay Length (m)     |      |      |      |
| Base Capacity (vph)     |      |      |      |
| Starvation Cap Reductn  |      |      |      |
| Spillback Cap Reductn   |      |      |      |
| Storage Cap Reductn     |      |      |      |
| Reduced v/c Ratio       |      |      |      |
| Intersection Summary    |      |      |      |










9: Highcroft Avenue & Byron Avenue  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Total Traffic

|                                   |   |   |   |   |   |   |
|-----------------------------------|---|---|---|---|---|---|
|                                   |  |  |  |  |  |  |
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 233   | 12  | 7   | 589   | 9   | 13  |
| Future Volume (Veh/h)             | 233   | 12  | 7   | 589   | 9   | 13  |
| Sign Control                      | Free  |   |   | Free  | Stop  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 233   | 12  | 7   | 589   | 9   | 13  |
| Pedestrians                       |   |   |   |   | 10  |   |
| Lane Width (m)                    |   |   |   |   | 3.7   |   |
| Walking Speed (m/s)               |   |   |   |   | 1.1   |   |
| Percent Blockage                  |   |   |   |   | 1   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       | None  |   |   | None  |   |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               | 85  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |
| vC, conflicting volume            |   |   | 255   |   | 852   | 249   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                |   |   | 255   |   | 852   | 249   |
| tC, single (s)                    |   |   | 4.1   |   | 6.4   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            |   |   | 2.2   |   | 3.5   | 3.3   |
| p0 queue free %                   |   |   | 99  |   | 97  | 98  |
| cM capacity (veh/h)               |   |   | 1309  |   | 328   | 787   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  |   |   |   |
| Volume Total                      | 245   | 596   | 22  |   |   |   |
| Volume Left                       | 0   | 7   | 9   |   |   |   |
| Volume Right                      | 12  | 0   | 13  |   |   |   |
| cSH                               | 1700  | 1309  | 500   |   |   |   |
| Volume to Capacity                | 0.14  | 0.01  | 0.04  |   |   |   |
| Queue Length 95th (m)             | 0.0   | 0.1   | 1.0   |   |   |   |
| Control Delay (s)                 | 0.0   | 0.2   | 12.5  |   |   |   |
| Lane LOS                          |   | A   | B   |   |   |   |
| Approach Delay (s)                | 0.0   | 0.2   | 12.5  |   |   |   |
| Approach LOS                      |   |   | B   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.4   |   |   |   |
| Intersection Capacity Utilization |   |   | 48.6%   | ICU Level of Service  |   | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

11: Highcroft Avenue & Access  
PM Peak

433-435 Churchill Avenue and 468-472 Byron Place  
2020 and 2025 Total Traffic

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBL   | EBR   | NBL   | NBT   | SBT   | SBR   |
| Lane Configurations               |  |   |   |  |  |   |
| Traffic Volume (veh/h)            | 13  | 0   | 0   | 9   | 1   | 19  |
| Future Volume (Veh/h)             | 13  | 0   | 0   | 9   | 1   | 19  |
| Sign Control                      | Stop  |   |   | Free  | Free  |   |
| Grade                             | 0%  |   |   | 0%  | 0%  |   |
| Peak Hour Factor                  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Hourly flow rate (vph)            | 13  | 0   | 0   | 9   | 1   | 19  |
| Pedestrians                       |   |   |   |   |   |   |
| Lane Width (m)                    |   |   |   |   |   |   |
| Walking Speed (m/s)               |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |
| Median type                       |   |   |   | None  | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |
| Upstream signal (m)               |   |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |
| vC, conflicting volume            | 20  | 10  | 20  |   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |
| vCu, unblocked vol                | 20  | 10  | 20  |   |   |   |
| tC, single (s)                    | 6.4   | 6.2   | 4.1   |   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 3.3   | 2.2   |   |   |   |
| p0 queue free %                   | 99  | 100   | 100   |   |   |   |
| cM capacity (veh/h)               | 998   | 1071  | 1596  |   |   |   |
| Direction, Lane #                 | EB 1  | NB 1  | SB 1  |   |   |   |
| Volume Total                      | 13  | 9   | 20  |   |   |   |
| Volume Left                       | 13  | 0   | 0   |   |   |   |
| Volume Right                      | 0   | 0   | 19  |   |   |   |
| cSH                               | 998   | 1596  | 1700  |   |   |   |
| Volume to Capacity                | 0.01  | 0.00  | 0.01  |   |   |   |
| Queue Length 95th (m)             | 0.3   | 0.0   | 0.0   |   |   |   |
| Control Delay (s)                 | 8.7   | 0.0   | 0.0   |   |   |   |
| Lane LOS                          | A   |   |   |   |   |   |
| Approach Delay (s)                | 8.7   | 0.0   | 0.0   |   |   |   |
| Approach LOS                      | A   |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |
| Average Delay                     |   | 2.7   |   |   |   |   |
| Intersection Capacity Utilization |   | 13.3%   |   | ICU Level of Service  |   | A   |
| Analysis Period (min)             |   | 15  |   |   |   |   |

## **APPENDIX K**

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### Intersection MMLOS Analysis

**Pedestrian Level of Service (PLOS)**

| Criteria                         | North Approach        |      | South Approach        |      | East Approach         |      | West Approach         |      |
|----------------------------------|-----------------------|------|-----------------------|------|-----------------------|------|-----------------------|------|
| Churchill Avenue/Byron Avenue    |                       |      |                       |      |                       |      |                       |      |
| PETSI SCORE                      |                       |      |                       |      |                       |      |                       |      |
| CROSSING DISTANCE CONDITIONS     |                       |      |                       |      |                       |      |                       |      |
| Median > 2.4m in Width           | No                    | 88   | No                    | 88   | No                    | 88   | No                    | 88   |
| Lanes Crossed (3.5m Lane Width)  | 4                     |      | 4                     |      | 4                     |      | 4                     |      |
| SIGNAL PHASING AND TIMING        |                       |      |                       |      |                       |      |                       |      |
| Left Turn Conflict               | Permissive            | -8   | Permissive            | -8   | Permissive            | -8   | Permissive            | -8   |
| Right Turn Conflict              | Permissive or Yield   | -5   | Permissive or Yield   | -5   | Permissive or Yield   | -5   | Permissive or Yield   | -5   |
| Right Turn on Red                | RTOR Allowed          | -3   | RTOR Allowed          | -3   | RTOR Allowed          | -3   | RTOR Allowed          | -3   |
| Leading Pedestrian Interval      | No                    | -2   | No                    | -2   | No                    | -2   | No                    | -2   |
| CORNER RADIUS                    |                       |      |                       |      |                       |      |                       |      |
| Parallel Radius                  | > 5m to 10m           | -5   | > 5m to 10m           | -5   | > 5m to 10m           | -5   | > 5m to 10m           | -5   |
| Parallel Right Turn Channel      | No Right Turn Channel | -4   | No Right Turn Channel | -4   | No Right Turn Channel | -4   | No Right Turn Channel | -4   |
| Perpendicular Radius             | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    |
| Perpendicular Right Turn Channel | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    |
| CROSSING TREATMENT               |                       |      |                       |      |                       |      |                       |      |
| Treatment                        | Zebra Stripe          | -4   | Zebra Stripe          | -4   | Zebra Stripe          | -4   | Zebra Stripe          | -4   |
| PETSI SCORE                      |                       | 57   |                       | 57   |                       | 57   |                       | 57   |
| LOS                              |                       | D    |                       | D    |                       | D    |                       | D    |
| DELAY SCORE                      |                       |      |                       |      |                       |      |                       |      |
| Cycle Length                     |                       | 80   |                       | 80   |                       | 80   |                       | 80   |
| Pedestrian Walk Time             |                       | 17.4 |                       | 17.4 |                       | 27.6 |                       | 27.6 |
| DELAY SCORE                      |                       | 24.5 |                       | 24.5 |                       | 17.2 |                       | 17.2 |
| LOS                              |                       | C    |                       | C    |                       | B    |                       | B    |
| OVERALL                          |                       | D    |                       | D    |                       | D    |                       | D    |

| Criteria                         | North Approach        |      | South Approach        |      | East Approach         |      | West Approach         |      |
|----------------------------------|-----------------------|------|-----------------------|------|-----------------------|------|-----------------------|------|
| Churchill Avenue/Richmond Road   |                       |      |                       |      |                       |      |                       |      |
| PETSI SCORE                      |                       |      |                       |      |                       |      |                       |      |
| CROSSING DISTANCE CONDITIONS     |                       |      |                       |      |                       |      |                       |      |
| Median > 2.4m in Width           | No                    | 88   | No                    | 88   | No                    | 88   | No                    | 88   |
| Lanes Crossed (3.5m Lane Width)  | 4                     |      | 4                     |      | 4                     |      | 4                     |      |
| SIGNAL PHASING AND TIMING        |                       |      |                       |      |                       |      |                       |      |
| Left Turn Conflict               | Perm + Prot           | -8   | Permissive            | -8   | Permissive            | -8   | Permissive            | -8   |
| Right Turn Conflict              | Permissive or Yield   | -5   | Permissive or Yield   | -5   | Permissive or Yield   | -5   | Permissive or Yield   | -5   |
| Right Turn on Red                | RTOR Allowed          | -3   | RTOR Allowed          | -3   | RTOR Allowed          | -3   | RTOR Allowed          | -3   |
| Leading Pedestrian Interval      | Yes                   | 0    | Yes                   | 0    | Yes                   | 0    | Yes                   | 0    |
| CORNER RADIUS                    |                       |      |                       |      |                       |      |                       |      |
| Parallel Radius                  | > 5m to 10m           | -5   | > 5m to 10m           | -5   | > 5m to 10m           | -5   | > 5m to 10m           | -5   |
| Parallel Right Turn Channel      | No Right Turn Channel | -4   | No Right Turn Channel | -4   | No Right Turn Channel | -4   | No Right Turn Channel | -4   |
| Perpendicular Radius             | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    |
| Perpendicular Right Turn Channel | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    | N/A                   | 0    |
| CROSSING TREATMENT               |                       |      |                       |      |                       |      |                       |      |
| Treatment                        | Zebra Stripe          | -4   | Zebra Stripe          | -4   | Zebra Stripe          | -4   | Zebra Stripe          | -4   |
| PETSI SCORE                      |                       | 59   | 59                    |      | 59                    |      | 59                    |      |
| LOS                              |                       | D    | D                     |      | D                     |      | D                     |      |
| DELAY SCORE                      |                       |      |                       |      |                       |      |                       |      |
| Cycle Length                     |                       | 80   |                       | 80   |                       | 80   |                       | 80   |
| Pedestrian Walk Time             |                       | 15.9 |                       | 24.9 |                       | 14.8 |                       | 14.8 |
| DELAY SCORE                      |                       | 25.7 | 19                    |      | 26.6                  |      | 26.6                  |      |
| LOS                              |                       | C    | B                     |      | C                     |      | C                     |      |
| OVERALL                          |                       | D    | D                     |      | D                     |      | D                     |      |

**Bicycle Level of Service (BLOS)**

| Approach                       | Bikeway Facility Type | Criteria                        | Travel Lanes and/or Speed  | BLOS |
|--------------------------------|-----------------------|---------------------------------|----------------------------|------|
| Churchill Avenue/Byron Avenue  |                       |                                 |                            |      |
| North Approach                 | Mixed Traffic         | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | One lane crossed, 60 km/hr | F    |
| South Approach                 | Mixed Traffic         | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | One lane crossed, 60 km/hr | F    |
| East Approach                  | Mixed Traffic         | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | No lanes crossed, 60 km/hr | D    |
| West Approach                  | Bike Lane             | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | No lanes crossed, 60 km/hr | C    |
| Churchill Avenue/Richmond Road |                       |                                 |                            |      |
| North Approach                 | Pocket Bike Lane      | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | No lanes crossed, 60 km/hr | D    |
| South Approach                 | Bike Lane             | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | No lanes crossed, 60 km/hr | D    |
| East Approach                  | Mixed Traffic         | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | One lane crossed, 60 km/hr | F    |
| West Approach                  | Mixed Traffic         | Right Turn Lane Characteristics | No impact on LTS           | A    |
|                                |                       | Left Turn Accommodation         | One lane crossed, 60 km/hr | F    |

**Transit Level of Service (TLOS)**

| Approach                              | Facility Type          | Delay <sup>1</sup> | TLOS             |
|---------------------------------------|------------------------|--------------------|------------------|
| <b>Churchill Avenue/Byron Avenue</b>  |                        |                    |                  |
| North Approach                        | Mixed Traffic (No TSP) | 20 seconds         | C                |
| South Approach                        | Mixed Traffic (No TSP) | 19 seconds         | C                |
| East Approach                         | Mixed Traffic (No TSP) | N/A <sup>2</sup>   | N/A <sup>2</sup> |
| West Approach                         | Mixed Traffic (No TSP) | N/A <sup>2</sup>   | N/A <sup>2</sup> |
| <b>Churchill Avenue/Richmond Road</b> |                        |                    |                  |
| North Approach                        | Mixed Traffic (No TSP) | 40 seconds         | F                |
| South Approach                        | Mixed Traffic (No TSP) | 61 seconds         | F                |
| East Approach                         | Mixed Traffic (No TSP) | 36 seconds         | E                |
| West Approach                         | Mixed Traffic (No TSP) | 19 seconds         | C                |

1. Mixed traffic delay based on the critical approach delay in Synchro analysis

2. No east-west transit along Byron Avenue

**Truck Level of Service (TkLOS)**

| Approach                              | Effective Corner Radius | Number of Receiving Lanes on Departure from Intersection | LOS |
|---------------------------------------|-------------------------|--|-----|
| <b>Churchill Avenue/Byron Avenue</b>  |                         |  |     |
| North Approach                        | < 10m                   | One  | F   |
| South Approach                        | < 10m                   | One  | F   |
| East Approach                         | < 10m                   | One  | F   |
| West Approach                         | < 10m                   | One  | F   |
| <b>Churchill Avenue/Richmond Road</b> |                         |  |     |
| North Approach                        | < 10m                   | One  | F   |
| South Approach                        | < 10m                   | One  | F   |
| East Approach                         | < 10m                   | One  | F   |
| West Approach                         | < 10m                   | One  | F   |



**Auto LOS**

| Approach                              | AM Peak      |     |       | PM Peak      |     |       |
|---------------------------------------|--------------|-----|-------|--------------|-----|-------|
|                                       | V/C or Delay | LOS | Mvmt  | V/C or Delay | LOS | Mvmt  |
| <b>Churchill Avenue/Byron Avenue</b>  |              |     |       |              |     |       |
| North Approach                        | 0.32         | A   | SBT/R | 0.55         | A   | SBT/R |
| South Approach                        | 0.39         | A   | NBT/R | 0.55         | A   | NBT/R |
| East Approach                         | 0.75         | C   | WB    | 0.92         | D   | WB    |
| West Approach                         | 0.75         | C   | EB    | 0.45         | A   | EB    |
| <b>Churchill Avenue/Richmond Road</b> |              |     |       |              |     |       |
| North Approach                        | 0.54         | A   | SB    | 0.82         | D   | SB    |
| South Approach                        | 0.61         | B   | NB    | 0.96         | E   | NB    |
| East Approach                         | 0.62         | B   | WBT/R | 0.86         | D   | WBT/R |
| West Approach                         | 0.93         | E   | EBL   | 0.71         | C   | EBL   |

MMLOS Summary Table

| Intersection |                              | Churchill Avenue/Byron Avenue |                |               |               | Churchill Avenue/Richmond Road |                |               |               |
|--------------|------------------------------|-------------------------------|----------------|---------------|---------------|--------------------------------|----------------|---------------|---------------|
|              |                              | North Approach                | South Approach | East Approach | West Approach | North Approach                 | South Approach | East Approach | West Approach |
| Pedestrian   | Median > 2.4m in Width       | No                            | No             | No            | No            | No                             | No             | No            | No            |
|              | Lanes (3.5m Lane Width)      | Four                          | Four           | Four          | Four          | Four                           | Four           | Four          | Four          |
|              | Conflicting Left Turns       | Permissive                    | Permissive     | Permissive    | Permissive    | Perm + Prot                    | Permissive     | Permissive    | Permissive    |
|              | Conflicting Right Turns      | Permissive                    | Permissive     | Permissive    | Permissive    | Permissive                     | Permissive     | Permissive    | Permissive    |
|              | Right Turn on Red            | Permitted                     | Permitted      | Permitted     | Permitted     | Permitted                      | Permitted      | Permitted     | Permitted     |
|              | Pedestrian Leading Interval  | No                            | No             | No            | No            | Yes                            | Yes            | Yes           | Yes           |
|              | Parallel Radius              | 5m to 10m                     | 5m to 10m      | 5m to 10m     | 5m to 10m     | 5m to 10m                      | 5m to 10m      | 5m to 10m     | 5m to 10m     |
|              | Parallel Channel             | No Channel                    | No Channel     | No Channel    | No Channel    | No Channel                     | No Channel     | No Channel    | No Channel    |
|              | Perpendicular Radius         | N/A                           | N/A            | N/A           | N/A           | N/A                            | N/A            | N/A           | N/A           |
|              | Perpendicular Channel        | N/A                           | N/A            | N/A           | N/A           | N/A                            | N/A            | N/A           | N/A           |
|              | Crosswalk Type               | Zebra Stripe                  | Zebra Stripe   | Zebra Stripe  | Zebra Stripe  | Zebra Stripe                   | Zebra Stripe   | Zebra Stripe  | Zebra Stripe  |
|              | PETSI Score                  | 57                            | 57             | 57            | 57            | 59                             | 59             | 59            | 59            |
|              | Delay Score                  | 24.5                          | 24.5           | 17.2          | 17.2          | 25.7                           | 19             | 26.6          | 26.6          |
|              | Level of Service             | D                             | D              | D             | D             | D                              | D              | D             | D             |
|              | Target                       | D                             |                |               |               | D                              |                |               |               |
| Cyclist      | Type of Bikeway              | Mixed Traffic                 | Mixed Traffic  | Mixed Traffic | Bike Lane     | Mixed Traffic                  | Mixed Traffic  | Mixed Traffic | Mixed Traffic |
|              | Turning Speed                | N/A                           | N/A            | N/A           | N/A           | N/A                            | N/A            | N/A           | N/A           |
|              | Right Turn Storage           | N/A                           | N/A            | N/A           | N/A           | N/A                            | N/A            | N/A           | N/A           |
|              | Dual Right Turn Lanes        | No                            | No             | No            | No            | No                             | No             | No            | No            |
|              | Shared Through-Right Lane    | Yes                           | Yes            | Yes           | Yes           | Yes                            | Yes            | Yes           | Yes           |
|              | Bike Box                     | No                            | No             | No            | No            | No                             | No             | No            | No            |
|              | Lanes Crossed for Left Turns | One                           | One            | None          | None          | None                           | None           | One           | One           |
|              | Dual Left Turn Lanes         | No                            | No             | No            | No            | No                             | No             | No            | No            |
|              | Approach Speed               | 60 km/hr                      | 60 km/hr       | 60 km/hr      | 60 km/hr      | 60 km/hr                       | 60 km/hr       | 60 km/hr      | 60 km/hr      |
|              | Level of Service             | F                             | F              | D             | C             | D                              | D              | F             | F             |
|              | Target                       | F                             |                |               |               | F                              |                |               |               |
|              | Target                       | B                             |                |               |               |                                |                |               |               |
| Transit      | Facility Type                | Mixed Traffic                 | Mixed Traffic  | N/A           | N/A           | Mixed Traffic                  | Mixed Traffic  | Mixed Traffic | Mixed Traffic |
|              | Average Signal Delay         | 20 Seconds                    | 19 Seconds     | N/A           | N/A           | 40 Seconds                     | 61 Seconds     | 36 Seconds    | 19 Seconds    |
|              | Level of Service             | C                             | C              | -             | -             | F                              | F              | E             | C             |
|              | Target                       | C                             |                |               |               | F                              |                |               |               |
| Truck        | Turning Radius               | < 10m                         | < 10m          | < 10m         | < 10m         | > 15m                          | > 15m          | 10m to 15m    | 10m to 15m    |
|              | Receiving Lanes              | One                           | One            | One           | One           | One                            | One            | One           | One           |
|              | Level of Service             | F                             | D              | F             | F             | C                              | C              | E             | E             |
|              | Target                       | F                             |                |               |               | E                              |                |               |               |
| Auto         | Volume to Capacity Ratio     | 0.55                          | 0.55           | 0.92          | 0.75          | 0.82                           | 0.96           | 0.86          | 0.93          |
|              | Level of Service             | A                             | A              | E             | C             | D                              | E              | D             | E             |
|              | Target                       | E                             |                |               |               | E                              |                |               |               |
|              | Target                       | E                             |                |               |               | E                              |                |               |               |