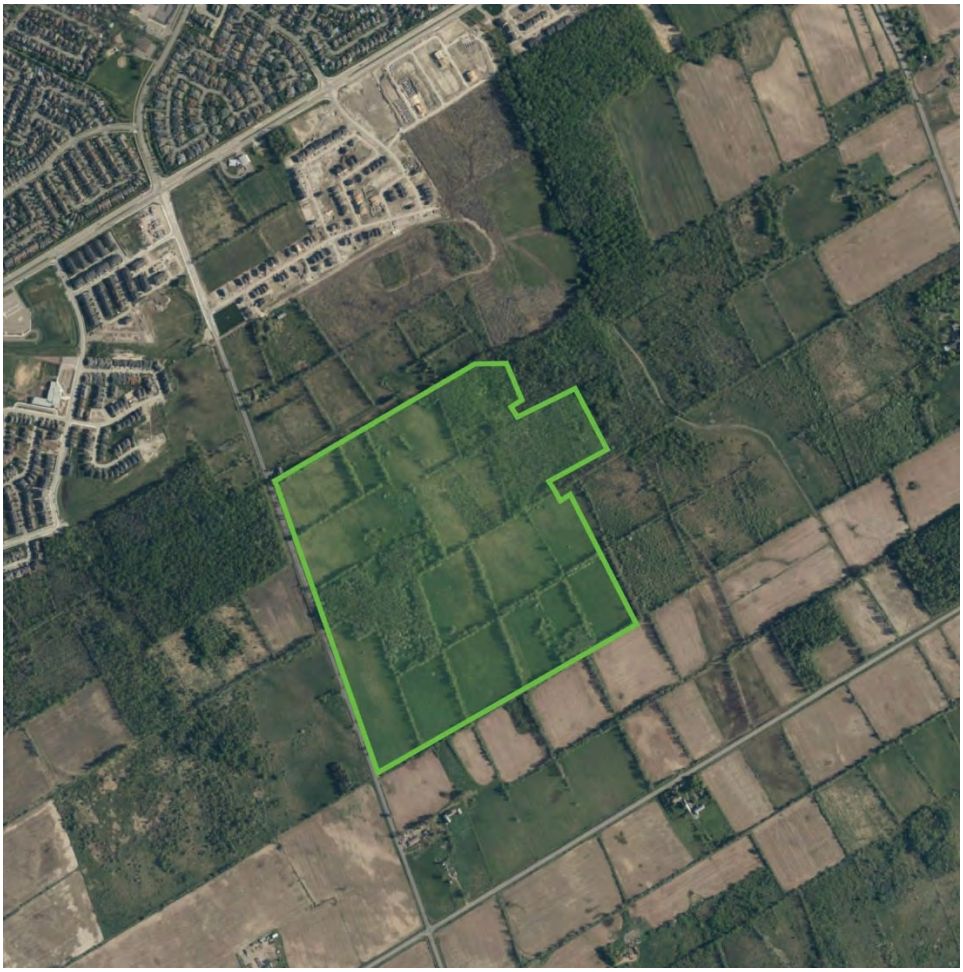
Transportation Impact Assessment – Step 4: Analysis

Riverside South Phase 17



Prepared for Riverside South Development Corporation
by IBI Group
August 10, 2020

IBI GROUP
400–333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Transmittal

To/Attention	Company/Address	Telephone No
Josiane Gervais, P.Eng.	Project Manager, Infrastructure Approvals City of Ottawa 110 Laurier Avenue West (4th Floor) Ottawa, ON K2P-2H9	613-580-2424 x21765
cc		

From	David Hook, P.Eng.
Sent By	E-mail/Electronic Submission
Date	August 10, 2020
Project No	125581
Subject	Riverside South Phase 17 - Transportation Impact Assessment: Step 4

Please find enclosed the finalized TIA report in support of the Draft Plan of Subdivision application relating to the proposed residential development at 4775 & 4875 Spratt Road on behalf of Riverside South Development Corporation (RSDC). We trust the circulation comments have been sufficiently addressed and incorporated in this report. All comments and responses associated with this study have been documented and provided in the report appendices.

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

Best Regards,

David Hook, P.Eng.

TIA Plan Reports - Certification

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

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

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

CERTIFICATION

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

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

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

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

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

Dated at Ottawa this 10th day of August, 2020.
(City)

Name: David Hook, P.Eng.

Professional Title: Project Engineer

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

Office Contact Information (Please Print)
Address: 400-333 Preston Street
City / Postal Code: K1S 5N4
Telephone / Extension: 613-225-1311 ext. 64029
E-Mail Address: dhook@ibigroup.com

Stamp

Document Control Page

CLIENT:	Riverside South Development Corporation (RSDC)
PROJECT NAME:	Riverside South Phase 17
REPORT TITLE:	Transportation Impact Assessment
IBI REFERENCE:	125581
VERSION:	Draft
DIGITAL MASTER:	J:\125581_RSDCPhase17\6.0_Technical\6.23_Traffic\03_Tech-Reports\TTR_RSS_Ph_17_TIA_MASTER_2020-05-13.docx
ORIGINATOR:	Ben Pascolo-Neveu/ Eric M^{c}Laren
REVIEWER:	David Hook
AUTHORIZATION:	Justin Date
CIRCULATION LIST:	Josiane Gervais - City of Ottawa Transportation Project Manager
HISTORY:	TIA Step 1 & 2 Submitted for City Review – June 4, 2020 TIA Step 3 Submitted for City Review – June 30, 2020 TIA Step 4 Submitted for Client Review – August 10, 2020

Table of Contents

Table of Contents

Table of Contents

List of Tables

Table of Contents

Table of Contents

List of Figures

List of Exhibits

Table of Contents

List of Appendices

Executive Summary

IBI Group (IBI) was retained by Riverside South Development Corporation (RSDC) to undertake a Transportation Impact Assessment (TIA) in support of a Draft Plan of Subdivision application for a proposed residential development to be located at 4775 and 4875 Spratt Road, Ottawa. The development is anticipated to be constructed over a period of five years, beginning in 2022. Full occupancy of the first sub-phase (17-1) is expected by the end of 2024 while full build-out of the subdivision, including sub-phases 17-2 and 17-3, is expected by 2026. The horizon year of the study was therefore taken as 2031, representing 5 years beyond the expected full build-out of the site. Direct access to the site from Spratt Road will be provided via two proposed access intersections, with a third connection proposed further north through the adjacent development at 4725 Spratt (by others). Additional access will be provided from Earl Armstrong Road via Ralph Hennessy Avenue. All four access intersections will provide full-movement connections to the adjacent transportation network.

There are 17 known developments of significance in the vicinity of the subject site that are either in the development application approval process, are in pre-construction or are in varying stages of construction. For these developments, all unoccupied units are accounted for in the development of background traffic volumes using consistent trip generation assumptions. Traffic generated by occupied units is assumed to have been captured in the existing traffic data, based on a site visit conducted by IBI staff on May 8, 2020.

In 2019, a Roadway Modification Application (RMA-2019-TPD-034) was undertaken for the redesign of Spratt Road from Cambie to the southern boundary of the site in accordance with the City's Complete Streets Framework (October, 2015). The functional design was divided into two phases, with Phase 2 covering the entire Phase 17 frontage. This RMA was subsequently approved by City technical staff. Within the timeframe of this study, it is expected that Spratt Road will be urbanized along the proposed development's frontage.

The proposed residential development is expected to generate up to 721 and 866 two-way vehicular trips during the weekday morning and afternoon peak hours, respectively. Site-generated traffic volumes were stratified by mode share and distributed amongst numerous access points with the arterial road network. Mode share assumptions were developed with reference to the O-D Survey South Gloucester/ Leitrim TAZ and with further adjustments to account for a linear increase in the transit mode share to 32% by 2031, consistent with the Draft Riverside South Community Design Plan Transportation Update. It is expected that OC-Transpo will plan future transit routes to accommodate the transit demand associated with growth in the Riverside South community, including the proposed development.

This study has identified critical deficiencies in the Level of Service across all transportation modes, with limited options available to achieve acceptable standards for all modes at the intersections of Earl Armstrong with Spratt and Ralph Hennessy/ Shoreline. It is expected, however, that the development of additional east-west major collector routes will help slow the rate of background traffic growth and distribute traffic amongst a variety of parallel routes, ultimately improving these conditions.

The results of the analysis indicate that the intersection of Earl Armstrong & Spratt is expected to approach its theoretical capacity (i.e. LOS 'E') by the 2031 study horizon year with or without the inclusion of site-generated traffic. Further, the proposed development will not contribute any additional traffic to the critical eastbound left-turn movement during the weekday morning or afternoon peak hours. The remaining study area intersections are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) beyond 2031.

Based on the queue length analyses conducted in this study, the intersection of Earl Armstrong & Spratt may require an extension of the eastbound left-turn, northbound right-turn and westbound left-turn auxiliary lanes to support growth in background and site-generated traffic. Similarly, at the intersection of Earl Armstrong & Ralph Hennessy/ Shoreline, possible storage deficiencies were identified at the channelized northbound right-turn and westbound left-turn movements.

The Spratt Road RMA was initially designed to accommodate a two-way stop controlled intersection at Spratt & Borbridge, however, subsequent analysis conducted as part of this TIA indicates that an all-way stop controlled intersection is warranted at this location under 2026 total traffic conditions as a result of revised development timing assumptions. Queue length analyses indicate that the intersection of Spratt & Borbridge may also experience spillback beyond its available storage by the 2031 study horizon year, but will continue operating at an acceptable level of service.

Due to potential variability associated with post-pandemic growth in background traffic and changing travel patterns, it is recommended that the need to upgrade auxiliary lanes at Earl Armstrong and its intersections with Spratt and Ralph Hennessy/ Shoreline be re-evaluated in 2024 using updated traffic data prior to the completion of Phase 17-1.

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

1 Introduction

IBI Group (IBI) was retained by Riverside South Development Corporation (RSDC) to undertake a Transportation Impact Assessment (TIA) in support of a Draft Plan of Subdivision application for a proposed residential development to be located at 4775 and 4875 Spratt Road, Ottawa.

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

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

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

A Roadway Modification Application (RMA-2019-TPD-034) was recently approved to support the urbanization of Spratt Road from Cambie Road to the southern limit of the proposed development. The design requirements from this RMA will be verified as part of this TIA. As such, it is not expected that an RMA will be required as part of this study. The submission may require a post-development Monitoring Plan to track performance of the planned TIA Strategy, however the need for a Monitoring Plan will be confirmed through the analysis undertaken for this report.

2 TIA Screening

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

- **Trip Generation**: Based on the proposed number of residential dwelling units, the minimum development size threshold has been exceeded and therefore the Trip Generation trigger is satisfied.
- **Location**: The proposed development will not be accessed from a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle network, nor is it located within a Transit-Oriented Development (TOD) zone shown on Annex 6 of the Official Plan.
- **Safety**: Boundary street conditions were reviewed to determine if there is an elevated potential for safety concerns adjacent to the site. As the proposed development will access Spratt Road, a major collector roadway with a posted speed limit of 80 km/h along its frontage, there may be potential for safety concerns and therefore the Safety trigger is satisfied.

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

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

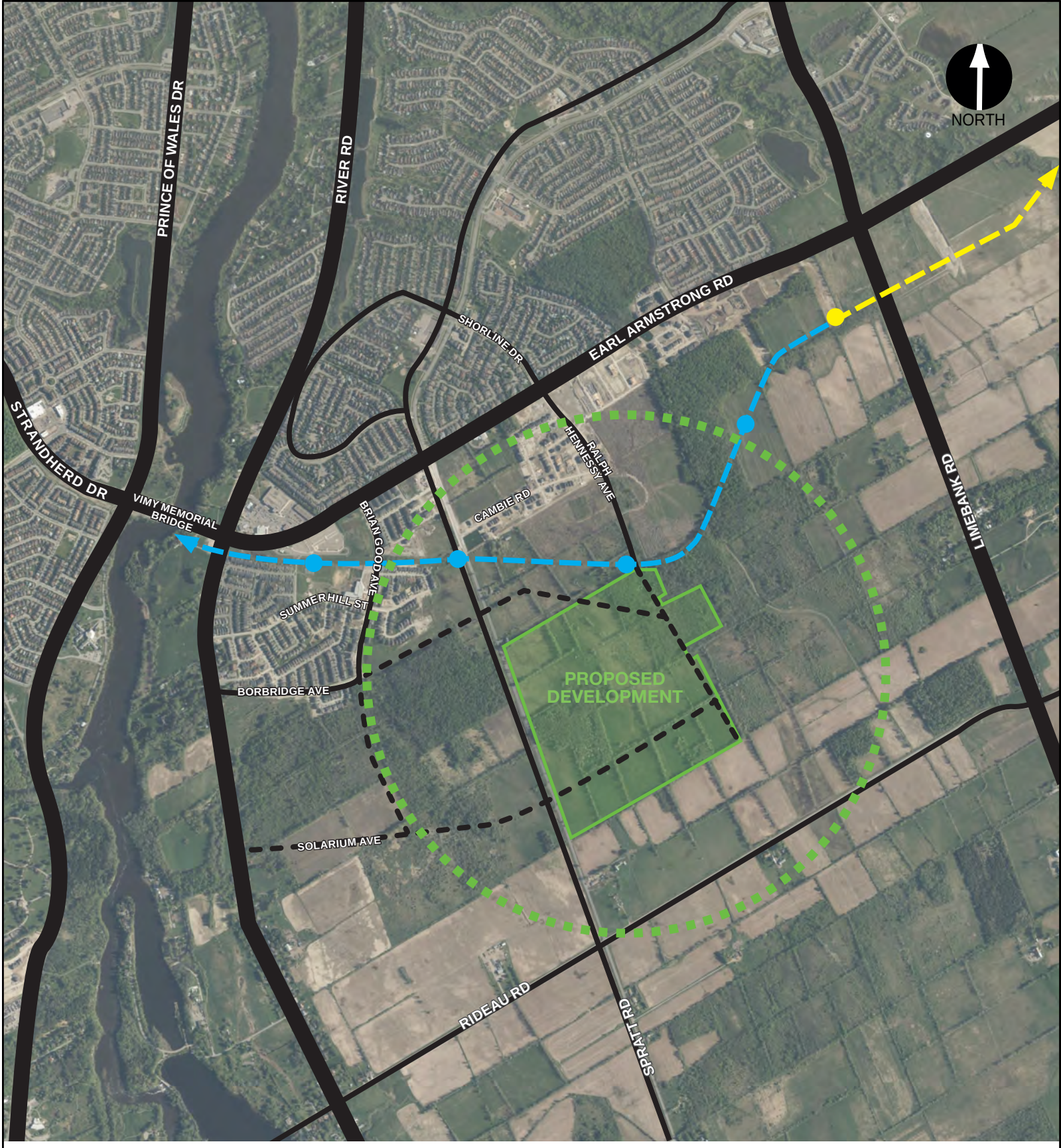
3 Project Scoping

3.1 Description of Proposed Development

3.1.1 Site Location

The proposed development is located at 4775 & 4875 Spratt Road in the community of Riverside South, approximately 840 metres south of Earl Armstrong Road. The site occupies approximately 63.2 hectares and is generally bound by Spratt Road to the west, a proposed residential development to the north, and undeveloped greenfield land to the east and south.

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



ARTERIALS
COLLECTORS
FUTURE ROAD
CONTEXT AREA - 1 KM RADIUS
FUTURE BRT
FUTURE BRT STATION
FUTURE LRT
FUTURE LRT STATION

IBI

Riverside South Phase 17
Transportation Impact Assessment

EXHIBIT 1: Site Location

Project No: 125581
Date: August 2020
Scale:
0m 100m

3.1.2 Land Use Details

Table 1 below summarizes the proposed land uses included in this development.

Table 1 - Land Use Statistics

LAND USE	SIZE (APPROX. # OF UNITS)
Single-Family Homes	399
Street Townhomes	602
Back-to-Back Townhomes	157
Local Commercial	~ 2,800 m^2

The Draft Plan of Subdivision for the proposed development is illustrated in **Exhibit 2**.

Direct access to the site from Spratt Road will be provided via two proposed access intersections, with a third connection proposed further north through the adjacent development at 4725 Spratt (by others). Additional access will be provided from Earl Armstrong Road via Ralph Hennessy Avenue. All four access intersections will provide full-movement connections to the adjacent transportation network.

The subject site is currently an undeveloped greenfield site and, according to GeoOttawa, is zoned DR – Development Reserve.

3.1.3 Development Phasing & Date of Occupancy

The proposed Riverside South Phase 17 development is anticipated to be constructed over a period of five years, beginning in 2022. Full occupancy of the first sub-phase (17-1) is expected by the end of 2024 while full build-out of the subdivision, including sub-phases 17-2 and 17-3, is expected by 2026. Further details regarding the development phasing in relation to ongoing adjacent developments will be provided in the Forecasting section of this study.

IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 2:
Proposed Development

PROJECT No. 125581
DATE: August 2020
SCALE: 0m 50m 100m

3.2 Existing Conditions

3.2.1 Existing Road Network

3.2.1.1 Roadways

The proposed development is bound by the following street:

- **Spratt Road** is a major collector road under the jurisdiction of the City of Ottawa that extends from Limebank Road in the north to Mitch Owens Road in the south and has a 26m ROW through the context area. Spratt Road has an urban cross-section with a posted speed limit of 50 km/h north of Cambie Road and becomes a rural road with a posted speed limit of 80 km/h further south. The posted speed limit is expected to be reduced through the context area of this study as the road is incrementally urbanized.

Other streets within the vicinity of the proposed development are as follows:

- **Earl Armstrong Road** is an urban arterial road under the jurisdiction of the City of Ottawa with a 44.5m ROW in the City of Ottawa Official Plan. Earl Armstrong Road is oriented east-west and extends from River Road in the west to High Road in the east. Further west, across the Vimy Memorial Bridge, Earl Armstrong Road becomes Strandherd Drive, which is also designated as an urban arterial road with a similar ROW. Through the context area of this study, Earl Armstrong Road has a four-lane, divided urban cross-section with a posted speed limit of 80km/h.
- **Borbridge Avenue** is an urban major collector road under the jurisdiction of the City of Ottawa that is presently open to general traffic from River Road to Brian Good Avenue and will ultimately extend further east to Bowesville Road as development proceeds in the area. The existing portion of Borbridge Avenue has a two-lane cross-section with a 26m ROW and an unposted speed limit of 50 km/h.
- **Ralph Hennessy Avenue** is a north-south urban collector road under the jurisdiction of the City of Ottawa that presently exists from Earl Armstrong Road to the southern limit of Phase 13. This road will be extended south through the proposed development and ultimately continue further south towards Rideau Road. The existing portion of Ralph Hennessy Avenue has a two-lane cross-section with a 26m ROW and an unposted speed limit of 50km/h.
- **Cambie Road** is an east-west, two-lane urban local road under the jurisdiction of the City of Ottawa with a ROW of 20m that provides access to the Riverside South Phase 8/13 communities and has an unposted speed limit of 50km/h.

3.2.1.2 Intersections

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

- **Earl Armstrong Road & Spratt Road** is a four-legged signalized intersection with left-turn lanes on all approaches, channelized right-turn auxiliary lanes on the eastbound and westbound approaches and a channelized right-turn taper on the northbound approach. It should be noted that the aerial image to the left is outdated and on the southbound approach there is now only one through lane and the second through lane now transitions to a channelized right-turn lane.

- **Earl Armstrong Road & Shoreline Drive / Ralph Hennessy Avenue** is a four-legged, signalized intersection with auxiliary left-turn lanes on all approaches, channelized right-turn auxiliary lanes on the eastbound and westbound approaches and channelized right-turn tapers on the northbound and southbound approaches. It should be noted that the aerial image to the left is outdated and the hatched area on the southbound approach is now a southbound through lane.

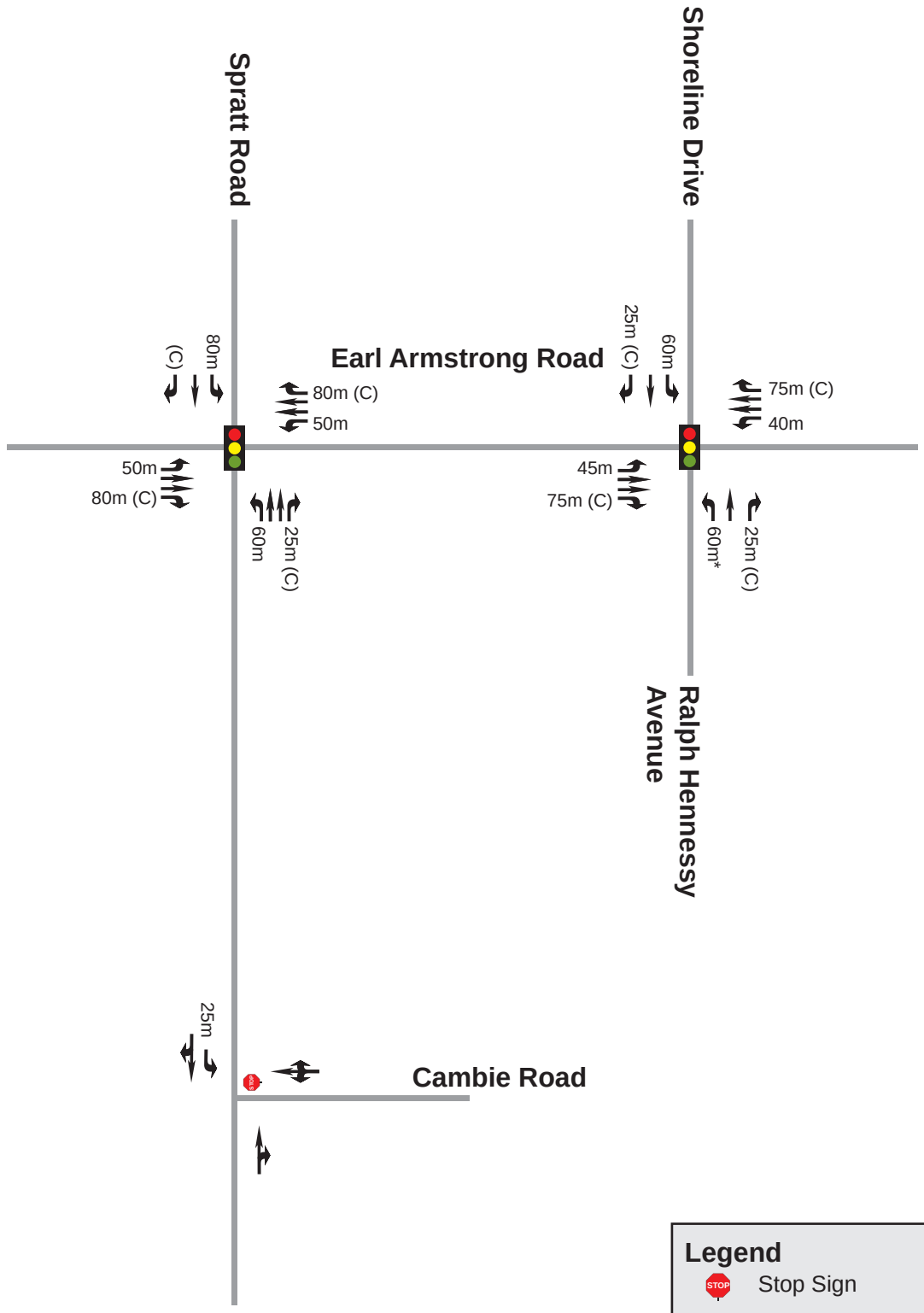
The intersection control and lane configurations of each intersection are shown in **Exhibit 3**.

3.2.1.3 Driveways Adjacent to Development Access

Two new intersections along the adjacent road network are proposed: Spratt Road & Solarium Avenue as well as Spratt Road & Street 17. All existing private approaches within 200m of both access intersections serve single-family homes on Spratt Road.

3.2.1.4 Traffic Management Measures

There are currently no existing traffic management or traffic calming measures on the boundary streets within the vicinity of the proposed development.



* Pavement markings have not been applied to date. As such, the storage length was assumed based on the storage length recommended in transportation studies completed in support of nearby adjacent developments.

IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 3:
Existing (2020)
Lane Configurations
and Intersection Controls

PROJECT No. 125581
DATE: June 2020
SCALE: N.T.S.

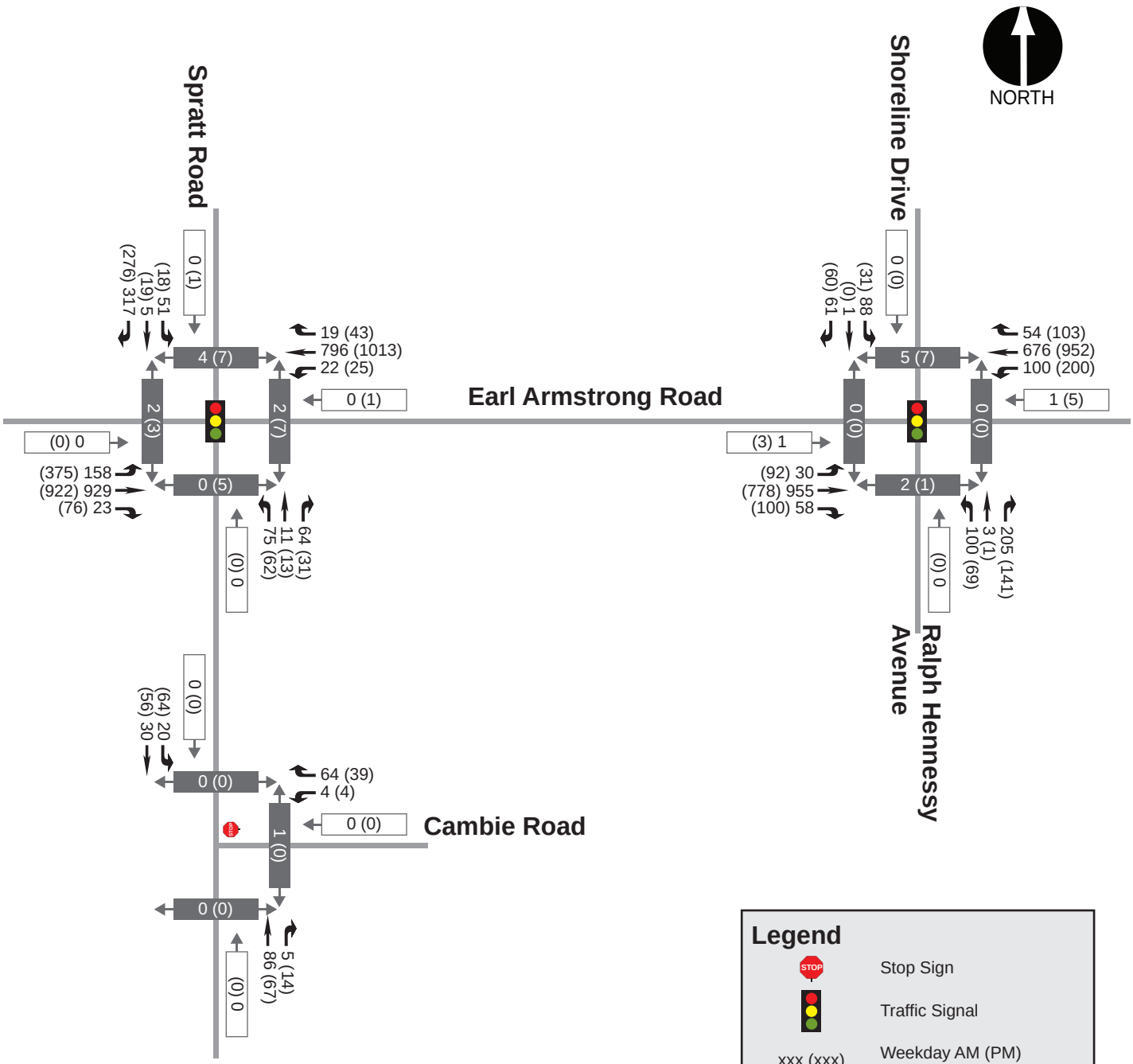
3.2.1.5 Existing Traffic Volumes

As the proposed development will consist primarily of residential land uses, the weekday peak hour traffic conditions will be most affected by the associated increase in traffic. Weekday morning and afternoon peak hour turning movement counts were therefore obtained from the City of Ottawa and supplemented with counts conducted by IBI Group at the following intersections within close proximity to the site:

- Earl Armstrong Road and Spratt Road (City of Ottawa, November 2019)
- Earl Armstrong Road and Ralph Hennessy Avenue/ Shoreline Drive (City of Ottawa, September 2017)
- Spratt Road & Cambie Road (IBI, August 2017)

A growth rate was applied to the above noted turning movement count data to approximate existing (2020) traffic volumes. Justification of background growth rates is discussed further in the Forecasting section of this TIA.

Peak hour traffic volumes representative of existing conditions are shown in **Exhibit 4**. Traffic count data is provided in **Appendix C**.



Riverside South Phase 17
Transportation Impact Assessment

Exhibit 4:
Existing (2020)
Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.

3.2.2 Existing Bicycle and Pedestrian Facilities

Exclusive bike lanes are currently provided on both sides of Earl Armstrong Road within the limits of the context area, as well as on Spratt Road between Earl Armstrong and Cambie.

Concrete sidewalks presently exist on both sides of Earl Armstrong Road within the vicinity of the proposed development, as well as on Spratt Road (Earl Armstrong to Cambie) and the existing segment of Ralph Hennessy Avenue, located north of the proposed development.

3.2.3 Existing Transit Facilities and Service

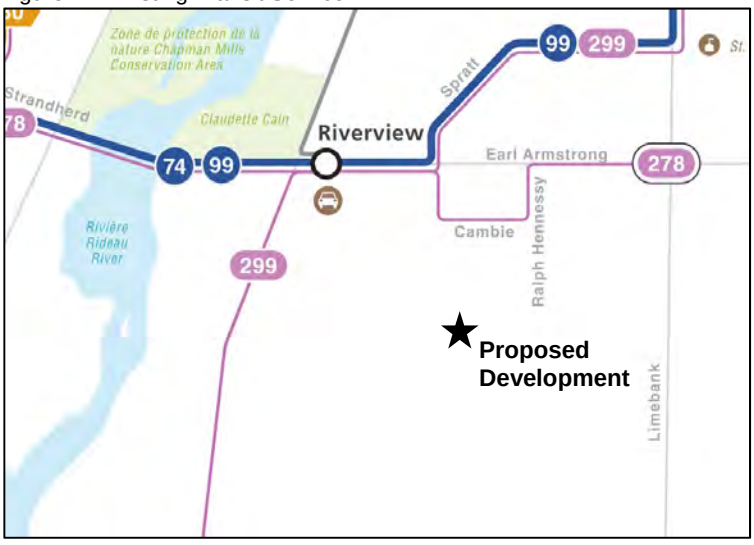
The following transit routes, operated by OC Transpo, exist within the vicinity of the site:

- **Route #74** provides regular, all-day service between Tunney's Pasture Station and the Riverview Park & Ride and operates on a 15-minute headway. On weekends, service frequency is reduced to every 30 minutes.
- **Route #99** provides regular, all-day service between Greenboro Station and Barrhaven Centre. During weekday peak periods, service is extended to Hurdman Station and the route operates on a 15-minute headway. On weekends, frequency is reduced to 30 minutes.
- **Route #278** provides weekday peak period service between Earl Armstrong/ Limebank and Tunney's Pasture Station and operates on a 15-minute headway.
- **Route #299** provides weekday peak period service between the village of Manotick and Hurdman Station.

The nearest bus stops to the proposed development are presently located at the intersection of Spratt/Cambie, approximately 450 metres north of the proposed development, providing access to Route #278. All other routes in the area are accessed via bus stops at the intersection of Spratt/Earl Armstrong or via the Riverside Park & Ride, approximately 1.4 kilometres northwest of the site.

The existing transit network within the vicinity of the proposed development is illustrated in **Figure 1**. Transit service maps for the individual routes above are provided in **Appendix D**.

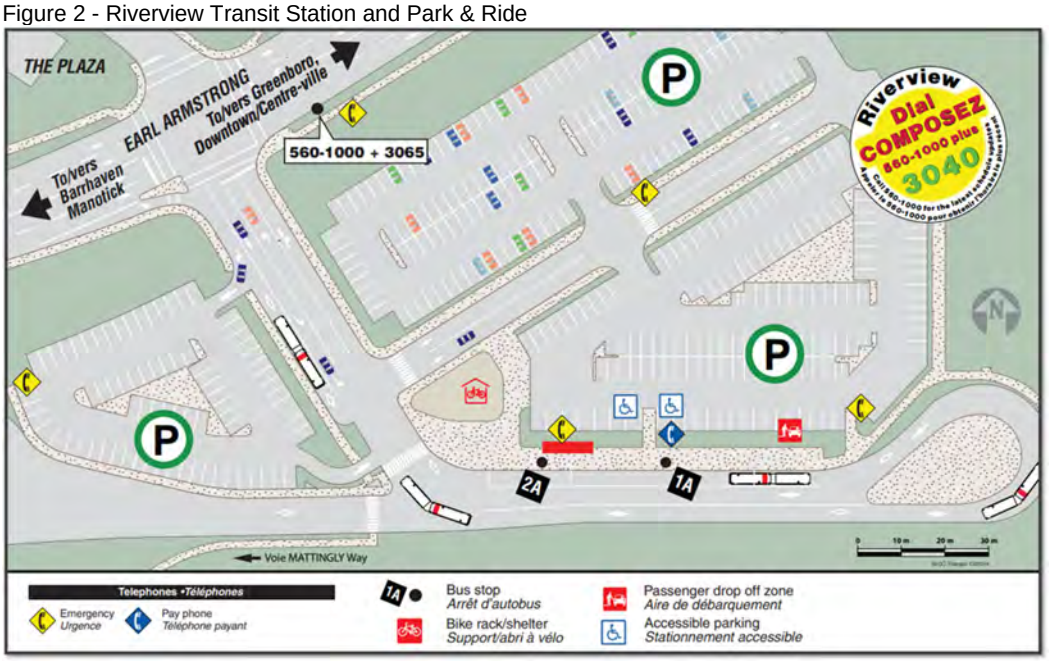
Figure 1 – Existing Transit Service



Source: OC-Transpo

The Riverview Park & Ride, completed in August 2010, contains approximately 400 parking spaces. Each of the transit routes described above can be accessed via this station. Exclusive transit lanes are provided on Earl Armstrong Road between the Riverview Park & Ride and the adjacent community of Barrhaven via the Vimy Memorial Bridge. The Riverview Park & Ride station is shown below in **Figure 2** below.

Figure 2 - Riverview Transit Station and Park & Ride



Source: OC Transpo

3.2.4 Collision History

A review of historical collision data has been conducted for the road network surrounding the proposed development. The TIA Guidelines require a safety review if at least six collisions for any one movement or of a discernible pattern, over a five year period have occurred. **Table 2** summarizes all reported collisions between January 1, 2014 and January 1, 2019.

Table 2 – Reported Collisions within Vicinity of Proposed Development

LOCATION	# OF REPORTED COLLISIONS
INTERSECTIONS	
Earl Armstrong & Spratt	30
Earl Armstrong & Ralph Hennessy/ Shoreline	9
SEGMENTS	
Earl Armstrong Road – Spratt to Ralph Hennessy/ Shoreline	2
Spratt Road - Earl Armstrong to Rideau	5

Based on the collision history noted above, intersections or road segments with more than six collisions over the five-year period may require further review.

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

Another method of evaluating the relative magnitude of collision frequency at one intersection compared to another is to quantify the average historical number of collisions against the daily volume of traffic entering the intersection. This is commonly expressed in terms of Million Vehicles Entering (MVE) and a rate of greater than 1.0 is considered significant.

The above noted intersections are therefore calculated as having average collision frequencies per MVE values:

- Earl Armstrong & Spratt – 0.58
- Earl Armstrong & Ralph Hennessy/ Shoreline – 0.22

Of the two intersections evaluated above, neither has a collision frequency in excess of 1.0 and therefore neither intersection is considered significant.

3.3 Planned Conditions

3.3.1 Transportation Network

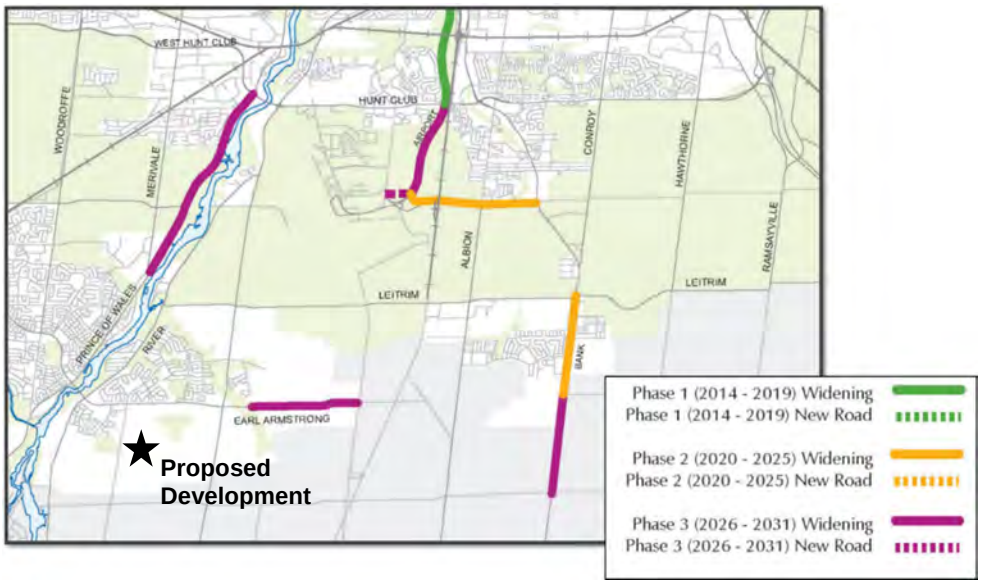
3.3.1.1 Future Road Network Projects

The 2013 Transportation Master Plan (TMP) outlines future road network modifications required in the 2031 'Affordable Network'. The following projects were noted that may have an impact on area traffic within the vicinity of the site:

- **Earl Armstrong Road** – Planned widening from two to four lanes between Limebank Road and Bowesville Road (Phase 3: 2026-2031)
- **Prince of Wales Drive** – Planned widening from two to four lanes between Merivale Road and West Hunt Club Road (Phase 3: 2026-2031)

Figure 3 below illustrates the planned changes to the arterial road network projects in the broader area, as per the TMP 'Affordable Network'. It should also be noted that Prince of Wales Drive underwent intersection and coordinated network modifications from approximately 480m north of Strandherd Drive to West Hunt Club Road in 2017.

Figure 3 - Future Road Network Projects



Source: 2013 Transportation Master Plan – Map 11 '2031 Affordable Network'

Development Charges Background Study

The Development Charges (DC) Amendment Background Study (March 2019), published well after the 2013 TMP, indicates the following refined timelines or additional transportation network projects expected within the context area:

- **Earl Armstrong Road:** Widening is now planned for implementation between 2030 and 2031, according to the DC study.
- **Prince of Wales Drive:** Widening in the DC study identifies a consistent timeline with the TMP (i.e. 2026-2031), however more recent correspondence from City technical staff now indicates the implementation of this widening is not expected to occur until after 2031.
- **Spratt Road:** The DC study indicates that this road is planned for urbanization between Cambie Road and the Urban Boundary, although the timing provided is beyond the 2031 horizon.

Spratt Road Urbanization

Despite the 2019 DC Background Study indicating an implementation timeline that is beyond 2031, the urbanization of Spratt Road is currently underway from Cambie Road to south of the future Borbridge Avenue intersection to support ongoing development in Riverside South. In 2019, a Roadway Modification Application (RMA) was undertaken for the redesign of Spratt Road from Cambie to the southern boundary of the site in accordance with the City's Complete Streets Framework (October, 2015). The functional design was divided into two phases, with Phase 2 covering the entire Phase 17 frontage. This RMA was subsequently approved by City technical staff.

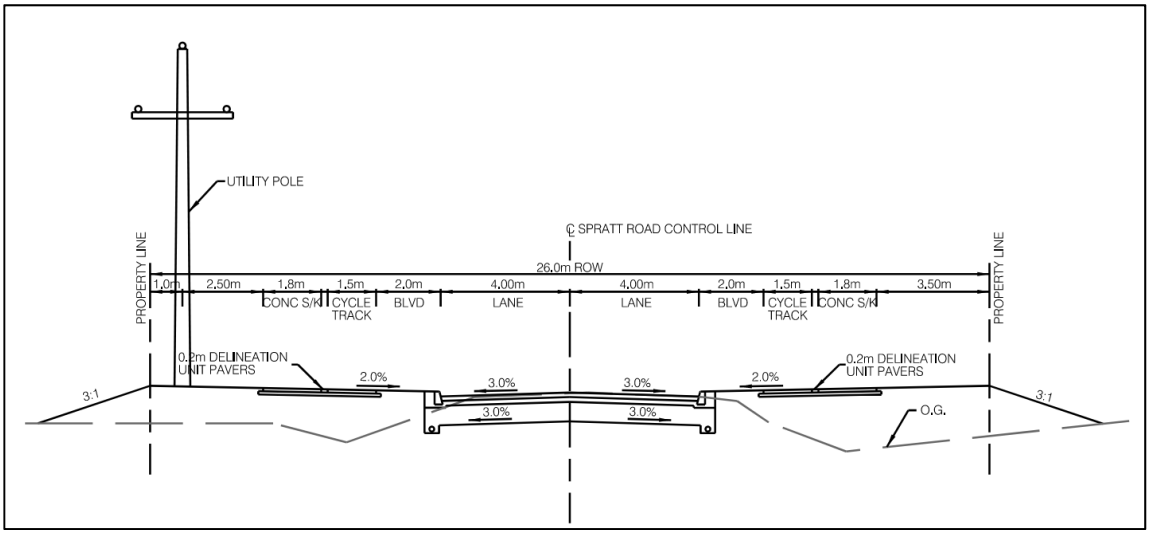
Typical cross-section plans for the Spratt Road RMA shown in **Figure 4** below.

As the Spratt Road urbanization includes a Complete Streets design, Module 4.3 of the TIA Guidelines indicates that the following must be completed:

- Identify the design at the interface of the street and the subject development; and
- Assess the potential impact of the subject development on the design.

- If changes to the design are required, develop an interim design concept for the boundary street.

Figure 4 – Typical Cross-section Plan - Spratt Road Urbanization RMA

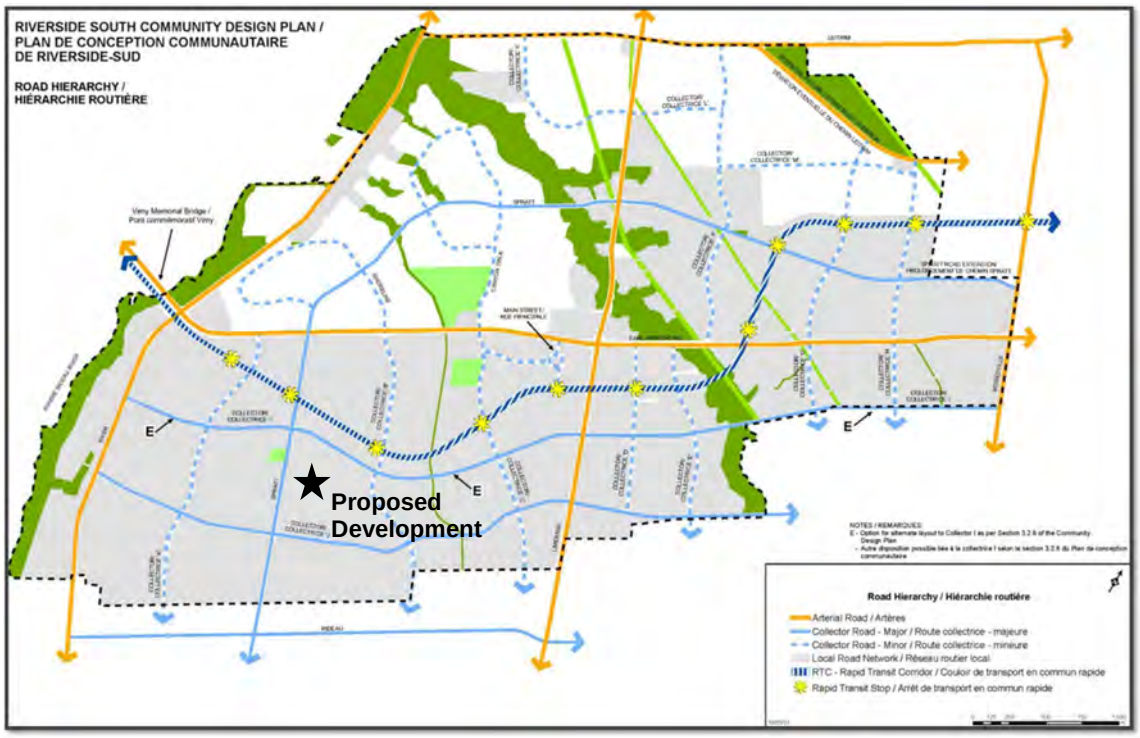


Source: City of Ottawa

Riverside South CDP

The Riverside South Community Design Plan (CDP) identifies two major east-west collector roads to the south of the planned rapid transit corridor. As indicated in **Figure 5** below, Collector 'I' represents Borbridge Avenue which will ultimately extend from River Road to Bowesville Road. Further to the south, Collector 'J' represents Solarium Avenue and will provide a connection between River Road and Limebank Road. Both major collector roadways will extend through the proposed development and serve as a primary means of access for the site. The CDP also indicates that Ralph Hennessy Avenue will be extended south towards Rideau Road, as indicated by a dashed line in **Figure 5** below. Further, the eventual construction of a Rapid Transit Corridor north of the proposed development, connecting the Riverside Park and Ride with the future O-Train terminus at Limebank Road, is identified in the CDP plans. The implementation of this corridor, however, is presently not expected within the City's 2031 planning horizon year.

Figure 5 - Riverside South Community Design Plan - Network Concept



Source: Riverside South Community Design Plan

3.3.1.2 Future Transit Facilities and Services

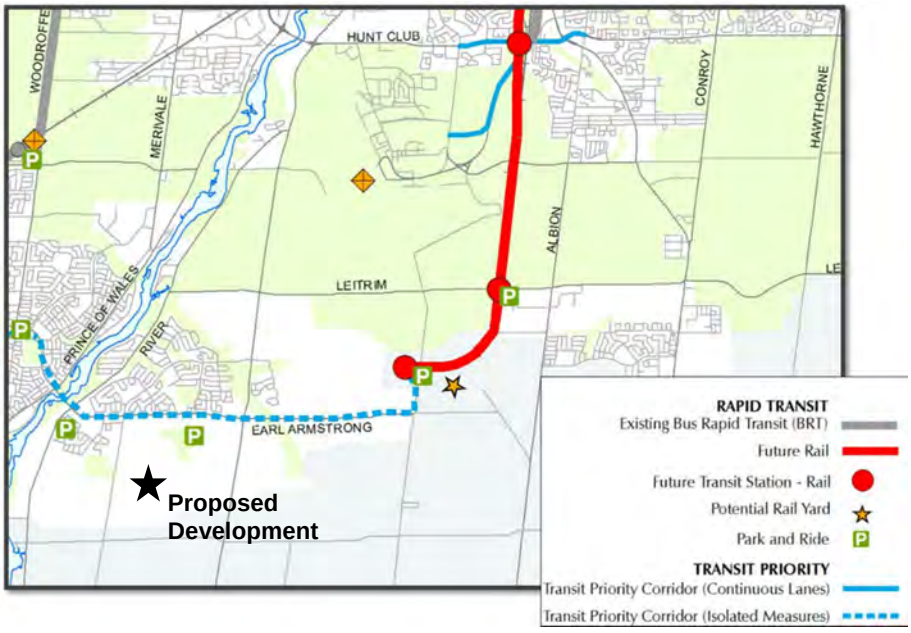
The 2013 TMP outlines the future rapid transit and transit priority (RTTP) network. The following projects were noted in the 'Affordable RTTP Network' that may have a future impact on study area traffic:

- **Trillium Line Extension** – Extension of the Trillium Line from its current terminus at Greenboro Station to Bowesville Station. The *Trillium Line Extension Planning and Environmental Assessment (EA) Study (January 2016)* and the *Trillium Line Light Rail Transit Extension Addendum (September 2018)* both expand upon the TMP. The Trillium Line will now extend to Limebank Road with a spur line to the Ottawa International Airport. Based on the official City of Ottawa Stage 2 LRT website, the Trillium Line South Extension is expected to begin revenue service by the end of 2022.
- **Chapman Mills/ Strandherd Drive/ Earl Armstrong Road Transit Priority Corridor** - The corridor is expected to be upgraded with transit signal priority and queue jump lanes between the Barrhaven Town Centre Station and Bowesville Station. There is presently no specific timing available for the implementation of this project.

Figure 6 below shows the transit infrastructure projects in the vicinity of the proposed development that are part of the 2031 Affordable Network. The proposed Trillium Line South Extension, including the recommendations from the EA study and the Addendum, are illustrated in **Figure 7** below.

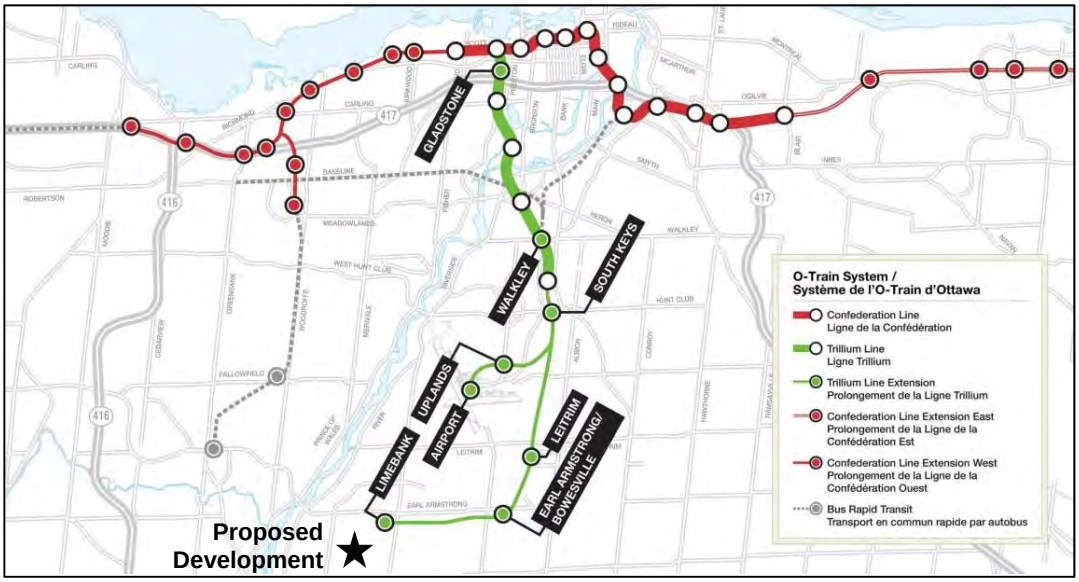
As shown previously in **Figure 5**, the Riverside South CDP identifies the eventual construction of a Rapid Transit Corridor to the north of the proposed development, connecting the Riverside Park and Ride with the future O-Train terminus at Limebank Road. The implementation of this corridor, however, is presently not expected to occur within the City's 2031 planning horizon.

Figure 6 - Future 'Affordable RTTP Network Projects'



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

Figure 7 - Stage 2 LRT - Trillium Line Extension



Source: City of Ottawa Stage 2 LRT Project Website – Trillium Line South Extension

3.3.1.3 Future Cycling and Pedestrian Facilities

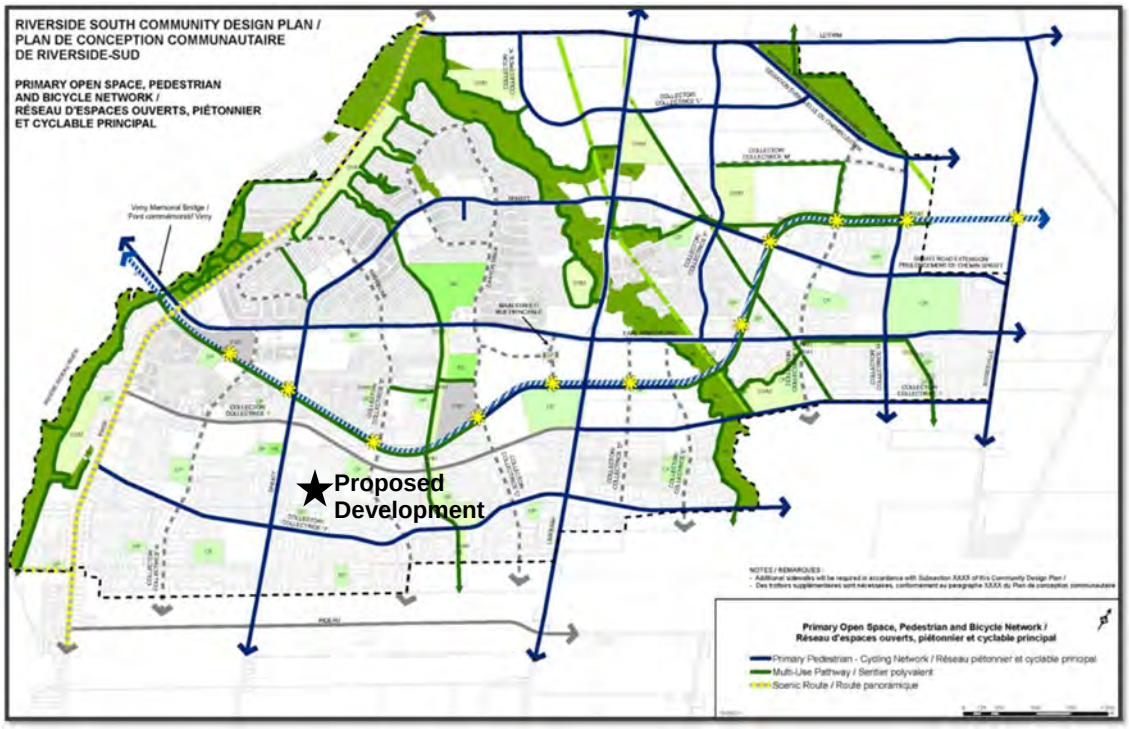
The Transportation Master Plan (TMP) designates Earl Armstrong Road as a 'Spine' or City-wide Cycling Route, which forms part of a system linking the commercial, employment, institutional, residential and educational nodes throughout the City of Ottawa. Spratt Road is identified as a "Local Route" in the Ultimate Cycling Network. No specific bike facilities are planned on either side of Borbridge or Solarium Avenue.

The Riverside South CDP provides guidance on future active transportation facilities within the area, including a multi-use pathway along the proposed Rapid Transit corridor. Furthermore, it describes Earl Armstrong Road, Spratt Road and Solarium Avenue each as being part of the 'Primary Pedestrian – Cycling Network'.

As indicated previously, the redesign of Spratt Road includes a narrowed pavement width and segregated bicycle and pedestrian facilities. Bicycle facilities are in the form of uni-directional cycle tracks on either side of Spratt Road which will transition to on-road bike lanes north of Cambie Road.

The planned cycling and pedestrian network indicated in the CDP is shown below in **Figure 8** below.

Figure 8 - Riverside South Community Design Plan - Cycling and Pedestrian Network



Source: Riverside South Community Design Plan

In late 2019, Ottawa City Council approved a set of Neighborhood Collector Road Guidelines intended to encourage future network roadways within developing communities that provide a more balanced distribution of infrastructure within the City right-of-way to support active transportation modes while calming traffic. The proposed development includes the extension of three collector roads: Borbridge Avenue, Solarium Avenue and Ralph Hennessy Avenue. The specific designs of these roadway extensions will be established through the Draft Plan approval process in consultation with City Staff and will consider both the context and continuity of these existing roadways.

3.3.2 Future Adjacent Developments

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

There are 17 known developments of significance in the vicinity of the proposed development that are either in the development application approval process, are in pre-construction or are in varying stages of construction. For these developments, all unoccupied units are accounted for in the development of background traffic volumes using consistent trip generation assumptions. Traffic generated by occupied units is assumed to have been captured in the existing traffic data, based on a site visit conducted by IBI staff on May 8, 2020.

All current development applications adjacent to the site are summarized in **Table 3**, while future potential developments that have no official status are summarized in **Table 4**. Build-out assumptions for future potential developments will be discussed further in the Forecasting section of this TIA. The approximate locations of all current adjacent development applications and future potential developments are shown in **Exhibit 5**.

Table 3 - Adjacent Developments (Current Development Applications)

DEVELOPMENT	LAND USE	SIZE	BUILT & OCCUPIED	% BUILT & OCCUPIED	BUILD-OUT
River's Edge Phase 1 (Claridge)	Single Family Residential	268 units	0 units	0%	2021
	Townhome	172 units	0 units	0%	2021
River's Edge Phase 2 (Claridge)	Single Family Residential	78 units	0 units	0%	2024
	Townhome	237 units	0 units	0%	2024
Phase 8 (RSDC)	Single Family Residential	176 units	176 units	100%	Completed
	Townhome	256 units	256 units	100%	Completed
	Stacked Townhomes	169 units	0 units	0%	2022
Phase 9 South (RSDC)	Single Family Residential	414 units	414 units	100%	Completed
	Townhome	760 units	760 units	100%	Completed
	Stacked Townhome	181 units	181 units	100%	Completed
Phase 9 North (RSDC)	Shopping Centre	101,000 sqft	0 sqft	0%	2022
	Stacked Townhome	94 units	94 units	100%	Completed
Phase 13 (RSDC)	Single Family Residential	282 units	254 units	90%	2020
	Townhome	190 units	171 units	90%	2020

DEVELOPMENT	LAND USE	SIZE	BUILT & OCCUPIED	% BUILT & OCCUPIED	BUILD-OUT
Phase 15-1 (RSDC)	Single Family Residential	168 units	0 units	0%	2021
	Townhome	342 units	0 units	0%	2021
Phases 15-2 (RSDC)	Single Family Residential	151 units	0 units	0%	2023
	Townhome	99 units	0 units	0%	2023
Phase 15-3 (RSDC)	Single Family Residential	260 units	0 units	0%	2025
	Townhome	158 units	0 units	0%	2025
Phase 15-4 (RSDC)	Single Family Residential	22 units	0 units	0%	2026
	Townhome	114 units	0 units	0%	2026
879 River Road (Richcraft)	Townhome	117 units	0 units	0%	2022
673 River Road (Cardel Homes)	Single Family Residential	234 units	0 units	0%	2029
	Townhome	260 units	0 units	0%	2029
708 River Road (Urbandale)	Single Family Residential	80 units	0 units	0%	2023
	Condominium	110 units	0 units	0%	2024
750 River Road (Urbandale)	Townhome	55 units	0 units	0%	2023
760 River Road (Claridge)	Single Family Residential	55 units	0 units	0%	2023
4725 Spratt Road (Claridge)	Townhome	275 units	0 units	0%	2023
Block K - Residential (Claridge)	Stacked Townhomes	43 units	43 units	100%	Completed

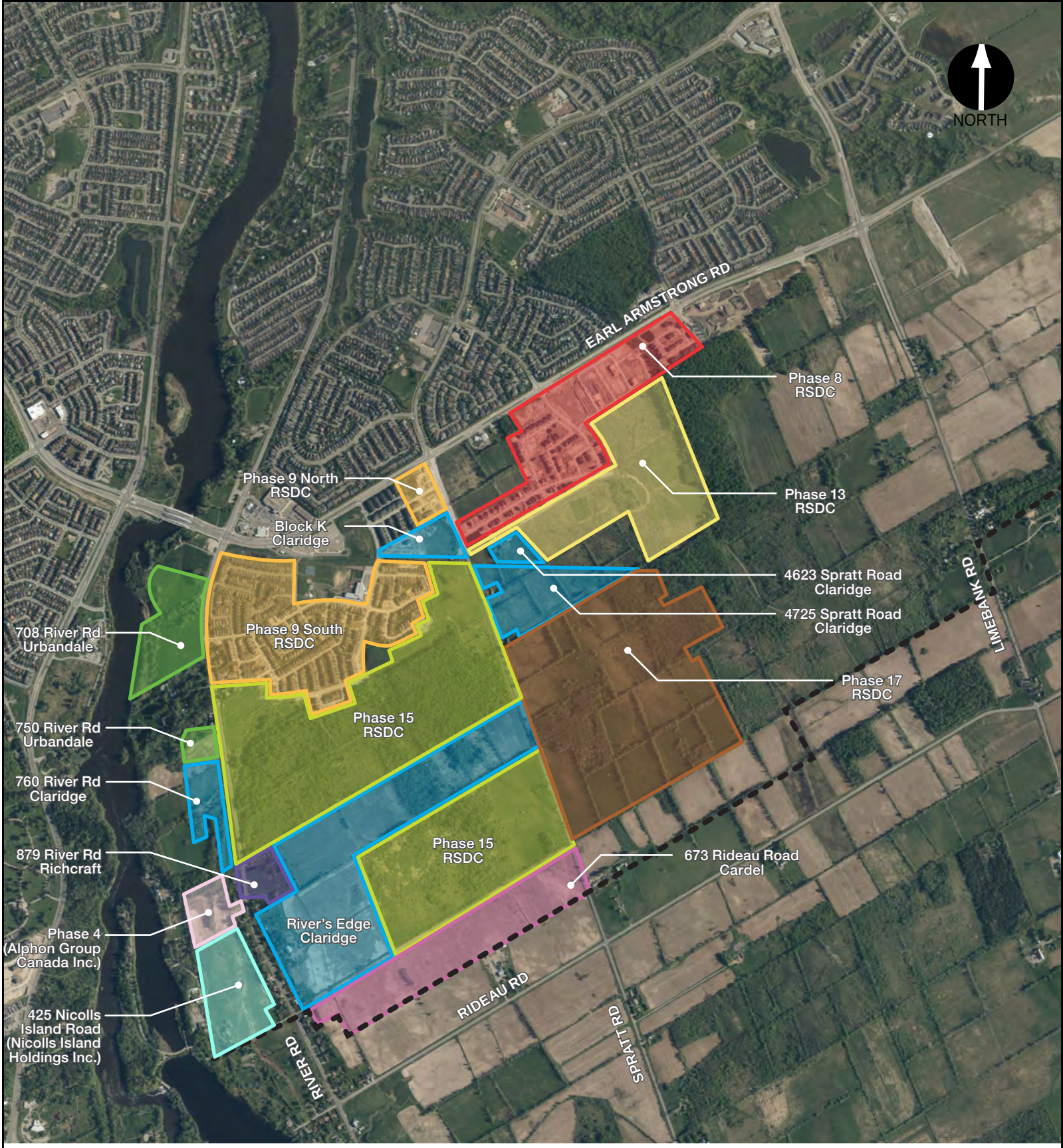
Notes:
Approximate occupancy rates are based on a site visit conducted by IBI Group staff on May 8, 2020
RSDC = Riverside South Development Corporation (RSDC).

Table 4 - Future Potential Developments [1]

DEVELOPMENT	LAND USE	SIZE
Block K – Commercial (Claridge)	Shopping Centre	143,000 sqft
Phase 4 (Nicolls Island Road Holdings Inc.)	Single Family Residential	24 units
	Townhome	31 units
425 Nicolls Island Road (Alphon Group Canada Inc.)	Single Family Residential	118 units
	Townhome	23 units

Notes:

[1] Build-out years are not known for these developments and construction has not started. Assumptions regarding the build-out of developments in Table 4 are provided in the Forecasting section of this TIA.



Riverside South Development Corporation (RSDC) – Phase 8
Riverside South Development Corporation (RSDC) – Phase 13
Riverside South Development Corporation (RSDC) – Phase 15
Riverside South Development Corporation (RSDC) – Phase 17
Cardel
Alphon Group Canada Inc.
Nicolls Island Holdings Inc.
Urban Boundary
Richcraft
Urbandale
Claridge

IBI

Riverside South Phase 17
Transportation Impact Assessment

EXHIBIT 5: Adjacent Development

Project No: 125581
Date: August 2020
Scale:
0m 100m

3.3.3 Network Concept Screenline

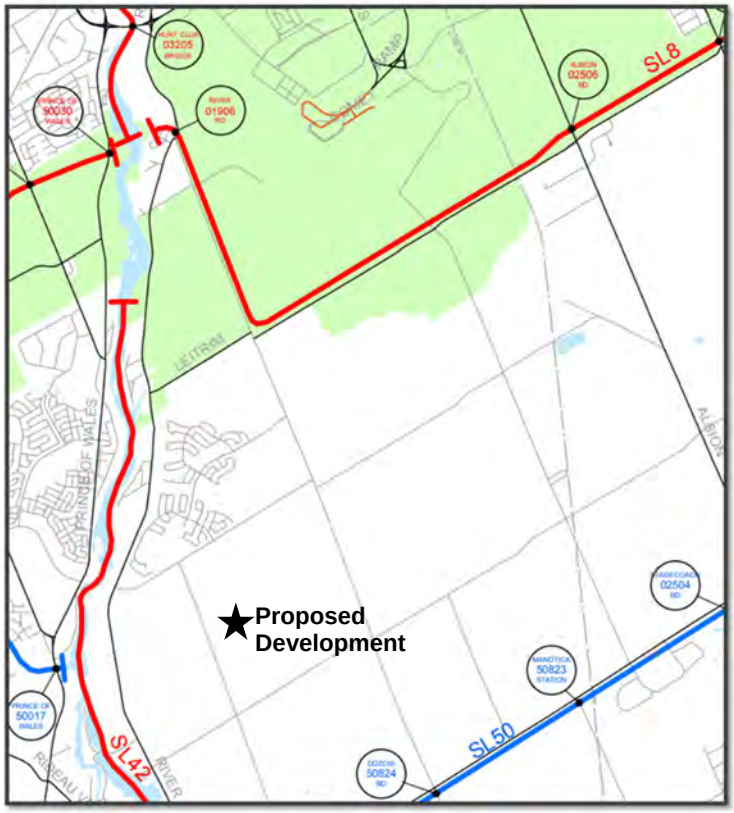
A screenline is a predetermined boundary between areas of major traffic generation that captures all significant points of entry from one area to another to compare crossing demand with the available roadway capacity. Screenlines are typically located along geographical barriers such as rivers, rail lines or within the greenbelt. To capture existing flow and model future demand, count stations are established at each crossing point along the screenline.

The nearest strategic planning screenlines adjacent to the development have been considered in the screenline analysis:

- **SL8 – Leitrim** – This is the nearest east/west screenline to the north of the study area. It is located just north of Leitrim Road and runs from east of Hawthorne Road to just east of Limebank Road, transitioning to a north/south screenline travelling east of Limebank Road before terminating at the intersection of Limebank and River Road. This screenline has three crossing points immediately north of Leitrim Road at Hawthorne Road, Bank Street and Albion Road, as well as an additional crossing point at River Road where Limebank Road transitions to Riverside Drive.
- **SL42 – Rideau River (Manotick)** – This is the nearest north/south screenline to the study area, and it is located along the Rideau River from just south of Mitch Owens Road to just north of Leitrim Road. It has two crossing points: the Vimy Memorial Bridge and the Manotick Bridge.

SL8 and SL42 are shown in **Figure 9** below, as determined from the City of Ottawa's Road Network Development Report (2013), a supporting document to the 2013 Transportation Master Plan (TMP).

Figure 9 – Screenlines



3.4 Study Area

Based on a review of the information presented thus far, a study area bound by Earl Armstrong Road to the north, Spratt Road to the west and the southern limit of the proposed development will provide a sufficient assessment of the development's impact on the adjacent transportation network.

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

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

- Earl Armstrong Road and Spratt Road
- Earl Armstrong Road and Ralph Hennessy Avenue/ Shoreline Drive
- Spratt Road & Cambie Road
- Spratt Road and Borbridge Avenue/ Collector 'I' (future intersection)
- Ralph Hennessy Avenue & Borbridge Avenue / Collector 'I' (future intersection)
- Spratt Road and Solarium Avenue/ Collector 'J' (future intersection)
- Ralph Hennessy Avenue & Solarium Avenue / Collector 'J' (future intersection)

It should also be noted the nearest intersection south of the proposed development, Rideau Road & Spratt Road, is located beyond the City's urban development boundary and thus was excluded from the proposed development's study area. Specifics regarding the distribution of site-generated traffic will be discussed in the Forecasting section of this report.

Multi-Modal Level of Service (MMLOS) will be conducted for any existing or future signalized study area intersections listed above. Stop-controlled intersections are exempt from this analysis, as no methodology currently exists for evaluating MMLOS at unsignalized intersections. Intersection control requirements for future intersections will be determined through intersection capacity analyses and control warrants, which will be undertaken in subsequent components of this study. As specified in the TIA Guidelines, however, since a Complete Street concept exists for the development's only boundary street (i.e. Spratt Road) along the site's frontage, segment-based MMLOS will not be required as part of this study.

3.5 Time Periods

As the proposed development will consist primarily of residential land uses, traffic generated during the weekday morning and afternoon peak hours is expected to result in the most significant impact to traffic operations on the adjacent network.

3.6 Study Horizon Year

The following future analysis years will be assessed in this study:

- Year 2024 – Build-out/ Occupancy of Phase 17-1 only
- Year 2026 – Full Build-out/ Occupancy of Proposed Development (Phase 17-1, 17-2, 17-3)
- Year 2031 – 5 Years Beyond Full Build-out/ Occupancy

3.7 Exemptions Review

The TIA Guidelines provide exemption considerations for elements of the Design Review and Network Impact components. **Table 5** summarizes the TIA modules that are not applicable to this study.

Table 5 - Exemptions Review

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

4 Forecasting

4.1 Development Generated Traffic

4.1.1 Trip Generation Methodology

Peak hour site-generated traffic volumes were developed using the 2009 TRANS Trip Generation Residential Trip Rates Study Report. The TRANS trip generation rates are based on a blended rate derived from the 17 trip generation studies undertaken in 2008, the Institute of Transportation Engineers (ITE) Trip Generation Manual and the 2005 TRANS O-D Travel Survey. Separate trip generation rates exist for each of the four general geographic areas in Ottawa: Core, Urban (Inside the Greenbelt), Suburban (Outside the Greenbelt) and Rural. These trip generation rates reflect existing travel behavior by dwelling type and geographic area.

The Transportation Impact Assessment (TIA) Guidelines recommends the TRANS trip generation rates be converted to person-trips based on the vehicular mode share proportions detailed in the TRANS Trip Generation study. Site-generated person-trips were then subdivided based on representative mode share percentages applicable to the study area to determine the number of vehicle, transit, pedestrian, cycling and other trip types.

Given the size of the commercial component of the proposed development, it is expected to primarily serve the local community and therefore unlikely to generate a significant volume of new external auto trips. Most of the traffic to and from the proposed commercial block is expected to be either pass-by or active internal trips. As such, the external trip generation of this component has been assumed to be negligible and was therefore omitted from the analysis. Similarly, future school blocks within the Phase 17 development limits are likely to generate traffic primarily within the development with a high proportion of pass-by and active transportation trips and therefore assumed will have a negligible impact on external study area intersections.

Local mode share targets were based on the TRANS Committee: 2011 Origin-Destination (O-D) Survey completed for the City of Ottawa. The O-D Survey provides approximations of the existing mode share for specific Traffic Assessment Zones (TAZs) throughout the City, including the South Gloucester/ Leitrim TAZ, which has been referenced for this study.

4.1.2 Trip Generation Results

4.1.2.1 Base Vehicle Trip Generation

Peak hour vehicular traffic volumes associated with the Riverside South Phase 17 development were determined using the peak hour trip generation rates in the TRANS Trip Generation study. The vehicular trip generation results for the proposed development have been summarized in **Table 6** below.

Table 6 - Base Vehicular Trip Generation

BUILD-OUT	LAND USE	SIZE (UNITS)	PERIOD	GENERATED TRIPS (VPH)		
				IN	OUT	TOTAL
2024 (Phase 17-1)	Single Family Homes	351	AM	71	174	246
			PM	193	123	316
	Townhomes	173	AM	35	59	93
			PM	65	58	123
2026 (Phases 17-1, 17-2 & 17-3)	Single Family Homes	602	AM	122	299	421
			PM	300	211	541
	Townhomes	556	AM	111	189	300
			PM	209	186	395

Note: vph = vehicles per hour

4.1.2.2 Person Trip Generation

The person-trip to vehicle-trip conversion factor for TRANS trip generation rates vary depending on the peak hour, geographic location and land use considered. The vehicular trip generation results for the residential land uses from the previous section were divided by the vehicle mode share distributions to determine the number of person-trips generated.

The results after applying this conversion factor have been summarized in **Table 7** below.

Table 7 - Person-Trip Results

BUILD-OUT	LAND USE	AUTO MODE SHARE	PERIOD	PERSON TRIPS (PPH)		
				IN	OUT	TOTAL
2024 (Phase 17-1)	Single Family Homes	55%	AM	130	317	447
		64%	PM	301	193	494
	Townhomes	55%	AM	63	107	170
		61%	PM	107	95	202
			AM Total	**193**	**424**	**617**
			PM Total	**408**	**288**	**696**
2026 (Phases 17-1, 17-2 & 17-3)	Single Family Homes	55%	AM	222	544	766
		64%	PM	516	330	846
	Townhomes	55%	AM	202	344	546
		61%	PM	343	304	647
			AM Total	**424**	**888**	**1312**
			PM Total	**859**	**634**	**1493**

Notes: pph = persons per hour

4.1.2.3 Mode Share Proportions

The 2011 TRANS Origin-Destination (O-D) Survey provides approximations of the existing modal share within the South Gloucester/ Leitrim Traffic Assessment Zone (TAZ).

With respect to future transit mode share, the 2013 Transportation Master Plan (TMP) indicates that between Riverside South/ Leitrim and all other areas of the City, the 2031 target is 16% during the weekday peak periods. Since the 2013 TMP, there have been significant changes to transit infrastructure planned within the Riverside South Community. A report entitled the Trillium Line LRT Extension Addendum (September 2018) outlined key changes to the TMP's conceptual alignment, including the relocation of the planned terminus station from its original location at Bowesville to within the Riverside South Community Core. The South Extension is planned as part of the Light Rail Transit (LRT) Phase 2 project, with a target completion date of 2022.

The impacts to travel behaviour associated with locating a major light rail transit hub within the community are not accounted for in the City's Transportation Master Plan (TMP) 2031 projections. As such, it is expected that the 2031 transit modal share target of 16% will be achieved by 2022 to coincide with the opening of the Trillium Line South Extension for full revenue service.

Further to the planned LRT realignment, the latest evaluation of mode share targets from the Draft Riverside South Community Design Plan Transportation Update (IBI, March 2020) indicates that an overall 32% transit mode share target is expected by 2031. The transit mode share target of 32% was applied at the 2031 study horizon year, while interim targets were derived through interpolation between the assumed 16% and 32% mode share values in 2022 and 2031, respectively.

Increases were therefore applied to the transit mode share targets for future analysis years to align with the 32% target recommended by 2031 in the Draft Riverside South Community Design Plan Transportation Update (March 2020). The increases in the transit mode share were offset by proportional decreases in auto driver and auto passenger mode share targets, maintaining the existing auto occupancy rate. Further explanation of these adjustments is provided in Section 4.3.2 of this report. No adjustments were made to other sustainable modes of transportation such as walking and cycling for future planning horizons.

The existing and proposed mode share targets for each analysis year are identified for the South Gloucester/ Leitrim TAZ, as outlined in **Table 8** below.

Relevant extracts from the 2011 O-D Survey are provided in **Appendix F**.

Table 8 - Existing and Proposed Mode Share for South Gloucester/Leitrim

TRAVEL MODE	EXISTING MODE SHARE		MODE SHARE TARGETS					
	2011 O-D SURVEY [1]		2024		2026		2031	
	AM	PM	AM	PM	AM	PM	AM	PM
Auto Driver	64%	68%	57%	60%	55%	58%	48%	51%
Auto Passenger	17%	15%	16%	14%	15%	13%	13%	11%
Transit	12%	11%	20%	20%	23%	23%	32%	32%
Cycling	1%	1%	1%	1%	1%	1%	1%	1%
Walking	0%	0%	0%	0%	0%	0%	0%	0%
Other	6%	5%	6%	5%	6%	5%	6%	5%

Notes:

1 AM 'From' and PM 'To' mode share distributions from the 2011 O-D Survey, South Gloucester/ Leitrim TAZ

4.1.2.4 Trip Reduction Factors

Deduction of Existing Development Trips

Not Applicable: The proposed development lands are currently undeveloped, and do not generate any traffic volumes.

Pass-by Traffic

As discussed previously, the size of the proposed commercial block suggests that it will be developed as neighbourhood-scale commercial with the majority of trips originating from the immediate vicinity. It has therefore been assumed that all traffic to and from the commercial component of the proposed development will be internal pass-by or active transportation trips from within the development. Traffic volumes on the section of Ralph Hennessy adjacent the commercial block will mostly consist of traffic associated with the residential component of the Phase 17 development. As such, no significant impact to any of the study area intersections are expected as a result of any new trips generated by the commercial land use.

Synergy/ Internalization

Synergy or internalization is typically applied to developments with two or more land uses to prevent double-counting of trips with multiple intermediate destinations within the same development. With respect to this development, it is assumed that the majority of trips generated by the future commercial and school blocks would originate from the residential component of Phase 17 and would therefore consist primarily of internal pass-by or active transportation trips from within the development. Although this interaction between the residential and commercial land uses would represent a reduction in the overall external trip generation of the site, it has been assumed that this would have a negligible impact on the study area intersections and was therefore not considered in future traffic projections presented in this study.

4.1.2.5 Trip Generation by Mode

The mode share targets from **Table 8** were applied to the number of development generated person-trips to determine the number of trips per travel mode. The results after applying the mode share targets are summarized in **Table 9** below.

Table 9 – Development-Generated Person Trips by Mode

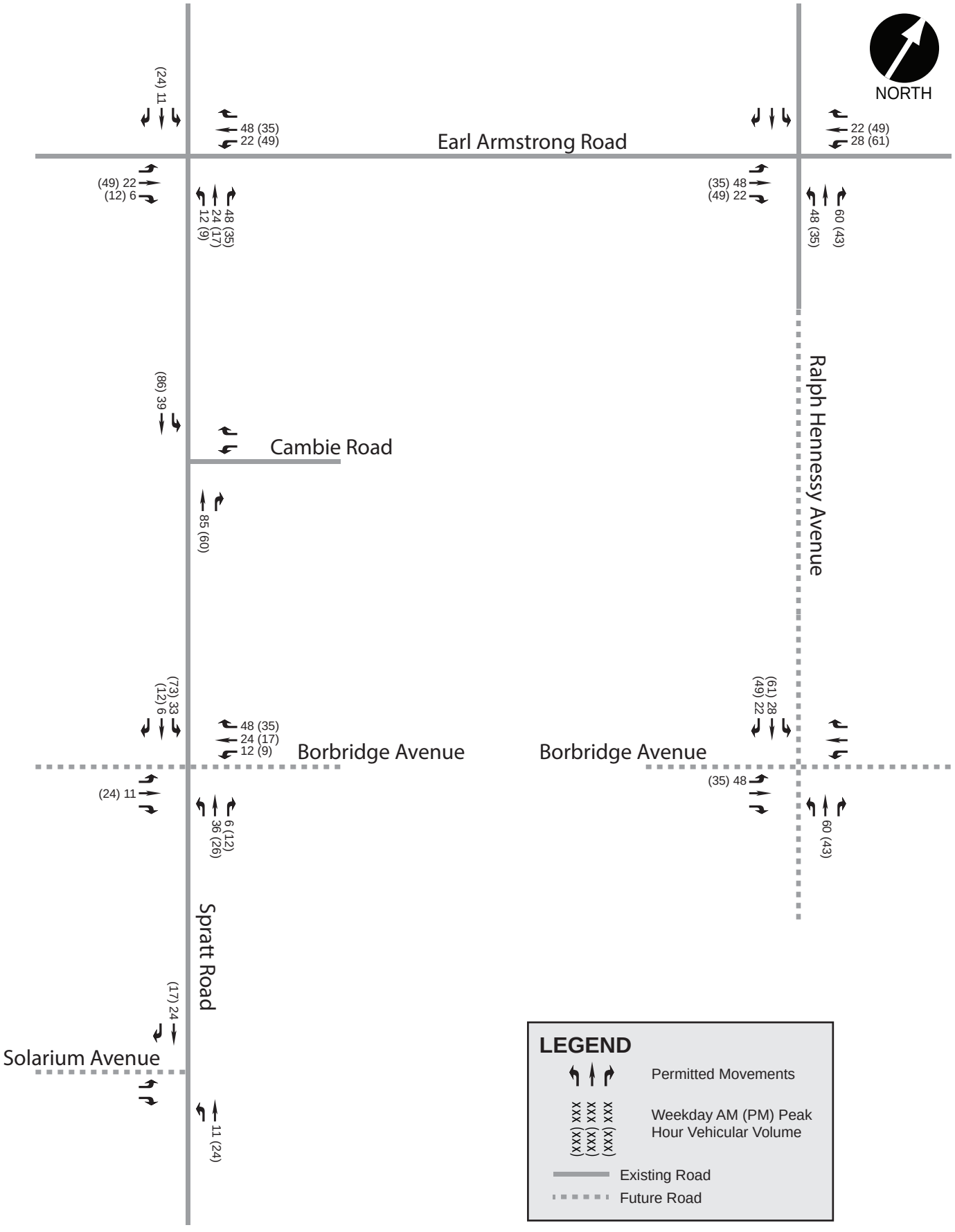
MODE	2024				2026				2031			
	AM		PM		AM		PM		AM		PM	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Auto Driver	110	242	245	173	233	488	498	368	204	427	438	323
Auto Passenger	31	68	57	40	64	133	112	82	55	115	94	70
Transit	39	85	82	58	98	204	198	146	136	284	275	203
Cycling	2	4	4	3	4	9	9	6	4	9	9	6
Walking	0	0	0	0	0	0	0	0	0	0	0	0
Other	12	25	20	14	25	53	43	32	25	53	43	32
Total	**617**		**696**		**1312**		**1493**		**1312**		**1493**	

4.1.3 Trip Distribution and Assignment

With consideration that the proposed development will primarily consist of residential land uses, it is anticipated that the distribution of site-generated traffic in each of the four cardinal directions aligns with the AM Peak commuter flow based on the 2011 O-D Survey data. Assignment of site-generated traffic along logical routes for each direction has been based on engineering judgement:

- 80% to/from North
    - 40% on Limebank Road (via Earl Armstrong Road)
    - 10% on Limebank Road (via Spratt Road)
    - 5% on Limebank Road (via Rideau Road)
    - 10% on River Road
    - 10% on Prince of Wales Drive
    - 5% on Albion Road
- 15% to/from the West
    - 15% on Strandherd Drive
- 5% to/from South
    - 5% on Spratt Road

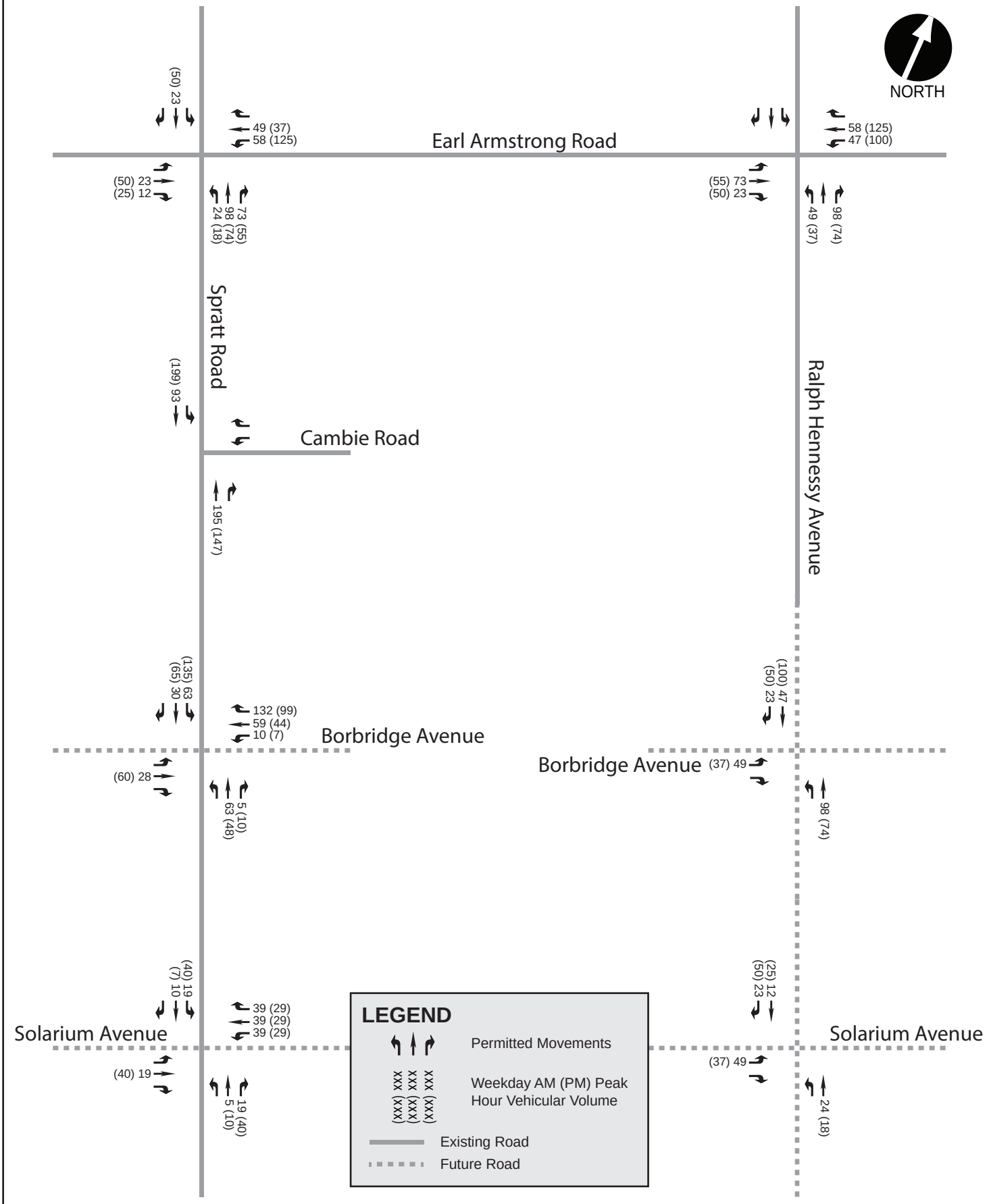
Utilizing the estimated number of new auto trips and applying the above distribution, future site-generated traffic volumes for the 2024, 2026 and 2031 analysis years are illustrated for each study area intersection in **Exhibit 6**, **Exhibit 7** and **Exhibit 8**.



Riverside South Phase 17
Transportation Impact Assessment

Exhibit 6:
2024 Site-Generated Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.

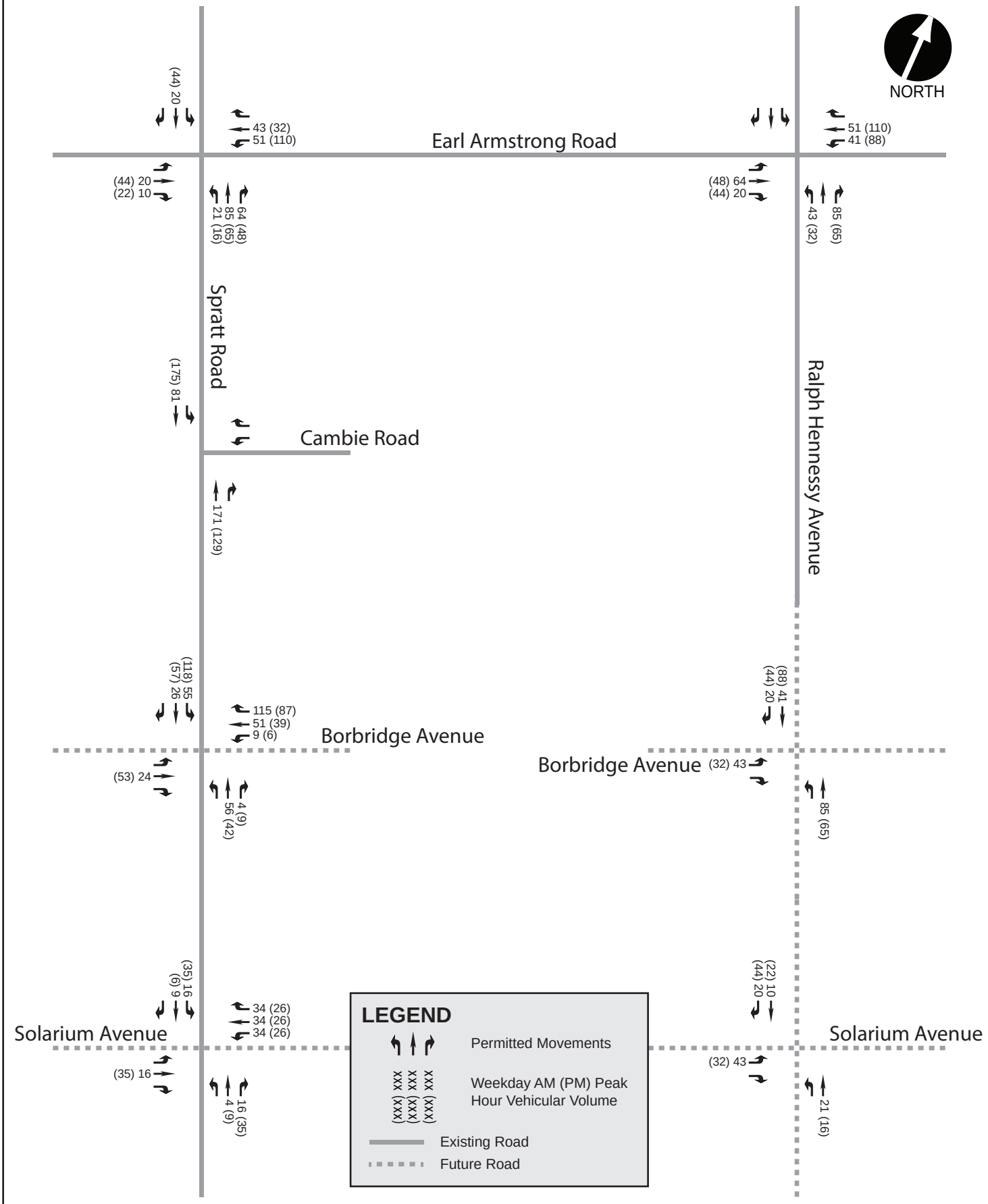


IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 7:
2026 Site-Generated Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.



IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 8:
2031 Site-Generated Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.

4.2 Background Network Traffic

4.2.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, planned modifications to the transportation network that may impact travel patterns or demand within the study area have been considered. The Scoping section of this TIA reviewed the anticipated changes to the study area transportation network based on the Transportation Master Plan (TMP) and the 2019 Development Charges (DC) Amendment Background Study. Based on a review of these planning policy documents, it was determined that there are no major road network modifications planned within the study area and 2031 horizon year.

There are, however, a number of anticipated transportation network changes triggered by development in the surrounding Riverside South Community. A summary of the relevant local transportation network changes has been provided below:

- Spratt Road will be urbanized from Cambie Road to the southern property boundary of the site. This RMA will be completed incrementally in two distinct phases, with Phase 1 planned for construction in 2020 from Cambie Road to south of Borbridge Avenue and Phase 2 to south of Solarium Avenue, planned for construction by 2022.
- Borbridge Avenue (Collector 'I'), an existing major collector road, will be extended further east from its current terminus at Brian Good Avenue, intersecting with Spratt Road and continuing through the northeast portion of the proposed development lands. The intersection of Spratt & Borbridge will be completed as part of Phase 1 of the Spratt Road urbanization, and is planned for construction in 2020. The east leg of this intersection will be constructed as part of the adjacent 4725 Spratt Road development and expected to be in place by 2022.
- Solarium Avenue (Collector 'J'), a new east-west major collector road, will connect River Road, Spratt Road and Limebank Road. This road will extend through the southern portion of the site. The intersection of Spratt & Solarium will be constructed as part of Phase 2 of the Spratt Road Urbanization, and is expected to occur in advance of the build-out/ occupancy of the subject site.
- Brian Good Avenue is presently being extended south of its existing terminus at Borbridge Avenue to provide a connection with Solarium Avenue through the Riverside South Phase 2 and 15 developments. This road will ultimately continue further south towards Rideau Road.
- The TIAs conducted in November 2017 in support of Riverside South Phase 2 and Phase 15 recommended the conversion of Earl Armstrong/ Brian Good from a stop-controlled intersection to a signalized intersection immediately due to existing traffic capacity issues.
- The TIA for 4725 Spratt Road conducted by IBI Group (February 2020) recommended that the eastbound and westbound left-turn parallel lanes at the intersection of Earl Armstrong/ Spratt be extended by at least 60m and 25m, respectively.

4.2.2 General Background Growth Rates

The background growth rate is intended to represent regional growth from outside the study area that will travel along the adjacent road network. Consistent with approved TIAs completed in the broader study area, a linear growth rate of 1.5% per annum is proposed for the calculation of future background traffic estimates.

This growth rate was applied only at through movements on Earl Armstrong Road to account for regional traffic growth through the study area.

A general background growth rate has not been applied to collector and local roadways within the study area, as traffic generation relating to all known future adjacent developments has been accounted for separately in the analysis.

4.2.3 Other Area Development

All current adjacent development applications and future potential developments within the study area were previously identified in **Table 3** and **Table 4**, respectively. As a conservative approach, all of these developments have been accounted for in the development of future background volume projections. The developments represent specific areas of growth within the study area and are therefore considered in addition to the general background growth rate discussed previously.

A site survey was conducted in May 2020 to document the approximate occupancy rates for each adjacent development, and these rates were considered in the development of existing (2020) traffic volumes. Any remaining units deemed not built out or occupied at the time of the survey were accounted for separately in the development of future background traffic volumes, according to the phasing assumptions outlined in **Table 10** below.

Table 10 – Riverside South Phase 17 – Estimated Phasing

Development (with Status)	Total Units/ GLA	Expected Full Build-out/ Occupancy	Year & Units Expected Built & Occupied												Total
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
River's Edge Phase 1 (Claridge)	440	2021	220	220											440
River's Edge Phase 2 (Claridge)	315	2024				158	158								315
Phase 8 (RSDC)	432	Complete													0
Phase 8 (RSDC)	169	2022		85	85										169
Phase 9 South (RSDC)	1355	Complete													0
Phase 9 North (RSDC)	101,000 sqft	2022													0
Phase 9 North (RSDC)	94	Complete													0
Phase 13 (RSDC)	472	90% Complete	47												47
Phase 15-1 (RSDC)	510	2021	255	255											510
Phase 15-2 (RSDC)	250	2023			125	125									250
Phase 15-3 (RSDC)	418	2025					209	209							418
Phase 15-4 (RSDC)	136	2026						68	68						136
Phase 17-1 (RSDC)	524	2024			175	175	**175**								524
Phase 17-2 (RSDC)	337	2025					169	**169**							337
Phase 17-3 (RSDC)	297	2026						149	**149**						297
879 River Road (Richcraft)	117	2022		59	59										117
673 River Road (Cardel Homes)	494	2029								165	165	165			494
708 River Road (Urbandale) - Single Family	80	2023			40	40									80
708 River Road (Urbandale) - Condominiums	110	2024				55	55								110
750 River Road (Urbandale)	55	2023			28	28									55
760 River Road (Claridge)	55	2023			28	28									55
4725 Spratt Road (Claridge)	275	2023			138	138									275
Block K - Residential (Claridge)	43	Complete													0
Phase 4 (Nicolls Island Road Holdings Inc.)	55	No Status [2]							55						55
425 Nicolls Island Road (Alphon Group Canada Inc.)	141	No Status [2]							141						141
Total Units (to be built out)	**4825**		**522**	**618**	**675**	**745**	**765**	**594**	**413**	**165**	**165**	**165**	**0**	**0**	

Notes:
Approximate occupancy rates are based on a site visit conducted by IBI Group staff on May 8, 2020
RSDC = Riverside South Development Corporation (RSDC).

4.3 Demand Rationalization

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

4.3.1 Description of Capacity Issues

As previously shown in **Exhibit 4**, weekday morning and afternoon peak hour volumes on Earl Armstrong Road at Spratt and Ralph Hennessy are presently in the order of 1,200 to 1,400 vehicles per hour in the peak direction, which is within the capacity limitations for two lanes of an arterial road.

With continued development expected to occur within Riverside South, however, the intersection of Earl Armstrong/ Spratt may experience capacity issues on critical turning movements within the 2031 study horizon year. The eastbound left-turn movements presently operate as a single lane with approximately 50m of parallel lane and permissive-protected signal phasing. This movement was identified previously in the TIA for 4725 Spratt Road as having potential to experience capacity issues, and was recommended for an additional parallel lane length of at least 60m. A traffic count conducted by the City of Ottawa in November 2019 provides further indication that the eastbound left-turn is currently experiencing operational issues, with significant turning movement volumes of approximately 375 vehicles observed on this turning movement during the weekday afternoon peak hour. Based on the logical distribution of traffic assumed in this study, site-generated traffic is not expected to contribute to this movement, therefore any modifications would be required to support existing and future background traffic growth. The northbound left-turn movement at Earl Armstrong/ Spratt has also been previously identified as a critical movement in TIAs conducted for adjacent sites. Site-generated traffic is expected to contribute at most 18 vehicle trips per hour to this movement during the critical weekday afternoon peak period, representing just 14% of the overall traffic volume projections in 2026. As such, any capacity issues experienced on the northbound left-turn movement would be primarily a result of background traffic.

The Analysis section of this TIA will confirm any additional traffic operational issues at study area intersections under both background and total traffic conditions, and suggest mitigation measures where applicable.

4.3.2 Adjustment to Development Generated Demands

Development generated demand and mode share can vary over time to reflect changes to the transportation network. The City continues to promote the proliferation of transit and active transportation modes in order to meet the mode share targets set in the Transportation Master Plan (TMP). Transit is expected to play a significant role, and will have an impact on travel behaviour within the study area.

Although pedestrian and cycling facilities have expanded within the Riverside South Community, the impact on development generated traffic demand is not expected to result in any significant changes to the target mode share assumed for this study during the weekday commuter periods. As a conservative approach, the active transportation mode share values derived from the 2011 O-D Survey were therefore assumed to remain unchanged for all three future analysis years in this study.

4.3.2.1 Transit Modal Share

As discussed previously, the trip generation results presented in **Table 9** above have been adjusted to account for future increases in transit mode share which are anticipated based on the 2011 O-D Survey and 2013 TMP. Further adjustments to the transit mode share were applied with

consideration of the Trillium Line LRT Extension Addendum (September 2018) and the Draft Riverside South Community Design Plan Transportation Update (IBI, March 2020). Upon reviewing these key policy documents, a transit mode share target of 32% was applied at the 2031 study horizon year to align with the CDP update, while a target of 16% was assumed to be feasible in 2022 to coincide with the planned opening of the LRT South Extension in Riverside South. Interim targets at the 2024 and 2026 analysis years were derived through interpolation between the 2022 and 2031 targets. These increases in the transit mode share described above were offset by proportional decreases in auto driver and auto passenger mode share targets to retain the existing auto occupancy rate.

Additional ridership resulting from the shift in transit mode share from 23% in 2026 to 32% in 2031 is expected to be in the order of 120 and 135 trips during the weekday morning and afternoon peak hours, respectively. It is expected that these trips will be accommodated through a combination of Transportation Demand Management (TDM) measures and strengthening of the local transit network, as discussed in subsequent sections of this TIA.

4.3.3 Adjustment to Background Network Demands

As a conservative measure, the mode share adjustments described above were limited to site-generated traffic volumes and therefore were not applied to existing and future adjacent development volumes.

4.4 Traffic Volume Summary

4.4.1 Future Background Traffic Volumes

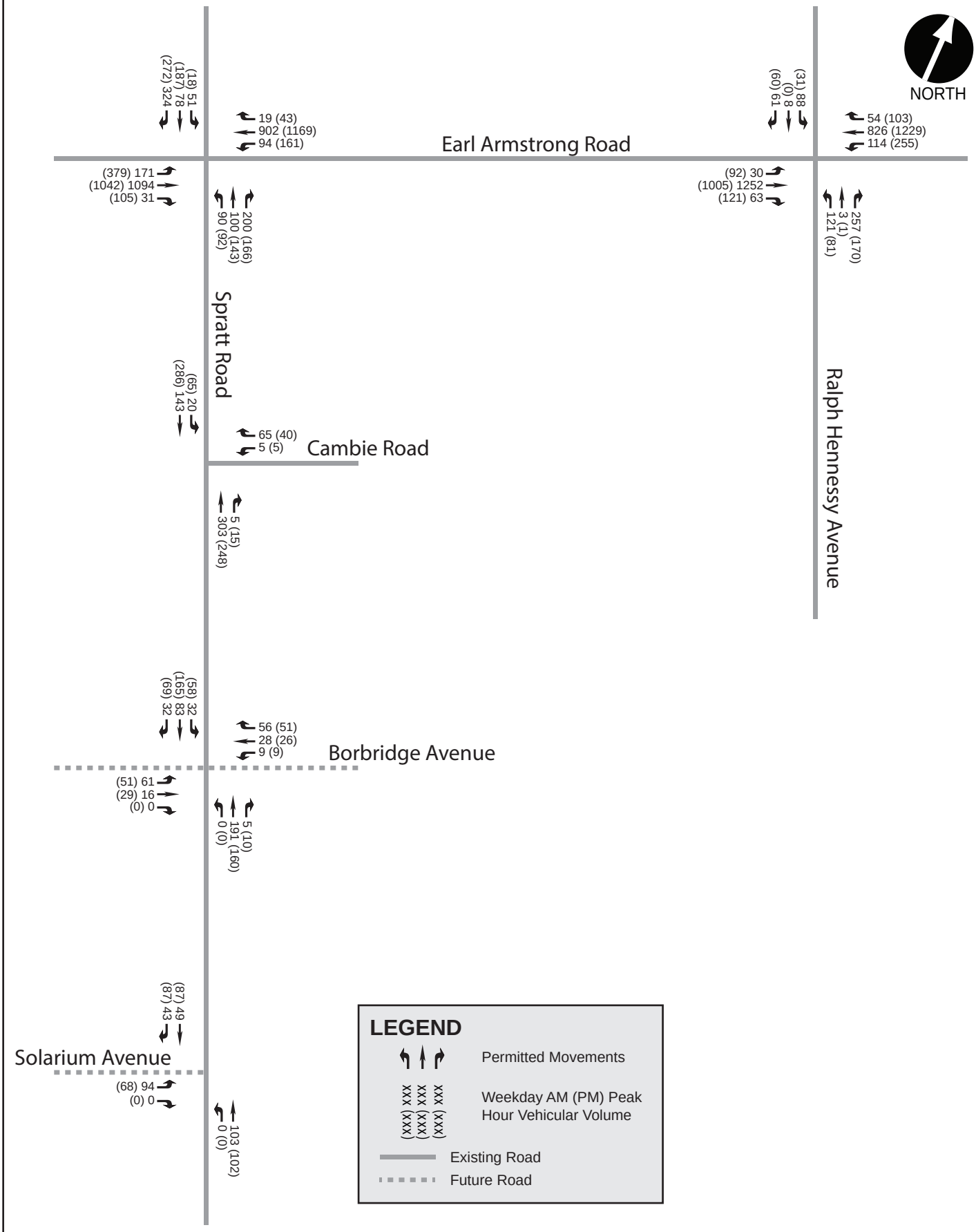
Future background traffic volume projections have been established by combining the adjacent development traffic and background traffic derived through the application of a growth rate, as discussed previously.

Exhibit 9, **Exhibit 10** and **Exhibit 11** present the future background traffic volumes anticipated for the 2024, 2026 and 2031 analysis years, respectively.

4.4.2 Future Total Traffic Volumes

Future total volumes have been derived by combining the site-generated traffic volumes with future background volumes.

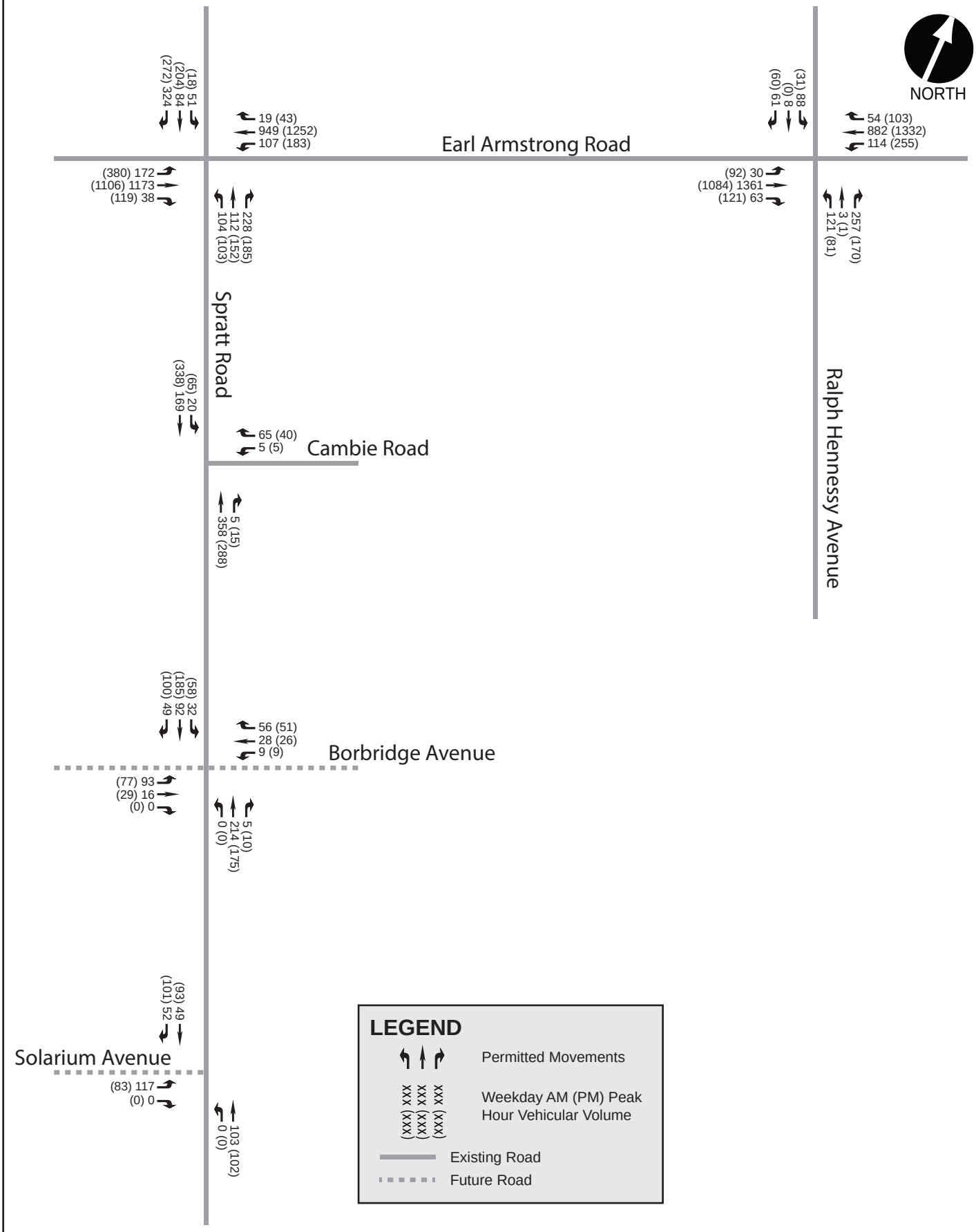
Exhibit 12, **Exhibit 13** and **Exhibit 14** present the future total traffic volumes anticipated for the 2024, 2026 and 2031 analysis years, respectively.



Riverside South Phase 17
Transportation Impact Assessment

Exhibit 9:
Future (2024) Background Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.

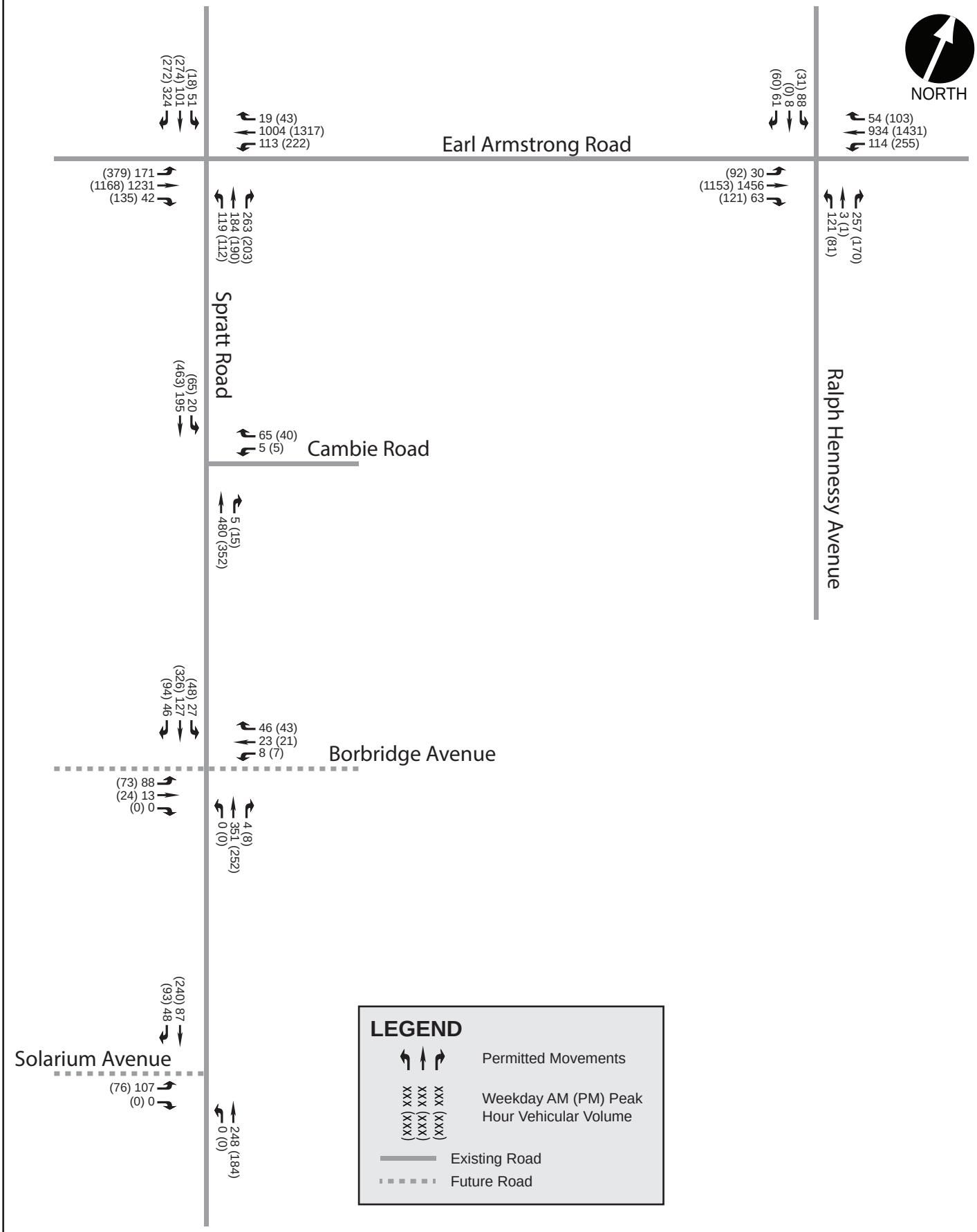


IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 10:
Future (2026) Background Traffic

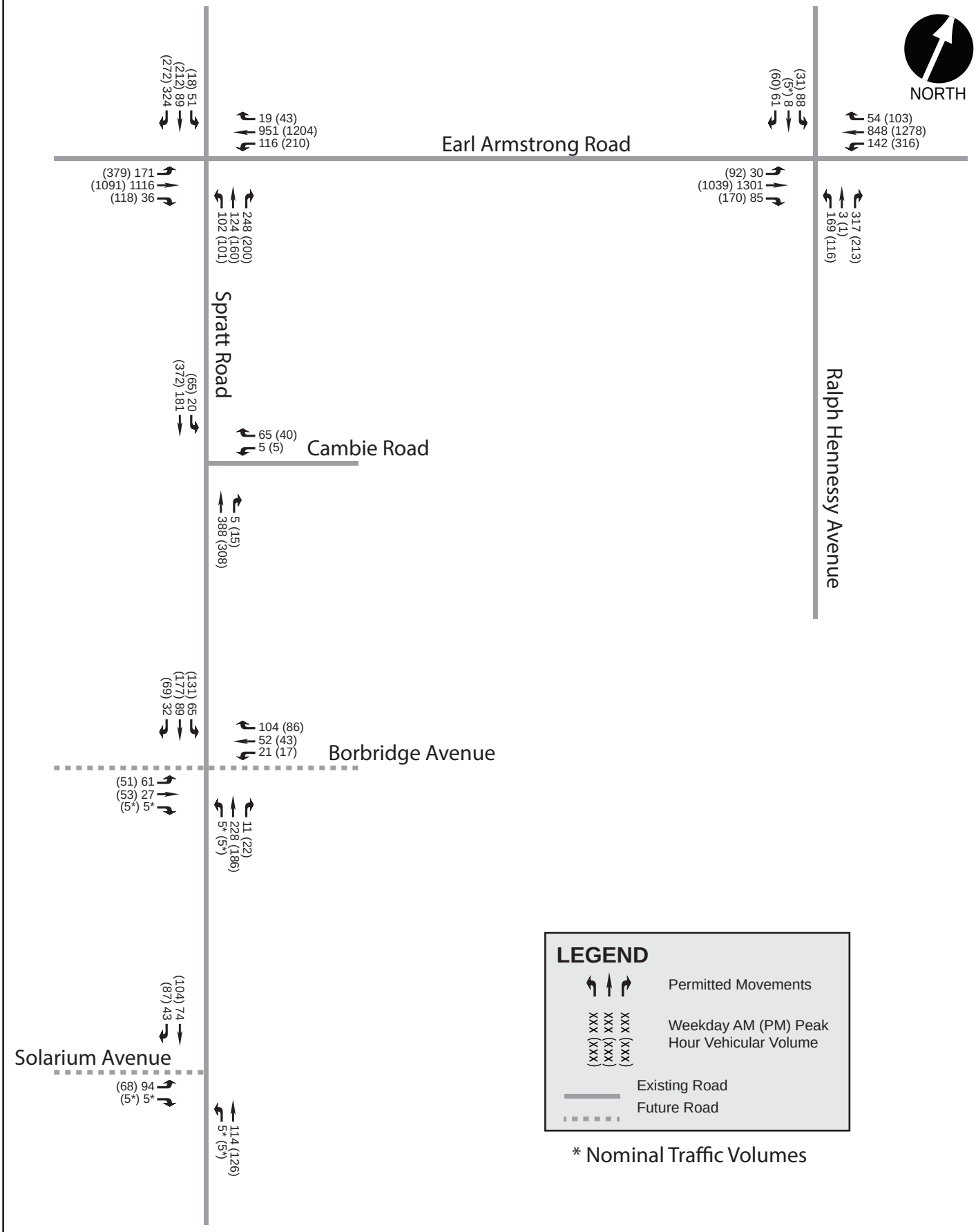
PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.



Riverside South Phase 17
Transportation Impact Assessment

Exhibit 11:
Future (2031) Background Traffic

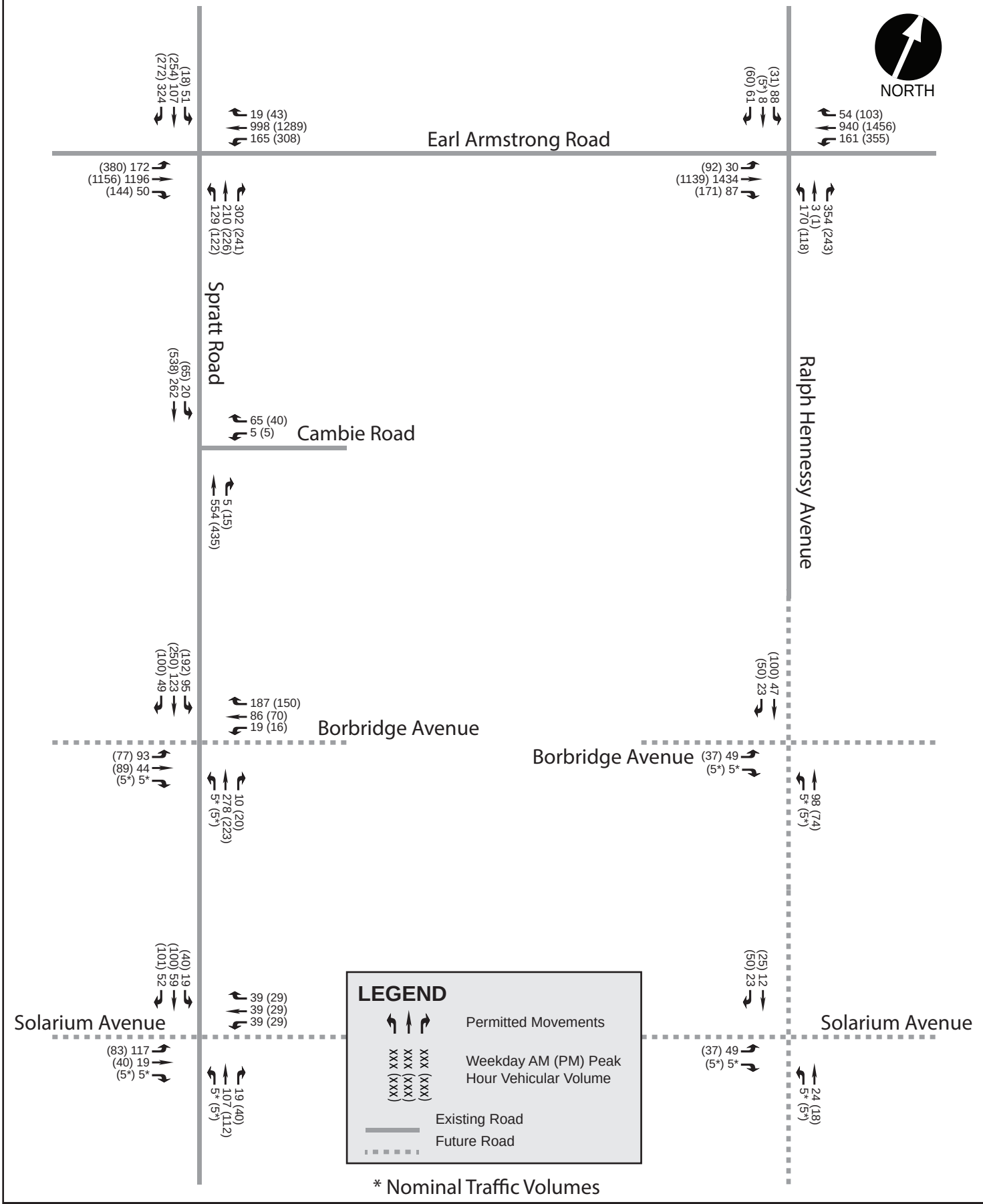
PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.



Riverside South Phase 17
Transportation Impact Assessment

Exhibit 12:
Future (2024) Total Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.

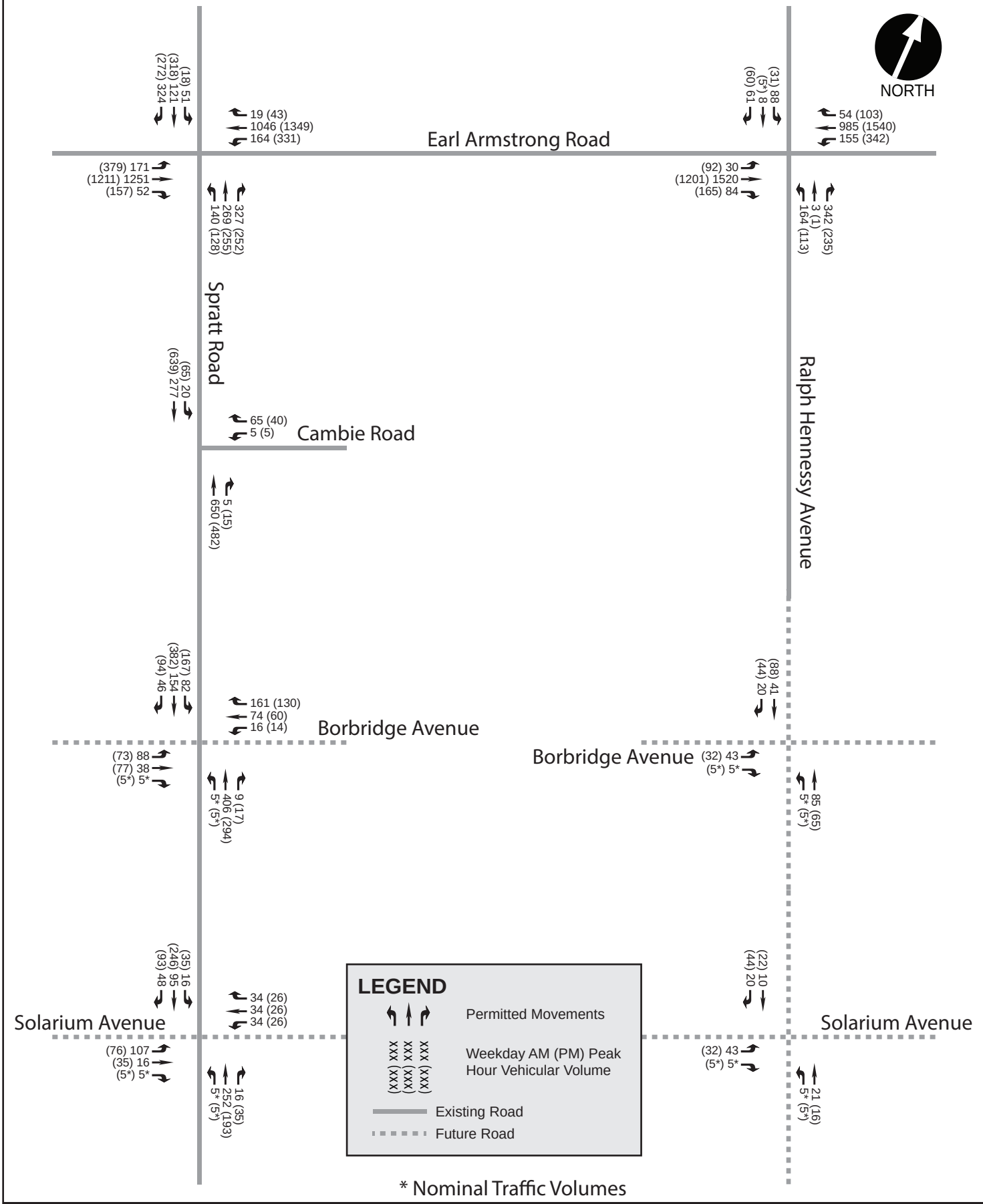


IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 13:
Future (2026) Total Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.



* Nominal Traffic Volumes

IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 14:
Future (2031) Total Traffic

PROJECT No. 125581
DATE: August 2020
SCALE: N.T.S.

5 Analysis

5.1 Development Design

5.1.1 Design for Sustainable Modes

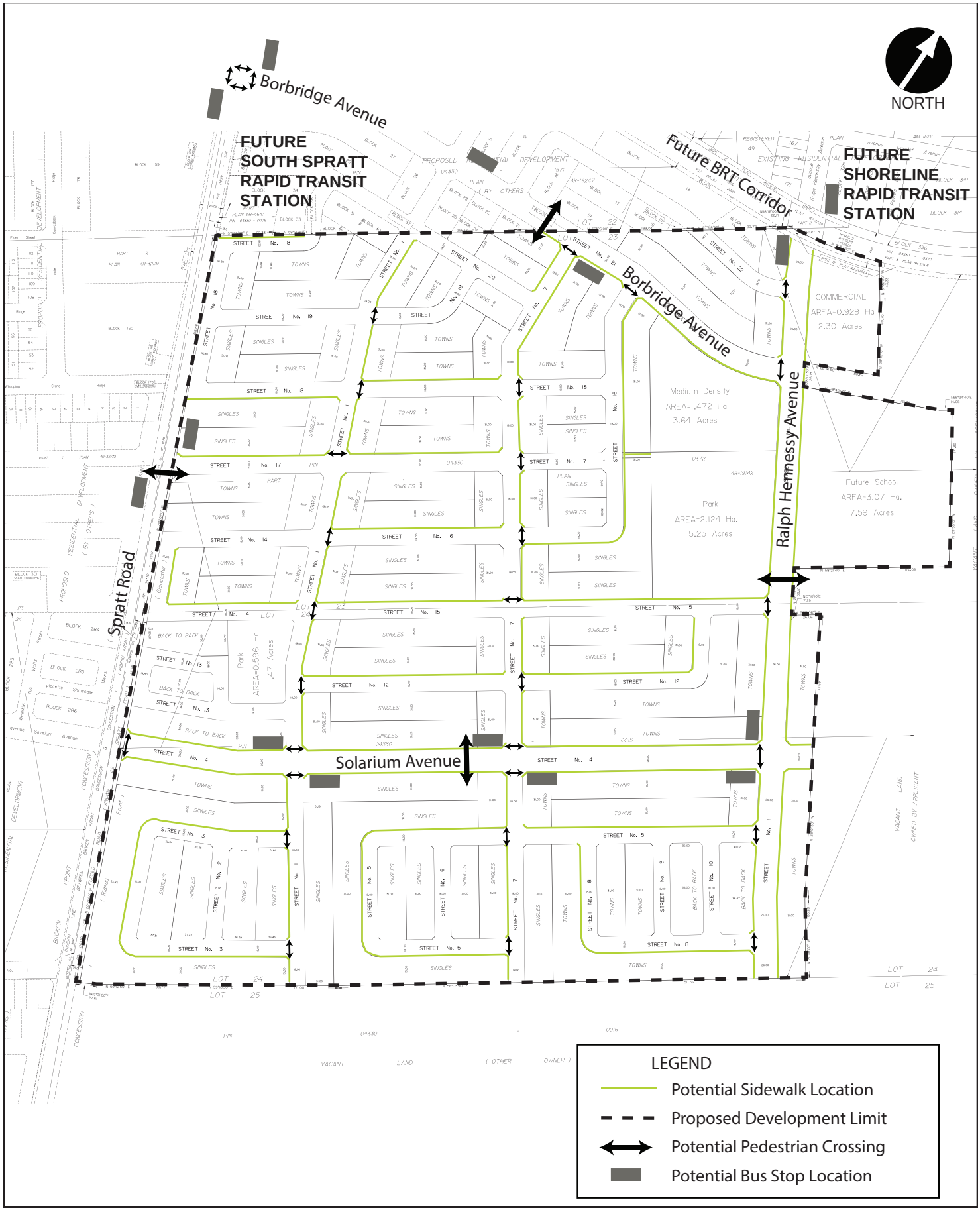
The extension of existing transit routes and/or the addition of new routes will be required to provide adequate transit service coverage. Transit service can potentially be extended along the collector road network within or adjacent to the site, with strategically placed stops to capture the majority of the proposed residential units within 400m walking distance, as shown in **Exhibit 15** below.

The Riverview Transit Station is located approximately 850m northwest of the proposed development and includes a Park and Ride facility, as well as drop off areas. It is anticipated that any local transit route providing service to the proposed development will provide direct connectivity to this station.

Once the future Barrhaven-Riverside South Rapid Transit Corridor is constructed, the two nearest transit stations (i.e. South Spratt Station and Shoreline Station) will provide sufficient coverage such that the majority of the proposed development will ultimately be located within a Transit-Oriented Development (TOD) zone, however this is not anticipated prior to the TMP's 2031 planning horizon.

The layout of the internal road network has been configured as a modified grid to maximize mobility within the development as well as provide connectivity to adjacent pedestrian and cycling facilities. Internal collector roads and select local roads will provide sidewalks on at least one side to facilitate connections to schools, pathways and other community attractions. Internal roadways have been designed to discourage high vehicular speeds and provide high pedestrian connectivity within the site. The Draft Plan also provisions for connectivity to adjacent pedestrian and cycling facilities within the surrounding area, particularly the future rapid transit station to be located near the northeast corner of the site and the future multi-use path proposed along this future transit corridor.

There are currently no sidewalks or cycling facilities on Spratt Road within the proposed development's frontage, however once this segment of Spratt is urbanized, formalized facilities will be provided to accommodate active transportation modes, including segregated bicycle and pedestrian facilities, as indicated in the Spratt Road RMA.

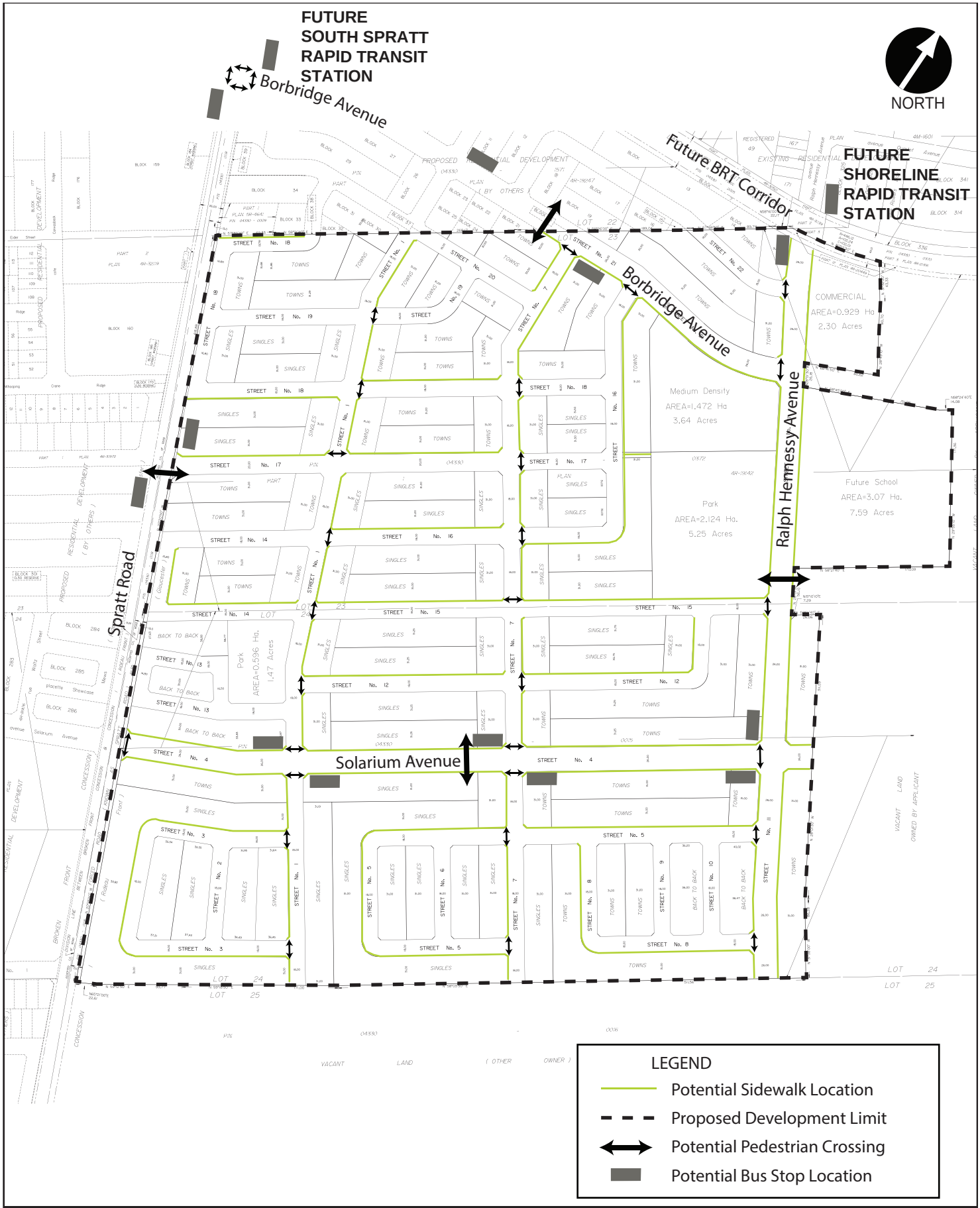


IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 15:
Proposed Mobility Plan

PROJECT No. 125581
DATE: August 2020
SCALE: 0m 50m 100m



IBI

Riverside South Phase 17
Transportation Impact Assessment

Exhibit 15:
Proposed Mobility Plan

PROJECT No. 125581
DATE: August 2020
SCALE: 0m 50m 100m

5.1.2 New Street Networks

The proposed development consists of local, collector and major collector roads configured in a modified grid pattern. Two direct connections to Spratt Road are proposed via Solarium Avenue and a local road access further north. Additional connections to the adjacent road network will be provided via Borbridge Avenue through the 4725 Spratt Road development immediately to the north, as well as a connection to Earl Armstrong via Ralph Hennessy. All internal collector and major collector roads will have a 26m right-of-way (ROW) to accommodate transit service, while local roads proposed within the development will range from 18m to 20m ROWs.

Sidewalks are anticipated on both sides of the collector and major collector roads, as well as on one side of select local roads. Roadway cross-section elements as well as potential traffic-calming measures will be developed in consultation with City staff following the Draft Plan approval. There may be opportunities to provide pedestrian connections between the proposed development and the future rapid transit corridor or multi-use pathway (MUP) to the north, as well as the window streets adjacent to Spratt Road.

5.2 Parking

The Parking Supply and Spillover Parking elements are exempt from this TIA, as defined in the study scope. These elements are not required for Draft Plans of Subdivision.

5.3 Boundary Streets

5.3.1 Mobility

As specified in the TIA Guidelines, since a Complete Street concept exists for the development's only boundary street (i.e. Spratt Road) along the site's frontage, segment-based MMLOS will not be required as part of this study.

The proposed development is expected to result in minimal impacts to the Spratt Road RMA design along the site's frontage. The locations of the two major access intersections on Spratt Road (i.e. Borbridge and Solarium) were previously defined in the CDP and therefore have been considered in the RMA design. Further, there are no dwelling units that will front directly onto Spratt Road within the site's frontage, helping to minimize potential design conflicts. It should be noted, however, that the location of any pedestrian connections along the Spratt Road frontage will be coordinated with the RMA design.

Road Safety

A summary of all reported collisions within the study period over the past 5 years was presented in the Scoping section of this report. The City requires a safety review if at least six collisions for any one movement or a discernible pattern, over a five year period have occurred. Based on a review of re-occurring events at the intersections, the following locations require further investigation:

Earl Armstrong & Spratt – 30 collisions

- Turning Movement – 18 collisions
  - Vehicle Manoeuvre: Eastbound Left-Turn and Westbound Going Ahead (14 of 18)
  - Surface Conditions: wet/snow (6 of 18)
  - Time of Day: Peak Hour (12 of 18)
- Rear end – 8 collisions
  - Vehicle Manoeuvre: Southbound Right-Turn (5 of 8)
  - Surface Conditions: wet/snow/rain (3 of 8)
  - Time of Day: Peak Hour (6 of 8)

The latest turning movement counts provided by the City at the intersection of Earl Armstrong & Spratt indicate that approximately 375 eastbound left-turning vehicles in the afternoon peak hour must yield to approximately 1,000 westbound through vehicles. The signal currently has a permitted-protected phase for the eastbound left-turn movement and there are no obvious geometric or visibility deficiencies that could be the cause of these collisions. Although the proposed development is not expected to contribute any traffic to the eastbound left-turn movement, it is recommended that the City explore options to increase the capacity of this movement to support future development within the Riverside South Community. An analysis of future traffic conditions will be summarized in later sections of this report.

Based on the collision data, the majority of rear ends (5 of 8) at the intersection of Earl Armstrong & Spratt occurred on the southbound right-turn movement during the weekday peak periods. Turning movement counts indicate that the southbound right-turn is consistently heavy in the morning and afternoon peak periods, with approximately 320 southbound right-turning vehicles recorded in either peak period. The southbound curbside lane at the intersection with Earl Armstrong on Spratt Road has been recently converted into a southbound right-turn lane to mitigate operational issues associated with spillback of the heavy right-turn movement into the through lane. These modifications are expected to help reduce the number of southbound right-turn rear end collisions.

Earl Armstrong & Ralph Hennessy/ Shoreline – 9 collisions

- Most Common Collision Types:
  - SMV other (3/9)
  - Rear end (3/9)
- Surface Conditions: Slush/Snow/Ice (4 of 9)
- Time of Day: Peak Hour (5 of 9)

A review of the collision records indicates that there are no collision types that occurred 6 or more times over the 5-year period, with the most common collision types being ‘SMV other’ (3/9) and rear end collisions (3/9). All collisions were determined to be relatively minor in nature, and were classified as either ‘non-fatal’ or ‘property damage only’. Poor surface conditions or increased traffic congestion during peak hours are likely contributing factors to the majority of collisions (7/9). Based on the above analysis, there is no evident pattern or specific cause for collisions at the intersection of Earl Armstrong & Ralph Hennessy/ Shoreline and each can be considered random occurrences.

5.4 Access Intersections

5.4.1 Location and Design of Access

The conceptual alignments of Borbridge and Solarium were defined through the Riverside South Community Design Plan process. When fully built out, both Borbridge and Solarium will provide access to the lands east and west of Spratt Road.

The proposed development will provide access to Spratt Road at these locations:

1) **Borbridge Avenue** – An all-movements connection is proposed on the east leg of the Borbridge/ Spratt intersection as part of the Spratt Road RMA (Phase 1), and is planned for construction in 2020. This access will be located approximately 320 metres south of Cambie Road and will have a 26m right-of-way. As discussed previously in Section 4.2.1, the extension of Borbridge Avenue east of Spratt Road will be constructed as part of the adjacent development at 4725 Spratt Road and will continue further east through the site, forming a T-intersection with the extension of Ralph Hennessy Avenue near the eastern property boundary of the site. The west leg of the Spratt/Borbridge intersection will serve primarily as an access for the Riverside South Phase 15 subdivision, currently under construction.

2) **Solarium Avenue** – An all-movements connection to Spratt Road is proposed approximately 1,070m south of Cambie Road which will form the east leg of the Spratt/Solarium intersection and have a 26m right-of-way. As discussed previously in Section 4.2.1, this access intersection is expected to be constructed as part of the Spratt Road RMA (Phase 2), which is planned for completion by 2022. Solarium Avenue will continue east through the development lands, forming a T-intersection with the extension of Ralph Hennessy Avenue near the eastern property boundary of the site. The west leg of the Spratt/Solarium intersection will primarily serve as an access for Riverside South Phase 15 and River's Edge subdivisions.

Appropriate forms of traffic control will be re-confirmed for both of the above noted access intersections in subsequent sections of this TIA, based on warrant methodologies from the Ontario Traffic Manual (OTM) and verified through intersection capacity analyses.

In addition to the above, there is an existing signalized access via Ralph Hennessy that provides a connection to Earl Armstrong Road. A local road access is also planned to provide a direct connection to Spratt between Borbridge and Solarium, as indicated on the Draft Plan.

5.4.2 Intersection Control

5.4.2.1 All-Way Stop Warrants

The Ontario Traffic Manual (OTM) indicates that all-way stop control should only be considered on major roads when the following conditions are met:

- *Total unit volume on minor approaches exceeds 200 for 8 hours. Unit volume is defined as vehicle and pedestrian volumes only; and*
- *Volume split does not exceed 70/30. Volume is defined as vehicle only.*
- *Total vehicle volume on all intersection approaches exceeds 500 for 8 hours recorded;*

Table 11 below provides a summary of projected AM and PM weekday peak hour volumes for 2024 and 2026 total traffic conditions, as an 8-hour count data is not available for future conditions**.**

Table 11 – Future Traffic Volume Splits – Spratt Road & Borbridge Avenue

SCENARIO	TIME PERIOD	BORBRIDGE AVE		SPRATT ROAD		TOTAL VEHICLE VOLUME
		UNIT VOLUME [1]	VOLUME SPLIT	VEHICLE VOLUME	VOLUME SPLIT	
2024 Total Traffic	AM Peak Hour	266	38%	425	62%	691
	PM Peak Hour	250	30%	585	70%	835
2026 Total Traffic	AM Peak Hour	430	44%	535	56%	985
	PM Peak Hour	402	34%	785	66%	1186

Notes: [1] Vehicles, Pedestrians & Cyclists

Based on the projected traffic volumes in **Table 11**, it is not expected that 2024 volumes will be sustained above the thresholds of 200 units per hour on the minor road and 500 vehicles per hour overall for 8 consecutive hours. By 2026, however, projected volumes are expected to exceed these thresholds by roughly two-fold, with a balanced split of at least 70/30. The all-way stop control warrant is therefore triggered under 2026 total traffic conditions. Intersection capacity analyses conducted in subsequent sections of this TIA will verify the operational performance of the intersection configured with this form of traffic control. It should be noted that the Spratt Road RMA does not consider All-Way Stop Control at the Borbridge intersection.

5.4.2.2 Traffic Signal Warrants

Based projected Future (2031) Total traffic volumes, traffic signals are not expected to be warranted at the following access intersections:

- Spratt Road and Borbridge Avenue
- Ralph Hennessy Avenue & Borbridge Avenue
- Spratt Road and Solarium Avenue
- Ralph Hennessy Avenue & Solarium Avenue

The results of the traffic signal warrants are provided in **Appendix H**.

5.4.2.3 Roundabout Analysis

As per the City's Roundabout Implementation Policy, intersections that satisfy any of the following criteria should be screened utilizing the Roundabout Initial Feasibility Screening Tool:

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

Based on the above criteria, a Roundabout Screening Form was completed for the following 'new City intersections':

- Ralph Hennessy Avenue & Borbridge Avenue
- Spratt Road and Solarium Avenue
- Ralph Hennessy Avenue & Solarium Avenue

The results of the Roundabout Feasibility Screening Tool for each of the above noted intersections indicate that a roundabout is not technically feasible, based on the suitability factors.

The results of the Roundabout Feasibility Screening Tool are provided in **Appendix H**.

5.4.3 Intersection Design (MMLOS)

Refer to Section 5.9 for Multi-Modal Level of Service (MMLOS) and Synchro analysis results.

5.5 Transportation Demand Management (TDM)

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

As described in the Forecasting section of this report, the mode share used to estimate future development traffic were based on the 2011 TRANS Origin-Destination Survey for the South Gloucester/Leitrim Traffic Assessment Zone (TAZ). The active transportation mode share was assumed to remain unchanged, as the relative impact of any reasonable adjustments would be insignificant across all modes within the timeframe of this study.

5.5.1 Context for TDM

The proposed development aligns with the objectives of the Riverside South Community Design Plan (CDP) and Building Better and Smarter Suburbs (BBSS) policy documents, which promote sustainable and compact growth. The proposed development consists an appropriate level of density for a suburban Transit-Oriented Development zone by providing a range of housing options that help promote transit ridership and use of adjacent active transportation facilities with the overall effect of reducing reliance on private automobile transportation.

5.5.2 Need and Opportunity

Riverside South is presently an auto-oriented suburb with a single transit hub, Riverview Station, however the planned implementation of a light rail station within the Town Centre and the future extension of the BRT corridor to the north of the site provide opportunities to increase transit modal share and more effectively utilize existing transit infrastructure. Improving transit connectivity between residential areas and nearby transit hubs as the community grows will help to maximize the use of the transit system.

5.5.3 TDM Program

The proposed development conforms to the City's TDM principles by providing convenient and direct connections to adjacent pedestrian, cycling and transit facilities. The internal road network has been configured with short street segments to provide maximum connectivity and direct connections to future rapid transit stations. Sidewalks and appropriate pedestrian connections will be provided throughout the subdivision to facilitate access to local amenities, pathways and the adjacent road and transit network.

The City of Ottawa's TDM Measures Checklist was completed for the proposed development, and the results are provided in **Appendix I**.

5.6 Neighbourhood Traffic Management

5.6.1 Adjacent Neighbourhoods

As the development is reliant on collector roads for access, a review of Neighbourhood Traffic Management thresholds is required as part of the TIA process.

The TIA Guidelines prescribe a liveability threshold of 300 vehicles per hour for collector roads and 600 vehicles per hour for major collector roads. Ralph Hennessy and it extension through the proposed development is identified as a collector road in the Riverside South CDP. Projected volumes on Ralph Hennessy under the 2026 and 2031 total traffic conditions are expected to remain well within 300 vehicles per hour, with the exception of the segment approaching Earl Armstrong, where volumes may occasionally exceed this threshold. It is not uncommon, however, for collector roads which provide direct, signalized access to the arterial road network to exceed liveability thresholds within close proximity to the intersection. Borbridge and Solarium are classified as major collector roads, and expected to operate well under the 600-vehicle per hour liveability threshold, with volumes up to 465 vehicle 190 vehicles per hour, respectively, within the horizon year of this study.

5.7 Transit

5.7.1 Route Capacity

The estimated Future (2031) Total transit passenger demand within the study area was provided in Section 4.1.2.5 Trip Generation by Mode. The results have been summarized in **Table 12** below.

Table 12 - 2026 Development Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	136	284
PM	275	303

Based on **Table 12**, transit ridership projections for the proposed development are expected to be approximately 420 and 578 trips during the weekday morning and afternoon peak hours, respectively, under 2031 total traffic conditions. The Trillium South Extension to Limebank Road is expected to be constructed and operating at full revenue service by the end of 2022, well in advance of the anticipated 2026 build-out of the proposed development. The operation of LRT service within the community, combined with a strengthening of local transit routes within or adjacent to the site should provide sufficient capacity to support transit demand associated with the proposed development. Further, it is expected that OC-Transpo will plan future transit routes to accommodate the transit demand associated with the growth in the Riverside South community.

5.7.1 Transit Priority Measures

There are no transit priority measures proposed within the study area. As indicated in the TMP Network Concept, ultimately when the rapid transit network is constructed linking the Barrhaven and Riverside South community cores, the majority of the site will be located within a Transit-Oriented Development (TOD) zone.

5.8 Review of Network Concept

As discussed in Section 3.3.3 Network Concept Screenline, the following screenlines are applicable to this study: SL8 – Leitrim; and SL42 – Rideau River (Manotick). A summary

comparison of the City 2031 Network Concept demand and capacity has been provided in **Table 13** below.

Table 13 – 2031 Network Concept

SCREENLINE	AM 2031 PREFERRED INBOUND		
	DEMAND	CAPACITY	V/C RATIO
SL8 - Leitrim	5,884	7,000	0.84
SL42 – Rideau River (Manotick)	2,596	3,800	0.68

Notes: Table results from Road Network Development Report: Final Report (December 2013)

Based on **Table 13** above, it is expected that site-generated traffic will not trigger any deficiencies across either screenline. Traffic generated exclusively by the proposed development is expected to contribute approximately 340 and 122 inbound weekday morning and afternoon peak hour trips across SL8 and SL42, respectively, which are both well within the screenline capacity. Further, it is important to note that since the publication of the TMP, the City has significantly increased investment in local transit infrastructure with the planned extension of the Trillium LRT Line into the Riverside South Community Core, which is expected to help reduce overall reliance on auto trips during the weekday peak periods across both screenlines.

5.9 Intersection Design

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

5.9.1 Intersection Control

5.9.1.1 Traffic Signal Warrants

Based on the traffic signal warrants completed for each site access intersection in Section 5.4, traffic signals are not warranted at any of the site access intersections under 2031 total traffic volume projections.

The remaining study area intersections, located on Earl Armstrong Road, are currently signalized.

5.9.1.2 Roundabout Analysis

The Roundabout Initial Feasibility Screening Tool was used to evaluate the study area intersections. A roundabout screening analysis was completed for the site access intersections, and the results were summarized previously in Section 5.4.

A roundabout was found to be unwarranted at the existing intersection of Spratt & Cambie, as it does not warrant traffic signals nor are there any capacity or safety issues anticipated.

5.9.2 Intersection Analysis Criteria (Automobile)

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

5.9.2.1 Signalized Intersections

In qualitative terms, the Level-of-Service (LOS) defines operational conditions within a traffic stream and their perception by motorists. A LOS definition generally describes these conditions in terms of such factors as delay, speed and travel time, freedom to manoeuvre, traffic interruptions,

safety, comfort and convenience. LOS can also be related to the ratio of the volume to capacity (v/c) which is simply the relationship of the traffic volume (either measured or forecast) to the capability of the intersection or road section to accommodate a given traffic volume. This capability varies depending on the factors described above. LOS are given letter designations from 'A' to 'F'. LOS 'A' represents the best operating conditions and LOS 'E' represents the level at which the intersection or an approach to the intersection is carrying the maximum traffic volume that can, practicably, be accommodated. LOS 'F' indicates that the intersection is operating beyond its theoretical capacity.

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

Table 14 - LOS Criteria for Signalized Intersections

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

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

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

5.9.2.2 Unsignalized Intersections

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

The Highway Capacity Manual 2010 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for un-signalized intersections, related to average movement delays at the intersection, as indicated in **Table 15** below.

Table 15 - LOS Criteria for Unsignalized Intersections

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

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

5.9.3 Intersection Capacity Analysis

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

The following section presents the results of the intersection capacity analysis. All tables summarize study area intersection LOS results during the weekday morning and afternoon peak hour periods. The Synchro output files have been provided in **Appendix J**.

5.9.3.1 Existing (2020) Traffic

An intersection capacity analysis has been undertaken using the Existing (2020) Traffic volumes presented in **Exhibit 4**, yielding the following results:

Table 16 - Intersection Capacity Analysis: Existing (2020) Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**B** (0.64)	SBR (0.84)	**C** (0.80)	EBL (0.80)
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**A** (0.49)	NBL (0.71)	**B** (0.62)	WBL (0.62)
Spratt & Cambie	Unsignalized	**A** (9.1s)	WBRL (9.1s)	**B** (10.4s)	WBRL (10.4s)

As indicated in **Table 16** above, all existing study area intersections are presently operating at acceptable levels of service (i.e. LOS 'D' or better) during the weekday morning and afternoon peak hours.

5.9.3.2 Future (2024) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2024) Background Traffic volumes presented in **Exhibit 9**, yielding the following results:

Table 17 - Intersection Capacity Analysis: 2024 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**A** (0.55)	SBR (0.73)	**C** (0.80)	EBL (0.80)
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**B** (0.62)	NBL (0.74)	**B** (0.62)	WBL (0.62)
Spratt & Cambie	Unsignalized	**B** (10.6s)	WBRL (10.6s)	**B** (10.4s)	WBRL (10.4s)
Spratt & Borbridge	Unsignalized	**B** (13.3s)	EBTRL (13.3s)	**C** (15.3s)	EBTRL (15.3s)
Spratt & Solarium	Unsignalized	**B** (10.0s)	EBTRL (10.0s)	**B** (10.2s)	EBTRL (10.2s)

As indicated in **Table 17** above, it is expected that all study area intersections will continue to operate at acceptable levels of service (i.e. LOS 'D' or better) during the weekday morning and afternoon peak hours under 2024 background traffic conditions.

5.9.3.3 Future (2026) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2026) Background Traffic volumes presented in **Exhibit 10**, yielding the following results:

Table 18 - Intersection Capacity Analysis: 2026 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**B** (0.63)	SBR (0.70)	**D** (0.86)	NBL (0.87)
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**B** (0.66)	NBL (0.72)	**B** (0.64)	WBL (0.64)
Spratt & Cambie	Unsignalized	**B** (11.0s)	WBRL (11.0s)	**B** (10.8s)	WBRL (10.8s)
Spratt & Borbridge	Unsignalized	**B** (14.8s)	EBTRL (14.8s)	**C** (17.6s)	EBTRL (17.6s)
Spratt & Solarium	Unsignalized	**B** (10.1s)	EBTRL (10.1s)	**B** (10.4s)	EBTRL (10.4s)

As indicated in **Table 18** above, it is expected that all study area intersections will continue to operate at acceptable levels of service (i.e. LOS 'D' or better) during the weekday morning and afternoon peak hours under 2026 background traffic conditions.

5.9.3.4 Future (2031) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2031) Background Traffic volumes presented in **Exhibit 11**, yielding the following results:

Table 19 - Intersection Capacity Analysis: 2031 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**B** (0.63)	SBR (0.80)	**E (0.96)**	**NBL (0.98)**
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**C** (0.71)	NBR (0.82)	**B** (0.66)	WBL (0.66)
Spratt & Cambie	Unsignalized	**B** (12.3s)	WBRL (12.3s)	**B** (11.6s)	WBRL (11.6s)
Spratt & Borbridge	Unsignalized	**C** (18.0s)	EBTRL (18.0s)	**C** (22.9s)	EBTRL (22.9s)
Spratt & Solarium	Unsignalized	**B** (11.7s)	EBTRL (11.7s)	**B** (12.5s)	EBTRL (12.5s)

As indicated in **Table 19** above, the intersection of Earl Armstrong & Spratt is expected to approach its theoretical capacity under 2031 background traffic conditions. Potential mitigation measures are discussed in Section 5.11.

5.9.3.5 Future (2024) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2024) Total Traffic volumes presented in **Exhibit 12**, yielding the following results:

Table 20 - Intersection Capacity Analysis: 2024 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**A** (0.60)	SBR (0.70)	**D** (0.83)	NBL (0.84)
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**C** (0.71)	NBL (0.80)	**C** (0.73)	WBL (0.73)
Spratt & Cambie	Unsignalized	**B** (11.3s)	WBRL (11.3s)	**B** (11.0s)	WBRL (11.0s)
Spratt & Borbridge	Unsignalized	**C** (17.5s)	EBTRL (17.5s)	**C** (24.1s)	EBTRL (24.1s)
Ralph Hennessy & Borbridge	Unsignalized	**A** (9.3s)	EBTRL (9.3s)	**A** (9.4s)	EBTRL (9.4s)
Spratt & Solarium	Unsignalized	**B** (10.2s)	EBTRL (10.2s)	**B** (10.5s)	EBTRL (10.5s)

As indicated above in **Table 20** above, it is expected that all study area intersections will continue to operate at acceptable levels of service (i.e. LOS 'D' or better) under 2024 total traffic conditions.

5.9.3.6 Future (2026) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2026) Total Traffic volumes presented in **Exhibit 13**, yielding the following results:

Table 21 - Intersection Capacity Analysis: 2026 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**B** (0.70)	NBL (0.71)	**E (0.96)**	**NBL (0.98)**
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**D** (0.82)	NBL (0.83)	**C** (0.80)	WBL (0.80)
Spratt & Cambie	Unsignalized	**B** (13.2s)	WBRL (13.2s)	**B** (12.7s)	WBRL (12.7s)
Spratt & Borbridge	Unsignalized[1]	**E (42.8s)**	**EBTRL (42.8s)**	**F (138.8s)**	**EBTRL (138.8s)**
> Spratt & Borbridge	Unsignalized[2]	**C** (15.8s)	NBTR (15.8s)	**C** (17.8s)	SBTR (17.8s)
Ralph Hennessy & Borbridge	Unsignalized	**A** (9.7s)	EBTRL (9.7s)	**A** (10.0s)	EBTRL (10.0s)
Spratt & Solarium	Unsignalized	**B** (12.5s)	EBTRL (12.5s)	**B** (14.0s)	EBTRL (14.0s)
Ralph Hennessy & Solarium	Unsignalized	**A** (9.0s)	EBTRL (9.0s)	**A** (9.0s)	EBTRL (9.0s)

Notes:
1. Two-way stop controlled intersection
2. All-way stop controlled intersection

As indicated above in **Table 21** above, the intersection of Earl Armstrong & Spratt is expected to approach its theoretical capacity (i.e. LOS 'E') under 2026 total traffic conditions, operating slightly above acceptable standards. Mitigation measures for this intersection, which consider all travel modes are discussed in Section 5.11.

The intersection of Spratt & Borbridge is expected to experience significant delays on the eastbound approach as a two-way stop-controlled intersection by 2026, triggering a LOS 'F' during the weekday afternoon peak hour. As indicated previously in Section 5.4, however, an all-way stop controlled intersection is warranted based on the 2026 total traffic volume projections. With this new configuration, the intersection can be expected to operate at a LOS 'C' during both the weekday morning and afternoon peak hours.

5.9.3.7 Future (2031) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2031) Total Traffic volumes presented in **Exhibit 14**, yielding the following results:

Table 22 - Intersection Capacity Analysis: 2031 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & Spratt	Signalized	**B** (0.70)	NBL (0.74)	**E (0.97)**	**EBL (0.99)**
Earl Armstrong & Ralph Hennessy/ Shoreline	Signalized	**D** (0.81)	EBT (0.81)	**D** (0.90)	WBL (0.90)
Spratt & Cambie	Unsignalized	**B** (14.5s)	WBRL (14.5s)	**B** (13.5s)	WBRL (13.5s)
Spratt & Borbridge	Unsignalized[1]	**D** (25.8s)	NBTR (25.8s)	**D** (32.6s)	SBTR (32.6s)
Ralph Hennessy & Borbridge	Unsignalized	**A** (9.5s)	EBTRL (9.5s)	**A** (9.7s)	EBTRL (9.7s)
Spratt & Solarium	Unsignalized	**C** (15.1s)	EBRTL (15.1s)	**C** (18.1s)	EBTRL (18.1s)
Ralph Hennessy & Solarium	Unsignalized	**A** (8.9s)	EBTRL (8.9s)	**A** (9.0s)	EBTRL (9.0s)

Notes:
1. All-way stop controlled intersection

As indicated in **Table 22** above, the intersection of Earl Armstrong & Spratt is expected to approach its theoretical capacity under 2031 total traffic conditions. Potential mitigation measures are discussed in Section 5.11. The remaining study area intersections are expected to continue to operate at acceptable levels of service (i.e. LOS 'D' or better) within the timeframe of this study.

5.9.4 Intersection Design (MMLOS)

An analysis of existing and future conditions for each mode has been conducted based on the methodology prescribed in the City of Ottawa Multi-Modal Level of Service (MMLOS) Guidelines. The level of service for each mode has been calculated for each signalized intersection. Unsignalized intersections are exempt from this analysis, as no methodology currently exists for evaluating MMLOS at these intersections.

As indicated previously, traffic signals are not warranted or required operationally at any of the proposed intersections analysed in this study, therefore only Earl Armstrong at its intersections with Spratt and Ralph Hennessy/ Shoreline will be required to undergo multi-modal analysis.

The existing MMLOS have been summarized in **Table 23**. These results remain for the Future conditions scenario, with the exception of the TLOS for both intersections which transitions from 'E' to 'F' under 2031 total traffic conditions.

Detailed analysis results for existing and future conditions are provided **Appendix G**.

Table 23 - Intersection MMLOS - Existing Conditions

LOCATION	SCENARIO	LEVEL OF SERVICE BY MODE			
		PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
TARGET		**C**	**C**	**D**	**D**
INTERSECTIONS					
Spratt & Earl Armstrong	Existing	**F**	**F**	**E**	**B**
Earl Armstrong & Ralph Hennessy/ Shoreline	Existing	**F**	**F**	**E**	**B**

5.9.4.1 Intersection Pedestrian Level of Service (PLOS)

The PLOS at intersections is based on several factors including the number of traffic lanes that pedestrians must cross, corner radii, and whether the crossing allows for permissive or protective right or left turns, among others. The City of Ottawa minimum target for PLOS in the General Urban Area is 'C'.

The results of the analysis indicate that the Earl Armstrong & Spratt intersection is currently experiencing a PLOS of 'F', primarily due to the number of lanes that pedestrians must cross at each approach.

Due to the physical size of the intersection, no reasonable modifications can be implemented to improve to PLOS 'E' or better without significantly degrading the automobile LOS. Features such as raised crosswalks or providing right-turn 'smart channels' would have no impact on the overall PLOS reported.

5.9.4.2 Intersection Bicycle Level of Service (BLOS)

The BLOS at intersections is dependent on several factors: the number of lanes that the cyclist is required to cross to make a left-turn; the presence of a dedicated right-turn lane on the approach; and the operating speed of each approach. The City target for BLOS at an intersection involving a 'Spine' cycling route in the General Urban Area is 'C'.

The results of the analysis indicate that the Earl Armstrong Road and Spratt Road intersection is currently experiencing a BLOS 'F', due to the high operating speeds on both roads (i.e. 60 km/h or greater), as well as the number of lanes that cyclists must cross to make a left-turn. No reasonable modifications can be implemented to improve the BLOS short of implementing two-stage left-turn bike boxes, which is not an appropriate treatment for roads with high posted speed limits.

5.9.4.3 Intersection Transit Level of Service (TLOS)

Intersection TLOS is based on the average signal delay experienced by transit vehicles at each intersection. The City Target TLOS in the General Urban Area along a corridor with Isolated Transit Priority Measures is 'D'.

The results of the analysis indicate that both the intersection of Earl Armstrong/ Spratt and Earl Armstrong & Ralph Hennessy/ Shoreline are operating with a TLOS of 'E'. The degradation of the TLOS from 'E' to 'F' at both intersections is triggered by the expected increase in background and site-generated travel demand within the timeframe of this study. No reasonable modifications can be implemented to improve the TLOS at either intersection without significantly impacting other modes.

5.9.4.4 Intersection Truck Level of Service (TkLOS)

The Truck LOS (TKLOS) is based on the right-turn radii, as well as the number of receiving lanes for vehicles making a right-turn from the traffic lane being analyzed. The City of Ottawa TkLOS target for a Truck Route in the General Urban Area is 'D'. According to the MMLOS Guidelines, the TkLOS evaluation is generally only required along truck routes or arterial roads.

The intersections of Earl Armstrong with Spratt and Ralph Hennessy/ Shoreline both operate well within the City's target TkLOS of 'D', providing sufficient turning radii and number of receiving lanes on Earl Armstrong Road, which is a classified as both an arterial road and truck route in the TMP.

5.10 Geometric Review

The following section reviews all geometric requirements for the study area intersections. All relevant excerpts from referenced technical standards have been provided in **Appendix K**.

5.10.1 Sight Distance and Corner Clearances

The proposed development access intersections are proposed along a straight section of Spratt Road with no significant horizontal or vertical alignment constraints. Corner clearances of 4m by 4m are proposed at all collector/collector intersections within the development limits. As such, sight distances are not expected to be a concern.

5.10.2 Auxiliary Lane Analysis

Auxiliary turning lane requirements for all intersections within the study area are described as follows:

5.10.2.1 Unsignalized Auxiliary Left-Turn Lane Requirements

Auxiliary left-turn lane analyses for all unsignalized study area intersections were completed under the 2031 total traffic conditions.

The MTO Geometric Design Standards for Ontario Highways left-turn warrant was applied to mainstreet approaches at all unsignalized intersections using the highest left-turn volume from either the weekday morning or afternoon peak hour. The results have been summarized below in **Table 24** below.

Table 24 - Auxiliary Left-Turn Lane Analysis at Unsignalized Intersections

INTERSECTION	APPROACH	VOLUME ADVANCING (V_A)	VOLUME OPPOSING (V_O)	% LEFT TURN IN V_A	STORAGE DEFICIENCY (M)
Spratt & Cambie	SB	297	655	7%	Existing Storage Adequate
Spratt & Borbridge [1]	SB	377	208	35%	Proposed Storage Adequate
> Spratt & Borbridge [2]	SB	644	311	25%	N/A
Spratt & Solarium	SB	374	228	9%	No Storage Required

Notes:
1. Two-way stop controlled configuration – 2024 total traffic conditions
2. All-way stop-controlled configuration – 2031 total traffic conditions

Based on the analysis presented above, the existing 25m southbound left-turn storage lane at the intersection of Spratt & Cambie is of sufficient parallel length to accommodate projected traffic volumes beyond the 2031 study horizon year.

Upon conversion of the Spratt/Borbridge intersection to all-way stop control, it is possible that the southbound left-turn auxiliary lane may experience storage deficiencies. Following the full build-out of the proposed development in 2026, however the intersection is expected to continue operating at an acceptable level of service.

The remaining study area intersections are expected to experience nominal left-turn volumes within the timeframe of this study and were therefore not subjected to left-turn warrant analysis.

5.10.2.2 Signalized Auxiliary Left-Turn Requirements

A review of auxiliary left-turn lane storage requirements was completed at all signalized intersections within the study area under 2031 total traffic conditions. The review compared the projected 95th percentile queue lengths from Synchro operational results, and the City of Ottawa queue length calculation based on the following equation:

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

Where:
N = number of vehicles per hour
L = Length occupied by a vehicle in the queue = 7 m
C = number of traffic signal cycles per hour (assumed 120s cycle length)

The results of the auxiliary left-turn lane analysis are summarized below in **Table 25** below.

Table 25 - Auxiliary Left-Turn Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	95TH %ILE QUEUE LENGTH / CALCULATED QUEUE (M)		EXISTING PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY (M)
		AM PEAK HR	PM PEAK HR		
Earl Armstrong & Spratt	NB	47.2 / 49.2	#63.6 / 44.8	60	<5 [1]
	SB	19.8 / 17.9	8.7 / 6.3	80	-
	EB	34.0 / 59.9	#125.3 / 132.6	50	85
	WB	m#44.3/ 57.2	#92.7/ 115.9	50	70
Earl Armstrong & Ralph Hennessy/ Shoreline	NB	#56.0 / 57.3	39.4 /39.7	60	-
	SB	29.5 / 30.8	13.5 / 10.9	60	-
	EB	m1.8/ 10.5	m3.5 / 39.7	45	-
	WB	#51.0 / 54.3	#104.7/ 10.9	40	65

Notes: [1] Potential queue spillback beyond available storage is minimal (i.e. less than one car length) and is expected to occur infrequently. As such, no modifications are recommended on the northbound approach.

As per the results of the queue length analysis presented in **Table 25** above, some modifications to the left-turn auxiliary lanes on Earl Armstrong Road at its intersections with Spratt Road and Ralph Hennessy/ Shoreline may be required to accommodate background and site-generated traffic volume projections at the 2031 study horizon years.

Based on the above analysis, the existing left-turn parallel lanes on the eastbound and westbound approaches may require an extension of at least 85m and 70m, respectively, at the intersection of Earl Armstrong & Spratt to accommodate 2031 total traffic volumes. It should be noted, however, that the proposed development is not expected to contribute any additional traffic to the eastbound left-turn movement and therefore this modification is triggered entirely by existing and future background volumes, while the westbound left-turn storage deficiency is triggered by a combination of background and site-generated traffic, as identified in other TIA's recently completed for adjacent developments. The existing westbound left-turn lane is expected to sufficiently accommodate site-generated traffic from Phase 17-1, and may only experience spillback issues during the later phases of the proposed development.

The intersection of Earl Armstrong & Ralph Hennessy/ Shoreline is expected to experience spillback on the westbound left-turn auxiliary lane. As such, it has been identified that this parallel lane length may also require an extension of at least 65 metres by the 2031 study horizon year. The westbound left-turn lane is expected to reach capacity under background traffic conditions, and is therefore any potential deficiency is largely a result of background traffic.

No additional storage deficiencies are expected under 2031 total traffic projections, based on the auxiliary left-lane analysis conducted for signalized intersections. The requirement for long-term physical modifications to storage capacities should be monitored and re-evaluated based on the collection of future traffic data.

5.10.2.3 Unsignalized Auxiliary Right-Turn Lane Requirements

There is currently no formal City of Ottawa or MTO warrant procedure governing the application of auxiliary right-turn lanes at unsignalized intersections. Referring to TAC Geometric Design Guide for Canadian Roads, an auxiliary right-turn lane be considered "when the volume of decelerating or accelerating vehicles compared with the through traffic volume causes undue hazard" and the volume of right-turning traffic exceeds 60 vehicles or 10% of the approach volume.

It is recognized that traffic volume projections developed during the Forecasting component of this study indicate that the intersections of Spratt & Cambie, Spratt & Borbridge and Spratt & Solarium are expected to exceed the above noted thresholds on select right-turn movements. It is important to note, however, that all three intersections are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) under 2031 total traffic conditions with shared through-right lane configurations on all approaches and no additional right-turn auxiliary lanes are recommended, as operating speeds are expected to be sufficiently low to avoid hazards to through-traffic.

The remaining stop-controlled study area intersections are expected to experience right-turn traffic volumes of 30 vehicles or less during the weekday morning and afternoon peak hours and operate at acceptable levels of service (i.e. LOS 'D' or better) as well.

Based on the traffic volumes developed for this study, it was therefore determined that no additional right-turn facilities are required as a result of projected background or site-generated traffic volumes within the timeframe of this study.

5.10.2.4 Signalized Auxiliary Right-Turn Lane Requirements

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

The results of the auxiliary right-turn lane analyses are summarized in **Table 26** below.

Table 26 – Auxiliary Right-Turn Lane Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	NUMBER OF RIGHT-TURNS / % RIGHT-TURNS		95TH %ILE QUEUE (M) AM / PM	EXISTING PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY (M)
		AM PEAK HOUR	PM PEAK HOUR			
Earl Armstrong & Spratt	NB	327 / 44%	252 / 40%	35.9 / 19.2	25	15
	SB	324 / 65%	272 / 45%	21.9 / 19.6	- [1]	-
	EB	52 / 4%	157 / 9%	2.0 / 11.0	80	-
	WB	19 / 2%	43 / 2%	m0 / m0.3	80	-
Earl Armstrong & Ralph Hennessy/ Shoreline	NB	342 / 67%	235 / 67%	51.9 / 19.4	25	30
	SB	61 / 39%	60 / 66%	0 / 0	25	-
	EB	84 / 5%	165 / 11%	m0.3 / m0	75	-
	WB	54 / 5%	103 / 5%	2.1 / 6.7	75	-

Notes:

1. Thru lane transitions to southbound channelized right-turn lane

Based on the above results, and confirmed through intersection capacity analyses, the northbound channelized right-turns for the intersections of Earl Armstrong & Spratt and Earl Armstrong & Ralph Hennessy/ Shoreline may require an extension of at least 15m and 30m, respectively, to accommodate a combination of background and site-generated traffic volumes. By the 2031 study horizon, however, due to the uncertainty of future traffic volumes, conditions at these intersections should be monitored in the future to confirm the need for improvements.

5.11 Summary of Improvements Indicated and Modification Options

Based on the intersection capacity, Multi-Modal Level of Service and auxiliary lane analyses results presented above, off-site improvements to the adjacent road network have been identified that may be required to accommodate multi-modal demands of both background and site-generated traffic. The MMLOS analysis indicated existing deficiencies for non-auto modes with respect to user comfort that could be considered for implementation by the City but are not required to safely accommodate the proposed development.

5.11.1 Earl Armstrong & Spratt

The results of the analysis indicate that the Earl Armstrong Road & Spratt Road intersection is expected to approach its theoretical capacity under 2026 total traffic conditions and 2031 background traffic conditions. It should be noted that there is only a marginal difference in the intersection capacity analysis results at this intersection under 2031 background and total traffic conditions, indicating the overall minor impacts of the proposed development on this critical intersection at the study horizon year.

Ultimately, the development of east-west major collector roads (Borbridge Avenue and Solarium Avenue) will provide greater connectivity through the community and provide long-term relief to this intersection. In addition to this, the City's planned investment in rapid transit in the community will also provide greater mobility options and will aid the operation of this intersection in the long term.

Based on the collision and intersection capacity analyses conducted as part of this study, it is recommended that the City explore options to increase the capacity of the eastbound left-turn movement at the Earl Armstrong & Spratt intersection in order to support future travel demand from other developments proposed within the Riverside South Community.

Queue length analyses indicate that storage deficiencies may be encountered prior to 2031. Modifications to the eastbound left-turn are required immediately and are based on turning movement count data conducted by the City of Ottawa, which recorded approximately 375 left-turning vehicles at this intersection during the weekday afternoon peak hour. Further analysis of other critical movements indicates potential spillback issues on the northbound channelized right-turn under 2026 total and 2031 background traffic conditions. The possible need to extend the westbound left-turn lane is also triggered under 2026 total traffic conditions, however it is not triggered under background traffic conditions within the timeframe of this study.

Due to the uncertainty of future traffic volumes and travel patterns, it is recommended that conditions be monitored and re-evaluated prior to implementing any changes. Based on current projections and aggressive timing of adjacent developments, it is possible that the eastbound left-turn, westbound left-turn and northbound right-turn lanes may require an extension of at least 85m, 70m, and 15m, respectively, to address potential future capacity limitations by the 2031 horizon year.

It has also been noted that the intersection is expected to perform poorly for other modes of travel, however no reasonable modifications can be implemented to provide a noticeable impact to these modes without significantly degrading the vehicular LOS and therefore may not be feasible until such time as the community is fully served by rapid transit.

5.11.2 Earl Armstrong & Ralph Hennessy/ Shoreline

The results of the analysis indicate that the Earl Armstrong & Ralph Hennessy/ Shoreline intersection is expected to operate at acceptable levels of service (i.e. LOS 'D' or better) under 2031 total traffic conditions with its existing configuration.

Queue length analyses indicates that storage deficiencies may be encountered between the 2026 and 2031 analysis years in this study. The channelized northbound right-turn lane triggers the possible need for an extension under 2026 total and 2031 background traffic conditions. The westbound left-turn triggers the possible need for an extension under 2026 total traffic conditions, however it is not triggered within the timeframe of this study under background traffic conditions.

Due to the uncertainty of future traffic volumes and travel patterns, it is recommended that conditions be monitored and re-evaluated prior to implementing any changes. Based on current projections and aggressive timing of adjacent developments, it is possible that the northbound channelized right-turn lane and westbound left-turn lane may require extensions of at least 30m and 65m, respectively, to address potential future capacity limitations by the 2031 horizon year.

It has also been noted that the intersection is expected to perform poorly for other modes of travel, and that no reasonable modifications can be implemented to provide a noticeable impact to these modes without further degrading the vehicular LOS.

5.11.3 Spratt & Cambie

The results of the analysis indicate that the Spratt & Cambie intersection is expected to operate at acceptable levels of service (i.e. LOS ‘D’ or better) under 2031 total traffic conditions with its existing configuration. Based on the queuing analysis, no additional auxiliary lanes are required at this intersection to accommodate projected turning vehicle volumes.

5.11.4 Spratt & Borbridge

The results of the analysis indicate that the Spratt & Borbridge intersection is expected to operate at acceptable levels of service (i.e. LOS ‘D’ or better) under 2024 total traffic conditions with two-way stop-control on the eastbound and westbound approaches. By 2026, however, delays experienced on the eastbound approach are expected to trigger an LOS ‘F’ during the weekday peak hour with a two-way stop controlled configuration. Further analysis indicates that an all-way stop control is warranted under 2026 total traffic conditions. With this form of traffic control in place, the proposed development is expected to operate at a LOS ‘D’ during the critical weekday morning and afternoon peak hours beyond the 2031 study horizon year.

It should be noted as well that the implementation of an all-way stop controlled intersection at Spratt & Borbridge will help to facilitate an east-west controlled pedestrian crossing location on Spratt Road and provide connectivity to the developing community further west.

The Spratt Road RMA design specified that the bus stops would be located on the far side of the intersection, therefore no sightline issues are expected with the inclusion of multi-lane approaches on the north and south approaches, when the intersection is reconfigured as an all-way stop.

It is possible that some spillback may be experienced on the southbound left-turn lane by 2031, however the intersection is expected to continue operating at an acceptable level of service.

5.11.5 Ralph Hennessy & Borbridge

The results of the analysis indicate that the Ralph Hennessy & Borbridge intersection is expected to operate at acceptable levels of service (i.e. LOS ‘D’ or better) under 2031 total traffic conditions with a stop-controlled eastbound approach. Based on the queuing analysis, no additional auxiliary lanes are required at this intersection to accommodate the projected turning vehicle volumes.

5.11.6 Spratt & Solarium

The results of the analysis indicate that the Spratt & Solarium intersection is expected to operate at acceptable levels of service (i.e. LOS ‘D’ or better) under 2031 total traffic conditions with stop-

controlled eastbound and westbound approaches. Based on the queuing analysis, no additional auxiliary lanes are required at this intersection to accommodate projected turning vehicle volumes.

5.11.7 Ralph Hennessy & Solarium

The results of the analysis indicate that the Ralph Hennessy & Solarium intersection is expected to operate at acceptable levels of service (i.e. LOS 'D' or better) under 2031 total traffic conditions with a stop-controlled eastbound approach. Based on the queuing analysis, no auxiliary lanes are required at this intersection to accommodate projected turning vehicle volumes.

5.11.8 Monitoring Plan

The results of the analysis indicate that the above noted auxiliary lane deficiencies at the intersections of Earl Armstrong & Spratt and Earl Armstrong & Ralph Hennessy/ Shoreline may require extensions sometime between 2026 and 2031. The intersection of Spratt & Borbridge may also experience queue spillback beyond its available storage by the 2031 study horizon year. Due to potential variability associated with growth in background traffic as a result of adjacent development progress, as well as unpredictable traffic patterns post pandemic, it is recommended that the need to implement any of the physical modifications identified in this study be reconfirmed in 2024, based on updated data prior to the build-out of Phase 17-1. Traffic operational issues will be monitored by obtaining revised traffic counts at the study area intersections to evaluate background traffic conditions, address uncertainties with regards to post-pandemic traffic patterns and re-confirm the need for future network modifications.

6 Conclusion

The proposed residential development at 4775 and 4875 Spratt Road is expected to generate up to 721 and 866 two-way vehicular trips during the weekday morning and afternoon peak hours, respectively. Site-generated traffic volumes were stratified by mode share and distributed amongst numerous access points with the arterial road network. Mode share assumptions were developed with reference to the O-D Survey South Gloucester/ Leitrim TAZ and with further adjustments to account for a linear increase in the transit mode share to 32% by 2031, consistent with the Draft Riverside South Community Design Plan Transportation Update. It is expected that OC-Transpo will plan future transit routes to accommodate the transit demand associated with growth in the Riverside South community, including the proposed development.

A Roadway Modification Application (RMA-2019-TPD-034) was recently approved to support the urbanization of Spratt Road from Cambie to the southern limit of the proposed development. Within the timeframe of this study, it is expected that Spratt Road will be urbanized along the proposed development's frontage.

This study has identified critical deficiencies in the Level of Service across all transportation modes, with limited options available to achieve acceptable standards for all modes at the intersections of Earl Armstrong with Spratt and Ralph Hennessy/ Shoreline. It is expected, however, that the development of additional east-west major collector routes will help slow the rate of background traffic growth and distribute traffic amongst a variety of parallel routes, ultimately improving these conditions.

The results of the analysis indicate that the intersection of Earl Armstrong & Spratt is expected to approach its theoretical capacity (i.e. LOS 'E') by the 2031 study horizon year with or without the inclusion of site-generated traffic. Further, the proposed development will not contribute any additional traffic to the critical eastbound left-turn movement during the weekday morning or afternoon peak hours. The remaining study area intersections are expected to operate at acceptable levels of service (i.e. LOS 'D' or better) beyond 2031.

Based on the queue length analyses conducted in this study, the intersection of Earl Armstrong & Spratt may require an extension of the eastbound left-turn, northbound right-turn and westbound left-turn auxiliary lanes to support growth in background and site-generated traffic. Similarly, at the intersection of Earl Armstrong & Ralph Hennessy/ Shoreline, possible storage deficiencies were identified at the channelized northbound right-turn and westbound left-turn movements.

The Spratt Road RMA was initially designed to accommodate a two-way stop controlled intersection at Spratt & Borbridge, however, subsequent analysis conducted as part of this TIA indicates that an all-way stop controlled intersection is warranted at this location under 2026 total traffic conditions as a result of revised development timing assumptions. Queue length analyses indicates that the intersection of Spratt & Borbridge may also experience spillback beyond its available storage by the 2031 study horizon year, but will continue operating at an acceptable level of service.

Due to potential variability associated with post-pandemic growth in background traffic and changing travel patterns, it is recommended that the need to upgrade auxiliary lanes at Earl Armstrong and its intersections with Spratt and Ralph Hennessy/ Shoreline be re-evaluated in 2024 using updated traffic data prior to the completion of Phase 17-1.

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

Appendix A – City Circulation Comments

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

Report Submitted: June 4, 2020
Comments Received: June 10, 2020
Transportation Project Manager: Josiane Gervais

1) No comments were received from the City as part of the Step 1 & 2: Screening & Scoping for the Riverside South Phase 17 Transportation Impact Assessment (TIA).

Step 3 Submission (Forecasting) – Circulation Comments & Response

Report Submitted: July 7, 2020
Comments Received: July 24, 2020
Transportation Project Manager: Josiane Gervais

Transportation Engineering Services

1) Section 2 TIA Screening: This development is not within 600m of Limebank Station.

   - **IBI Response: The Screening Form has been updated accordingly.**

2) Section 3.2.2 Existing Bicycle and Pedestrian Facilities: Include the pedestrian facilities provided along Ralph Hennessy.

   - **IBI Response: Section 3.2.2 of the TIA has been revised to include the pedestrian facilities provided on the existing segment of Ralph Hennessy Avenue.**

3) Section 3.3.1.1 Future Road Network Projects: Assume that the Prince of Wales widening will not occur within the horizon years of this project.

   - **IBI Response: Acknowledged. Section 3.3.1.1 has been updated to reflect this change in the timing for the implementation of the Prince of Wales widening.**

4) Section 3.3.1.3 Future Cycling and Pedestrian Facilities: Consideration should be given to providing dedicated cycling facilities along Solarium as it is part of the Primary Pedestrian and Cycling Network in the Riverside South CDP.

   - **IBI Response: Acknowledged. As indicated in Section 3.3.1.3, the specific design elements for each collector road within the proposed development will be established through the Draft Plan approval process in consultation with City staff.**

5) Section 3.4: While it is accepted that development volumes will only be assigned to through movements at Spratt/Cambie, this intersection should be evaluated to ensure that the intersection LOS does not fail.

   - **IBI Response: The intersection of Spratt/Cambie has been incorporated into the study area for this TIA.**

6) Section 4.1.1 Trip Generation Methodology: Include the anticipated trip generation for the school and commercial blocks. While few generated trips may originate outside of the subdivision, pass-by volumes are still beneficial in the assignment of turning movement counts and assessment of general conditions at these development access intersections.

   - **IBI Response: TIAs for the school and commercial blocks will be undertaken as part of separate Site Plan Control applications for each development and will provide an**

assessment of their respective site access driveways. Based on the high proportion of pass-by and active transportation trips expected from either land use, the downstream impacts at the study area intersections are expected to be minimal.

7) Section 4.1.2.3: Correct the existing mode shares. For a residential development, these should be a combination of from/within district trips in the AM Peak and to/within district trips in the PM Peak.

   - **IBI Response: The use of a blended rate to include the 'Within' mode share results in a 9% pedestrian share which may not be achievable for this site, given the significant walking distance to the nearest local employment nodes within the TAZ. It is therefore anticipated that the majority of commuter trips will continue to follow a general blend of the 'From District' and 'To District' mode shares during the weekday morning and afternoon peak hours, respectively. Further, the existing mode share distribution is consistent with other recent TIAs conducted within the community, including Riverside South Phase 12 and 4725 Spratt Road, located immediately to the north.**

8) Section 4.1.3: Justify the northbound trip distribution along Spratt Road to Limebank. While some may take Spratt, it seems more likely and in keeping with the road hierarchy that most vehicles would take Earl Armstrong to Limebank.

   - **IBI Response: Spratt Road north of Earl Armstrong consists of a four-lane cross-section with significant capacity and minimal site access driveway conflicts. As such, it is likely to draw some traffic from the proposed development. It is recognized, however, that a 10% inbound/outbound trip generation on Spratt Road to Limebank may reflect a more realistic assignment of trips in comparison to 20%, based on the road hierarchy. The remaining 10% of trips have been reassigned to the northbound right-turn movement at the intersection of Earl Armstrong/ Spratt and are assumed to utilize Earl Armstrong/Limebank corridors. The overall cardinal distribution will remain unchanged.**

   - **The revised distribution is provided in Section 4.1.3 and given below:**

     - **80% to/from North**
       - **40% on Limebank Road (via Earl Armstrong Road)**
       - **10% on Limebank Road (via Spratt Road)**
       - **5% on Limebank Road (via Rideau Road)**
       - **10% on River Road**
       - **10% on Prince of Wales Drive**
       - **5% on Albion Road**
     - **15% to/from the West**
       - **15% on Strandherd Drive**
     - **5% to/from South**
       - **5% on Spratt Road**

9) Section 4.3 Demand Rationalization: This module should include a general quantification of the amount of volume that needs rationalization. Consider that while transit mode share exiting Riverside South should increase with time, this would require accompanying appropriate TDM measures.

- **IBI Response: By 2031, the transit mode share increase to 32% will result in a 9% reduction in auto driver/ passenger mode share in comparison to full build-out in 2026. Consequently, transit ridership resulting from the proposed development is expected to increase by 120 and 135 trip during the weekday morning and afternoon peak hours, respectively. These increases equates to slightly more than the capacity of regular OC-Transpo bus. It is expected that this additional capacity will be absorbed through the strengthening of local transit connections on the collector road network within and adjacent to the proposed development. It is expected that OC-Transpo will plan future expansions of the transit network to accommodate growth within the Riverside South community, including the proposed development, as discussed in Section 5.7.1 of this TIA.**

Traffic Signal Operations

10) Existing volumes are incorrect at Earl Armstrong & Shoreline.

- **IBI Response: The neighbourhood to the south of the Earl Armstrong & Shoreline/ Ralph Hennessy intersection has experienced significant growth since the City's latest turning movement count was conducted at this intersection in September 2017. Traffic volumes at the intersection of Earl Armstrong & Shoreline were therefore adjusted to account for additional inbound and outbound trips on Ralph Hennessy Avenue. The east/west through volumes on Earl Armstrong were balanced with the more recent count conducted at Earl further west at Spratt Road in November 2019.**

11) Spratt & Cambie should be included in the analysis as it falls between Earl Armstrong and Borbridge.

- **IBI Response: Acknowledged. As indicated previously in response #5, the intersection of Spratt & Cambie has been added to the study area for this TIA.**

12) Agree with Transportation Engineering Services that 20% trip distribution on Limebank via Spratt seems high considering Spratt is mostly 40km/h with some 60km/h and multiple stop control intersections compared to Earl Armstrong at 80km/h. Most of the traffic is likely to avoid this low speed road with multiple stop control intersections.

- **IBI Response: Acknowledged. As indicated previously in response #8, the trip distribution has been updated to reflect just 10% of trips utilizing Spratt Road north of Earl Armstrong.**

13) In section 4.3.1. when discussing the EBL turning movement at Earl Armstrong and Spratt, the volume for the EBL's during the weekday morning period is actually 158 vehicles not 375. The 375 value is the PM volume. Please correct before using them in the analysis.

- **IBI Response: Acknowledged. The text in Section 4.3.1 has been corrected to indicate that the 375 vehicles were observed on the eastbound left-turn movement during the weekday afternoon peak hour.**

Appendix B – Screening Form

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	4775 & 4875 Spratt Road, Ottawa, ON
Description of Location	Gloucester South Nepean – Between Earl Armstrong Road and Rideau Road and east of Spratt Road 
Land Use Classification	Residential & Commercial
Development Size (units)	602 street townhome units 399 single-family homes 157 back-to-back townhome units
Development Size (m^2)	~2,800 m^2 GFA Commercial (assumed)
Number of Accesses and Locations	Three (3) all movement access intersections on Spratt Road One (1) all movement access on Earl Armstrong Road via the extension of Ralph Hennessy Avenue
Phase of Development	Two-Phase Development

Build-out Year	2024 – Phase 17-1 (Full Build-out of Phase 17-1 only) 2026 – Phase 17-2 (Full Build-out of Proposed Development)

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^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

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

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

Proposed Development:

3. Location Triggers

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

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

Based on the results above, the Location Trigger is <u>not</u> satisfied.

4. Safety Triggers

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

Based on the results above, the Safety Trigger is satisfied.

5. Summary

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

CONCLUSION: As one or more of the above triggers has been satisfied, a TIA will be required.

Appendix C – Traffic Data

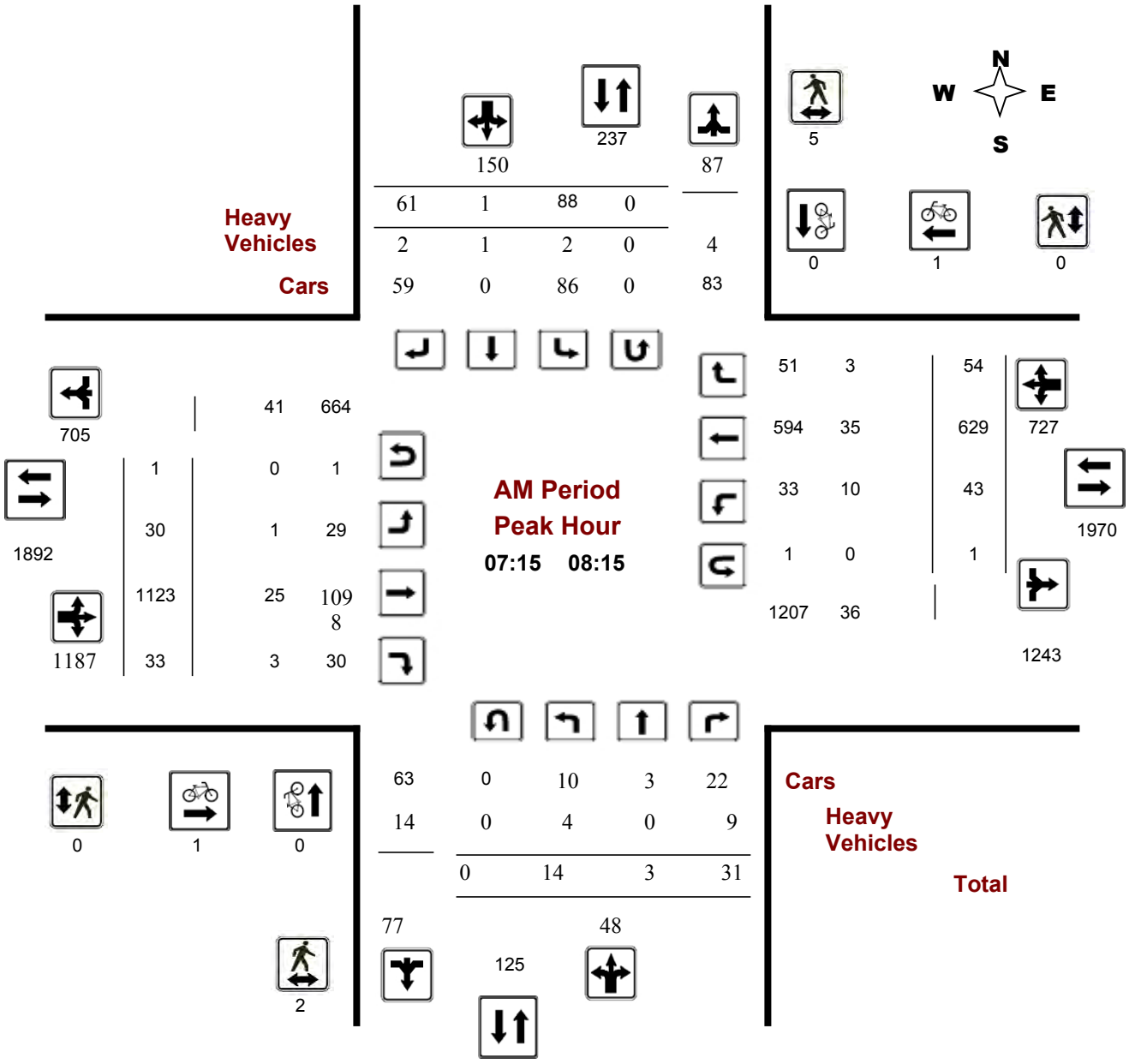
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EARL ARMSTRONG RD @ SHORELINE DR

Survey Date: Wednesday, September 13, 2017 **WO No:** 37239

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



Comments

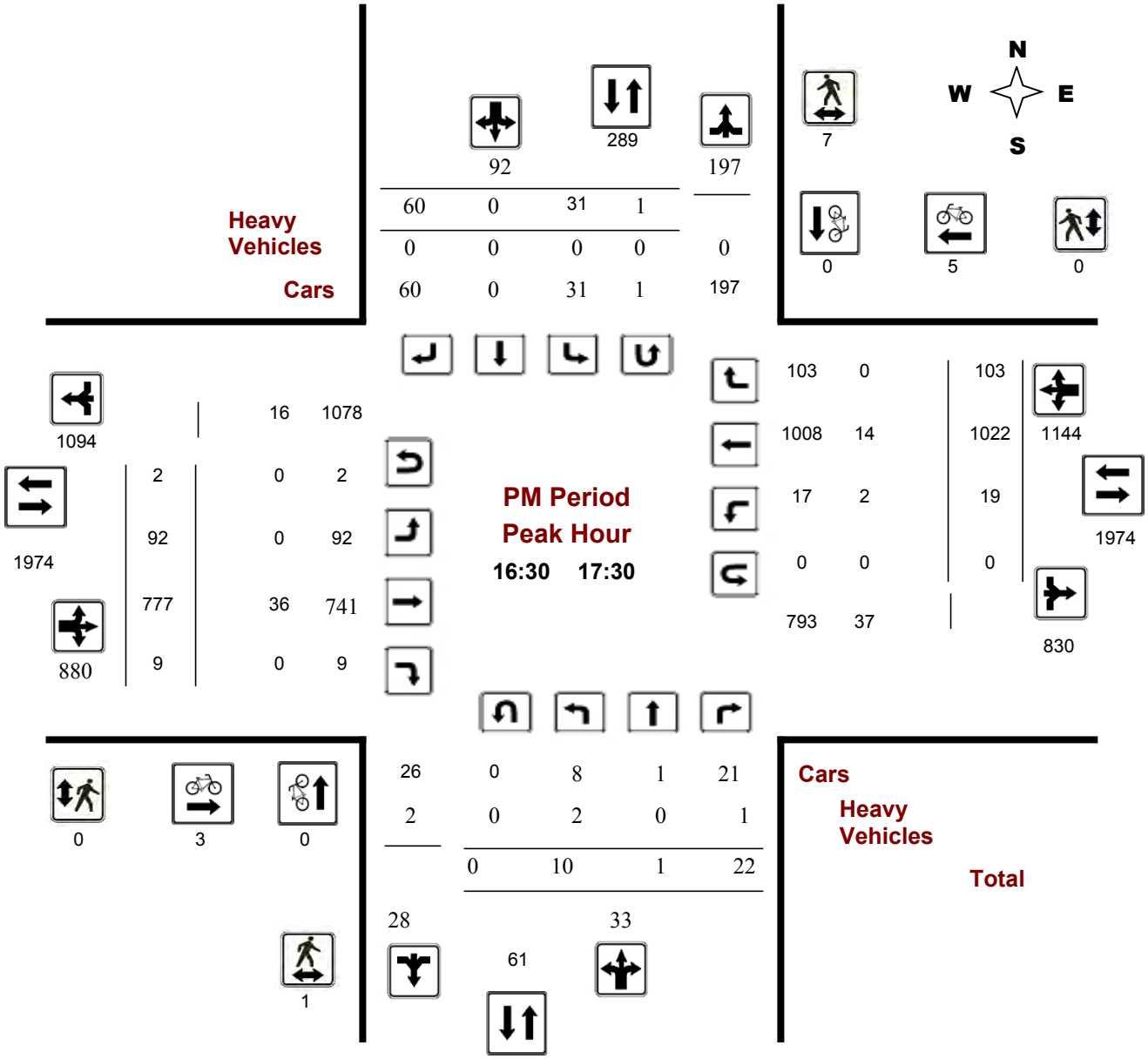
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EARL ARMSTRONG RD @ SHORELINE DR

Survey Date: Wednesday, September 13, 2017 **WO No:** 37239

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



Comments

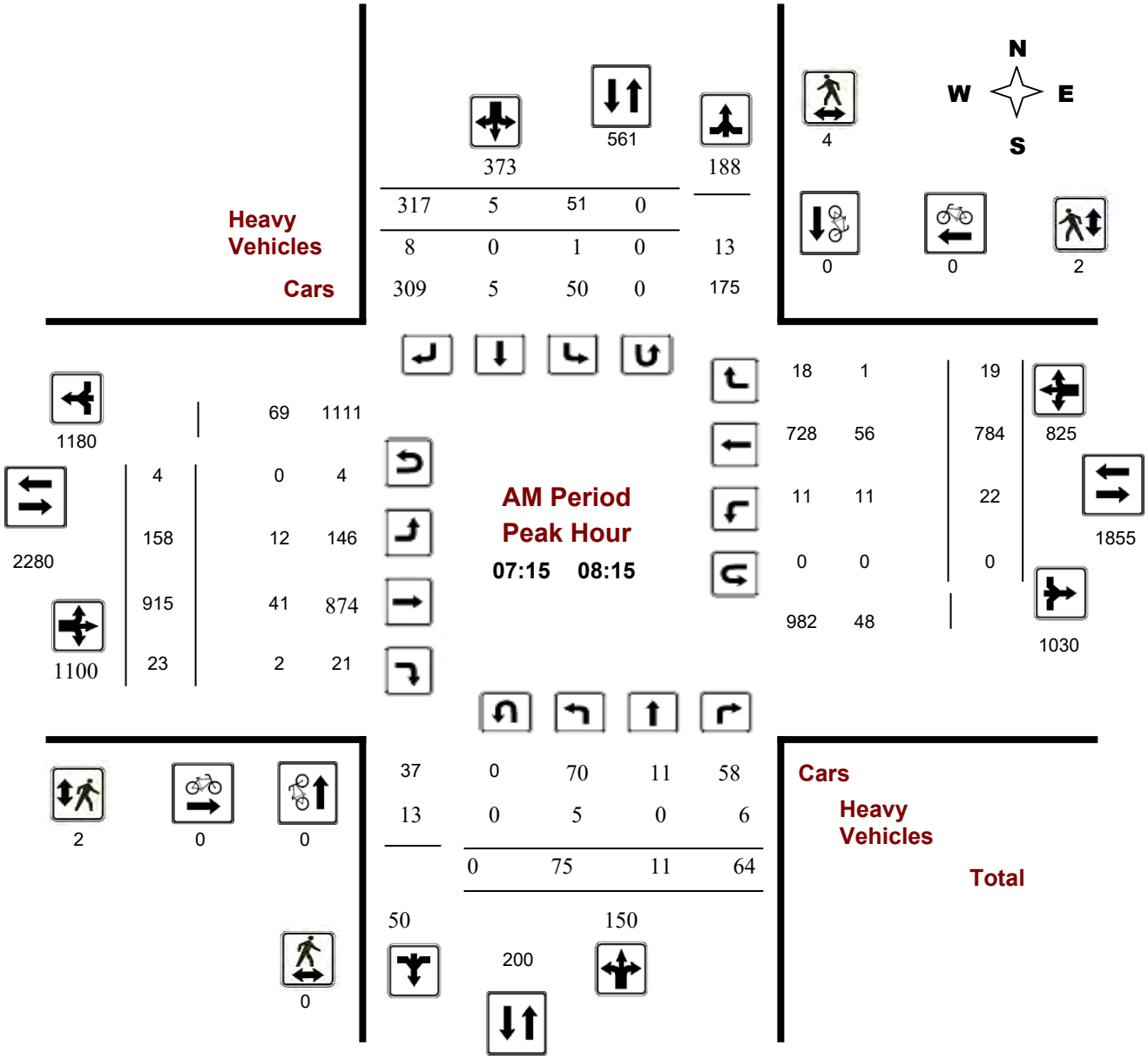
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EARL ARMSTRONG RD @ SPRATT RD

Survey Date: Tuesday, November 26, 2019 **WO No:** 39110

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



Comments

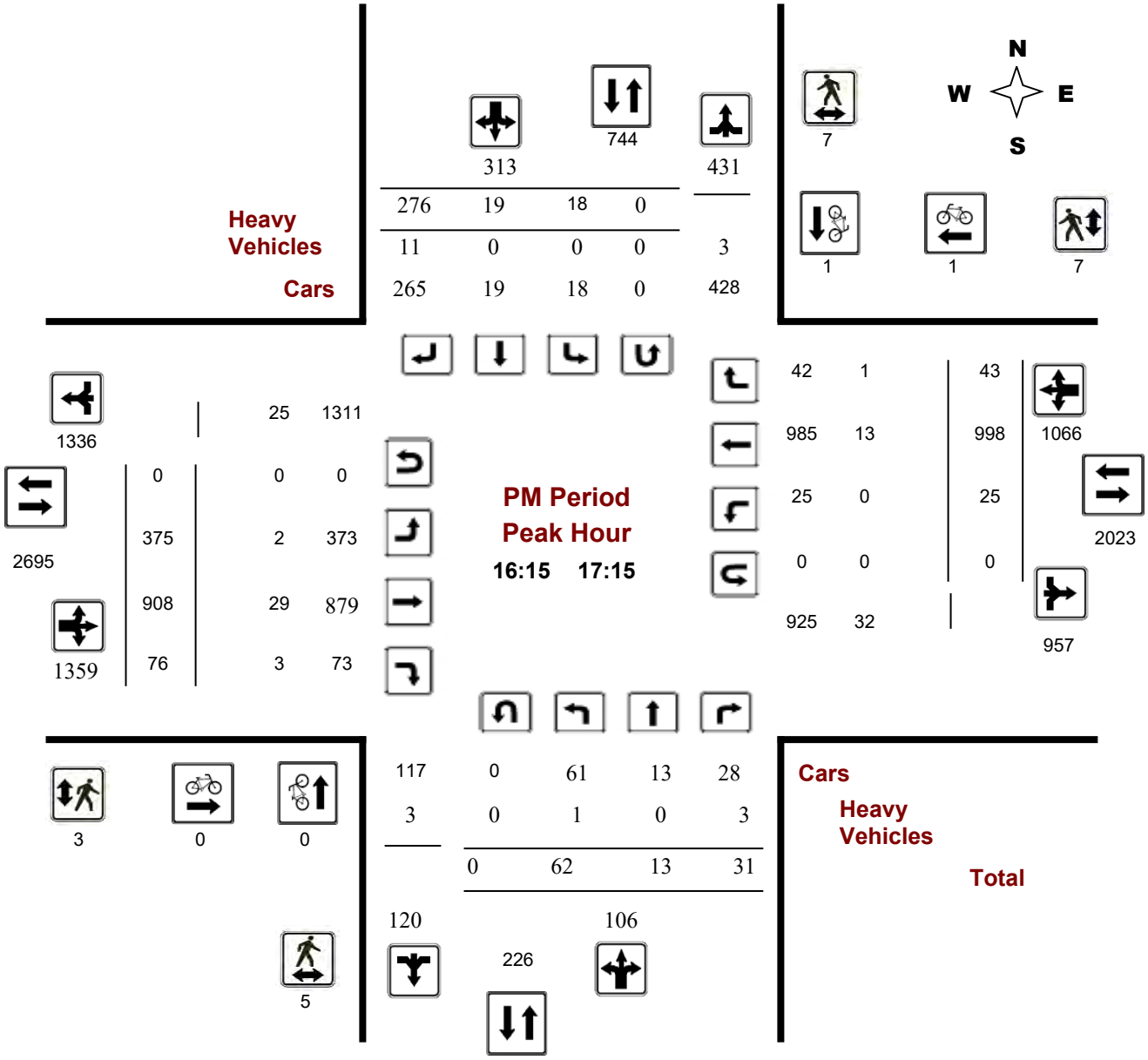
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EARL ARMSTRONG RD @ SPRATT RD

Survey Date: Tuesday, November 26, 2019 **WO No:** 39110

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



Comments

Survey Date: Thursday August 17 2017
Weather: Dry

TURNING MOVEMENT COUNT SUMMARY - ALL MODES

AM Peak Hour: 7:00 AM to 8:00 AM
MD Peak Hour: 11:30 AM to 12:30 PM
PM Peak Hour: 3:45 PM to 4:45 PM

AADT FACTOR: 0.9

Turning Movement Count - Full Study Summary Report (Vehicles)

Time Period		Spratt Northbound					Spratt Southbound					N/S STREET TOTAL	0 Eastbound					Cambie Westbound					E/W STREET TOTAL	Grand TOTAL
		LT	ST	RT	U-Turns	NB TOTAL	LT	ST	RT	U-Turns	SB TOTAL		LT	ST	RT	U-Turns	EB TOTAL	LT	ST	RT	U-Turns	WB TOTAL		
7:00	8:00	0	0	5	0	**5**	67	0	0	0	**67**	**72**	0	0	0	0	**0**	0	0	37	0	**37**	**37**	**109**
8:00	9:00	0	0	4	0	**4**	26	0	0	0	**26**	**30**	0	0	0	0	**0**	1	0	40	0	**41**	**41**	**71**
9:00	10:00	0	0	3	0	**3**	42	0	0	0	**42**	**45**	0	0	0	0	**0**	3	0	38	0	**41**	**41**	**86**
AVG AM Pk HR		0	0	4	0	**4**	45	0	0	0	**45**	**49**	0	0	0	0	**0**	1	0	38	0	**40**	**40**	**89**
11:30	12:30	0	0	4	0	**4**	46	0	0	0	**46**	**50**	0	0	0	0	**0**	1	0	51	0	**52**	**52**	**102**
12:30	13:30	0	0	4	0	**4**	43	0	0	0	**43**	**47**	0	0	0	0	**0**	3	0	30	0	**33**	**33**	**80**
AVG MD Pk HR		0	0	4	0	**4**	45	0	0	0	**45**	**49**	0	0	0	0	**0**	2	0	41	0	**43**	**43**	**91**
15:00	16:00	0	0	3	0	**3**	8	0	0	0	**8**	**11**	0	0	0	0	**0**	1	0	29	0	**30**	**30**	**41**
16:00	17:00	0	0	2	0	**2**	26	0	0	0	**26**	**28**	0	0	0	0	**0**	4	0	41	0	**45**	**45**	**73**
17:00	18:00	0	0	2	0	**2**	24	0	0	0	**24**	**26**	0	0	0	0	**0**	2	0	14	0	**16**	**16**	**42**
AVG PM Pk HR		0	0	2	0	**2**	19	0	0	0	**19**	**22**	0	0	0	0	**0**	2	0	28	0	**30**	**30**	**52**
TOTAL		0	0	35	0	**35**	372	0	0	0	**372**	**407**	0	0	0	0	**0**	18	0	359	0	**377**	**377**	**784**
EQ 12Hr		0	0	49	0	49	516	0	0	0	516	565	0	0	0	0	0	25	0	499	0	524	524	1089
Note: These volumes are calculated by multiplying the totals by the appropriate expansion factor.											1.39													
AVG 12Hr		0	0	44	0	44	465	0	0	0	465	509	0	0	0	0	0	23	0	449	0	472	472	980
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.											0.9													
AVG 24Hr		0	0	57	0	57	609	0	0	0	609	666	0	0	0	0	0	30	0	588	0	618	618	1284
Note: These volumes are calculated by multiplying the Average Daily 12hr. totals by the 12 to 24 expansion factor.													1.31											

Turning Movement Count - Full Study Summary Report (Pedestrians)

Time Period		Spratt NB Approach (East or West Crossing)	Spratt SB Approach (East or West Crossing)	N/S STREET TOTAL	0 EB Approach (North or South Crossing)	Cambie WB Approach (North or South Crossing)	E/W STREET TOTAL	Grand TOTAL
7:00	8:00	0	0	**0**	1	0	**1**	**1**
8:00	9:00	0	0	**0**	1	1	**2**	**2**
9:00	10:00	0	0	**0**	2	3	**5**	**5**
11:30	12:30	0	0	**0**	0	2	**2**	**2**
12:30	13:30	0	0	**0**	1	1	**2**	**2**
15:00	16:00	0	0	**0**	0	0	**0**	**0**
16:00	17:00	0	22	**22**	0	0	**0**	**22**
17:00	18:00	0	0	**0**	0	0	**0**	**0**
TOTAL:		0	22	**22**	5	7	**12**	**34**

Turning Movement Count - Full Study Summary Report (Cyclists)

Time Period		Spratt Northbound	Spratt Southbound	N/S STREET TOTAL	0 Eastbound	Cambie Westbound	E/W STREET TOTAL	Grand TOTAL
7:00	8:00	0	0	**0**	0	0	**0**	**0**
8:00	9:00	0	0	**0**	0	0	**0**	**0**
9:00	10:00	1	3	**4**	0	0	**0**	**4**
11:30	12:30	3	1	**4**	0	0	**0**	**4**
12:30	13:30	2	0	**2**	0	0	**0**	**2**
15:00	16:00	0	0	**0**	0	0	**0**	**0**
16:00	17:00	0	0	**0**	0	0	**0**	**0**
17:00	18:00	0	0	**0**	0	0	**0**	**0**
TOTAL:		6	4	**10**	0	0	**0**	**10**

Turning Movement Count - Full Study Summary Report (Heavy Vehicles)

Time Period		Spratt Northbound					Spratt Southbound					N/S STREET TOTAL	0 Eastbound					Cambie Westbound					E/W STREET TOTAL	Grand TOTAL
		LT	ST	RT	U-Turns	NB TOTAL	LT	ST	RT	U-Turns	SB TOTAL		LT	ST	RT	U-Turns	EB TOTAL	LT	ST	RT	U-Turns	WB TOTAL		
7:00	8:00	0	0	1	0	**1**	4	0	0	0	**4**	**5**	0	0	0	0	**0**	0	0	6	0	**6**	**6**	**11**
8:00	9:00	0	0	1	0	**1**	0	0	0	0	**0**	**1**	0	0	0	0	**0**	0	0	4	0	**4**	**4**	**5**
9:00	10:00	0	0	0	0	**0**	2	0	0	0	**2**	**2**	0	0	0	0	**0**	0	0	0	0	**0**	**0**	**2**
11:30	12:30	0	0	0	0	**0**	3	0	0	0	**3**	**3**	0	0	0	0	**0**	0	0	3	0	**3**	**3**	**6**
12:30	13:30	0	0	0	0	**0**	2	0	0	0	**2**	**2**	0	0	0	0	**0**	0	0	0	0	**0**	**0**	**2**
15:00	16:00	0	0	2	0	**2**	3	0	0	0	**3**	**5**	0	0	0	0	**0**	0	0	2	0	**2**	**2**	**7**
16:00	17:00	0	0	0	0	**0**	0	0	0	0	**0**	**0**	0	0	0	0	**0**	0	0	3	0	**3**	**3**	**3**
17:00	18:00	0	0	1	0	**1**	2	0	0	0	**2**	**3**	0	0	0	0	**0**	0	0	1	0	**1**	**1**	**4**
TOTAL:		0	0	5	0	**5**	16	0	0	0	**16**	**21**	0	0	0	0	**0**	0	0	19	0	**19**	**19**	**40**

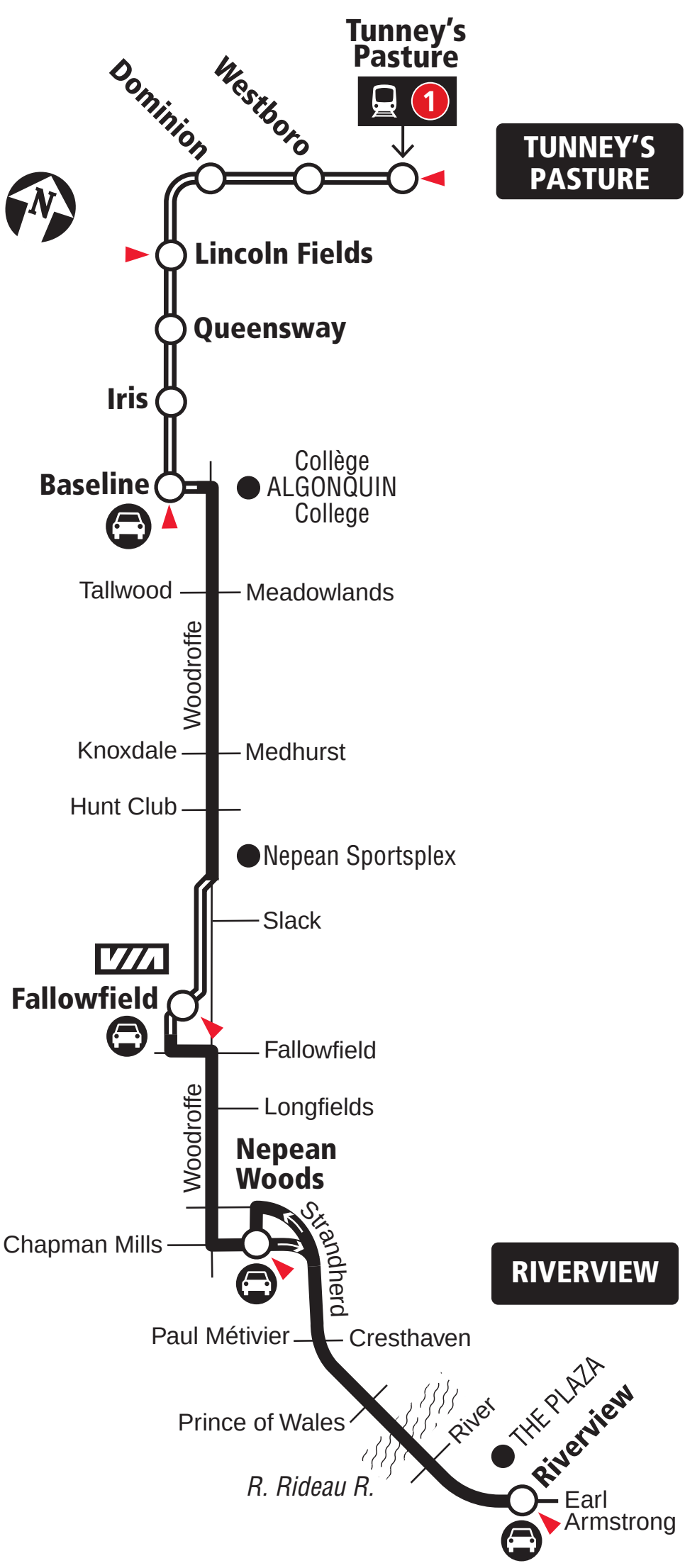
Appendix D – OC Transpo Routes

74 Rapide

RIVERVIEW
TUNNEY'S PASTURE

7 days a week / 7 jours par semaine

All day service
Service toute la journée



Transitway & Station

Park & Ride / Parc-o-bus

Timepoint / Heures de passage

2019.07

1

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

Lost and Found / Objets perdus..... **613-563-4011**
Security / Sécurité..... **613-741-2478**

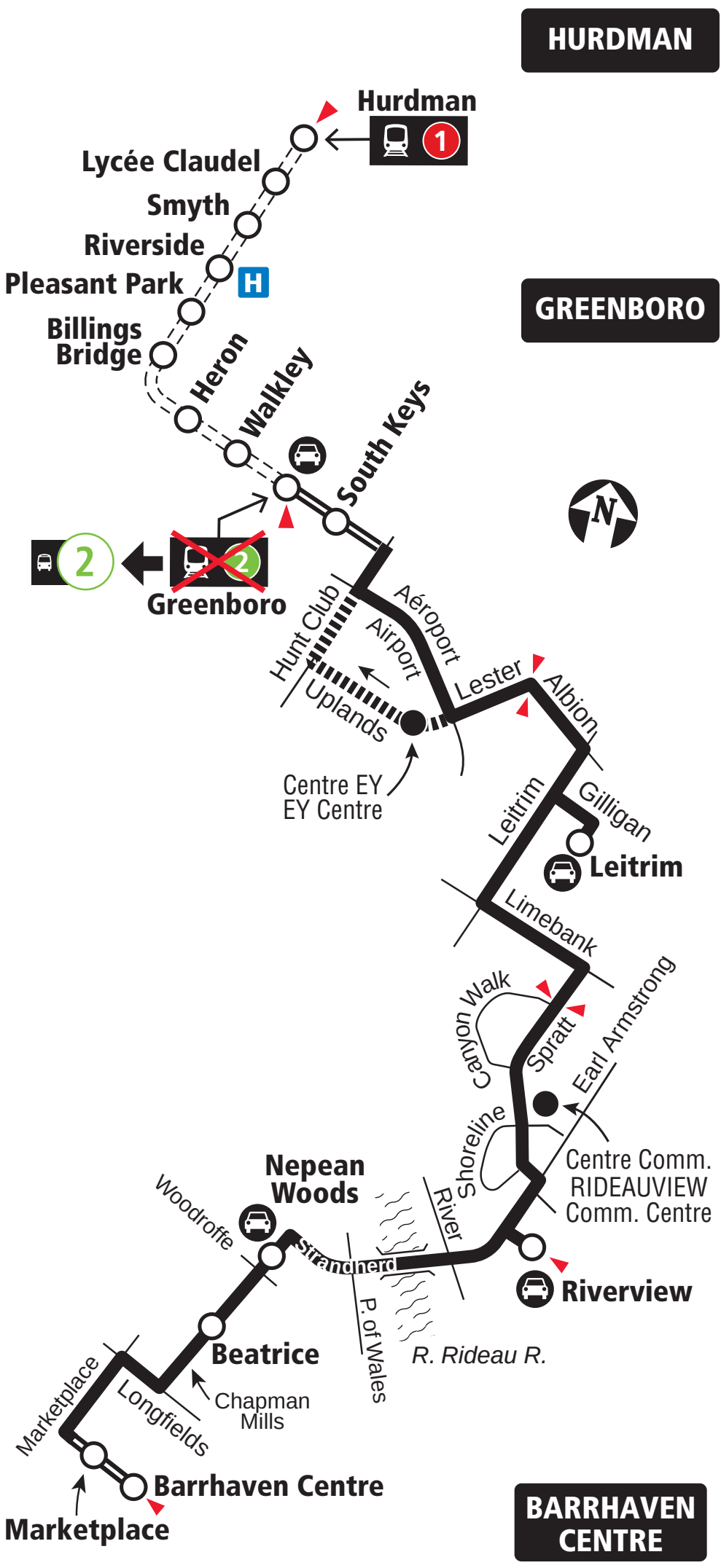
OC Transpo

INFO 613-741-4390
octranspo.com

99 Rapide

BARRHAVEN CENTRE
HURDMAN
GREENBORO

7 days a week / 7 jours par semaine



	Transitway & Station
	Transitway & Station Peak period / Période de pointe
	Saturday & Sunday only / Sam. et dim. seulement
	Park & Ride / Parc-o-bus
	Timepoint / Heures de passage

2020.04

Schedule / Horaire.....613-560-1000
Text / Texto 560560

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

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

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

Security / Sécurité **613-741-2478**

Effective May 3, 2020
En vigueur 3 mai 2020

OC Transpo

INFO 613-741-4390
octranspo.com

278

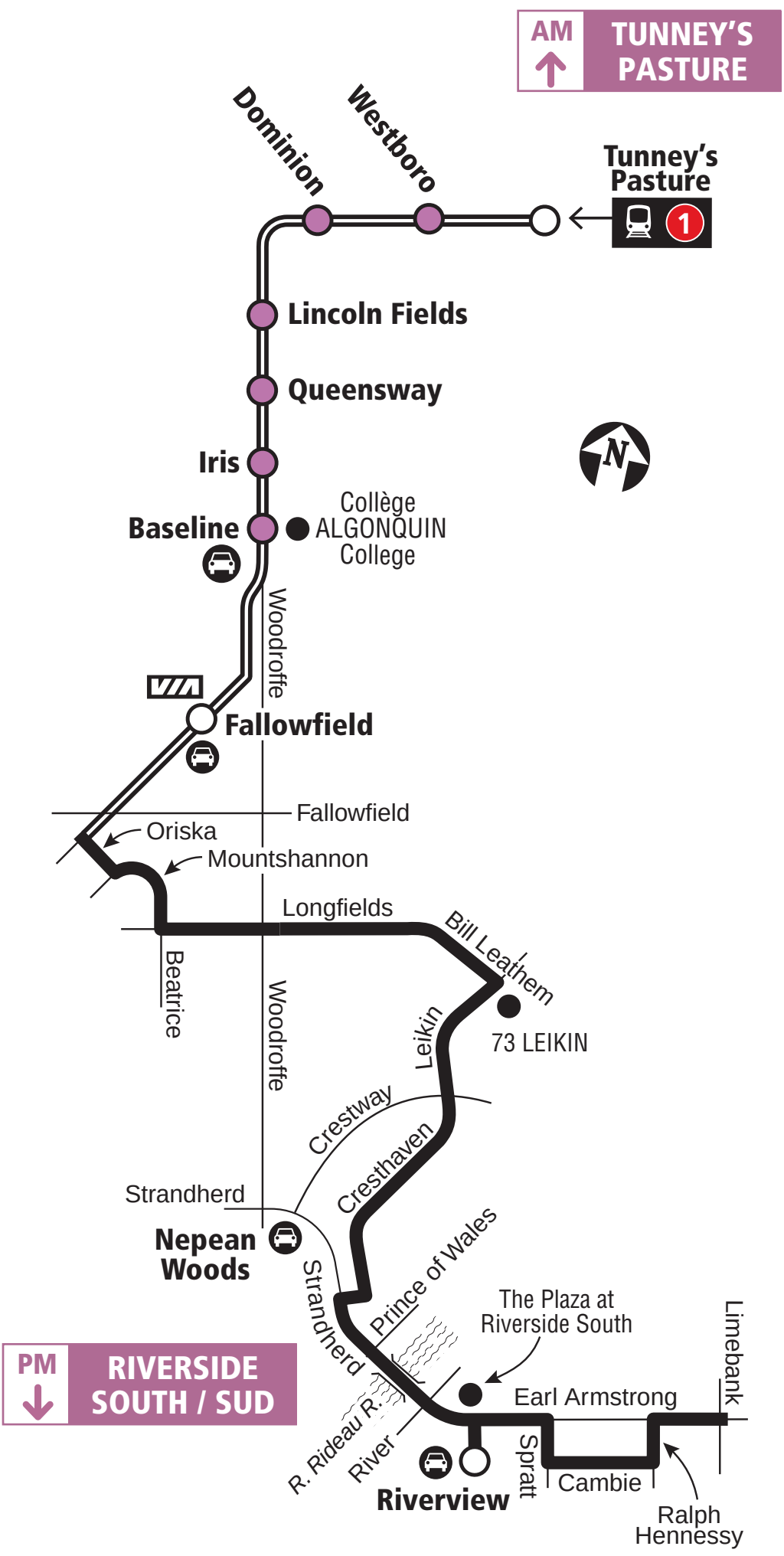
RIVERSIDE SOUTH / SUD
TUNNEY'S PASTURE

Connexion

Monday to Friday / Lundi au vendredi

Peak periods only

Périodes de pointe seulement



Transitway & Station

Limited stops: Off only in AM / No stop in PM
Arrêts limités : Débarquement en AM seulement / Aucun arrêt en PM

Park & Ride / Parc-o-bus

2020.01

Schedule / Horaire.....613-560-1000
Text / Texto 560560

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

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

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

Security / Sécurité **613-741-2478**

Effective December 2, 2018
En vigueur 2 décembre 2018

OC Transpo

INFO 613-741-4390
octranspo.com

299

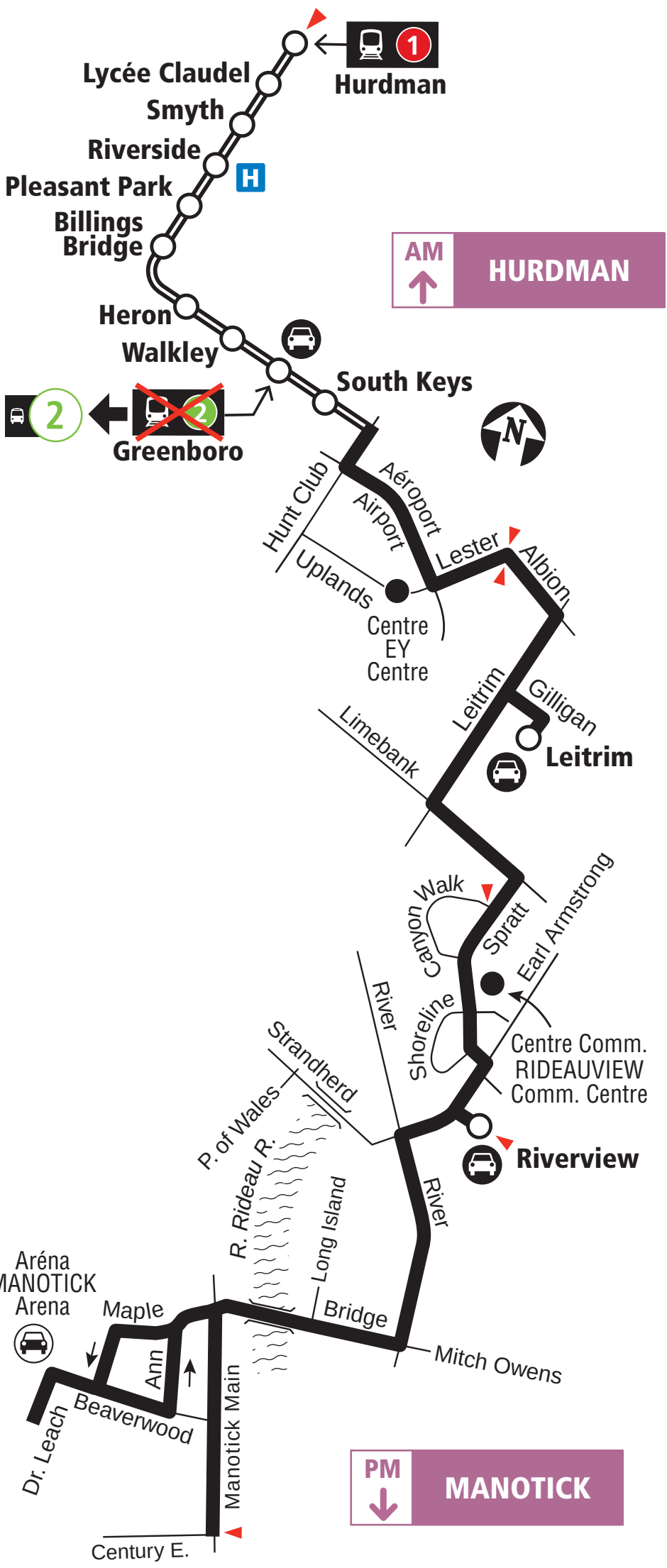
MANOTICK
HURDMAN

Connexion

Monday to Friday / Lundi au vendredi

Peak periods only

Périodes de pointe seulement



Transitway & Station

Park & Ride / Parc-o-bus

Timepoint / Heures de passage

2020.04

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

Text / Texto 560560

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

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

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

Security / Sécurité **613-741-2478**

Effective May 3, 2020

En vigueur 3 mai 2020

OC Transpo

INFO 613-741-4390
octranspo.com

Appendix E – Collision Data

City Operations - Transportation Services

Collision Details Report - Public Version

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

Location: EARL ARMSTRONG RD @ SHORELINE DR

Traffic Control: Traffic signal **Total Collisions:** 9

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Feb-02, Mon,15:46	Snow	Other	Non-fatal injury	Loose snow	North	Reversing	Snow plow	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Jan-05, Mon,07:52	Clear	Angle	P.D. only	Slush	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2016-Aug-31, Wed,15:49	Clear	SMV other	Non-fatal injury	Dry	West	Going ahead	Pick-up truck	Pole (utility, power)	
2016-Jun-09, Thu,10:20	Clear	SMV other	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Curb	
2015-Nov-16, Mon,16:23	Clear	Angle	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Turning right	Passenger van	Other motor vehicle	
2017-Feb-11, Sat,09:08	Clear	SMV other	P.D. only	Slush	West	Turning right	Automobile, station wagon	Skidding/sliding	
2018-May-05, Sat,08:02	Clear	Rear end	Non-fatal injury	Dry	West	Going ahead	School bus	Other motor vehicle	

					West	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Oct-22, Mon,07:45	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Nov-23, Fri,09:46	Clear	Angle	Non-fatal injury	Ice	North	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: EARL ARMSTRONG RD @ SPRATT RD

Traffic Control: Traffic signal **Total Collisions:** 30

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Apr-04, Fri,10:30	Clear	SMV other	P.D. only	Dry	East	Turning left	Pick-up truck	Ran off road	
2014-Oct-30, Thu,18:39	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle	
					South	Turning right	Pick-up truck	Other motor vehicle	
2014-Jan-03, Fri,11:15	Snow	Turning movement	P.D. only	Ice	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2014-May-27, Tue,09:20	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle	
					South	Turning right	Passenger van	Other motor vehicle	

2015-Feb-12, Thu,20:30	Clear	Angle	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Dec-16, Tue,08:54	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Jul-04, Fri,18:09	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2015-May-19, Tue,16:21	Clear	Turning movement	Non-fatal injury	Dry	West	Going ahead	Pick-up truck	Other motor vehicle
					East	Turning left	Passenger van	Other motor vehicle
2015-May-28, Thu,08:30	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Passenger van	Other motor vehicle
2015-Sep-17, Thu,14:25	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Stopped	Passenger van	Other motor vehicle
2016-Feb-18, Thu,13:46	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Truck - open	Other motor vehicle

2016-May-10, Tue,07:30	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Delivery van	Other motor vehicle
2016-Oct-26, Wed,20:00	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jan-05, Thu,15:55	Clear	Turning movement	Non-fatal injury	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Nov-09, Wed,08:03	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-21, Wed,17:45	Clear	Turning movement	P.D. only	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jan-26, Thu,07:40	Rain	Rear end	Non-fatal injury	Wet	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2017-Mar-21, Tue,18:44	Clear	Turning movement	P.D. only	Dry	East	Turning left	Unknown	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle

2017-Apr-06, Thu,08:00	Clear	Rear end	Non-fatal injury	Wet	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Passenger van	Other motor vehicle
2017-Oct-28, Sat,22:05	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
2017-Aug-01, Tue,16:55	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2017-Aug-09, Wed,18:00	Clear	Rear end	P.D. only	Dry	West	Going ahead	Pick-up truck	Other motor vehicle
					West	Stopped	Pick-up truck	Other motor vehicle
2017-Nov-24, Fri,18:25	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-15, Fri,17:30	Snow	Rear end	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2018-Feb-01, Thu,17:46	Snow	Turning movement	P.D. only	Loose snow	West	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle

2018-Jun-30, Sat,01:00	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Passenger van	Other motor vehicle
2018-Dec-13, Thu,16:26	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Nov-14, Wed,08:02	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2018-Nov-13, Tue,16:25	Clear	Turning movement	Non-fatal injury	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2018-Nov-09, Fri,21:07	Snow	Turning movement	Non-fatal injury	Loose snow	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle

Location: EARL ARMSTRONG RD btwn SPRATT RD & SHORELINE DR

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

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Aug-28, Fri,15:45	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Nov-06, Mon,16:06	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

					East	Slowing or stopping	Pick-up truck	Other motor vehicle	

Location: POPLIN ST @ SPRATT RD

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
2017-Dec-08, Fri,10:00	Clear	Other	P.D. only	Dry	West	Reversing	Unknown	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	

Location: RIDEAU RD @ SPRATT RD

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
2018-Mar-01, Thu,13:00	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Ran off road	

Location: SPRATT RD btwn EARL ARMSTRONG RD & RIDEAU RD

Traffic Control: No control **Total Collisions:** 5

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Sep-03, Wed,19:30	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Animal - wild	
2015-Jul-25, Sat,06:40	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Ditch	
2018-Mar-31, Sat,17:23	Clear	Rear end	P.D. only	Dry	North	Going ahead	Delivery van	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Sep-30, Sun,01:50	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Animal - wild	

2018-Dec-14, Fri,17:21	Freezing Rain	SMV other	P.D. only	Ice	South	Going ahead	Pick-up truck	Skidding/sliding

Appendix F – Trip Generation Data

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

Person Trip Generation Rates

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

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

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

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

Reported Mode Shares

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

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

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

Table 3.17: Blended Vehicle Trip Rate Directional Splits

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

The analysis of the OD Survey results confirmed that lower vehicle trip rates were reported in the core areas and higher vehicle trip rates in the suburban and rural areas. To account for the change in vehicle trip rates between geographic areas, the blended rates have been adjusted using information contained in Table 3.14. The resulting vehicle trip rates are highlighted in Table 3.18: Recommended Vehicle Trip Generation Rates without Transit Bonus.

Table 3.18: Recommended Vehicle Trip Generation Rates without Transit Bonus

Recommended Vehicle Trip Generation Rates AM and PM Peak Hours							
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rates				
			Core	Urban (Inside the Greenbelt)	Suburban (Outside the Greenbelt)	Rural	All Areas
210	Single-detached dwellings	AM	0.40	0.67	0.70	0.62	0.66
		PM	0.60	0.76	0.90	0.92	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.51	0.54	0.62	0.52
		PM	0.39	0.51	0.71	0.67	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.50	0.60	0.71	0.47
		PM	0.29	0.49	0.66	0.72	0.46
232	High-rise condominiums (3+ floors)	AM	0.26	0.38	0.46	0.54	0.36
		PM	0.20	0.34	0.46	0.50	0.32
233	Luxury condominiums	AM	0.31	0.45	0.55	0.65	0.43
		PM	0.24	0.40	0.55	0.59	0.38
221	Low-rise apartments (2 floors)	AM	0.21	0.31	0.37	0.44	0.29
		PM	0.20	0.34	0.46	0.50	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.24	0.29	0.35	0.23
		PM	0.16	0.28	0.37	0.41	0.26
222	High-rise apartments (10+ floors)	AM	0.17	0.24	0.29	0.35	0.23
		PM	0.16	0.27	0.36	0.39	0.25

Note: See Table 6.3 for recommended vehicle trip rates with transit bonus

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

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

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

6.5 Future Data Collection

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

South Gloucester / Leitrim

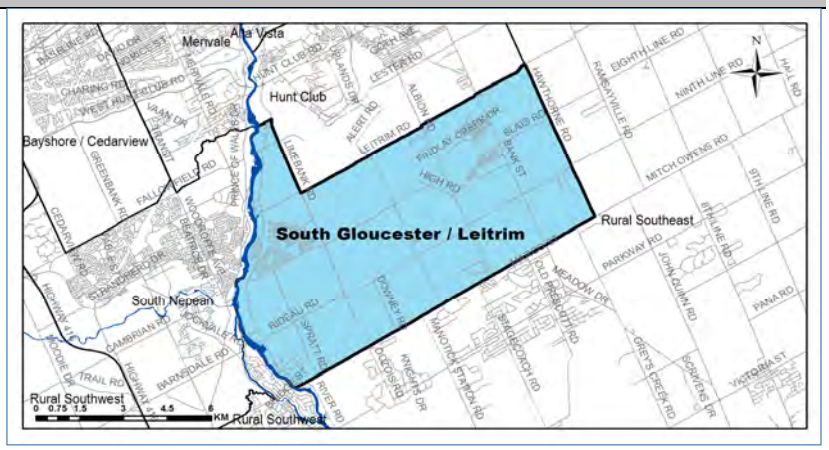
Demographic Characteristics

Population	17,600	Actively Travelled	14,190
Employed Population	8,910	Number of Vehicles	11,080
Households	6,240	Area (km^2)	78.9

Occupation Status (age 5+)	Male	Female	Total
Full Time Employed	4,550	3,630	8,180
Part Time Employed	130	590	730
Student	2,160	2,130	4,290
Retiree	720	770	1,490
Unemployed	90	220	320
Homemaker	20	540	560
Other	80	120	200
Total:	7,750	8,010	15,760

Traveller Characteristics	Male	Female	Total
Transit Pass Holders	790	1,070	1,850
Licensed Drivers	5,790	5,940	11,730
Telecommuters	60	10	70
Trips made by residents	20,810	24,430	45,240

Selected Indicators	
Daily Trips per Person (age 5+)	2.87
Vehicles per Person	0.63
Number of Persons per Household	2.82
Daily Trips per Household	7.25
Vehicles per Household	1.78
Workers per Household	1.43
Population Density (Pop/km2)	220

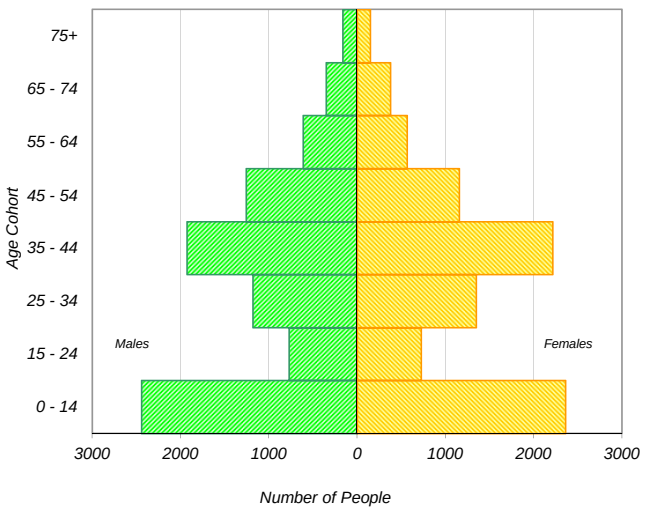


Household Size		
1 person	880	14%
2 persons	1,870	30%
3 persons	1,170	19%
4 persons	1,630	26%
5+ persons	690	11%
Total:	6,240	100%

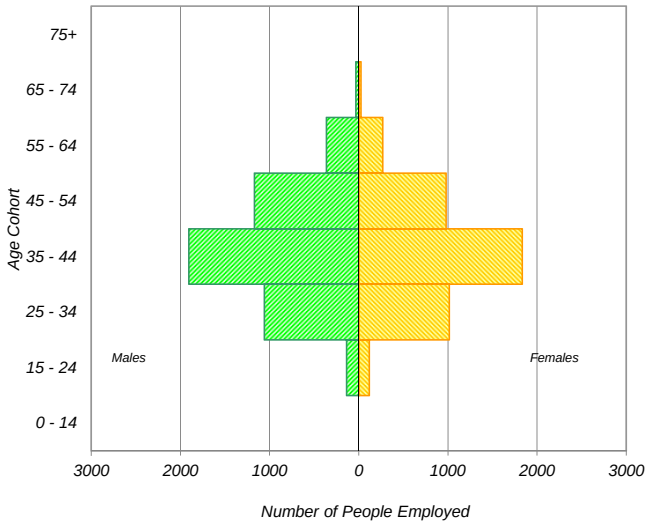
Households by Vehicle Availability		
0 vehicles	40	1%
1 vehicle	2,080	33%
2 vehicles	3,510	56%
3 vehicles	510	8%
4+ vehicles	100	2%
Total:	6,240	100%

Households by Dwelling Type		
Single-detached	3,300	53%
Semi-detached	770	12%
Townhouse	2,010	32%
Apartment/Condo	150	2%
Total:	6,240	100%

Population



Employed Population

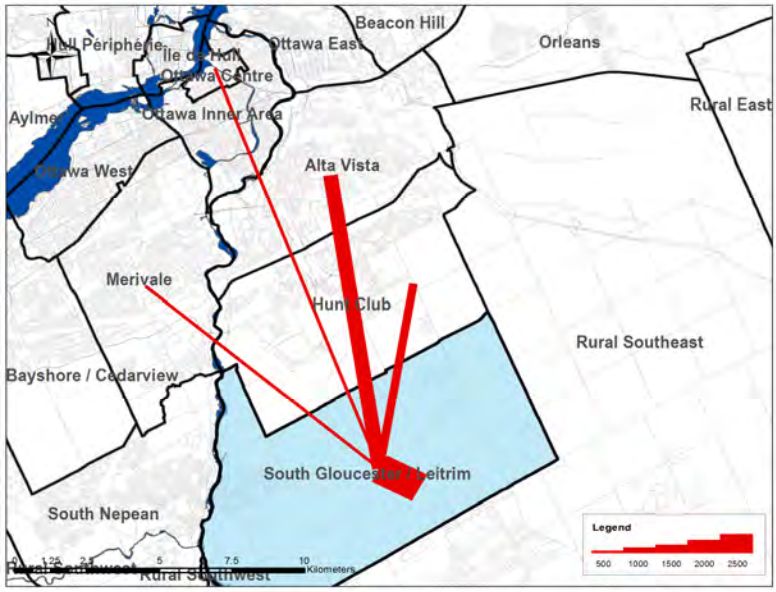


* In 2005 data was only collected for household members aged 11$^+$ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from South Gloucester / Leitrim

AM Peak Period



Summary of Trips to and from South Gloucester / Leitrim

AM Peak Period (6:30 - 8:59)	Destinations of Trips From District	% Total	Origins of Trips To District	% Total
Ottawa Centre	930	9%	0	0%
Ottawa Inner Area	530	5%	250	4%
Ottawa East	240	2%	40	1%
Beacon Hill	240	2%	30	0%
Alta Vista	1,970	18%	160	2%
Hunt Club	1,100	10%	870	13%
Merivale	770	7%	340	5%
Ottawa West	290	3%	0	0%
Bayshore / Cedarview	170	2%	70	1%
Orléans	50	0%	170	3%
Rural East	0	0%	10	0%
Rural Southeast	210	2%	570	8%
South Gloucester / Leitrim	3,680	34%	3,680	55%
South Nepean	310	3%	100	1%
Rural Southwest	120	1%	220	3%
Kanata / Stittsvile	140	1%	60	1%
Rural West	40	0%	60	1%
Île de Hull	90	1%	0	0%
Hull Périphérie	10	0%	20	0%
Plateau	0	0%	20	0%
Aylmer	0	0%	0	0%
Rural Northwest	20	0%	10	0%
Pointe Gatineau	10	0%	30	0%
Gatineau Est	0	0%	0	0%
Rural Northeast	20	0%	0	0%
Buckingham / Masson-Angers	0	0%	20	0%
Ontario Sub-Total:	10,790	99%	6,630	99%
Québec Sub-Total:	150	1%	100	1%
Total:	10,940	100%	6,730	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	6,300	29%	3,270	15%	700	6%
School	1,640	8%	840	4%	1,930	16%
Shopping	1,830	8%	720	3%	700	6%
Leisure	2,730	13%	1,990	9%	660	6%
Medical	440	2%	120	1%	120	1%
Pick-up / drive passenger	1,610	7%	970	4%	1,720	14%
Return Home	6,020	28%	13,110	60%	5,320	44%
Other	1,160	5%	680	3%	850	7%
Total:	21,730	100%	21,700	100%	12,000	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	4,650	64%	1,740	57%	420	11%
School	1,310	18%	810	27%	1,580	43%
Shopping	60	1%	40	1%	10	0%
Leisure	140	2%	50	2%	0	0%
Medical	80	1%	0	0%	0	0%
Pick-up / drive passenger	780	11%	180	6%	900	25%
Return Home	100	1%	120	4%	330	9%
Other	150	2%	110	4%	430	12%
Total:	7,270	100%	3,050	100%	3,670	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	140	3%	150	2%	40	1%
School	30	1%	0	0%	80	2%
Shopping	270	6%	170	2%	210	6%
Leisure	840	19%	420	6%	140	4%
Medical	50	1%	0	0%	30	1%
Pick-up / drive passenger	310	7%	360	5%	400	12%
Return Home	2,400	54%	5,990	82%	2,350	69%
Other	400	9%	200	3%	150	4%
Total:	4,440	100%	7,290	100%	3,400	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	55,430		22%
AM Peak Period	13,990	25%	26%
PM Peak Period	15,130	27%	22%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	14,990	69%	14,970	69%	5,210	43%
Auto Passenger	3,870	18%	3,650	17%	3,120	26%
Transit	1,630	8%	1,740	8%	200	2%
Bicycle	90	0%	100	0%	20	0%
Walk	40	0%	40	0%	2,680	22%
Other	1,110	5%	1,200	6%	770	6%
Total:	21,730	100%	21,700	100%	12,000	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	4,640	64%	2,070	68%	1,540	42%
Auto Passenger	1,260	17%	210	7%	1,140	31%
Transit	860	12%	100	3%	60	2%
Bicycle	70	1%	20	1%	10	0%
Walk	20	0%	0	0%	620	17%
Other	420	6%	640	21%	300	8%
Total:	7,270	100%	3,040	100%	3,670	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	3,100	70%	4,920	67%	1,510	44%
Auto Passenger	1,020	23%	1,120	15%	860	25%
Transit	150	3%	790	11%	50	1%
Bicycle	20	0%	80	1%	0	0%
Walk	10	0%	0	0%	850	25%
Other	130	3%	390	5%	130	4%
Total:	4,430	100%	7,300	100%	3,400	100%

Avg Vehicle Occupancy	From District	To District	Within District
24 Hours	1.26	1.24	1.60
AM Peak Period	1.27	1.10	1.74
PM Peak Period	1.33	1.23	1.57

Transit Modal Split	From District	To District	Within District
24 Hours	8%	9%	2%
AM Peak Period	13%	4%	2%
PM Peak Period	4%	12%	2%

Appendix G – MMLOS Analysis

Multi-Modal Level of Service
Riverside South Phase 17
Scenario: Existing Conditions

INTERSECTIONS		Earl Armstrong Road & Spratt Road				Earl Armstrong & Ralph Hennessy / Shoreline			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	6	6	7	7	6	5	7	7
	Median	Median (>2.4m)	Median (>2.4m)	Median (>2.4m)	Median (>2.4m)	No Median	No Median	Median (>2.4m)	Median (>2.4m)
	Island Refuge								
	Conflicting Left Turns (from street to right)	Protected/permissive	Protected/permissive	Permissive	Permissive	Protected/permissive	Protected/permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No	No	No	No	No
	Corner Radius	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'
	Right Turn Channel	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSI)	**39 E**	**39 E**	**24 F**	**24 F**	**34 E**	**51 D**	**24 F**	**24 F**
	Cycle Length (sec)	120	120	120	120	120	120	120	120
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	10	10	7	7	10	10
	LOS (Delay,seconds)	**54.3 E**	**54.3 E**	**52.0 E**	**52.0 E**	**54.3 E**	**54.3 E**	**52.0 E**	**52.0 E**
	Overall Level of Service	**F**				**F**			
Cyclist	Type of Bikeway	Bike Pocket at Intersection	Mixed Traffic	Bike Pocket at Intersection	Bike Pocket at Intersection	Mixed Traffic	Mixed Traffic	Bike Pocket at Intersection	Bike Pocket at Intersection
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	> 50m	> 50m	> 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No	No	No	No	No	No
	Shared Through-Right?	No	No	No	No	No	No	No	No
	Bike Box / Two-Stage Left-Turn?	No	No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No	No	No	No	No	No
	Level of Service	**E**	**F**	**F**	**F**	**F**	**F**	**F**	**F**
		F				**F**			
Transit	Average Signal Delay	≤40 sec	≤40 sec		≤20 sec		≤40 sec	≤10 sec	
	Level of Service	**E**	**E**		**C**		**E**	**B**	
		E					**E**		
Truck	Turning Radius (Right Turn)			10 to 15m	> 15m			10 to 15m	> 15m
	Number of Receiving Lanes			2+	2+			2+	2+
				B	**A**			**B**	**A**
		B				**B**			

Multi-Modal Level of Service
Riverside South Phase 17
Scenario: Future Conditions

INTERSECTIONS		Earl Armstrong Road & Spratt Road				Earl Armstrong & Ralph Hennessy / Shoreline			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	6	6	7	7	6	5	7	7
	Median	Median (>2.4m)	Median (>2.4m)	Median (>2.4m)	Median (>2.4m)	No Median	No Median	Median (>2.4m)	Median (>2.4m)
	Island Refuge								
	Conflicting Left Turns (from street to right)	Protected/permissive	Protected/permissive	Permissive	Permissive	Protected/permissive	Protected/permissive	Permissive	Permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No	No	No	No	No
	Corner Radius	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'
	Right Turn Channel	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSI)	**39 E**	**39 E**	**24 F**	**24 F**	**34 E**	**51 D**	**24 F**	**24 F**
	Cycle Length (sec)	120	120	120	120	120	120	120	120
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	10	10	7	7	10	10
	LOS (Delay,seconds)	**54.3 E**	**54.3 E**	**52.0 E**	**52.0 E**	**54.3 E**	**54.3 E**	**52.0 E**	**52.0 E**
	Overall Level of Service	**F**				**F**			
Cyclist	Type of Bikeway	Bike Pocket at Intersection	Mixed Traffic	Bike Pocket at Intersection	Bike Pocket at Intersection	Mixed Traffic	Mixed Traffic	Bike Pocket at Intersection	Bike Pocket at Intersection
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	> 50m	> 50m	> 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No	No	No	No	No	No
	Shared Through-Right?	No	No	No	No	No	No	No	No
	Bike Box / Two-Stage Left-Turn?	No	No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No	No	No	No	No	No
	Level of Service	**E**	**F**	**F**	**F**	**F**	**F**	**F**	**F**
		F				**F**			
Transit	Average Signal Delay	≤40 sec	>40 sec		>40 sec		>40 sec	≤30 sec	
	Level of Service	**E**	**F**		**F**		**F**	**D**	
		F				**F**			
Truck	Turning Radius (Right Turn)			10 to 15m	> 15m			10 to 15m	> 15m
	Number of Receiving Lanes			2+	2+			2+	2+
				B	**A**			**B**	**A**
		B				**B**			

Appendix H – Intersection Control Warrants

City of Ottawa
Roundabout Initial Feasability Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	Riverside South Phase 17 TIA
2	Intersection:	Ralph Hennessy & Borbridge
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	proposed 3-legged intersection to be located near the eastern property boundary of the proposed development; AADT is approximately 2,280 vehicles per hour under 2031 Total Traffic conditions
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Stop control on eastbound approach (Bobridge Avenue)
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	this is a 'new City intersection'
6	Why is a roundabout being considered?	single-lane roundabout

7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes [ ] No [x]
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes [ ] No [x]
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes [ ] No [x]
4	Is the intersection located within a coordinated signal system?	Yes [ ] No [x]
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes [x] ** No [ ]
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes [ ] No [x]
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes [ ] No [x]

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection.

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	N/A - Future Intersection
2	Has there been a fatal crash at the intersection in the last 10 years?	N/A - Future Intersection
3	Are capacity problems currently being experienced, or expected in the future?	Yes [ ] No [x]
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes [ ] No [x]
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes [ ] No [x]
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes [ ] No [x]
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes [ ] No [x]

Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the Roundabout Screening Tool, a roundabout is not recommended at the intersection of Ralph Hennessy & Borbridge. The results of the screening exercise indicate that a roundabout may be problematic or have higher implementation costs at this location. Further, this form of traffic control is not technically feasible at this location, based on the suitability factors.

**The Barrhaven Riverside South 2013 EPR indicates that once the BRT is constructed north of the proposed development, the grade-level crossing at Ralph Hennessy will be signalized. This crossing is approximately 160m north of the proposed Collector 'I'/ Borbridge site access.

City of Ottawa
Roundabout Initial Feasability Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	Riverside South Phase 17 TIA
2	Intersection:	Spratt & Solarium
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	the proposed intersection to be located approximtely 1,070m south of Spratt/Cambie; AADT is approximately 7,190 vehicles under 2031 Total Traffic conditions
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Two-Way Stop Control (on east/ west legs)
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	this is a 'new City intersection'
6	Why is a roundabout being considered?	single-lane roundabout

7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐ No ☒
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐ No ☒
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐ No ☒
4	Is the intersection located within a coordinated signal system?	Yes ☐ No ☒
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐ No ☒
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☐ No ☒
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐ No ☒

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection.

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	N/A - Future Intersection
2	Has there been a fatal crash at the intersection in the last 10 years?	N/A - Future Intersection
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☐ No ☒
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☐ No ☒
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐ No ☒
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐ No ☒
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☐ No ☒

Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the Roundabout Screening Tool, a roundabout is not recommended at the intersection of Spratt & Solarium, based on the suitability factors which indicate that a roundabout is not technically feasible.

City of Ottawa
Roundabout Initial Feasability Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	Riverside South Phase 17 TIA
2	Intersection:	Ralph Hennessy & Solarium
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	the proposed intersection 3-legged intersection located near the southeast corner of the subject site and just inside the eastern property boundary; AADT is approximately 1,140 vehicles under 2031 Total Traffic conditions
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	stop control on Solarium Avenue only
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	this is a 'new City intersection'
6	Why is a roundabout being considered?	single-lane roundabout

7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes [ ] No [x]
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes [ ] No [x]
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes [ ] No [x]
4	Is the intersection located within a coordinated signal system?	Yes [ ] No [x]
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes [ ] No [x]
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes [ ] No [x]
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes [ ] No [x]

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection.

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	N/A - Future Intersection
2	Has there been a fatal crash at the intersection in the last 10 years?	N/A - Future Intersection
3	Are capacity problems currently being experienced, or expected in the future?	Yes [ ] No [x]
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes [ ] No [x]
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes [ ] No [x]
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes [ ] No [x]
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes [ ] No [x]

Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the Roundabout Screening Tool, a roundabout is not recommended at the intersection of Ralph Hennessy & Solarium, based on the suitability factors which indicate that a roundabout is not technically feasible at this intersection.

IBI

OTM BOOK 12* - JUSTIFICATION 7

Project: Riverside South Phase 17 **Date:** July 31, 2020

Project #: 125581

Location: Spratt (Major Roadway) at Borbridge (Minor Roadway)

Orientation: North/South East/West

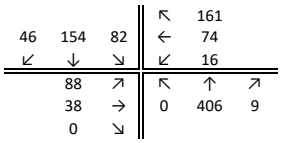
Municipality: City of Ottawa **Scenario:** Future (2031) Total Traffic

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL Number	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	595	55%	55%
	B. Vehicle volume along minor roads (Average Hour)	120	170	180	255	183	72%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	412	38%	38%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	81	72%	

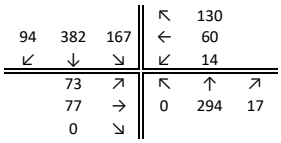
Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

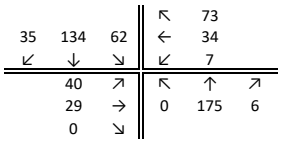
AM Peak Hour Volumes



PM Peak Hour Volumes



Average Hourly Volumes (AHV)



Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above. — 1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h. — Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only). — 4-legged Intersection

5. All flow values for Warrant 1 and Warrant 2 are to be increased by 20% for existing intersections and by 50% in the case of new intersections. — New Intersection

6. The crossing volumes are defined as the sum of:

(a) Left-turns from both minor road approaches. — 7 / 40

(b) The heaviest through volume from the minor road. — 34

(c) 50% of the heavier left turn movement from major road when both of the following are met: — 62

(i) the left-turn volume >120 vph — No

(ii) the left-turn volume plus the opposing volume >720 vph — No

(d) Pedestrians crossing the main road. — 0

CONCLUSION: **The intersection does NOT meet the minimum warrants for traffic control signals.**

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - JUSTIFICATION 7

Project: Riverside South Phase 17 **Date:** July 31, 2020

Project #: 125581

Location: Ralph Hennessy *(Major Roadway)* at Borbridge *(Minor Roadway)*

Orientation: North/South East/West

Municipality: City of Ottawa **Scenario:** Future (2031) Total Traffic

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL Number	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	105	10%	
	B. Vehicle volume along minor roads (Average Hour)	120	170	270	383	19	5%	5%
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	86	8%	
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	19	17%	8%

Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

AM Peak Hour Volumes

			↖	0				
20	41	0	←	0				
↙	↓	↘	↙	0				
	43	↗	↖	↑	↗			
	0	→	0	85	0			
	0	↘						

PM Peak Hour Volumes

			↖	0				
44	88	0	←	0				
↙	↓	↘	↙	0				
	32	↗	↖	↑	↗			
	0	→	0	65	0			
	0	↘						

Average Hourly Volumes (AHV)

			↖	0				
16	32	0	←	0				
↙	↓	↘	↙	0				
	19	↗	↖	↑	↗			
	0	→	0	38	0			
	0	↘						

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above. — 1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h. — Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only). — 3-legged Intersection

5. All flow values for Warrant 1 and Warrant 2 are to be increased by 20% for existing intersections and by 50% in the case of new intersections. — New Intersection

6. The crossing volumes are defined as the sum of:

(a) Left-turns from both minor road approaches. — 0 / 19

(b) The heaviest through volume from the minor road. — 0

(c) 50% of the heavier left turn movement from major road when both of the following are met: — 0

(i) the left-turn volume >120 vph — No

(ii) the left-turn volume plus the opposing volume >720 vph — No

(d) Pedestrians crossing the main road. — 0

CONCLUSION: **The intersection does NOT meet the minimum warrants for traffic control signals.**

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - JUSTIFICATION 7

Project: Riverside South Phase 17 **Date:** July 31, 2020

Project #: 125581

Location: Spratt (Major Roadway) at Solarium (Minor Roadway)

Orientation: North/South East/West

Municipality: City of Ottawa **Scenario:** Future (2031) Total Traffic

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL Number	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	362	34%	34%
	B. Vehicle volume along minor roads (Average Hour)	120	170	180	255	104	41%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	258	24%	24%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	76	68%	

Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

AM Peak Hour Volumes

			↖	34	
48	56	56	←	34	
↙	↓	↘	↙	34	
	107	↗	↖	↑	↗
	16	→	0	252	16
	0	↘			

PM Peak Hour Volumes

			↖	26	
93	246	35	←	26	
↙	↓	↘	↙	26	
	76	↗	↖	↑	↗
	35	→	0	193	35
	0	↘			

Average Hourly Volumes (AHV)

			↖	15	
35	76	23	←	15	
↙	↓	↘	↙	15	
	46	↗	↖	↑	↗
	13	→	0	111	13
	0	↘			

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above. — 1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h. — Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only). — 4-legged Intersection

5. All flow values for Warrant 1 and Warrant 2 are to be increased by 20% for existing intersections and by 50% in the case of new intersections. — New Intersection

6. The crossing volumes are defined as the sum of:

(a) Left-turns from both minor road approaches. — 15, 46

(b) The heaviest through volume from the minor road. — 15

(c) 50% of the heavier left turn movement from major road when both of the following are met: — 23

(i) the left-turn volume >120 vph — No

(ii) the left-turn volume plus the opposing volume >720 vph — No

(d) Pedestrians crossing the main road. — 0

CONCLUSION: **The intersection does NOT meet the minimum warrants for traffic control signals.**

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - JUSTIFICATION 7

Project: Riverside South Phase 17 **Date:** July 31, 2020

Project #: 125581

Location: Ralph Hennessy *(Major Roadway)* at Solarium *(Minor Roadway)*

Orientation: North/South East/West

Municipality: City of Ottawa **Scenario:** Future (2031) Total Traffic

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL Number	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	52	5%	5%
	B. Vehicle volume along minor roads (Average Hour)	120	170	270	383	19	5%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	33	3%	3%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	19	17%	

Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

AM Peak Hour Volumes

			↖	0				
20	10	0	←	0				
↙	↓	↘	↙	0				
	43	↗	↖	↑	↗			
	0	→	0	21	0			
	0	↘						

PM Peak Hour Volumes

			↖	0				
44	22	0	←	0				
↙	↓	↘	↙	0				
	32	↗	↖	↑	↗			
	0	→	0	16	0			
	0	↘						

Average Hourly Volumes (AHV)

			↖	0				
16	8	0	←	0				
↙	↓	↘	↙	0				
	19	↗	↖	↑	↗			
	0	→	0	9	0			
	0	↘						

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above. — 1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h. — Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only). — 3-legged Intersection

5. All flow values for Warrant 1 and Warrant 2 are to be increased by 20% for existing intersections and by 50% in the case of new intersections. — New Intersection

6. The crossing volumes are defined as the sum of:

(a) Left-turns from both minor road approaches. — 0 / 19

(b) The heaviest through volume from the minor road. — 0

(c) 50% of the heavier left turn movement from major road when both of the following are met: — 0

(i) the left-turn volume >120 vph — No

(ii) the left-turn volume plus the opposing volume >720 vph — No

(d) Pedestrians crossing the main road. — 0

CONCLUSION: **The intersection does NOT meet the minimum warrants for traffic control signals.**

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

Appendix I – TDM Checklist

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

Legend

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

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

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

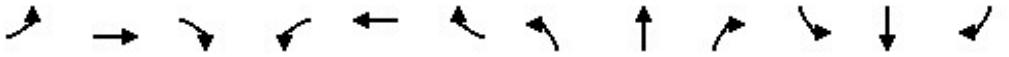
		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify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

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

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

Appendix J – Intersection Capacity Analyses

Existing (2020) Traffic

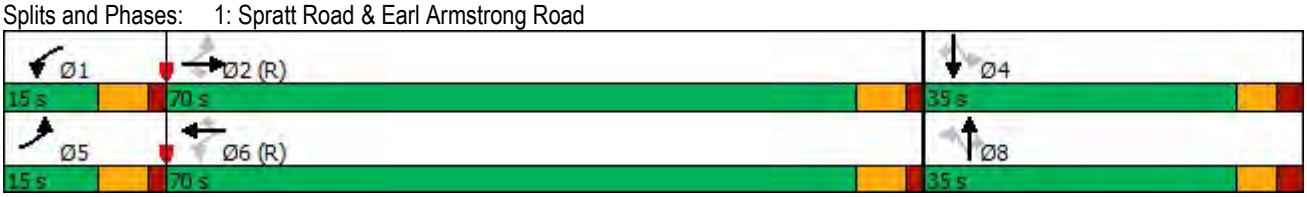


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	929	23	22	796	19	75	11	64	51	5	317
Future Volume (vph)	158	929	23	22	796	19	75	11	64	51	5	317
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.265			0.252			0.754			0.749		
Satd. Flow (perm)	446	3325	1419	306	3232	1447	1279	3458	1398	1333	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			88			234
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	176	1032	26	24	884	21	83	12	71	57	6	352
Shared Lane Traffic (%)												
Lane Group Flow (vph)	176	1032	26	24	884	21	83	12	71	57	6	352
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	15.0	70.0	70.0	15.0	70.0	70.0	35.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	12.5%	58.3%	58.3%	12.5%	58.3%	58.3%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%
Maximum Green (s)	8.6	63.7	63.7	8.6	63.7	63.7	28.8	28.8	28.8	28.8	28.8	28.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	87.4	81.8	81.8	81.0	74.8	74.8	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.73	0.68	0.68	0.68	0.62	0.62	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.43	0.46	0.03	0.10	0.44	0.02	0.44	0.02	0.25	0.29	0.02	0.84
Control Delay	8.9	11.9	0.0	13.1	23.8	2.8	51.6	38.7	7.2	46.3	38.2	34.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.9	11.9	0.0	13.1	23.8	2.8	51.6	38.7	7.2	46.3	38.2	34.1
LOS	A	B	A	B	C	A	D	D	A	D	D	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		11.2			23.1			31.7			35.9	
Approach LOS		B			C			C			D	
Queue Length 50th (m)	9.0	54.6	0.0	2.3	72.4	0.0	16.8	1.2	0.0	11.3	1.1	25.7
Queue Length 95th (m)	22.0	93.4	0.0	m8.0	112.3	m2.0	28.0	3.4	7.5	20.5	4.2	52.9
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	412	2267	995	273	2013	934	306	829	402	319	436	533
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.46	0.03	0.09	0.44	0.02	0.27	0.01	0.18	0.18	0.01	0.66

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 93 (78%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 20.2		Intersection LOS: C	
Intersection Capacity Utilization 68.1%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road



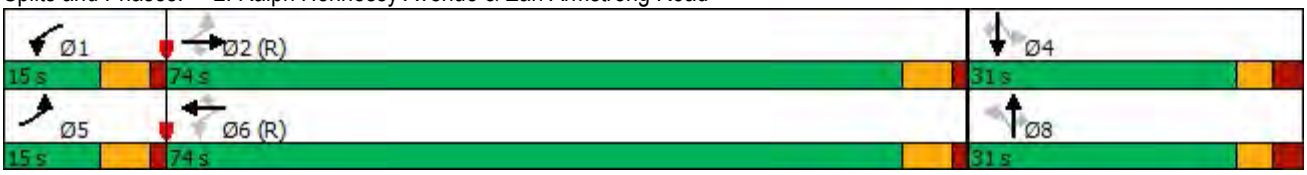
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	955	58	100	676	54	100	3	205	88	1	61
Future Volume (vph)	30	955	58	100	676	54	100	3	205	88	1	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97	1.00		0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.361			0.210			0.757			0.756		
Satd. Flow (perm)	635	3390	1381	310	3262	1407	1068	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			206			84
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	33	1061	64	111	751	60	111	3	228	98	1	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	33	1061	64	111	751	60	111	3	228	98	1	68
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.0	74.0	74.0	15.0	74.0	74.0	31.0	31.0	31.0	31.0	31.0	31.0
Total Split (%)	12.5%	61.7%	61.7%	12.5%	61.7%	61.7%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Maximum Green (s)	8.9	67.9	67.9	8.9	67.9	67.9	24.7	24.7	24.7	24.7	24.7	24.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	82.3	76.1	76.1	87.7	82.4	82.4	17.6	17.6	17.6	17.6	17.6	17.6
Actuated g/C Ratio	0.69	0.63	0.63	0.73	0.69	0.69	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.07	0.49	0.07	0.37	0.34	0.06	0.71	0.01	0.65	0.50	0.01	0.23
Control Delay	3.4	17.4	4.8	8.6	9.7	1.1	71.9	39.7	17.2	54.5	40.0	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.4	17.4	4.8	8.6	9.7	1.1	71.9	39.7	17.2	54.5	40.0	7.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	A	A	A	E	D	B	D	D	A
Approach Delay		16.3			9.0			35.2			35.3	
Approach LOS		B			A			D			D	
Queue Length 50th (m)	2.1	94.0	2.8	5.7	36.2	0.0	23.2	0.6	4.2	19.8	0.2	0.0
Queue Length 95th (m)	m1.6	127.5	8.7	12.9	56.2	2.8	38.9	3.0	25.9	33.3	1.6	7.9
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	526	2149	906	308	2241	993	219	374	410	277	187	375
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.49	0.07	0.36	0.34	0.06	0.51	0.01	0.56	0.35	0.01	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 17.4		Intersection LOS: B	
Intersection Capacity Utilization 65.2%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



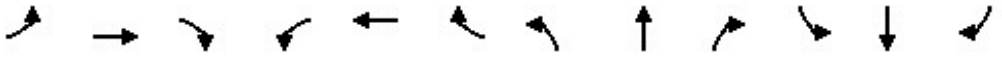
Intersection	
Int Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	64	86	5	20	30
Future Vol, veh/h	4	64	86	5	20	30
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	4	71	96	6	22	33

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	177	100	0	0	103	0
Stage 1	100	-	-	-	-	-
Stage 2	77	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	817	961	-	-	1502	-
Stage 1	929	-	-	-	-	-
Stage 2	951	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	804	960	-	-	1500	-
Mov Cap-2 Maneuver	804	-	-	-	-	-
Stage 1	928	-	-	-	-	-
Stage 2	937	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	949	1500	-
HCM Lane V/C Ratio	-	-	0.08	0.015	-
HCM Control Delay (s)	-	-	9.1	7.4	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-



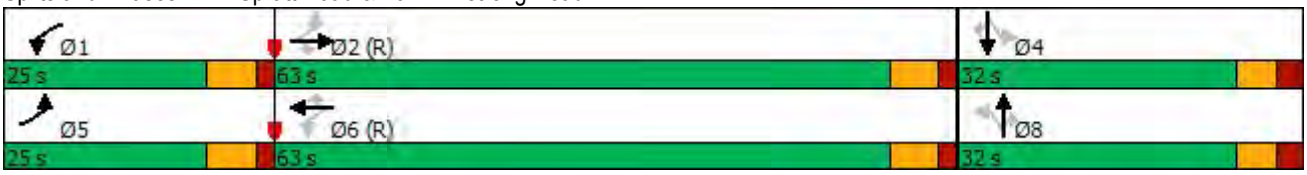
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	375	922	76	25	1013	43	62	13	31	18	19	276
Future Volume (vph)	375	922	76	25	1013	43	62	13	31	18	19	276
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.136			0.280			0.744			0.748		
Satd. Flow (perm)	245	3357	1440	509	3424	1482	1322	3458	1376	1348	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			88			301
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	417	1024	84	28	1126	48	69	14	34	20	21	307
Shared Lane Traffic (%)												
Lane Group Flow (vph)	417	1024	84	28	1126	48	69	14	34	20	21	307
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	25.0	63.0	63.0	25.0	63.0	63.0	32.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	20.8%	52.5%	52.5%	20.8%	52.5%	52.5%	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%
Maximum Green (s)	18.6	56.7	56.7	18.6	56.7	56.7	25.8	25.8	25.8	25.8	25.8	25.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	93.3	85.8	85.8	64.6	58.7	58.7	14.1	14.1	14.1	14.1	14.1	14.1
Actuated g/C Ratio	0.78	0.72	0.72	0.54	0.49	0.49	0.12	0.12	0.12	0.12	0.12	0.12
v/c Ratio	0.78	0.43	0.08	0.08	0.67	0.06	0.45	0.03	0.14	0.13	0.10	0.70
Control Delay	32.2	9.3	2.1	8.4	41.5	8.7	56.7	43.4	1.3	46.1	45.1	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.2	9.3	2.1	8.4	41.5	8.7	56.7	43.4	1.3	46.1	45.1	14.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	A	A	A	D	A	E	D	A	D	D	B
Approach Delay		15.2			39.4			39.0			18.3	
Approach LOS		B			D			D			B	
Queue Length 50th (m)	48.9	45.7	0.0	2.1	127.5	1.2	14.5	1.4	0.0	4.0	4.2	1.2
Queue Length 95th (m)	#123.7	83.5	5.8	m5.5	151.7	8.5	25.0	3.9	0.0	9.7	10.0	23.7
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	537	2400	1054	516	1674	769	284	743	364	289	391	550
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.43	0.08	0.05	0.67	0.06	0.24	0.02	0.09	0.07	0.05	0.56

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 95 (79%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 25.5 Intersection LOS: C
Intersection Capacity Utilization 79.7% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Spratt Road & Earl Armstrong Road



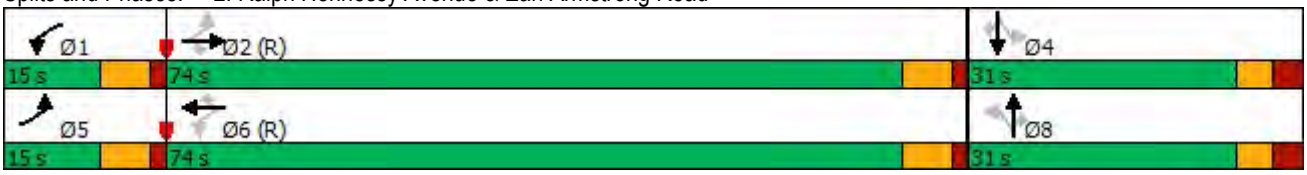
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	778	100	200	952	103	69	1	141	31	0	60
Future Volume (vph)	92	778	100	200	952	103	69	1	141	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97	1.00		0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.239			0.283			0.757			0.757		
Satd. Flow (perm)	434	3293	1508	464	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			111			114			157			204
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	102	864	111	222	1058	114	77	1	157	34	0	67
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	864	111	222	1058	114	77	1	157	34	0	67
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.0	74.0	74.0	15.0	74.0	74.0	31.0	31.0	31.0	31.0	31.0	31.0
Total Split (%)	12.5%	61.7%	61.7%	12.5%	61.7%	61.7%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Maximum Green (s)	8.9	67.9	67.9	8.9	67.9	67.9	24.7	24.7	24.7	24.7	24.7	24.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	84.7	77.4	77.4	90.4	80.3	80.3	14.0	14.0	14.0	14.0		14.0
Actuated g/C Ratio	0.71	0.64	0.64	0.75	0.67	0.67	0.12	0.12	0.12	0.12		0.12
v/c Ratio	0.27	0.41	0.11	0.50	0.46	0.11	0.58	0.00	0.51	0.21		0.19
Control Delay	9.0	22.0	10.4	8.0	10.9	1.9	66.5	44.0	13.0	49.5		1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	9.0	22.0	10.4	8.0	10.9	1.9	66.5	44.0	13.0	49.5		1.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	C	B	A	B	A	E	D	B	D		A
Approach Delay		19.6			9.7			30.6			17.4	
Approach LOS		B			A			C			B	
Queue Length 50th (m)	9.9	74.4	3.7	10.0	51.7	0.0	16.2	0.2	0.0	6.8		0.0
Queue Length 95th (m)	17.5	121.2	23.7	20.4	79.4	6.3	29.3	1.7	16.8	15.2		0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	408	2123	1011	447	2290	1026	236	374	427	283		480
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.25	0.41	0.11	0.50	0.46	0.11	0.33	0.00	0.37	0.12		0.14

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 27 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 15.5 Intersection LOS: B
Intersection Capacity Utilization 60.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	3.6

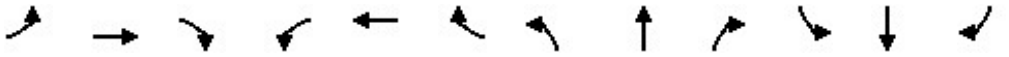
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	39	67	14	64	56
Future Vol, veh/h	4	39	67	14	64	56
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	4	43	74	16	71	62

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	286	82	0	0	90	0
Stage 1	82	-	-	-	-	-
Stage 2	204	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	709	983	-	-	1518	-
Stage 1	946	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	676	983	-	-	1518	-
Mov Cap-2 Maneuver	676	-	-	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	796	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	943	1518	-
HCM Lane V/C Ratio	-	-	0.051	0.047	-
HCM Control Delay (s)	-	-	9	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Future (2024) Background Traffic

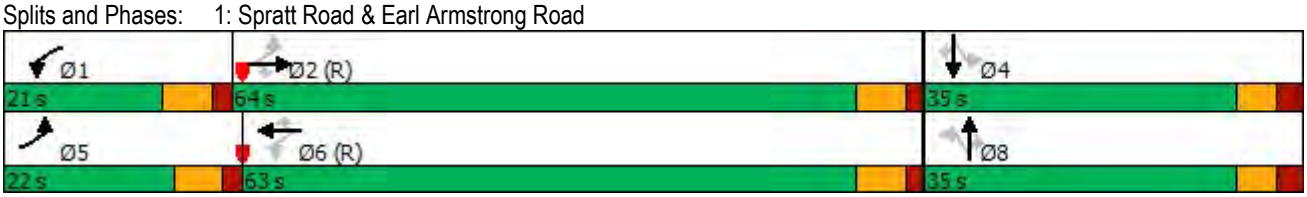


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	1094	31	94	902	19	90	100	200	51	78	324
Future Volume (vph)	171	1094	31	94	902	19	90	100	200	51	78	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.274			0.216			0.706			0.689		
Satd. Flow (perm)	461	3325	1419	262	3232	1447	1198	3458	1398	1226	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			200			290
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	171	1094	31	94	902	19	90	100	200	51	78	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	171	1094	31	94	902	19	90	100	200	51	78	324
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	22.0	64.0	64.0	21.0	63.0	63.0	35.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	18.3%	53.3%	53.3%	17.5%	52.5%	52.5%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%
Maximum Green (s)	15.6	57.7	57.7	14.6	56.7	56.7	28.8	28.8	28.8	28.8	28.8	28.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	85.9	76.9	76.9	84.5	76.2	76.2	15.8	15.8	15.8	15.8	15.8	15.8
Actuated g/C Ratio	0.72	0.64	0.64	0.70	0.64	0.64	0.13	0.13	0.13	0.13	0.13	0.13
v/c Ratio	0.41	0.51	0.03	0.38	0.44	0.02	0.57	0.22	0.56	0.32	0.33	0.73
Control Delay	7.8	13.9	0.1	10.9	8.1	0.1	61.9	45.9	12.1	50.2	49.0	17.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	13.9	0.1	10.9	8.1	0.1	61.9	45.9	12.1	50.2	49.0	17.7
LOS	A	B	A	B	A	A	E	D	B	D	D	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		12.7			8.2			32.3			26.7	
Approach LOS		B			A			C			C	
Queue Length 50th (m)	7.8	58.5	0.0	3.6	22.5	0.0	18.9	10.5	0.0	10.3	15.8	6.8
Queue Length 95th (m)	19.1	103.5	0.0	8.3	39.0	m0.0	31.5	16.4	17.6	19.7	26.7	31.3
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	497	2130	940	305	2051	950	287	829	487	294	436	575
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.51	0.03	0.31	0.44	0.02	0.31	0.12	0.41	0.17	0.18	0.56

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 18 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 71.6%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1252	63	114	826	54	121	3	257	88	8	61
Future Volume (vph)	30	1252	63	114	826	54	121	3	257	88	8	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.341			0.136			0.752			0.756		
Satd. Flow (perm)	600	3390	1381	201	3262	1407	1061	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			257			139
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			713.4			318.3	
Travel Time (s)		23.7			16.6			51.4			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	30	1252	63	114	826	54	121	3	257	88	8	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1252	63	114	826	54	121	3	257	88	8	61
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	11.2	66.4	66.4	21.2	76.4	76.4	32.4	32.4	32.4	32.4	32.4	32.4
Total Split (%)	9.3%	55.3%	55.3%	17.7%	63.7%	63.7%	27.0%	27.0%	27.0%	27.0%	27.0%	27.0%
Maximum Green (s)	5.1	60.3	60.3	15.1	70.3	70.3	26.1	26.1	26.1	26.1	26.1	26.1
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	73.0	73.0	73.0	82.3	82.3	82.3	18.6	18.6	18.6	18.6	18.6	18.6
Actuated g/C Ratio	0.61	0.61	0.61	0.69	0.69	0.69	0.16	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.07	0.61	0.07	0.48	0.37	0.05	0.74	0.01	0.64	0.42	0.06	0.17
Control Delay	8.5	9.3	0.3	15.6	10.1	0.9	72.4	38.7	12.7	50.2	40.1	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	9.3	0.3	15.6	10.1	0.9	72.4	38.7	12.7	50.2	40.1	1.1

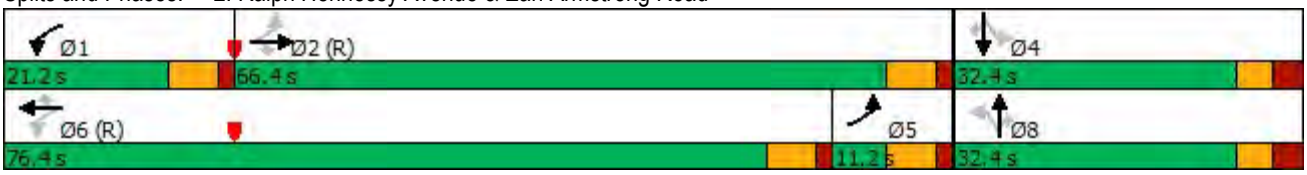
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	B	A	E	D	B	D	D	A
Approach Delay		8.9			10.2			31.9			30.6	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	1.2	29.8	0.0	8.8	41.3	0.0	25.3	0.6	0.0	17.4	1.5	0.0
Queue Length 95th (m)	m3.3	41.2	0.4	18.6	62.4	2.0	41.6	2.9	21.2	30.1	5.3	0.0
Internal Link Dist (m)		501.8			344.8			689.4			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	410	2062	873	289	2235	991	230	395	461	293	197	435
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.61	0.07	0.39	0.37	0.05	0.53	0.01	0.56	0.30	0.04	0.14

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 77.2% ICU Level of Service D
Analysis Period (min) 15

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

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	65	303	5	20	143
Future Vol, veh/h	5	65	303	5	20	143
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	5	65	303	5	20	143

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	490	307	0	0	309	0
Stage 1	307	-	-	-	-	-
Stage 2	183	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	541	738	-	-	1263	-
Stage 1	751	-	-	-	-	-
Stage 2	853	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	532	737	-	-	1262	-
Mov Cap-2 Maneuver	532	-	-	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	839	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	717	1262	-
HCM Lane V/C Ratio	-	-	0.098	0.016	-
HCM Control Delay (s)	-	-	10.6	7.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	61	16	0	9	28	56	0	191	5	32	83	32
Future Vol, veh/h	61	16	0	9	28	56	0	191	5	32	83	32
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	61	16	0	9	28	56	0	191	5	32	83	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	399	359	99	365	373	194	115	0	0	196	0	0
Stage 1	163	163	-	194	194	-	-	-	-	-	-	-
Stage 2	236	196	-	171	179	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	565	571	962	595	561	853	1487	-	-	1389	-	-
Stage 1	844	767	-	812	744	-	-	-	-	-	-	-
Stage 2	772	742	-	836	755	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	498	558	962	572	548	853	1487	-	-	1389	-	-
Mov Cap-2 Maneuver	498	558	-	572	548	-	-	-	-	-	-	-
Stage 1	844	749	-	812	744	-	-	-	-	-	-	-
Stage 2	694	742	-	799	738	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.3	10.9	0	1.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1487	-	-	509	702	1389	-	-
HCM Lane V/C Ratio	-	-	-	0.151	0.132	0.023	-	-
HCM Control Delay (s)	0	-	-	13.3	10.9	7.7	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.5	0.1	-	-

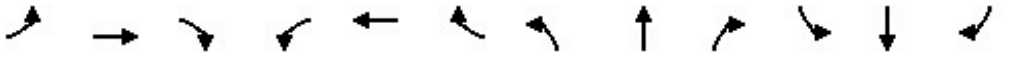
Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	94	0	0	103	49	43
Future Vol, veh/h	94	0	0	103	49	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	12	37	0
Mvmt Flow	94	0	0	103	49	43

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	174	71	92	0	-	0
Stage 1	71	-	-	-	-	-
Stage 2	103	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	821	997	1515	-	-	-
Stage 1	957	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	821	997	1515	-	-	-
Mov Cap-2 Maneuver	821	-	-	-	-	-
Stage 1	957	-	-	-	-	-
Stage 2	926	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1515	-	821	-	-
HCM Lane V/C Ratio	-	-	0.114	-	-
HCM Control Delay (s)	0	-	10	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-



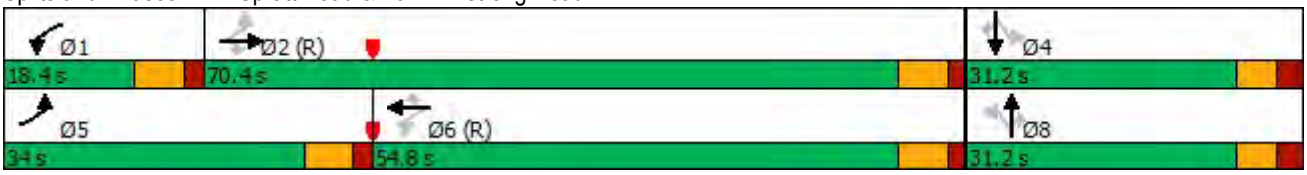
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	379	1042	105	161	1169	43	92	143	166	18	187	272
Future Volume (vph)	379	1042	105	161	1169	43	92	143	166	18	187	272
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.121			0.275			0.441			0.661		
Satd. Flow (perm)	218	3357	1440	499	3424	1482	785	3458	1376	1193	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105			145			166			272
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	379	1042	105	161	1169	43	92	143	166	18	187	272
Shared Lane Traffic (%)												
Lane Group Flow (vph)	379	1042	105	161	1169	43	92	143	166	18	187	272
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	34.0	70.4	70.4	18.4	54.8	54.8	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	28.3%	58.7%	58.7%	15.3%	45.7%	45.7%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
Maximum Green (s)	27.6	64.1	64.1	12.0	48.5	48.5	25.0	25.0	25.0	25.0	25.0	25.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	89.3	74.1	74.1	66.9	58.1	58.1	18.1	18.1	18.1	18.1	18.1	18.1
Actuated g/C Ratio	0.74	0.62	0.62	0.56	0.48	0.48	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.80	0.50	0.11	0.44	0.71	0.05	0.78	0.27	0.48	0.10	0.68	0.60
Control Delay	35.9	14.9	2.7	9.7	20.4	0.1	87.1	45.0	10.9	42.2	60.1	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.9	14.9	2.7	9.7	20.4	0.1	87.1	45.0	10.9	42.2	60.1	10.9

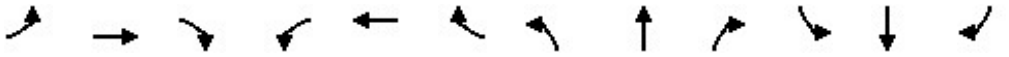
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B	A	A	C	A	F	D	B	D	E	B
Approach Delay		19.3			18.5			40.5			31.4	
Approach LOS		B			B			D			C	
Queue Length 50th (m)	48.2	60.4	0.0	7.8	51.2	0.0	19.5	14.7	0.0	3.4	39.1	0.0
Queue Length 95th (m)	#87.5	95.0	7.3	18.5	58.7	m0.0	34.8	22.0	16.3	9.0	57.0	20.7
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	514	2073	929	414	1658	792	163	720	418	248	379	519
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.50	0.11	0.39	0.71	0.05	0.56	0.20	0.40	0.07	0.49	0.52

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 16 (13%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 22.8 Intersection LOS: C
Intersection Capacity Utilization 96.9% 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: 1: Spratt Road & Earl Armstrong Road



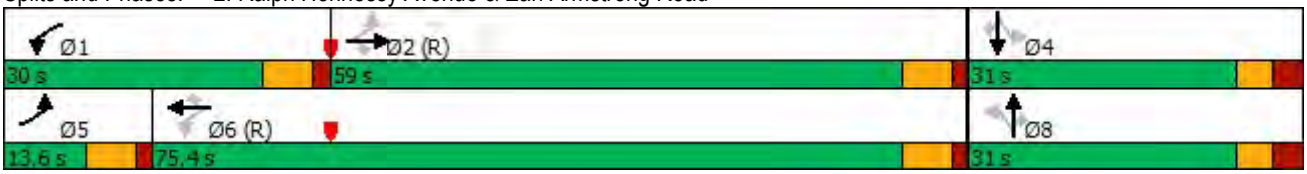


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1005	121	255	1229	103	81	1	170	31	0	60
Future Volume (vph)	92	1005	121	255	1229	103	81	1	170	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.200			0.214			0.757			0.757		
Satd. Flow (perm)	363	3293	1507	351	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			141			103			170			171
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			713.4			318.3	
Travel Time (s)		23.7			16.6			51.4			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	92	1005	121	255	1229	103	81	1	170	31	0	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	1005	121	255	1229	103	81	1	170	31	0	60
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	13.6	59.0	59.0	30.0	75.4	75.4	31.0	31.0	31.0	31.0	31.0	31.0
Total Split (%)	11.3%	49.2%	49.2%	25.0%	62.8%	62.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Maximum Green (s)	7.5	52.9	52.9	23.9	69.3	69.3	24.7	24.7	24.7	24.7	24.7	24.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	79.9	72.8	72.8	92.0	80.1	80.1	14.3	14.3	14.3	14.3		14.3
Actuated g/C Ratio	0.67	0.61	0.61	0.77	0.67	0.67	0.12	0.12	0.12	0.12		0.12
v/c Ratio	0.29	0.50	0.12	0.62	0.54	0.10	0.60	0.00	0.52	0.19		0.18
Control Delay	4.8	7.0	0.3	11.3	12.1	2.0	66.9	43.0	12.8	48.4		1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	4.8	7.0	0.3	11.3	12.1	2.0	66.9	43.0	12.8	48.4		1.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	B	A	E	D	B	D		A
Approach Delay		6.2			11.3			30.3			17.3	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	2.5	18.1	0.0	12.0	65.2	0.0	17.0	0.2	0.0	6.2		0.0
Queue Length 95th (m)	5.8	26.9	0.5	25.4	99.5	6.1	30.5	1.7	17.1	14.1		0.0
Internal Link Dist (m)		501.8			344.8			689.4			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	332	1997	969	513	2285	1020	236	374	438	283		454
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.28	0.50	0.12	0.50	0.54	0.10	0.34	0.00	0.39	0.11		0.13

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 11.0		Intersection LOS: B	
Intersection Capacity Utilization 71.1%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	40	248	15	65	286
Future Vol, veh/h	5	40	248	15	65	286
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	5	40	248	15	65	286

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	672	256	0	0	263	0
Stage 1	256	-	-	-	-	-
Stage 2	416	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	424	788	-	-	1313	-
Stage 1	791	-	-	-	-	-
Stage 2	670	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	403	788	-	-	1313	-
Mov Cap-2 Maneuver	403	-	-	-	-	-
Stage 1	791	-	-	-	-	-
Stage 2	637	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	712	1313	-
HCM Lane V/C Ratio	-	-	0.063	0.05	-
HCM Control Delay (s)	-	-	10.4	7.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	51	29	0	9	26	51	0	160	10	58	165	69
Future Vol, veh/h	51	29	0	9	26	51	0	160	10	58	165	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	51	29	0	9	26	51	0	160	10	58	165	69

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	520	486	200	495	515	165	234	0	0	170	0	0
Stage 1	316	316	-	165	165	-	-	-	-	-	-	-
Stage 2	204	170	-	330	350	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	470	484	846	488	466	885	1345	-	-	1420	-	-
Stage 1	699	659	-	842	766	-	-	-	-	-	-	-
Stage 2	803	762	-	687	636	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	410	464	846	450	447	885	1345	-	-	1420	-	-
Mov Cap-2 Maneuver	410	464	-	450	447	-	-	-	-	-	-	-
Stage 1	699	632	-	842	766	-	-	-	-	-	-	-
Stage 2	731	762	-	629	610	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.3	11.6	0	1.5
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1345	-	-	428	633	1420	-	-
HCM Lane V/C Ratio	-	-	-	0.187	0.136	0.041	-	-
HCM Control Delay (s)	0	-	-	15.3	11.6	7.6	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.7	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	68	0	0	102	87	87
Future Vol, veh/h	68	0	0	102	87	87
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	68	0	0	102	87	87

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	233	131	174	0	-	0
Stage 1	131	-	-	-	-	-
Stage 2	102	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	760	924	1415	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	927	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	760	924	1415	-	-	-
Mov Cap-2 Maneuver	760	-	-	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	927	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1415	-	760	-	-
HCM Lane V/C Ratio	-	-	0.089	-	-
HCM Control Delay (s)	0	-	10.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	2

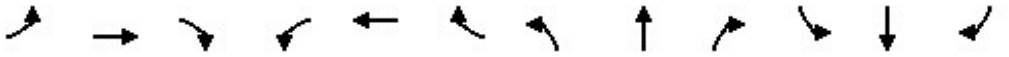
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	68	0	0	102	87	87
Future Vol, veh/h	68	0	0	102	87	87
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	68	0	0	102	87	87

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	233	131	174	0	-	0
Stage 1	131	-	-	-	-	-
Stage 2	102	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	760	924	1415	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	927	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	760	924	1415	-	-	-
Mov Cap-2 Maneuver	760	-	-	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	927	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1415	-	760	-	-
HCM Lane V/C Ratio	-	-	0.089	-	-
HCM Control Delay (s)	0	-	10.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Future (2026) Background Traffic

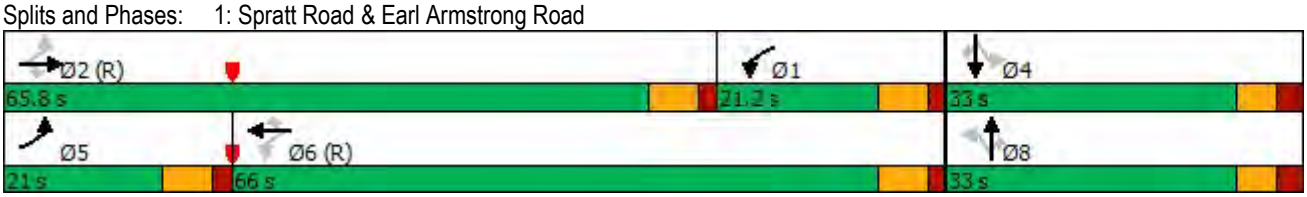


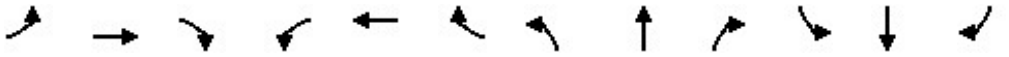
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	1173	38	107	949	19	104	112	228	51	84	324
Future Volume (vph)	172	1173	38	107	949	19	104	112	228	51	84	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.206			0.234			0.702			0.681		
Satd. Flow (perm)	347	3325	1419	284	3232	1447	1191	3458	1398	1212	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			228			301
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	172	1173	38	107	949	19	104	112	228	51	84	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	172	1173	38	107	949	19	104	112	228	51	84	324
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	21.0	65.8	65.8	21.2	66.0	66.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (%)	17.5%	54.8%	54.8%	17.7%	55.0%	55.0%	27.5%	27.5%	27.5%	27.5%	27.5%	27.5%
Maximum Green (s)	14.6	59.5	59.5	14.8	59.7	59.7	26.8	26.8	26.8	26.8	26.8	26.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	69.6	69.7	69.7	72.6	72.7	72.7	16.6	16.6	16.6	16.6	16.6	16.6
Actuated g/C Ratio	0.58	0.58	0.58	0.60	0.61	0.61	0.14	0.14	0.14	0.14	0.14	0.14
v/c Ratio	0.53	0.61	0.04	0.38	0.48	0.02	0.63	0.23	0.58	0.30	0.33	0.70
Control Delay	19.4	18.9	0.1	18.0	9.0	0.1	64.4	45.4	11.8	48.9	48.4	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	18.9	0.1	18.0	9.0	0.1	64.4	45.4	11.8	48.9	48.4	15.1
LOS	B	B	A	B	A	A	E	D	B	D	D	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.5			9.7			32.6			25.0	
Approach LOS		B			A			C			C	
Queue Length 50th (m)	16.3	80.7	0.0	5.2	24.8	0.0	21.7	11.6	0.0	10.2	16.8	4.5
Queue Length 95th (m)	32.0	120.2	0.0	17.4	58.5	m0.0	35.8	17.9	19.1	19.7	28.3	28.4
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	357	1930	860	279	1958	910	265	772	489	270	406	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.61	0.04	0.38	0.48	0.02	0.39	0.15	0.47	0.19	0.21	0.57

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 28 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 18.4		Intersection LOS: B	
Intersection Capacity Utilization 73.6%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1361	63	114	882	54	121	3	257	88	8	61
Future Volume (vph)	30	1361	63	114	882	54	121	3	257	88	8	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.322			0.111			0.752			0.756		
Satd. Flow (perm)	566	3390	1381	164	3262	1407	1061	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			217			139
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	30	1361	63	114	882	54	121	3	257	88	8	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1361	63	114	882	54	121	3	257	88	8	61
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	11.2	68.0	68.0	18.0	74.8	74.8	34.0	34.0	34.0	34.0	34.0	34.0
Total Split (%)	9.3%	56.7%	56.7%	15.0%	62.3%	62.3%	28.3%	28.3%	28.3%	28.3%	28.3%	28.3%
Maximum Green (s)	5.1	61.9	61.9	11.9	68.7	68.7	27.7	27.7	27.7	27.7	27.7	27.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	73.0	73.0	73.0	81.9	81.9	81.9	19.0	19.0	19.0	19.0	19.0	19.0
Actuated g/C Ratio	0.61	0.61	0.61	0.68	0.68	0.68	0.16	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.08	0.66	0.07	0.54	0.40	0.05	0.72	0.01	0.69	0.41	0.06	0.17
Control Delay	4.6	6.6	0.2	20.4	10.6	1.0	70.4	38.0	19.4	49.4	39.5	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	6.6	0.2	20.4	10.6	1.0	70.4	38.0	19.4	49.4	39.5	1.1

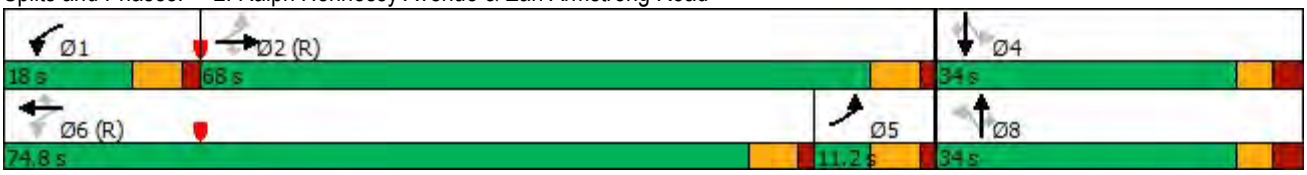
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	C	B	A	E	D	B	D	D	A
Approach Delay		6.3			11.2			35.7			30.1	
Approach LOS		A			B			D			C	
Queue Length 50th (m)	0.8	21.1	0.0	8.8	45.2	0.0	25.3	0.6	7.7	17.4	1.5	0.0
Queue Length 95th (m)	m1.9	31.6	m0.2	22.4	70.2	2.1	40.8	2.9	31.0	29.6	5.2	0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	391	2061	873	237	2226	987	244	420	443	311	210	453
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.66	0.07	0.48	0.40	0.05	0.50	0.01	0.58	0.28	0.04	0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 80.4% ICU Level of Service D
Analysis Period (min) 15

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

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	65	358	5	20	169
Future Vol, veh/h	5	65	358	5	20	169
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	5	65	358	5	20	169

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	571	362	0	0	364	0
Stage 1	362	-	-	-	-	-
Stage 2	209	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	486	687	-	-	1206	-
Stage 1	709	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	477	686	-	-	1205	-
Mov Cap-2 Maneuver	477	-	-	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	817	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	665	1205	-
HCM Lane V/C Ratio	-	-	0.105	0.017	-
HCM Control Delay (s)	-	-	11	8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	93	16	0	9	28	56	0	214	5	32	92	49
Future Vol, veh/h	93	16	0	9	28	56	0	214	5	32	92	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	93	16	0	9	28	56	0	214	5	32	92	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	440	400	117	406	422	217	141	0	0	219	0	0
Stage 1	181	181	-	217	217	-	-	-	-	-	-	-
Stage 2	259	219	-	189	205	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	531	541	941	559	526	828	1455	-	-	1362	-	-
Stage 1	825	754	-	790	727	-	-	-	-	-	-	-
Stage 2	750	726	-	817	736	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	466	529	941	536	514	828	1455	-	-	1362	-	-
Mov Cap-2 Maneuver	466	529	-	536	514	-	-	-	-	-	-	-
Stage 1	825	737	-	790	727	-	-	-	-	-	-	-
Stage 2	672	726	-	780	719	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.8	11.2	0	1.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1455	-	-	474	670	1362	-	-
HCM Lane V/C Ratio	-	-	-	0.23	0.139	0.023	-	-
HCM Control Delay (s)	0	-	-	14.8	11.2	7.7	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1	1	1	1	1	0	1	0	0	0	0	0
Stage 1	1	1	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1027	899	1090	1027	899	-	1635	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	899	1090	1027	899	-	1635	-	-	-	-	-
Mov Cap-2 Maneuver	-	899	-	1027	899	-	-	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1635	-	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	117	0	0	103	49	52
Future Vol, veh/h	117	0	0	103	49	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	12	37	0
Mvmt Flow	117	0	0	103	49	52

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	178	75	101	0	-	0
Stage 1	75	-	-	-	-	-
Stage 2	103	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	816	992	1504	-	-	-
Stage 1	953	-	-	-	-	-
Stage 2	926	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	816	992	1504	-	-	-
Mov Cap-2 Maneuver	816	-	-	-	-	-
Stage 1	953	-	-	-	-	-
Stage 2	926	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1504	-	816	-	-
HCM Lane V/C Ratio	-	-	0.143	-	-
HCM Control Delay (s)	0	-	10.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1	1	1	1	1	0	1	0	0	0	0	0
Stage 1	1	1	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1027	899	1090	1027	899	-	1635	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	899	1090	1027	899	-	1635	-	-	-	-	-
Mov Cap-2 Maneuver	-	899	-	1027	899	-	-	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1635	-	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-	-	-

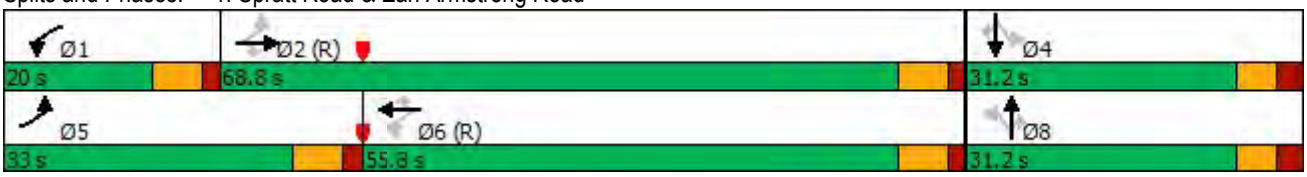
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	380	1106	119	183	1252	43	103	152	185	18	204	272
Future Volume (vph)	380	1106	119	183	1252	43	103	152	185	18	204	272
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.094			0.251			0.415			0.656		
Satd. Flow (perm)	169	3357	1440	456	3424	1482	738	3458	1376	1184	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			119			145			185			272
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	380	1106	119	183	1252	43	103	152	185	18	204	272
Shared Lane Traffic (%)												
Lane Group Flow (vph)	380	1106	119	183	1252	43	103	152	185	18	204	272
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	33.0	68.8	68.8	20.0	55.8	55.8	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	27.5%	57.3%	57.3%	16.7%	46.5%	46.5%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
Maximum Green (s)	26.6	62.5	62.5	13.6	49.5	49.5	25.0	25.0	25.0	25.0	25.0	25.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	87.9	72.0	72.0	66.4	56.9	56.9	19.5	19.5	19.5	19.5	19.5	19.5
Actuated g/C Ratio	0.73	0.60	0.60	0.55	0.47	0.47	0.16	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.86	0.55	0.13	0.52	0.77	0.06	0.87	0.27	0.49	0.09	0.69	0.59
Control Delay	47.7	16.8	2.8	12.5	22.3	0.1	100.1	44.0	10.4	41.1	59.2	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.7	16.8	2.8	12.5	22.3	0.1	100.1	44.0	10.4	41.1	59.2	10.3

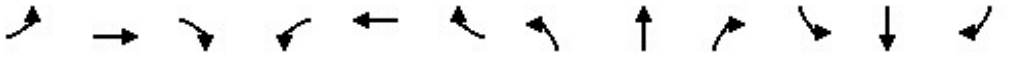
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B	A	B	C	A	F	D	B	D	E	B
Approach Delay		23.1			20.4			43.0			31.6	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	56.3	70.7	0.0	9.8	125.9	0.0	21.9	15.3	0.0	3.4	42.2	0.0
Queue Length 95th (m)	#104.3	106.2	8.0	23.8	#80.2	m0.0	#44.3	23.1	17.2	9.0	62.2	20.7
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	472	2013	911	411	1622	778	153	720	433	246	379	519
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.55	0.13	0.45	0.77	0.06	0.67	0.21	0.43	0.07	0.54	0.52

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 28 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 25.3 Intersection LOS: C
Intersection Capacity Utilization 100.2% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Spratt Road & Earl Armstrong Road



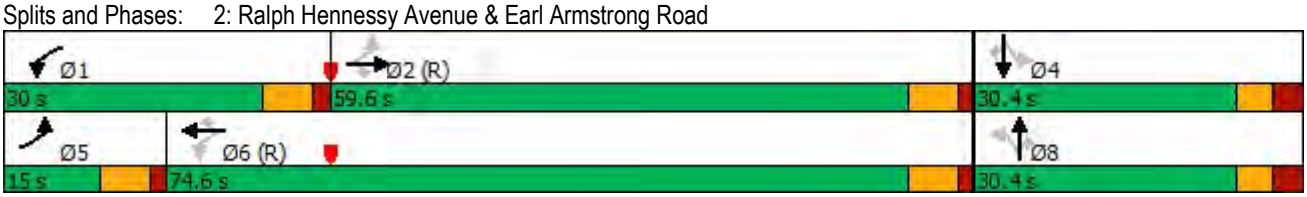


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1084	121	255	1332	103	81	1	170	31	0	60
Future Volume (vph)	92	1084	121	255	1332	103	81	1	170	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.175			0.187			0.757			0.757		
Satd. Flow (perm)	318	3293	1507	307	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			141			103			170			176
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	92	1084	121	255	1332	103	81	1	170	31	0	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	1084	121	255	1332	103	81	1	170	31	0	60
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.0	59.6	59.6	30.0	74.6	74.6	30.4	30.4	30.4	30.4	30.4	30.4
Total Split (%)	12.5%	49.7%	49.7%	25.0%	62.2%	62.2%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Maximum Green (s)	8.9	53.5	53.5	23.9	68.5	68.5	24.1	24.1	24.1	24.1	24.1	24.1
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	78.4	71.3	71.3	92.4	80.1	80.1	14.3	14.3	14.3	14.3		14.3
Actuated g/C Ratio	0.65	0.59	0.59	0.77	0.67	0.67	0.12	0.12	0.12	0.12		0.12
v/c Ratio	0.32	0.55	0.13	0.64	0.58	0.10	0.60	0.00	0.52	0.19		0.18
Control Delay	6.2	8.6	0.4	13.4	12.9	2.0	66.9	43.0	12.8	48.4		1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	6.2	8.6	0.4	13.4	12.9	2.0	66.9	43.0	12.8	48.4		1.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	B	A	E	D	B	D		A
Approach Delay		7.7			12.3			30.3			17.2	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	2.9	24.3	0.0	12.0	74.1	0.0	17.0	0.2	0.0	6.2		0.0
Queue Length 95th (m)	6.6	34.4	0.9	32.4	112.8	6.1	30.5	1.7	17.1	14.1		0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	317	1957	953	488	2285	1020	230	365	431	276		451
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.29	0.55	0.13	0.52	0.58	0.10	0.35	0.00	0.39	0.11		0.13

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 32 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 12.0		Intersection LOS: B	
Intersection Capacity Utilization 73.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	40	288	15	65	338
Future Vol, veh/h	5	40	288	15	65	338
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	5	40	288	15	65	338

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	764	296	0	0	303	0
Stage 1	296	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	375	748	-	-	1269	-
Stage 1	759	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	356	748	-	-	1269	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	759	-	-	-	-	-
Stage 2	602	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	1.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	666	1269	-
HCM Lane V/C Ratio	-	-	0.068	0.051	-
HCM Control Delay (s)	-	-	10.8	8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	77	29	0	9	26	51	0	175	10	58	185	100
Future Vol, veh/h	77	29	0	9	26	51	0	175	10	58	185	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	77	29	0	9	26	51	0	175	10	58	185	100

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	570	536	235	546	581	180	285	0	0	185	0	0
Stage 1	351	351	-	180	180	-	-	-	-	-	-	-
Stage 2	219	185	-	366	401	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	435	454	809	452	428	868	1289	-	-	1402	-	-
Stage 1	670	636	-	826	754	-	-	-	-	-	-	-
Stage 2	788	751	-	657	604	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	378	435	809	415	410	868	1289	-	-	1402	-	-
Mov Cap-2 Maneuver	378	435	-	415	410	-	-	-	-	-	-	-
Stage 1	670	610	-	826	754	-	-	-	-	-	-	-
Stage 2	716	751	-	600	579	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.6	12	0	1.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1289	-	-	392	598	1402	-	-
HCM Lane V/C Ratio	-	-	-	0.27	0.144	0.041	-	-
HCM Control Delay (s)	0	-	-	17.6	12	7.7	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.1	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1	1	1	1	1	0	1	0	0	0	0	0
Stage 1	1	1	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1027	899	1090	1027	899	-	1635	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	899	1090	1027	899	-	1635	-	-	-	-	-
Mov Cap-2 Maneuver	-	899	-	1027	899	-	-	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1635	-	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	83	0	0	102	93	101
Future Vol, veh/h	83	0	0	102	93	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	83	0	0	102	93	101

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	246	144	194	0	-	0
Stage 1	144	-	-	-	-	-
Stage 2	102	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	747	909	1391	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	927	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	747	909	1391	-	-	-
Mov Cap-2 Maneuver	747	-	-	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	927	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1391	-	747	-	-
HCM Lane V/C Ratio	-	-	0.111	-	-
HCM Control Delay (s)	0	-	10.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1	1	1	1	1	0	1	0	0	0	0	0
Stage 1	1	1	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1027	899	1090	1027	899	-	1635	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	899	1090	1027	899	-	1635	-	-	-	-	-
Mov Cap-2 Maneuver	-	899	-	1027	899	-	-	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1635	-	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-	-	-

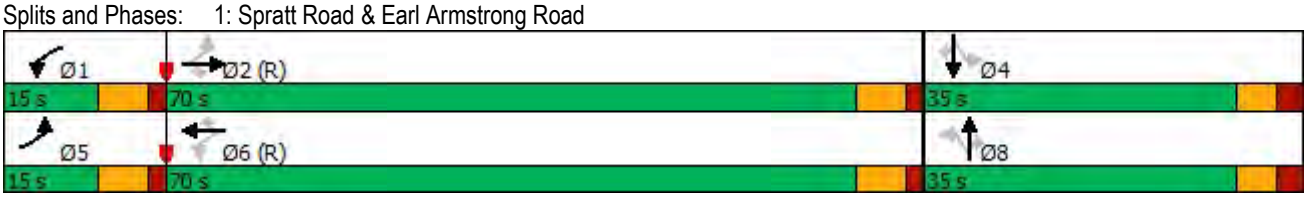
Future (2031) Background Traffic

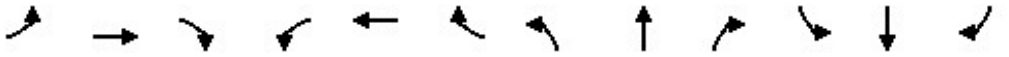
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	1231	42	113	1004	19	119	184	263	51	101	324
Future Volume (vph)	171	1231	42	113	1004	19	119	184	263	51	101	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.236			0.166			0.692			0.636		
Satd. Flow (perm)	397	3325	1419	201	3232	1447	1174	3458	1398	1132	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			173			206
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	171	1231	42	113	1004	19	119	184	263	51	101	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	171	1231	42	113	1004	19	119	184	263	51	101	324
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	15.0	70.0	70.0	15.0	70.0	70.0	35.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	12.5%	58.3%	58.3%	12.5%	58.3%	58.3%	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%
Maximum Green (s)	8.6	63.7	63.7	8.6	63.7	63.7	28.8	28.8	28.8	28.8	28.8	28.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	82.1	73.6	73.6	82.4	73.7	73.7	18.8	18.8	18.8	18.8	18.8	18.8
Actuated g/C Ratio	0.68	0.61	0.61	0.69	0.61	0.61	0.16	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.48	0.60	0.05	0.55	0.51	0.02	0.65	0.34	0.72	0.29	0.36	0.80
Control Delay	10.6	17.2	0.2	25.7	26.2	1.7	62.4	45.2	27.6	46.0	46.6	32.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.6	17.2	0.2	25.7	26.2	1.7	62.4	45.2	27.6	46.0	46.6	32.0
LOS	B	B	A	C	C	A	E	D	C	D	D	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		15.9			25.8			40.7			36.6	
Approach LOS		B			C			D			D	
Queue Length 50th (m)	9.3	81.2	0.0	13.6	97.3	0.0	24.6	19.0	18.1	9.9	19.9	25.1
Queue Length 95th (m)	21.4	123.3	0.3	29.0	131.1	m0.9	38.7	26.0	41.1	19.0	31.7	50.9
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	365	2038	903	212	1986	922	281	829	467	271	436	511
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.60	0.05	0.53	0.51	0.02	0.42	0.22	0.56	0.19	0.23	0.63

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 93 (78%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 25.6		Intersection LOS: C	
Intersection Capacity Utilization 80.9%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1456	63	114	934	54	121	3	257	88	8	61
Future Volume (vph)	30	1456	63	114	934	54	121	3	257	88	8	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.287			0.108			0.752			0.756		
Satd. Flow (perm)	506	3390	1381	160	3262	1407	1061	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			156			84
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	30	1456	63	114	934	54	121	3	257	88	8	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1456	63	114	934	54	121	3	257	88	8	61
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.0	74.0	74.0	15.0	74.0	74.0	31.0	31.0	31.0	31.0	31.0	31.0
Total Split (%)	12.5%	61.7%	61.7%	12.5%	61.7%	61.7%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Maximum Green (s)	8.9	67.9	67.9	8.9	67.9	67.9	24.7	24.7	24.7	24.7	24.7	24.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	80.9	74.8	74.8	87.4	81.7	81.7	18.3	18.3	18.3	18.3	18.3	18.3
Actuated g/C Ratio	0.67	0.62	0.62	0.73	0.68	0.68	0.15	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.07	0.69	0.07	0.56	0.42	0.05	0.75	0.01	0.82	0.43	0.06	0.20
Control Delay	2.7	20.7	2.9	19.7	10.9	0.9	74.4	39.3	39.4	51.0	40.9	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.7	20.7	2.9	19.7	10.9	0.9	74.4	39.3	39.4	51.0	40.9	5.6

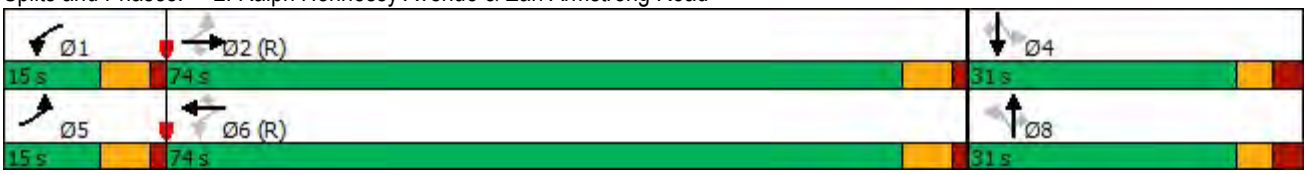
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	C	A	B	B	A	E	D	D	D	D	A
Approach Delay		19.6			11.4			50.5			32.8	
Approach LOS		B			B			D			C	
Queue Length 50th (m)	1.0	142.0	2.4	6.1	50.1	0.0	25.3	0.6	21.5	17.4	1.5	0.0
Queue Length 95th (m)	m0.8	172.3	m4.2	19.5	73.8	2.0	42.3	3.0	48.4	30.6	5.4	6.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	440	2113	893	213	2222	985	218	374	370	277	187	375
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.69	0.07	0.54	0.42	0.05	0.56	0.01	0.69	0.32	0.04	0.16

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 21.1 Intersection LOS: C
Intersection Capacity Utilization 83.2% ICU Level of Service E
Analysis Period (min) 15

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

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	65	480	5	20	195
Future Vol, veh/h	5	65	480	5	20	195
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	5	65	480	5	20	195

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	719	484	0	0	486	0
Stage 1	484	-	-	-	-	-
Stage 2	235	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	398	587	-	-	1087	-
Stage 1	624	-	-	-	-	-
Stage 2	809	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	390	586	-	-	1086	-
Mov Cap-2 Maneuver	390	-	-	-	-	-
Stage 1	623	-	-	-	-	-
Stage 2	794	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.3	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	566	1086	-
HCM Lane V/C Ratio	-	-	0.124	0.018	-
HCM Control Delay (s)	-	-	12.3	8.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	88	13	0	8	23	46	0	351	4	27	127	46
Future Vol, veh/h	88	13	0	8	23	46	0	351	4	27	127	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	88	13	0	8	23	46	0	351	4	27	127	46

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	592	559	150	564	580	353	173	0	0	355	0	0
Stage 1	204	204	-	353	353	-	-	-	-	-	-	-
Stage 2	388	355	-	211	227	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	421	440	902	439	428	695	1416	-	-	1215	-	-
Stage 1	803	737	-	668	634	-	-	-	-	-	-	-
Stage 2	640	633	-	796	720	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	370	430	902	421	419	695	1416	-	-	1215	-	-
Mov Cap-2 Maneuver	370	430	-	421	419	-	-	-	-	-	-	-
Stage 1	803	721	-	668	634	-	-	-	-	-	-	-
Stage 2	576	633	-	764	704	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18	12.6	0	1.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1416	-	-	377	550	1215	-	-
HCM Lane V/C Ratio	-	-	-	0.268	0.14	0.022	-	-
HCM Control Delay (s)	0	-	-	18	12.6	8	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.1	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	107	0	0	248	87	48
Future Vol, veh/h	107	0	0	248	87	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	12	37	0
Mvmt Flow	107	0	0	248	87	48

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	359	111	135	0	-	0
Stage 1	111	-	-	-	-	-
Stage 2	248	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	644	948	1462	-	-	-
Stage 1	919	-	-	-	-	-
Stage 2	798	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	644	948	1462	-	-	-
Mov Cap-2 Maneuver	644	-	-	-	-	-
Stage 1	919	-	-	-	-	-
Stage 2	798	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1462	-	644	-	-
HCM Lane V/C Ratio	-	-	0.166	-	-
HCM Control Delay (s)	0	-	11.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	379	1168	135	222	1317	43	112	190	203	18	274	272
Future Volume (vph)	379	1168	135	222	1317	43	112	190	203	18	274	272
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.101			0.242			0.321			0.632		
Satd. Flow (perm)	182	3357	1440	439	3424	1482	571	3458	1376	1141	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			135			87			203			272
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	379	1168	135	222	1317	43	112	190	203	18	274	272
Shared Lane Traffic (%)												
Lane Group Flow (vph)	379	1168	135	222	1317	43	112	190	203	18	274	272
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	30.0	66.0	66.0	20.0	56.0	56.0	34.0	34.0	34.0	34.0	34.0	34.0
Total Split (%)	25.0%	55.0%	55.0%	16.7%	46.7%	46.7%	28.3%	28.3%	28.3%	28.3%	28.3%	28.3%
Maximum Green (s)	23.6	59.7	59.7	13.6	49.7	49.7	27.8	27.8	27.8	27.8	27.8	27.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	63.3	63.4	63.4	53.0	53.1	53.1	24.1	24.1	24.1	24.1	24.1	24.1
Actuated g/C Ratio	0.53	0.53	0.53	0.44	0.44	0.44	0.20	0.20	0.20	0.20	0.20	0.20
v/c Ratio	0.95	0.66	0.16	0.65	0.87	0.06	0.98	0.27	0.46	0.08	0.75	0.53
Control Delay	67.7	23.5	3.1	34.4	28.4	0.3	126.2	40.5	8.8	37.5	57.8	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.7	23.5	3.1	34.4	28.4	0.3	126.2	40.5	8.8	37.5	57.8	8.6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	C	A	C	C	A	F	D	A	D	E	A
Approach Delay		31.9			28.5			46.8			33.4	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	69.1	99.4	0.0	20.0	142.6	0.0	23.4	17.7	0.0	3.1	54.2	0.0
Queue Length 95th (m)	#125.0	122.1	9.1	32.1	#178.2	m0.2	#54.1	27.2	17.4	8.8	80.8	20.0
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	407	1772	824	339	1514	703	132	801	474	264	421	547
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.66	0.16	0.65	0.87	0.06	0.85	0.24	0.43	0.07	0.65	0.50

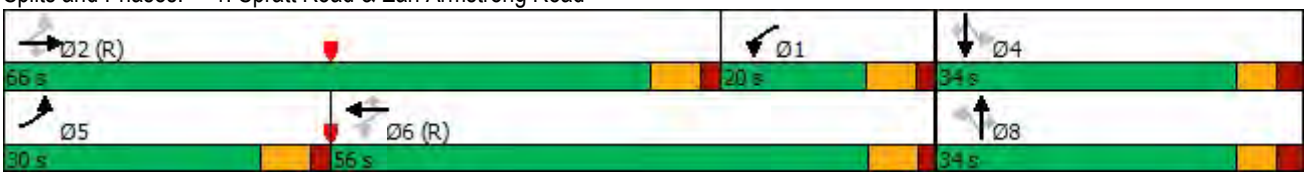
Intersection Summary

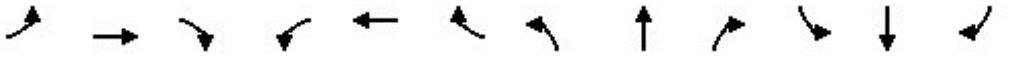
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 32.6 Intersection LOS: C
Intersection Capacity Utilization 105.6% ICU Level of Service G
Analysis Period (min) 15

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

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

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





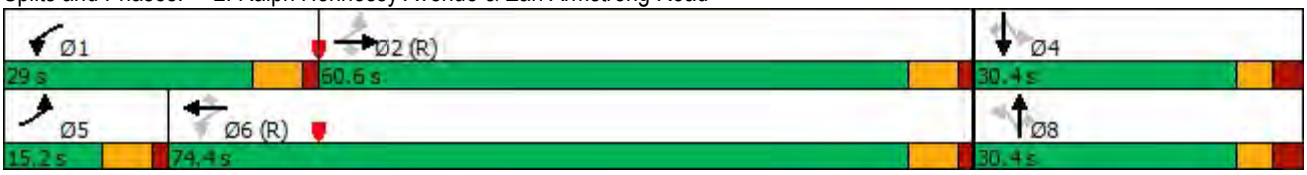
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1153	121	255	1431	103	81	1	170	31	0	60
Future Volume (vph)	92	1153	121	255	1431	103	81	1	170	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.152			0.165			0.757			0.757		
Satd. Flow (perm)	276	3293	1507	271	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			141			103			170			170
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	92	1153	121	255	1431	103	81	1	170	31	0	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	1153	121	255	1431	103	81	1	170	31	0	60
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.2	60.6	60.6	29.0	74.4	74.4	30.4	30.4	30.4	30.4	30.4	30.4
Total Split (%)	12.7%	50.5%	50.5%	24.2%	62.0%	62.0%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Maximum Green (s)	9.1	54.5	54.5	22.9	68.3	68.3	24.1	24.1	24.1	24.1	24.1	24.1
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	77.4	70.3	70.3	92.6	80.1	80.1	14.3	14.3	14.3	14.3		14.3
Actuated g/C Ratio	0.64	0.59	0.59	0.77	0.67	0.67	0.12	0.12	0.12	0.12		0.12
v/c Ratio	0.35	0.60	0.13	0.66	0.63	0.10	0.60	0.00	0.52	0.19		0.18
Control Delay	8.3	5.0	0.3	16.3	13.7	2.0	66.9	43.0	12.8	48.4		1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	8.3	5.0	0.3	16.3	13.7	2.0	66.9	43.0	12.8	48.4		1.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	B	B	A	E	D	B	D		A
Approach Delay		4.8			13.4			30.3			17.3	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	0.5	9.6	0.0	12.0	83.5	0.0	17.0	0.2	0.0	6.2		0.0
Queue Length 95th (m)	m5.1	93.8	m0.0	37.9	126.8	6.1	30.5	1.7	17.1	14.1		0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	292	1930	941	461	2285	1020	230	365	431	276		446
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.32	0.60	0.13	0.55	0.63	0.10	0.35	0.00	0.39	0.11		0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 11.4 Intersection LOS: B
Intersection Capacity Utilization 75.4% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	40	352	15	65	463
Future Vol, veh/h	5	40	352	15	65	463
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	5	40	352	15	65	463

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	953	360	0	0	367	0
Stage 1	360	-	-	-	-	-
Stage 2	593	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	290	689	-	-	1203	-
Stage 1	710	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	274	689	-	-	1203	-
Mov Cap-2 Maneuver	274	-	-	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	526	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	590	1203	-
HCM Lane V/C Ratio	-	-	0.076	0.054	-
HCM Control Delay (s)	-	-	11.6	8.2	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	73	24	0	7	21	43	0	252	8	48	326	94
Future Vol, veh/h	73	24	0	7	21	43	0	252	8	48	326	94
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	73	24	0	7	21	43	0	252	8	48	326	94

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	757	729	373	737	772	256	420	0	0	260	0	0
Stage 1	469	469	-	256	256	-	-	-	-	-	-	-
Stage 2	288	260	-	481	516	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	327	352	678	337	333	788	1150	-	-	1316	-	-
Stage 1	579	564	-	753	699	-	-	-	-	-	-	-
Stage 2	724	697	-	570	538	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	285	339	678	310	321	788	1150	-	-	1316	-	-
Mov Cap-2 Maneuver	285	339	-	310	321	-	-	-	-	-	-	-
Stage 1	579	544	-	753	699	-	-	-	-	-	-	-
Stage 2	664	697	-	525	519	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.9	13.4	0	0.8
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1150	-	-	297	498	1316	-	-
HCM Lane V/C Ratio	-	-	-	0.327	0.143	0.036	-	-
HCM Control Delay (s)	0	-	-	22.9	13.4	7.8	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.4	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1	1	1	1	1	0	1	0	0	0	0	0
Stage 1	1	1	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1027	899	1090	1027	899	-	1635	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	899	1090	1027	899	-	1635	-	-	-	-	-
Mov Cap-2 Maneuver	-	899	-	1027	899	-	-	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1635	-	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	76	0	0	184	240	93
Future Vol, veh/h	76	0	0	184	240	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	76	0	0	184	240	93

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	471	287	333	0	-	0
Stage 1	287	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	555	757	1238	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	852	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	555	757	1238	-	-	-
Mov Cap-2 Maneuver	555	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	852	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1238	-	555	-	-
HCM Lane V/C Ratio	-	-	0.137	-	-
HCM Control Delay (s)	0	-	12.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Intersection	
Int Delay, s/veh	0

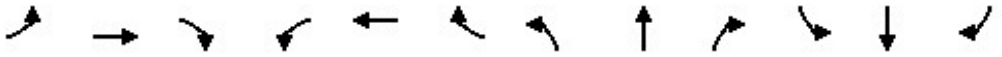
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	0	0	0	0	0	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1	1	1	1	1	0	1	0	0	0	0	0
Stage 1	1	1	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	1	1	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1027	899	1090	1027	899	-	1635	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	899	1090	1027	899	-	1635	-	-	-	-	-
Mov Cap-2 Maneuver	-	899	-	1027	899	-	-	-	-	-	-	-
Stage 1	1027	899	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	1027	899	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1635	-	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	-	-	-

Future (2024) Total Traffic

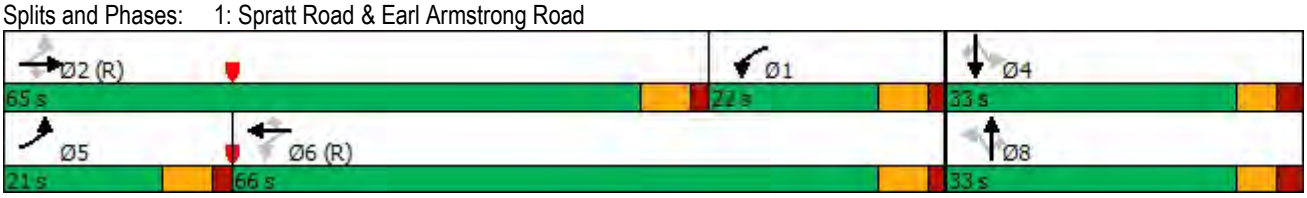


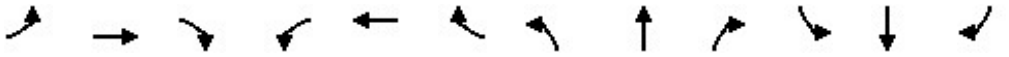
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	1116	36	116	951	19	102	124	248	51	89	324
Future Volume (vph)	171	1116	36	116	951	19	102	124	248	51	89	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.205			0.254			0.699			0.673		
Satd. Flow (perm)	345	3325	1419	308	3232	1447	1186	3458	1398	1198	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			248			300
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	171	1116	36	116	951	19	102	124	248	51	89	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	171	1116	36	116	951	19	102	124	248	51	89	324
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	21.0	65.0	65.0	22.0	66.0	66.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (%)	17.5%	54.2%	54.2%	18.3%	55.0%	55.0%	27.5%	27.5%	27.5%	27.5%	27.5%	27.5%
Maximum Green (s)	14.6	58.7	58.7	15.6	59.7	59.7	26.8	26.8	26.8	26.8	26.8	26.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	68.9	69.0	69.0	72.7	72.8	72.8	16.5	16.5	16.5	16.5	16.5	16.5
Actuated g/C Ratio	0.57	0.58	0.58	0.61	0.61	0.61	0.14	0.14	0.14	0.14	0.14	0.14
v/c Ratio	0.53	0.58	0.04	0.39	0.49	0.02	0.63	0.26	0.61	0.31	0.36	0.70
Control Delay	19.8	18.8	0.1	17.3	8.8	0.1	64.3	45.9	12.0	49.2	49.1	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.8	18.8	0.1	17.3	8.8	0.1	64.3	45.9	12.0	49.2	49.1	15.4
LOS	B	B	A	B	A	A	E	D	B	D	D	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		18.4			9.5			32.1			25.6	
Approach LOS		B			A			C			C	
Queue Length 50th (m)	16.5	75.8	0.0	5.4	23.9	0.0	21.4	12.9	0.0	10.2	17.9	4.7
Queue Length 95th (m)	32.3	113.3	0.0	19.7	102.8	m0.1	35.3	19.5	19.9	19.7	29.7	28.7
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	354	1910	852	296	1959	911	264	772	504	267	406	563
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.58	0.04	0.39	0.49	0.02	0.39	0.16	0.49	0.19	0.22	0.58

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 30 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 18.5		Intersection LOS: B	
Intersection Capacity Utilization 77.7%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1301	85	142	848	54	169	3	317	88	8	61
Future Volume (vph)	30	1301	85	142	848	54	169	3	317	88	8	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.333			0.100			0.752			0.756		
Satd. Flow (perm)	586	3390	1381	148	3262	1407	1061	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			242			139
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	30	1301	85	142	848	54	169	3	317	88	8	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1301	85	142	848	54	169	3	317	88	8	61
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	11.2	63.0	63.0	19.0	70.8	70.8	38.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	9.3%	52.5%	52.5%	15.8%	59.0%	59.0%	31.7%	31.7%	31.7%	31.7%	31.7%	31.7%
Maximum Green (s)	5.1	56.9	56.9	12.9	64.7	64.7	31.7	31.7	31.7	31.7	31.7	31.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	66.0	66.0	66.0	76.8	76.8	76.8	24.1	24.1	24.1	24.1	24.1	24.1
Actuated g/C Ratio	0.55	0.55	0.55	0.64	0.64	0.64	0.20	0.20	0.20	0.20	0.20	0.20
v/c Ratio	0.08	0.70	0.11	0.66	0.41	0.06	0.80	0.01	0.73	0.33	0.04	0.15
Control Delay	7.9	11.6	0.6	32.1	13.1	1.1	70.4	34.0	21.3	42.2	35.1	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	11.6	0.6	32.1	13.1	1.1	70.4	34.0	21.3	42.2	35.1	0.8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	C	B	A	E	C	C	D	D	A
Approach Delay		10.8			15.1			38.3			25.8	
Approach LOS		B			B			D			C	
Queue Length 50th (m)	1.2	30.7	0.0	13.1	50.2	0.0	34.7	0.5	13.8	16.3	1.4	0.0
Queue Length 95th (m)	m2.7	41.2	m0.7	#37.7	72.7	2.3	54.3	2.7	42.3	28.2	5.0	0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	368	1863	797	235	2087	930	280	480	494	356	240	499
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.70	0.11	0.60	0.41	0.06	0.60	0.01	0.64	0.25	0.03	0.12

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 17.3 Intersection LOS: B
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	65	388	5	20	181
Future Vol, veh/h	5	65	388	5	20	181
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	5	65	388	5	20	181

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	613	392	0	0	394	0
Stage 1	392	-	-	-	-	-
Stage 2	221	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	459	661	-	-	1176	-
Stage 1	687	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	451	660	-	-	1175	-
Mov Cap-2 Maneuver	451	-	-	-	-	-
Stage 1	686	-	-	-	-	-
Stage 2	807	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.3	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	639	1175	-
HCM Lane V/C Ratio	-	-	0.11	0.017	-
HCM Control Delay (s)	-	-	11.3	8.1	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	61	27	0	21	52	104	0	228	11	65	89	32
Future Vol, veh/h	61	27	0	21	52	104	0	228	11	65	89	32
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	61	27	0	21	52	104	0	228	11	65	89	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	547	474	105	483	485	234	121	0	0	239	0	0
Stage 1	235	235	-	234	234	-	-	-	-	-	-	-
Stage 2	312	239	-	249	251	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	451	492	955	497	485	810	1479	-	-	1340	-	-
Stage 1	773	714	-	774	715	-	-	-	-	-	-	-
Stage 2	703	711	-	759	703	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	346	468	955	458	461	810	1479	-	-	1340	-	-
Mov Cap-2 Maneuver	346	468	-	458	461	-	-	-	-	-	-	-
Stage 1	773	679	-	774	715	-	-	-	-	-	-	-
Stage 2	568	711	-	693	669	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.5	13.2	0	2.7
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1479	-	-	376	617	1340	-	-
HCM Lane V/C Ratio	-	-	-	0.234	0.287	0.049	-	-
HCM Control Delay (s)	0	-	-	17.5	13.2	7.8	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	1.2	0.2	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	48	0	0	0	0	0	0	60	0	0	28	22
Future Vol, veh/h	48	0	0	0	0	0	0	60	0	0	28	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	48	0	0	0	0	0	0	60	0	0	28	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	99	99	39	99	110	60	50	0	0	60	0	0
Stage 1	39	39	-	60	60	-	-	-	-	-	-	-
Stage 2	60	60	-	39	50	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	888	795	1038	888	784	1011	1570	-	-	1556	-	-
Stage 1	981	866	-	957	849	-	-	-	-	-	-	-
Stage 2	957	849	-	981	857	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	888	795	1038	888	784	1011	1570	-	-	1556	-	-
Mov Cap-2 Maneuver	888	795	-	888	784	-	-	-	-	-	-	-
Stage 1	981	866	-	957	849	-	-	-	-	-	-	-
Stage 2	957	849	-	981	857	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1570	-	-	888	-	1556	-	-
HCM Lane V/C Ratio	-	-	-	0.054	-	-	-	-
HCM Control Delay (s)	0	-	-	9.3	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0	-	-

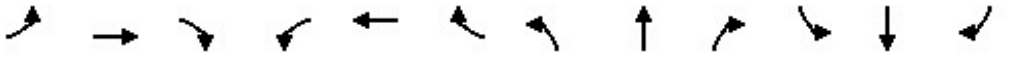
Intersection	
Int Delay, s/veh	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	94	0	0	114	74	43
Future Vol, veh/h	94	0	0	114	74	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	12	37	0
Mvmt Flow	94	0	0	114	74	43

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	210	96	117	0	-	0
Stage 1	96	-	-	-	-	-
Stage 2	114	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	783	966	1484	-	-	-
Stage 1	933	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	783	966	1484	-	-	-
Mov Cap-2 Maneuver	783	-	-	-	-	-
Stage 1	933	-	-	-	-	-
Stage 2	916	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1484	-	783	-	-
HCM Lane V/C Ratio	-	-	0.12	-	-
HCM Control Delay (s)	0	-	10.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	379	1091	118	210	1204	43	101	160	200	18	212	272
Future Volume (vph)	379	1091	118	210	1204	43	101	160	200	18	212	272
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.101			0.245			0.403			0.651		
Satd. Flow (perm)	182	3357	1440	445	3424	1482	717	3458	1376	1175	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			118			145			200			272
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	379	1091	118	210	1204	43	101	160	200	18	212	272
Shared Lane Traffic (%)												
Lane Group Flow (vph)	379	1091	118	210	1204	43	101	160	200	18	212	272
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	33.4	61.0	61.0	20.0	47.6	47.6	39.0	39.0	39.0	39.0	39.0	39.0
Total Split (%)	27.8%	50.8%	50.8%	16.7%	39.7%	39.7%	32.5%	32.5%	32.5%	32.5%	32.5%	32.5%
Maximum Green (s)	27.0	54.7	54.7	13.6	41.3	41.3	32.8	32.8	32.8	32.8	32.8	32.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	87.3	69.3	69.3	67.0	55.4	55.4	20.1	20.1	20.1	20.1	20.1	20.1
Actuated g/C Ratio	0.73	0.58	0.58	0.56	0.46	0.46	0.17	0.17	0.17	0.17	0.17	0.17
v/c Ratio	0.83	0.56	0.13	0.56	0.76	0.06	0.84	0.28	0.50	0.09	0.70	0.58
Control Delay	42.0	19.1	3.4	17.4	25.6	0.2	95.7	43.3	9.9	39.9	58.5	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	19.1	3.4	17.4	25.6	0.2	95.7	43.3	9.9	39.9	58.5	9.8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B	A	B	C	A	F	D	A	D	E	A
Approach Delay		23.4			23.7			40.3			31.4	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	54.6	71.9	0.0	10.9	59.5	0.0	21.7	16.2	0.0	3.4	44.2	0.0
Queue Length 95th (m)	90.1	120.9	9.3	39.1	#179.6	m0.1	37.7	23.1	16.9	8.6	61.6	19.6
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	496	1938	881	413	1581	762	195	945	521	321	497	597
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.56	0.13	0.51	0.76	0.06	0.52	0.17	0.38	0.06	0.43	0.46

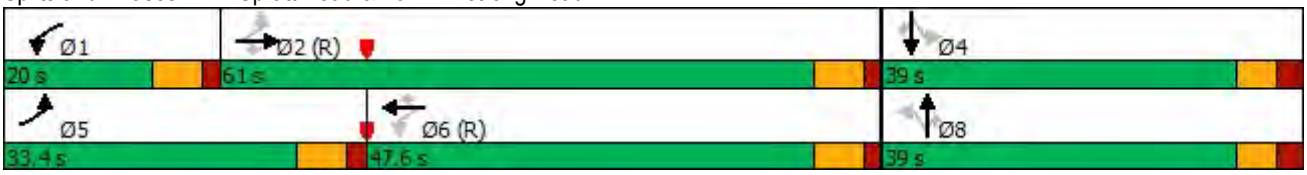
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 26.5 Intersection LOS: C
Intersection Capacity Utilization 99.2% 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: 1: Spratt Road & Earl Armstrong Road



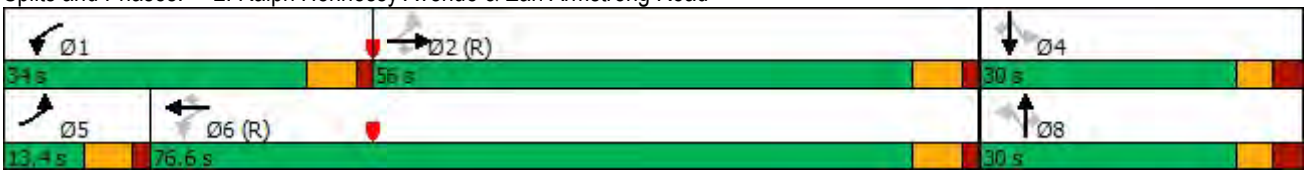
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1039	170	316	1278	103	116	1	213	31	0	60
Future Volume (vph)	92	1039	170	316	1278	103	116	1	213	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.196			0.181			0.757			0.757		
Satd. Flow (perm)	355	3293	1507	297	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			170			103			213			163
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	92	1039	170	316	1278	103	116	1	213	31	0	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	1039	170	316	1278	103	116	1	213	31	0	60
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	13.4	56.0	56.0	34.0	76.6	76.6	30.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	11.2%	46.7%	46.7%	28.3%	63.8%	63.8%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Maximum Green (s)	7.3	49.9	49.9	27.9	70.5	70.5	23.7	23.7	23.7	23.7	23.7	23.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	71.3	64.4	64.4	90.2	77.4	77.4	17.2	17.2	17.2	17.2		17.2
Actuated g/C Ratio	0.59	0.54	0.54	0.75	0.64	0.64	0.14	0.14	0.14	0.14		0.14
v/c Ratio	0.32	0.59	0.19	0.73	0.58	0.10	0.71	0.00	0.54	0.16		0.17
Control Delay	5.4	9.1	0.5	21.4	14.2	2.2	70.9	40.0	11.0	44.4		1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	5.4	9.1	0.5	21.4	14.2	2.2	70.9	40.0	11.0	44.4		1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	C	B	A	E	D	B	D		A
Approach Delay		7.7			14.8			32.1			15.8	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	2.0	17.1	0.1	21.6	77.2	0.0	24.2	0.2	0.0	6.0		0.0
Queue Length 95th (m)	5.0	25.7	0.5	54.3	110.7	6.4	40.5	1.6	18.4	13.5		0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	297	1766	886	516	2209	989	226	359	461	272		436
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.31	0.59	0.19	0.61	0.58	0.10	0.51	0.00	0.46	0.11		0.14

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 32 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 13.8 Intersection LOS: B
Intersection Capacity Utilization 77.7% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	40	308	15	65	372
Future Vol, veh/h	5	40	308	15	65	372
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	5	40	308	15	65	372

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	818	316	0	0	323	0
Stage 1	316	-	-	-	-	-
Stage 2	502	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	348	729	-	-	1248	-
Stage 1	744	-	-	-	-	-
Stage 2	612	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	330	729	-	-	1248	-
Mov Cap-2 Maneuver	330	-	-	-	-	-
Stage 1	744	-	-	-	-	-
Stage 2	580	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	1.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	643	1248	-
HCM Lane V/C Ratio	-	-	0.07	0.052	-
HCM Control Delay (s)	-	-	11	8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	51	53	0	17	43	86	0	186	22	131	177	69
Future Vol, veh/h	51	53	0	17	43	86	0	186	22	131	177	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	51	53	0	17	43	86	0	186	22	131	177	69

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	736	682	212	697	705	197	246	0	0	208	0	0
Stage 1	474	474	-	197	197	-	-	-	-	-	-	-
Stage 2	262	208	-	500	508	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	337	375	833	358	363	849	1332	-	-	1375	-	-
Stage 1	575	561	-	809	742	-	-	-	-	-	-	-
Stage 2	747	734	-	557	542	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	253	339	833	293	329	849	1332	-	-	1375	-	-
Mov Cap-2 Maneuver	253	339	-	293	329	-	-	-	-	-	-	-
Stage 1	575	508	-	809	742	-	-	-	-	-	-	-
Stage 2	632	734	-	451	491	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.1	15.1	0	2.7
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1332	-	-	291	503	1375	-	-
HCM Lane V/C Ratio	-	-	-	0.357	0.29	0.095	-	-
HCM Control Delay (s)	0	-	-	24.1	15.1	7.9	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.6	1.2	0.3	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	35	0	0	0	0	0	0	43	0	0	61	49
Future Vol, veh/h	35	0	0	0	0	0	0	43	0	0	61	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	35	0	0	0	0	0	0	43	0	0	61	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	129	129	86	129	153	43	110	0	0	43	0	0
Stage 1	86	86	-	43	43	-	-	-	-	-	-	-
Stage 2	43	43	-	86	110	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	849	765	978	849	742	1033	1493	-	-	1579	-	-
Stage 1	927	827	-	976	863	-	-	-	-	-	-	-
Stage 2	976	863	-	927	808	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	849	765	978	849	742	1033	1493	-	-	1579	-	-
Mov Cap-2 Maneuver	849	765	-	849	742	-	-	-	-	-	-	-
Stage 1	927	827	-	976	863	-	-	-	-	-	-	-
Stage 2	976	863	-	927	808	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.4	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1493	-	-	849	-	1579	-	-
HCM Lane V/C Ratio	-	-	-	0.041	-	-	-	-
HCM Control Delay (s)	0	-	-	9.4	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-	0	-	-

Intersection	
Int Delay, s/veh	1.9

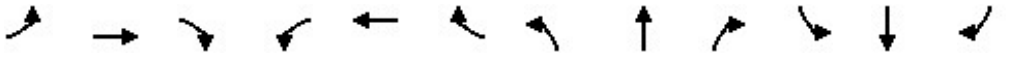
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	68	0	0	126	104	87
Future Vol, veh/h	68	0	0	126	104	87
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	0
Mvmt Flow	68	0	0	126	104	87

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	274	148	191	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	126	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	720	904	1395	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	905	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	720	904	1395	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	905	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1395	-	720	-	-
HCM Lane V/C Ratio	-	-	0.094	-	-
HCM Control Delay (s)	0	-	10.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Future (2026) Total Traffic

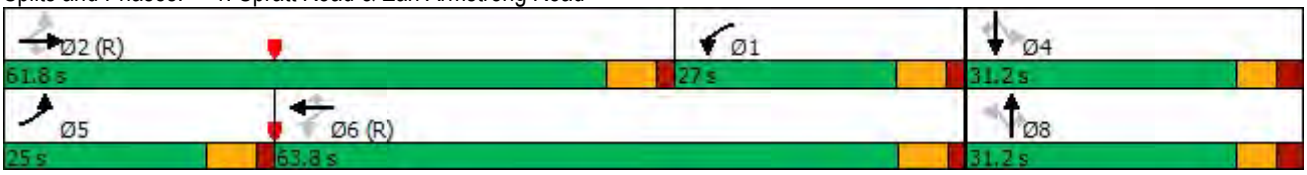


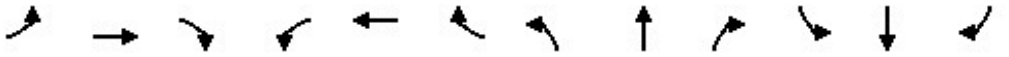
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	1196	50	165	998	19	129	210	302	51	107	324
Future Volume (vph)	172	1196	50	165	998	19	129	210	302	51	107	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor						0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.162			0.208			0.681			0.607		
Satd. Flow (perm)	273	3325	1419	252	3232	1447	1155	3458	1398	1081	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			302			324
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	172	1196	50	165	998	19	129	210	302	51	107	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	172	1196	50	165	998	19	129	210	302	51	107	324
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	25.0	61.8	61.8	27.0	63.8	63.8	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	20.8%	51.5%	51.5%	22.5%	53.2%	53.2%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
Maximum Green (s)	18.6	55.5	55.5	20.6	57.5	57.5	25.0	25.0	25.0	25.0	25.0	25.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	61.5	61.6	61.6	69.0	69.1	69.1	18.9	18.9	18.9	18.9	18.9	18.9
Actuated g/C Ratio	0.51	0.51	0.51	0.58	0.58	0.58	0.16	0.16	0.16	0.16	0.16	0.16
v/c Ratio	0.60	0.70	0.06	0.55	0.54	0.02	0.71	0.39	0.64	0.30	0.37	0.64
Control Delay	26.7	26.0	1.1	28.8	11.3	0.1	68.1	46.2	11.2	47.1	47.4	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	26.0	1.1	28.8	11.3	0.1	68.1	46.2	11.2	47.1	47.4	10.7
LOS	C	C	A	C	B	A	E	D	B	D	D	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		25.2			13.5			34.1			22.7	
Approach LOS		C			B			C			C	
Queue Length 50th (m)	19.9	101.1	0.0	14.2	27.4	0.0	26.7	21.6	0.0	9.9	20.9	0.0
Queue Length 95th (m)	35.6	137.2	1.9	m37.0	112.2	m0.0	43.9	30.6	22.3	19.9	34.6	22.4
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	345	1707	771	299	1860	870	240	720	530	225	379	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.70	0.06	0.55	0.54	0.02	0.54	0.29	0.57	0.23	0.28	0.57

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 30 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 22.7		Intersection LOS: C	
Intersection Capacity Utilization 82.9%		ICU Level of Service E	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





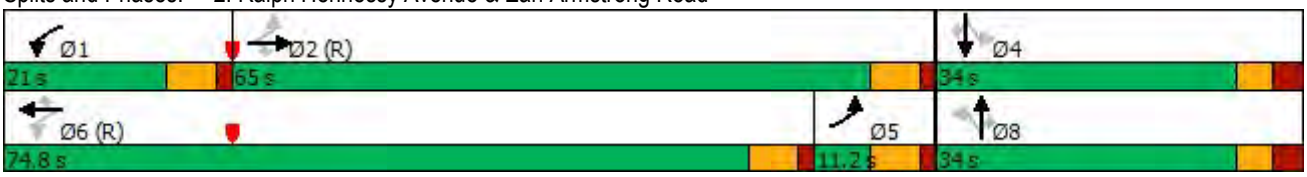
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1434	87	161	940	54	170	3	354	88	8	61
Future Volume (vph)	30	1434	87	161	940	54	170	3	354	88	8	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.304			0.069			0.752			0.756		
Satd. Flow (perm)	535	3390	1381	102	3262	1407	1061	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			256			139
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	30	1434	87	161	940	54	170	3	354	88	8	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1434	87	161	940	54	170	3	354	88	8	61
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	11.2	65.0	65.0	21.0	74.8	74.8	34.0	34.0	34.0	34.0	34.0	34.0
Total Split (%)	9.3%	54.2%	54.2%	17.5%	62.3%	62.3%	28.3%	28.3%	28.3%	28.3%	28.3%	28.3%
Maximum Green (s)	5.1	58.9	58.9	14.9	68.7	68.7	27.7	27.7	27.7	27.7	27.7	27.7
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	65.7	65.7	65.7	77.6	77.6	77.6	23.3	23.3	23.3	23.3	23.3	23.3
Actuated g/C Ratio	0.55	0.55	0.55	0.65	0.65	0.65	0.19	0.19	0.19	0.19	0.19	0.19
v/c Ratio	0.09	0.77	0.11	0.80	0.45	0.06	0.83	0.01	0.81	0.34	0.05	0.15
Control Delay	4.8	9.3	0.4	54.5	12.9	1.0	76.4	36.0	27.8	43.9	37.1	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.8	9.3	0.4	54.5	12.9	1.0	76.4	36.0	27.8	43.9	37.1	0.8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A	A	D	B	A	E	D	C	D	D	A
Approach Delay		8.7			18.2			43.5			26.8	
Approach LOS		A			B			D			C	
Queue Length 50th (m)	0.9	24.5	0.0	22.5	58.4	0.0	34.8	0.5	19.7	16.2	1.4	0.0
Queue Length 95th (m)	m1.6	33.9	m0.5	#51.8	76.3	2.1	#61.2	2.9	55.0	29.6	5.2	0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	341	1856	794	227	2109	939	244	420	473	311	210	453
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.77	0.11	0.71	0.45	0.06	0.70	0.01	0.75	0.28	0.04	0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 88.9% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	65	554	5	20	262
Future Vol, veh/h	5	65	554	5	20	262
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	5	65	554	5	20	262

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	860	558	0	0	560	0
Stage 1	558	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	329	533	-	-	1021	-
Stage 1	577	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	322	532	-	-	1020	-
Mov Cap-2 Maneuver	322	-	-	-	-	-
Stage 1	576	-	-	-	-	-
Stage 2	740	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	508	1020	-
HCM Lane V/C Ratio	-	-	0.138	0.02	-
HCM Control Delay (s)	-	-	13.2	8.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	12.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	93	44	0	19	86	187	0	278	10	95	123	49
Future Vol, veh/h	93	44	0	19	86	187	0	278	10	95	123	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	93	44	0	19	86	187	0	278	10	95	123	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	758	626	148	643	645	283	172	0	0	288	0	0
Stage 1	338	338	-	283	283	-	-	-	-	-	-	-
Stage 2	420	288	-	360	362	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	326	403	904	389	393	761	1417	-	-	1286	-	-
Stage 1	681	644	-	728	681	-	-	-	-	-	-	-
Stage 2	615	677	-	662	629	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	190	373	904	334	364	761	1417	-	-	1286	-	-
Mov Cap-2 Maneuver	190	373	-	334	364	-	-	-	-	-	-	-
Stage 1	681	596	-	728	681	-	-	-	-	-	-	-
Stage 2	405	677	-	568	582	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	42.8	19.1	0	2.9
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1417	-	-	226	542	1286	-	-
HCM Lane V/C Ratio	-	-	-	0.606	0.539	0.074	-	-
HCM Control Delay (s)	0	-	-	42.8	19.1	8	-	-
HCM Lane LOS	A	-	-	E	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	3.5	3.2	0.2	-	-

Intersection	
Intersection Delay, s/veh	13.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	93	44	0	19	86	187	0	278	10	95	123	49
Future Vol, veh/h	93	44	0	19	86	187	0	278	10	95	123	49
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	0	0	12	0	0	37	0
Mvmt Flow	93	44	0	19	86	187	0	278	10	95	123	49
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	11.4	13	15.8	12
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	0%	68%	7%	100%	0%
Vol Thru, %	100%	97%	32%	29%	0%	72%
Vol Right, %	0%	3%	0%	64%	0%	28%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	288	137	292	95	172
LT Vol	0	0	93	19	95	0
Through Vol	0	278	44	86	0	123
RT Vol	0	10	0	187	0	49
Lane Flow Rate	0	288	137	292	95	172
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0	0.512	0.24	0.446	0.178	0.32
Departure Headway (Hd)	6.222	6.405	6.31	5.504	6.759	6.688
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	562	564	651	528	535
Service Time	3.989	4.172	4.397	3.576	4.53	4.459
HCM Lane V/C Ratio	0	0.512	0.243	0.449	0.18	0.321
HCM Control Delay	9	15.8	11.4	13	11	12.6
HCM Lane LOS	N	C	B	B	B	B
HCM 95th-tile Q	0	2.9	0.9	2.3	0.6	1.4

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	49	0	0	0	0	0	0	98	0	0	47	23
Future Vol, veh/h	49	0	0	0	0	0	0	98	0	0	47	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	49	0	0	0	0	0	0	98	0	0	47	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	157	157	59	157	168	98	70	0	0	98	0	0
Stage 1	59	59	-	98	98	-	-	-	-	-	-	-
Stage 2	98	98	-	59	70	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	814	739	1012	814	728	963	1544	-	-	1508	-	-
Stage 1	958	850	-	913	818	-	-	-	-	-	-	-
Stage 2	913	818	-	958	841	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	814	739	1012	814	728	963	1544	-	-	1508	-	-
Mov Cap-2 Maneuver	814	739	-	814	728	-	-	-	-	-	-	-
Stage 1	958	850	-	913	818	-	-	-	-	-	-	-
Stage 2	913	818	-	958	841	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.7	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1544	-	-	814	-	1508	-	-
HCM Lane V/C Ratio	-	-	-	0.06	-	-	-	-
HCM Control Delay (s)	0	-	-	9.7	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0	-	-

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	117	19	0	39	39	39	0	107	19	19	59	52
Future Vol, veh/h	117	19	0	39	39	39	0	107	19	19	59	52
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	117	19	0	39	39	39	0	107	19	19	59	52

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	279	249	85	250	266	117	111	0	0	126	0	0
Stage 1	123	123	-	117	117	-	-	-	-	-	-	-
Stage 2	156	126	-	133	149	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	677	657	980	708	643	941	1492	-	-	1473	-	-
Stage 1	886	798	-	892	803	-	-	-	-	-	-	-
Stage 2	851	796	-	875	778	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	612	648	980	685	634	941	1492	-	-	1473	-	-
Mov Cap-2 Maneuver	612	648	-	685	634	-	-	-	-	-	-	-
Stage 1	886	787	-	892	803	-	-	-	-	-	-	-
Stage 2	776	796	-	842	767	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	10.9	0	1.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1492	-	-	617	732	1473	-	-
HCM Lane V/C Ratio	-	-	-	0.22	0.16	0.013	-	-
HCM Control Delay (s)	0	-	-	12.5	10.9	7.5	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.6	0	-	-

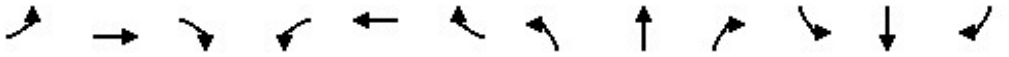
Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	49	0	0	0	0	0	0	24	0	0	12	23
Future Vol, veh/h	49	0	0	0	0	0	0	24	0	0	12	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	49	0	0	0	0	0	0	24	0	0	12	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	48	48	24	48	59	24	35	0	0	24	0	0
Stage 1	24	24	-	24	24	-	-	-	-	-	-	-
Stage 2	24	24	-	24	35	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	958	847	1058	958	836	1058	1589	-	-	1604	-	-
Stage 1	999	879	-	999	879	-	-	-	-	-	-	-
Stage 2	999	879	-	999	870	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	958	847	1058	958	836	1058	1589	-	-	1604	-	-
Mov Cap-2 Maneuver	958	847	-	958	836	-	-	-	-	-	-	-
Stage 1	999	879	-	999	879	-	-	-	-	-	-	-
Stage 2	999	879	-	999	870	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1589	-	-	958	-	1604	-	-
HCM Lane V/C Ratio	-	-	-	0.051	-	-	-	-
HCM Control Delay (s)	0	-	-	9	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0	-	-



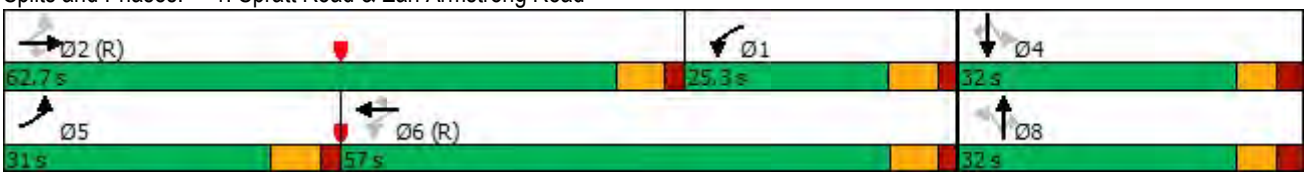
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	380	1156	144	308	1289	43	122	226	241	18	254	272
Future Volume (vph)	380	1156	144	308	1289	43	122	226	241	18	254	272
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.115			0.245			0.357			0.595		
Satd. Flow (perm)	207	3357	1440	445	3424	1482	635	3458	1376	1075	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			144			87			241			272
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	380	1156	144	308	1289	43	122	226	241	18	254	272
Shared Lane Traffic (%)												
Lane Group Flow (vph)	380	1156	144	308	1289	43	122	226	241	18	254	272
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	31.0	62.7	62.7	25.3	57.0	57.0	32.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	25.8%	52.3%	52.3%	21.1%	47.5%	47.5%	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%
Maximum Green (s)	24.6	56.4	56.4	18.9	50.7	50.7	25.8	25.8	25.8	25.8	25.8	25.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	58.4	58.5	58.5	53.5	53.6	53.6	23.7	23.7	23.7	23.7	23.7	23.7
Actuated g/C Ratio	0.49	0.49	0.49	0.45	0.45	0.45	0.20	0.20	0.20	0.20	0.20	0.20
v/c Ratio	0.95	0.71	0.19	0.77	0.84	0.06	0.98	0.33	0.52	0.08	0.71	0.54
Control Delay	68.4	27.5	3.5	38.3	24.7	0.2	123.0	42.2	9.2	39.1	56.1	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.4	27.5	3.5	38.3	24.7	0.2	123.0	42.2	9.2	39.1	56.1	8.9

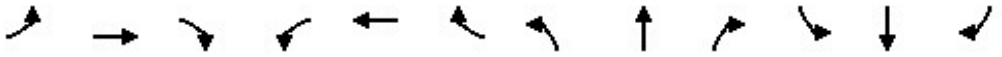
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	C	A	D	C	A	F	D	A	D	E	A
Approach Delay		34.7			26.6			45.4			31.9	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	68.5	104.0	0.0	40.1	136.7	0.1	25.9	21.8	0.0	3.2	50.6	0.0
Queue Length 95th (m)	#122.1	127.7	9.9	#71.4	#114.1	m0.1	#59.5	32.3	19.6	9.0	76.4	20.5
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	412	1637	776	400	1530	710	136	743	485	231	391	527
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.71	0.19	0.77	0.84	0.06	0.90	0.30	0.50	0.08	0.65	0.52

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 30 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 32.8 Intersection LOS: C
Intersection Capacity Utilization 103.8% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





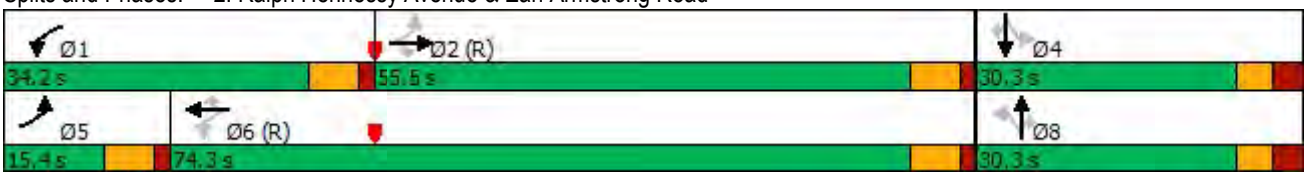
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1139	171	355	1456	103	118	1	243	31	0	60
Future Volume (vph)	92	1139	171	355	1456	103	118	1	243	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.157			0.132			0.757			0.757		
Satd. Flow (perm)	285	3293	1507	216	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			171			103			243			171
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	92	1139	171	355	1456	103	118	1	243	31	0	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	1139	171	355	1456	103	118	1	243	31	0	60
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.4	55.5	55.5	34.2	74.3	74.3	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (%)	12.8%	46.3%	46.3%	28.5%	61.9%	61.9%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Maximum Green (s)	9.3	49.4	49.4	28.1	68.2	68.2	24.0	24.0	24.0	24.0	24.0	24.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	66.2	58.9	58.9	90.3	76.8	76.8	17.3	17.3	17.3	17.3		17.3
Actuated g/C Ratio	0.55	0.49	0.49	0.75	0.64	0.64	0.14	0.14	0.14	0.14		0.14
v/c Ratio	0.38	0.70	0.21	0.80	0.66	0.10	0.72	0.00	0.58	0.16		0.16
Control Delay	10.1	10.4	0.5	34.8	16.5	2.4	71.0	40.0	11.0	44.1		0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	10.1	10.4	0.5	34.8	16.5	2.4	71.0	40.0	11.0	44.1		0.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	B	A	C	B	A	E	D	B	D		A
Approach Delay		9.2			19.1			30.7			15.7	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	1.6	19.7	0.0	43.5	96.4	0.0	24.7	0.2	0.0	6.0		0.0
Queue Length 95th (m)	m2.4	82.3	m0.0	#82.9	144.3	6.7	40.9	1.6	19.6	13.5		0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	273	1616	826	484	2192	983	229	364	489	275		446
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.34	0.70	0.21	0.73	0.66	0.10	0.52	0.00	0.50	0.11		0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 16.5 Intersection LOS: B
Intersection Capacity Utilization 83.0% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	40	435	15	65	538
Future Vol, veh/h	5	40	435	15	65	538
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	5	40	435	15	65	538

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1111	443	0	0	450	0
Stage 1	443	-	-	-	-	-
Stage 2	668	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	233	619	-	-	1121	-
Stage 1	651	-	-	-	-	-
Stage 2	513	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	219	619	-	-	1121	-
Mov Cap-2 Maneuver	219	-	-	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	483	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	515	1121	-
HCM Lane V/C Ratio	-	-	0.087	0.058	-
HCM Control Delay (s)	-	-	12.7	8.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.2	-

Intersection	
Int Delay, s/veh	26.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	77	89	0	16	70	150	0	223	20	192	250	100
Future Vol, veh/h	77	89	0	16	70	150	0	223	20	192	250	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	250	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	77	89	0	16	70	150	0	223	20	192	250	100

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1027	927	300	962	967	233	350	0	0	243	0	0
Stage 1	684	684	-	233	233	-	-	-	-	-	-	-
Stage 2	343	243	-	729	734	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	215	270	744	237	256	811	1220	-	-	1335	-	-
Stage 1	442	452	-	775	716	-	-	-	-	-	-	-
Stage 2	676	708	-	417	429	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	118	231	744	149	219	811	1220	-	-	1335	-	-
Mov Cap-2 Maneuver	118	231	-	149	219	-	-	-	-	-	-	-
Stage 1	442	387	-	775	716	-	-	-	-	-	-	-
Stage 2	497	708	-	275	367	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	138.8	27.9	0	2.9
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1220	-	-	160	386	1335	-	-
HCM Lane V/C Ratio	-	-	-	1.038	0.611	0.144	-	-
HCM Control Delay (s)	0	-	-	138.8	27.9	8.1	-	-
HCM Lane LOS	A	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	8.3	3.9	0.5	-	-

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	77	89	0	16	70	150	0	223	20	192	250	100
Future Vol, veh/h	77	89	0	16	70	150	0	223	20	192	250	100
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	0	0	5	0	0	5	0
Mvmt Flow	77	89	0	16	70	150	0	223	20	192	250	100
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	12.8	13.3	15.1	16.2
HCM LOS	B	B	C	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	0%	46%	7%	100%	0%
Vol Thru, %	100%	92%	54%	30%	0%	71%
Vol Right, %	0%	8%	0%	64%	0%	29%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	243	166	236	192	350
LT Vol	0	0	77	16	192	0
Through Vol	0	223	89	70	0	250
RT Vol	0	20	0	150	0	100
Lane Flow Rate	0	243	166	236	192	350
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0	0.456	0.311	0.403	0.363	0.601
Departure Headway (Hd)	6.736	6.753	6.743	6.143	6.807	6.181
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	535	533	588	530	585
Service Time	4.466	4.494	4.787	4.159	4.524	3.898
HCM Lane V/C Ratio	0	0.454	0.311	0.401	0.362	0.598
HCM Control Delay	9.5	15.1	12.8	13.3	13.4	17.8
HCM Lane LOS	N	C	B	B	B	C
HCM 95th-tile Q	0	2.4	1.3	1.9	1.6	4

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	37	0	0	0	0	0	0	74	0	0	100	50
Future Vol, veh/h	37	0	0	0	0	0	0	74	0	0	100	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	37	0	0	0	0	0	0	74	0	0	100	50

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	199	199	125	199	224	74	150	0	0	74	0	0
Stage 1	125	125	-	74	74	-	-	-	-	-	-	-
Stage 2	74	74	-	125	150	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	764	700	931	764	678	993	1444	-	-	1538	-	-
Stage 1	884	796	-	940	837	-	-	-	-	-	-	-
Stage 2	940	837	-	884	777	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	764	700	931	764	678	993	1444	-	-	1538	-	-
Mov Cap-2 Maneuver	764	700	-	764	678	-	-	-	-	-	-	-
Stage 1	884	796	-	940	837	-	-	-	-	-	-	-
Stage 2	940	837	-	884	777	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10	0	0	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1444	-	-	764	-	1538	-	-
HCM Lane V/C Ratio	-	-	-	0.048	-	-	-	-
HCM Control Delay (s)	0	-	-	10	0	0	-	-
HCM Lane LOS	A	-	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	83	40	0	29	29	29	0	112	40	40	100	101
Future Vol, veh/h	83	40	0	29	29	29	0	112	40	40	100	101
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	83	40	0	29	29	29	0	112	40	40	100	101

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	392	383	151	383	413	132	201	0	0	152	0	0
Stage 1	231	231	-	132	132	-	-	-	-	-	-	-
Stage 2	161	152	-	251	281	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	571	553	901	579	532	923	1383	-	-	1441	-	-
Stage 1	776	717	-	876	791	-	-	-	-	-	-	-
Stage 2	846	775	-	758	682	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	516	535	901	533	515	923	1383	-	-	1441	-	-
Mov Cap-2 Maneuver	516	535	-	533	515	-	-	-	-	-	-	-
Stage 1	776	694	-	876	791	-	-	-	-	-	-	-
Stage 2	789	775	-	691	660	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14	11.9	0	1.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1383	-	-	522	612	1441	-	-
HCM Lane V/C Ratio	-	-	-	0.236	0.142	0.028	-	-
HCM Control Delay (s)	0	-	-	14	11.9	7.6	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	2.6

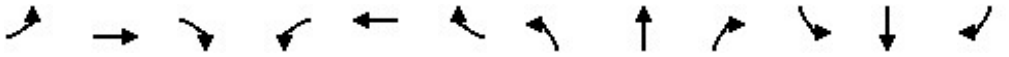
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	37	0	0	0	0	0	0	18	0	0	25	50
Future Vol, veh/h	37	0	0	0	0	0	0	18	0	0	25	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	37	0	0	0	0	0	0	18	0	0	25	50

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	68	68	50	68	93	18	75	0	0	18	0	0
Stage 1	50	50	-	18	18	-	-	-	-	-	-	-
Stage 2	18	18	-	50	75	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	930	826	1024	930	801	1066	1537	-	-	1612	-	-
Stage 1	968	857	-	1006	884	-	-	-	-	-	-	-
Stage 2	1006	884	-	968	836	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	930	826	1024	930	801	1066	1537	-	-	1612	-	-
Mov Cap-2 Maneuver	930	826	-	930	801	-	-	-	-	-	-	-
Stage 1	968	857	-	1006	884	-	-	-	-	-	-	-
Stage 2	1006	884	-	968	836	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1537	-	-	930	-	1612	-	-
HCM Lane V/C Ratio	-	-	-	0.04	-	-	-	-
HCM Control Delay (s)	0	-	-	9	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-	0	-	-

Future (2031) Total Traffic

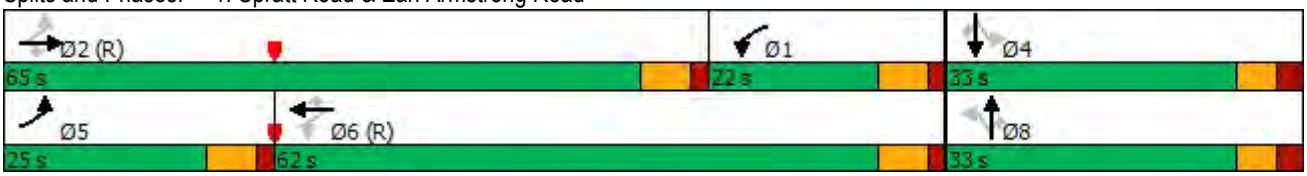


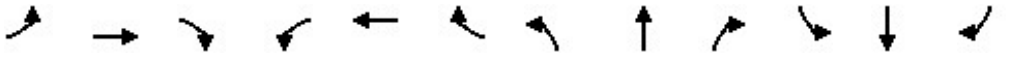
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	1251	52	164	1046	19	140	269	327	51	121	324
Future Volume (vph)	171	1251	52	164	1046	19	140	269	327	51	121	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor						0.98	1.00		0.99	1.00		0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1601	3325	1419	1153	3232	1473	1616	3458	1419	1695	1820	1502
Flt Permitted	0.151			0.196			0.648			0.522		
Satd. Flow (perm)	254	3325	1419	238	3232	1447	1100	3458	1398	930	1820	1480
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			87			277			324
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	4					4	2		2	2		2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	4%	9%	50%	7%	5%	7%	0%	9%	2%	0%	3%
Adj. Flow (vph)	171	1251	52	164	1046	19	140	269	327	51	121	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	171	1251	52	164	1046	19	140	269	327	51	121	324
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	11.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	25.0	65.0	65.0	22.0	62.0	62.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (%)	20.8%	54.2%	54.2%	18.3%	51.7%	51.7%	27.5%	27.5%	27.5%	27.5%	27.5%	27.5%
Maximum Green (s)	18.6	58.7	58.7	15.6	55.7	55.7	26.8	26.8	26.8	26.8	26.8	26.8
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		0	0		4	4	2	2	2	2	2	2
Act Effct Green (s)	64.7	64.8	64.8	67.4	67.5	67.5	20.7	20.7	20.7	20.7	20.7	20.7
Actuated g/C Ratio	0.54	0.54	0.54	0.56	0.56	0.56	0.17	0.17	0.17	0.17	0.17	0.17
v/c Ratio	0.61	0.70	0.06	0.65	0.58	0.02	0.74	0.45	0.70	0.32	0.39	0.62
Control Delay	25.5	24.1	1.1	35.8	12.1	0.1	68.9	45.9	16.7	46.5	46.1	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.5	24.1	1.1	35.8	12.1	0.1	68.9	45.9	16.7	46.5	46.1	9.8
LOS	C	C	A	D	B	A	E	D	B	D	D	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		23.4			15.1			37.3			22.4	
Approach LOS		C			B			D			C	
Queue Length 50th (m)	18.8	103.2	0.0	14.4	32.5	0.0	28.8	27.5	9.3	9.7	23.2	0.0
Queue Length 95th (m)	34.0	139.2	2.0	m#44.3	112.5	m0.0	47.2	37.5	35.9	19.8	37.7	21.9
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	345	1796	806	252	1816	851	245	772	527	207	406	582
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.70	0.06	0.65	0.58	0.02	0.57	0.35	0.62	0.25	0.30	0.56

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 26 (22%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 23.3		Intersection LOS: C	
Intersection Capacity Utilization 84.5%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 1: Spratt Road & Earl Armstrong Road





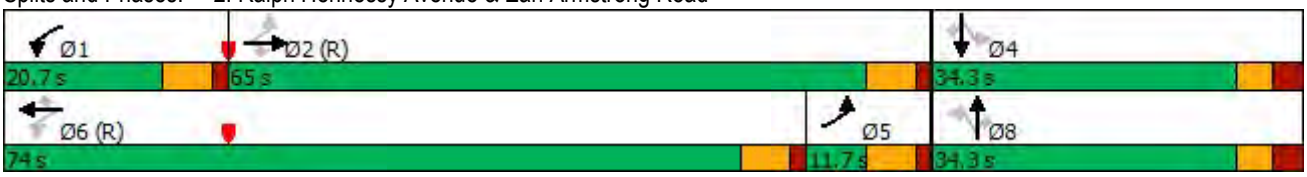
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1520	84	155	985	54	164	3	342	88	8	61
Future Volume (vph)	30	1520	84	155	985	54	164	3	342	88	8	61
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1679	3390	1419	1406	3262	1459	1340	1820	1199	1695	910	1502
Flt Permitted	0.291			0.063			0.752			0.756		
Satd. Flow (perm)	512	3390	1381	93	3262	1407	1061	1820	1199	1349	910	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			85			249			139
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1			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%	2%	9%	23%	6%	6%	29%	0%	29%	2%	100%	3%
Adj. Flow (vph)	30	1520	84	155	985	54	164	3	342	88	8	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1520	84	155	985	54	164	3	342	88	8	61
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	11.7	65.0	65.0	20.7	74.0	74.0	34.3	34.3	34.3	34.3	34.3	34.3
Total Split (%)	9.8%	54.2%	54.2%	17.3%	61.7%	61.7%	28.6%	28.6%	28.6%	28.6%	28.6%	28.6%
Maximum Green (s)	5.6	58.9	58.9	14.6	67.9	67.9	28.0	28.0	28.0	28.0	28.0	28.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		2	2		5	5	0	0	0	0	0	0
Act Effct Green (s)	66.6	66.6	66.6	77.7	77.7	77.7	22.9	22.9	22.9	22.9	22.9	22.9
Actuated g/C Ratio	0.56	0.56	0.56	0.65	0.65	0.65	0.19	0.19	0.19	0.19	0.19	0.19
v/c Ratio	0.09	0.81	0.10	0.81	0.47	0.06	0.81	0.01	0.80	0.34	0.05	0.15
Control Delay	5.0	12.1	0.5	58.3	13.3	1.0	74.7	35.7	27.0	44.2	37.0	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.0	12.1	0.5	58.3	13.3	1.0	74.7	35.7	27.0	44.2	37.0	0.8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B	A	E	B	A	E	D	C	D	D	A
Approach Delay		11.4			18.6			42.4			27.0	
Approach LOS		B			B			D			C	
Queue Length 50th (m)	1.0	149.4	0.1	22.2	61.8	0.0	33.7	0.5	18.5	16.4	1.4	0.0
Queue Length 95th (m)	m1.8	#196.3	m0.3	#51.0	82.8	2.1	#56.0	2.9	51.9	29.5	5.2	0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	338	1881	804	219	2112	941	247	424	470	314	212	457
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.81	0.10	0.71	0.47	0.06	0.66	0.01	0.73	0.28	0.04	0.13

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 24 (20%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 90.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	65	650	5	20	277
Future Vol, veh/h	5	65	650	5	20	277
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	13	0	0	43
Mvmt Flow	5	65	650	5	20	277

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	971	654	0	0	656	0
Stage 1	654	-	-	-	-	-
Stage 2	317	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	283	470	-	-	941	-
Stage 1	521	-	-	-	-	-
Stage 2	743	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	277	470	-	-	940	-
Mov Cap-2 Maneuver	277	-	-	-	-	-
Stage 1	520	-	-	-	-	-
Stage 2	727	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	448	940	-
HCM Lane V/C Ratio	-	-	0.156	0.021	-
HCM Control Delay (s)	-	-	14.5	8.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Intersection Delay, s/veh	18
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	88	38	0	16	74	161	0	406	9	82	154	46
Future Vol, veh/h	88	38	0	16	74	161	0	406	9	82	154	46
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	0	0	12	0	0	37	0
Mvmt Flow	88	38	0	16	74	161	0	406	9	82	154	46
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	12.1	13.4	25.8	13.2
HCM LOS	B	B	D	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	0%	70%	6%	100%	0%
Vol Thru, %	100%	98%	30%	29%	0%	77%
Vol Right, %	0%	2%	0%	64%	0%	23%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	415	126	251	82	200
LT Vol	0	0	88	16	82	0
Through Vol	0	406	38	74	0	154
RT Vol	0	9	0	161	0	46
Lane Flow Rate	0	415	126	251	82	200
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0	0.746	0.241	0.421	0.16	0.388
Departure Headway (Hd)	6.278	6.47	6.873	6.044	7.01	6.978
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	560	522	595	514	518
Service Time	3.987	4.18	4.924	4.088	4.723	4.69
HCM Lane V/C Ratio	0	0.741	0.241	0.422	0.16	0.386
HCM Control Delay	9	25.8	12.1	13.4	11.1	14.1
HCM Lane LOS	N	D	B	B	B	B
HCM 95th-tile Q	0	6.5	0.9	2.1	0.6	1.8

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	43	0	0	0	0	0	0	85	0	0	41	20
Future Vol, veh/h	43	0	0	0	0	0	0	85	0	0	41	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	43	0	0	0	0	0	0	85	0	0	41	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	136	136	51	136	146	85	61	0	0	85	0	0
Stage 1	51	51	-	85	85	-	-	-	-	-	-	-
Stage 2	85	85	-	51	61	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	840	759	1023	840	749	980	1555	-	-	1524	-	-
Stage 1	967	856	-	928	828	-	-	-	-	-	-	-
Stage 2	928	828	-	967	848	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	840	759	1023	840	749	980	1555	-	-	1524	-	-
Mov Cap-2 Maneuver	840	759	-	840	749	-	-	-	-	-	-	-
Stage 1	967	856	-	928	828	-	-	-	-	-	-	-
Stage 2	928	828	-	967	848	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1555	-	-	840	-	1524	-	-
HCM Lane V/C Ratio	-	-	-	0.051	-	-	-	-
HCM Control Delay (s)	0	-	-	9.5	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0	-	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	107	16	0	34	34	34	0	252	16	16	95	48
Future Vol, veh/h	107	16	0	34	34	34	0	252	16	16	95	48
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	12	0	0	37	0
Mvmt Flow	107	16	0	34	34	34	0	252	16	16	95	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	445	419	119	419	435	260	143	0	0	268	0	0
Stage 1	151	151	-	260	260	-	-	-	-	-	-	-
Stage 2	294	268	-	159	175	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	527	528	938	548	517	784	1452	-	-	1307	-	-
Stage 1	856	776	-	749	697	-	-	-	-	-	-	-
Stage 2	719	691	-	848	758	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	474	521	938	530	510	784	1452	-	-	1307	-	-
Mov Cap-2 Maneuver	474	521	-	530	510	-	-	-	-	-	-	-
Stage 1	856	766	-	749	697	-	-	-	-	-	-	-
Stage 2	654	691	-	819	748	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.1	12.4	0	0.8
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1452	-	-	480	586	1307	-	-
HCM Lane V/C Ratio	-	-	-	0.256	0.174	0.012	-	-
HCM Control Delay (s)	0	-	-	15.1	12.4	7.8	0	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.6	0	-	-

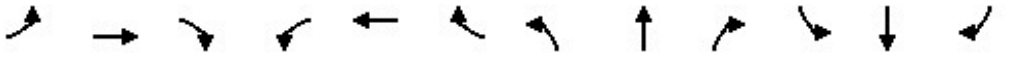
Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	43	0	0	0	0	0	0	21	0	0	10	20
Future Vol, veh/h	43	0	0	0	0	0	0	21	0	0	10	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	43	0	0	0	0	0	0	21	0	0	10	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	41	41	20	41	51	21	30	0	0	21	0	0
Stage 1	20	20	-	21	21	-	-	-	-	-	-	-
Stage 2	21	21	-	20	30	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	968	855	1064	968	844	1062	1596	-	-	1608	-	-
Stage 1	1004	883	-	1003	882	-	-	-	-	-	-	-
Stage 2	1003	882	-	1004	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	968	855	1064	968	844	1062	1596	-	-	1608	-	-
Mov Cap-2 Maneuver	968	855	-	968	844	-	-	-	-	-	-	-
Stage 1	1004	883	-	1003	882	-	-	-	-	-	-	-
Stage 2	1003	882	-	1004	874	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1596	-	-	968	-	1608	-	-
HCM Lane V/C Ratio	-	-	-	0.044	-	-	-	-
HCM Control Delay (s)	0	-	-	8.9	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	379	1211	157	331	1349	43	128	255	252	18	318	272
Future Volume (vph)	379	1211	157	331	1349	43	128	255	252	18	318	272
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97	1.00		0.98	1.00		0.98	0.99		0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3357	1488	1729	3424	1517	1695	3458	1406	1729	1820	1488
Flt Permitted	0.137			0.218			0.307			0.571		
Satd. Flow (perm)	247	3357	1440	396	3424	1482	547	3458	1376	1032	1820	1462
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			157			87			252			272
Link Speed (k/h)		80			80			50			60	
Link Distance (m)		332.0			525.8			96.0			223.6	
Travel Time (s)		14.9			23.7			6.9			13.4	
Confl. Peds. (#/hr)	7		5	5		7	3		7	7		3
Confl. Bikes (#/hr)						1						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 (%)	1%	3%	4%	0%	1%	2%	2%	0%	10%	0%	0%	4%
Adj. Flow (vph)	379	1211	157	331	1349	43	128	255	252	18	318	272
Shared Lane Traffic (%)												
Lane Group Flow (vph)	379	1211	157	331	1349	43	128	255	252	18	318	272
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	10.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.4	30.3	30.3	16.4	30.3	30.3	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (s)	29.2	58.2	58.2	26.6	55.6	55.6	35.2	35.2	35.2	35.2	35.2	35.2
Total Split (%)	24.3%	48.5%	48.5%	22.2%	46.3%	46.3%	29.3%	29.3%	29.3%	29.3%	29.3%	29.3%
Maximum Green (s)	22.8	51.9	51.9	20.2	49.3	49.3	29.0	29.0	29.0	29.0	29.0	29.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	1.8	1.7	1.7	1.8	1.7	1.7	2.5	2.5	2.5	2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.3	6.3	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?		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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		14.0	14.0		14.0	14.0	18.0	18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)		5	5		7	7	7	7	7	3	3	3
Act Effct Green (s)	51.8	51.9	51.9	49.2	49.3	49.3	29.0	29.0	29.0	29.0	29.0	29.0
Actuated g/C Ratio	0.43	0.43	0.43	0.41	0.41	0.41	0.24	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.99	0.83	0.22	0.86	0.96	0.07	0.97	0.31	0.48	0.07	0.72	0.49
Control Delay	77.0	36.5	3.9	45.7	35.3	0.5	117.2	38.5	7.8	36.3	52.5	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.0	36.5	3.9	45.7	35.3	0.5	117.2	38.5	7.8	36.3	52.5	7.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	D	A	D	D	A	F	D	A	D	D	A
Approach Delay		42.4			36.4			42.2			31.9	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	68.4	120.5	0.0	50.3	149.6	0.0	27.6	23.9	0.0	3.0	63.7	0.0
Queue Length 95th (m)	#125.3	147.7	11.0	#92.7	#192.1	m0.3	#63.6	34.8	19.2	8.7	93.4	19.6
Internal Link Dist (m)		308.0			501.8			72.0			199.6	
Turn Bay Length (m)	50.0		80.0	50.0		80.0	60.0		25.0	80.0		
Base Capacity (vph)	384	1451	711	386	1406	660	132	835	523	249	439	559
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.83	0.22	0.86	0.96	0.07	0.97	0.31	0.48	0.07	0.72	0.49

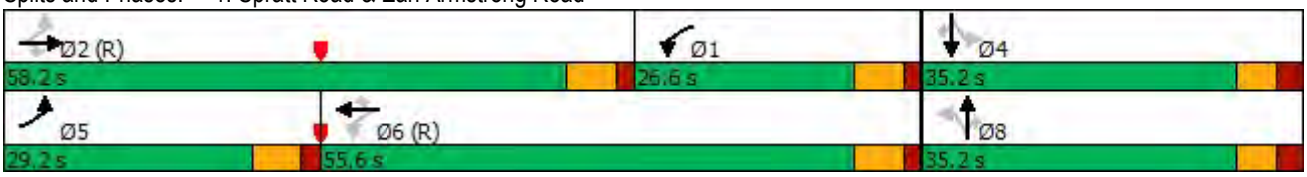
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 38.8 Intersection LOS: D
Intersection Capacity Utilization 108.7% ICU Level of Service G
Analysis Period (min) 15

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

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

Splits and Phases: 1: Spratt Road & Earl Armstrong Road



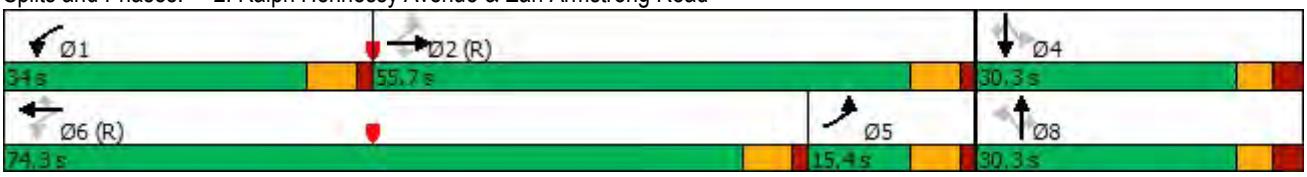
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	1201	165	342	1540	103	113	1	235	31	0	60
Future Volume (vph)	92	1201	165	342	1540	103	113	1	235	31	0	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.97			0.96						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1729	3293	1547	1558	3424	1547	1441	1820	1473	1729	1820	1547
Flt Permitted	0.166			0.082			0.757			0.757		
Satd. Flow (perm)	301	3293	1507	134	3424	1478	1148	1820	1473	1378	1820	1547
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			156			103			235			165
Link Speed (k/h)		80			80			50			50	
Link Distance (m)		525.8			368.8			927.0			318.3	
Travel Time (s)		23.7			16.6			66.7			22.9	
Confl. Peds. (#/hr)	7		1	1		7						
Confl. Bikes (#/hr)			3			5						
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%	5%	0%	11%	1%	0%	20%	0%	5%	0%	0%	0%
Adj. Flow (vph)	92	1201	165	342	1540	103	113	1	235	31	0	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	1201	165	342	1540	103	113	1	235	31	0	60
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm		Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	11.1	27.1	27.1	11.1	27.1	27.1	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (s)	15.4	55.7	55.7	34.0	74.3	74.3	30.3	30.3	30.3	30.3	30.3	30.3
Total Split (%)	12.8%	46.4%	46.4%	28.3%	61.9%	61.9%	25.3%	25.3%	25.3%	25.3%	25.3%	25.3%
Maximum Green (s)	9.3	49.6	49.6	27.9	68.2	68.2	24.0	24.0	24.0	24.0	24.0	24.0
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1	6.3	6.3	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead						
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		9.0	9.0		9.0	9.0	17.0	17.0	17.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		7	7	0	0	0	0	0	0
Act Effct Green (s)	59.6	59.6	59.6	75.2	75.2	75.2	17.0	17.0	17.0	17.0		17.0
Actuated g/C Ratio	0.50	0.50	0.50	0.63	0.63	0.63	0.14	0.14	0.14	0.14		0.14
v/c Ratio	0.35	0.73	0.20	0.90	0.72	0.11	0.70	0.00	0.57	0.16		0.17
Control Delay	10.7	8.5	0.4	60.1	18.6	2.4	69.8	40.0	11.2	44.4		1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	10.7	8.5	0.4	60.1	18.6	2.4	69.8	40.0	11.2	44.4		1.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	A	A	E	B	A	E	D	B	D		A
Approach Delay		7.7			24.9			30.3			15.8	
Approach LOS		A			C			C			B	
Queue Length 50th (m)	2.1	14.6	0.0	58.1	111.6	0.0	23.6	0.2	0.0	6.0		0.0
Queue Length 95th (m)	m3.5	#91.5	m0.0	#104.7	159.2	6.7	39.4	1.6	19.4	13.5		0.0
Internal Link Dist (m)		501.8			344.8			903.0			294.3	
Turn Bay Length (m)	45.0		75.0	40.0		75.0	60.0		25.0	25.0		60.0
Base Capacity (vph)	260	1635	827	423	2144	964	229	364	482	275		441
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		0
Reduced v/c Ratio	0.35	0.73	0.20	0.81	0.72	0.11	0.49	0.00	0.49	0.11		0.14

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 8 (7%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 18.7 Intersection LOS: B
Intersection Capacity Utilization 83.7% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Ralph Hennessy Avenue & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	40	482	15	65	639
Future Vol, veh/h	5	40	482	15	65	639
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	6	0	0	5
Mvmt Flow	5	40	482	15	65	639

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1259	490	0	0	497	0
Stage 1	490	-	-	-	-	-
Stage 2	769	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	190	582	-	-	1077	-
Stage 1	620	-	-	-	-	-
Stage 2	461	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	179	582	-	-	1077	-
Mov Cap-2 Maneuver	179	-	-	-	-	-
Stage 1	620	-	-	-	-	-
Stage 2	433	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.5	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	466	1077	-
HCM Lane V/C Ratio	-	-	0.097	0.06	-
HCM Control Delay (s)	-	-	13.5	8.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.2	-

Intersection	
Intersection Delay, s/veh	21.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	73	77	0	14	60	130	0	294	17	167	382	94
Future Vol, veh/h	73	77	0	14	60	130	0	294	17	167	382	94
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	0	0	5	0	0	5	0
Mvmt Flow	73	77	0	14	60	130	0	294	17	167	382	94
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	13.4	13.6	19.1	27.4
HCM LOS	B	B	C	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	0%	0%	49%	7%	100%	0%
Vol Thru, %	100%	95%	51%	29%	0%	80%
Vol Right, %	0%	5%	0%	64%	0%	20%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	0	311	150	204	167	476
LT Vol	0	0	73	14	167	0
Through Vol	0	294	77	60	0	382
RT Vol	0	17	0	130	0	94
Lane Flow Rate	0	311	150	204	167	476
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0	0.592	0.301	0.374	0.317	0.83
Departure Headway (Hd)	6.807	6.855	7.213	6.594	6.844	6.281
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	0	526	498	545	526	576
Service Time	4.553	4.601	5.266	4.641	4.586	4.022
HCM Lane V/C Ratio	0	0.591	0.301	0.374	0.317	0.826
HCM Control Delay	9.6	19.1	13.4	13.6	12.7	32.6
HCM Lane LOS	N	C	B	B	B	D
HCM 95th-tile Q	0	3.8	1.3	1.7	1.4	8.6

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	32	0	0	0	0	0	0	65	0	0	88	44
Future Vol, veh/h	32	0	0	0	0	0	0	65	0	0	88	44
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	32	0	0	0	0	0	0	65	0	0	88	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	175	175	110	175	197	65	132	0	0	65	0	0
Stage 1	110	110	-	65	65	-	-	-	-	-	-	-
Stage 2	65	65	-	110	132	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	792	722	949	792	702	1005	1466	-	-	1550	-	-
Stage 1	900	808	-	951	845	-	-	-	-	-	-	-
Stage 2	951	845	-	900	791	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	792	722	949	792	702	1005	1466	-	-	1550	-	-
Mov Cap-2 Maneuver	792	722	-	792	702	-	-	-	-	-	-	-
Stage 1	900	808	-	951	845	-	-	-	-	-	-	-
Stage 2	951	845	-	900	791	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.7	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1466	-	-	792	-	1550	-	-
HCM Lane V/C Ratio	-	-	-	0.04	-	-	-	-
HCM Control Delay (s)	0	-	-	9.7	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-	0	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	76	35	0	26	26	26	0	193	35	35	246	93
Future Vol, veh/h	76	35	0	26	26	26	0	193	35	35	246	93
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	5	0	0	5	0
Mvmt Flow	76	35	0	26	26	26	0	193	35	35	246	93

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	600	591	293	591	620	211	339	0	0	228	0	0
Stage 1	363	363	-	211	211	-	-	-	-	-	-	-
Stage 2	237	228	-	380	409	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	416	422	751	422	407	834	1231	-	-	1352	-	-
Stage 1	660	628	-	796	731	-	-	-	-	-	-	-
Stage 2	771	719	-	646	600	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	374	408	751	385	394	834	1231	-	-	1352	-	-
Mov Cap-2 Maneuver	374	408	-	385	394	-	-	-	-	-	-	-
Stage 1	660	608	-	796	731	-	-	-	-	-	-	-
Stage 2	720	719	-	589	581	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.1	14.1	0	0.7
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1231	-	-	384	474	1352	-	-
HCM Lane V/C Ratio	-	-	-	0.289	0.165	0.026	-	-
HCM Control Delay (s)	0	-	-	18.1	14.1	7.7	0	-
HCM Lane LOS	A	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.2	0.6	0.1	-	-

Intersection	
Int Delay, s/veh	2.5

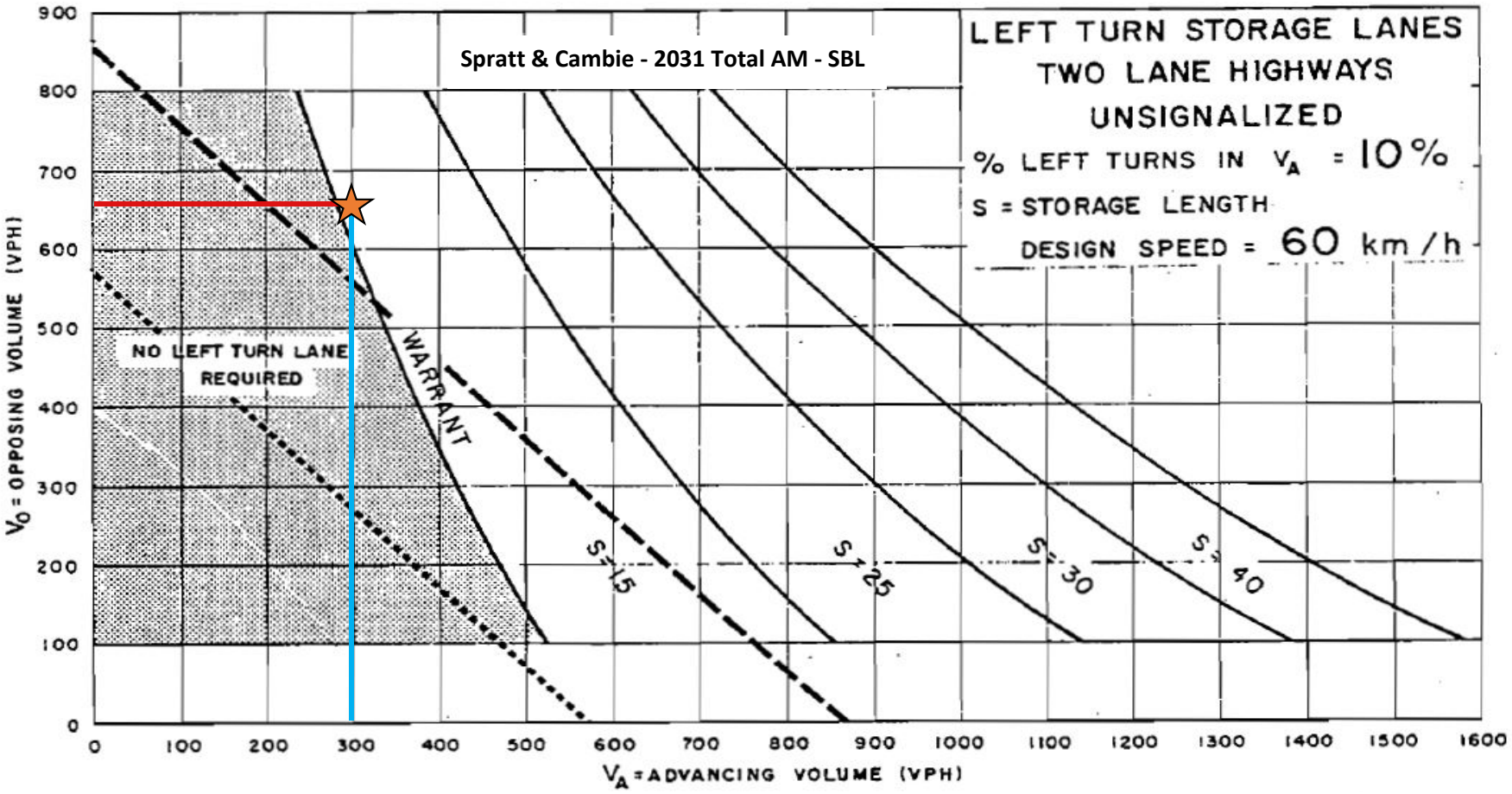
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	32	0	0	0	0	0	0	16	0	0	22	44
Future Vol, veh/h	32	0	0	0	0	0	0	16	0	0	22	44
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	32	0	0	0	0	0	0	16	0	0	22	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	60	60	44	60	82	16	66	0	0	16	0	0
Stage 1	44	44	-	16	16	-	-	-	-	-	-	-
Stage 2	16	16	-	44	66	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	941	835	1032	941	812	1069	1549	-	-	1615	-	-
Stage 1	975	862	-	1009	886	-	-	-	-	-	-	-
Stage 2	1009	886	-	975	844	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	941	835	1032	941	812	1069	1549	-	-	1615	-	-
Mov Cap-2 Maneuver	941	835	-	941	812	-	-	-	-	-	-	-
Stage 1	975	862	-	1009	886	-	-	-	-	-	-	-
Stage 2	1009	886	-	975	844	-	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1549	-	-	941	-	1615	-	-
HCM Lane V/C Ratio	-	-	-	0.034	-	-	-	-
HCM Control Delay (s)	0	-	-	9	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-	0	-	-

Appendix K – Auxiliary Lane Analyses

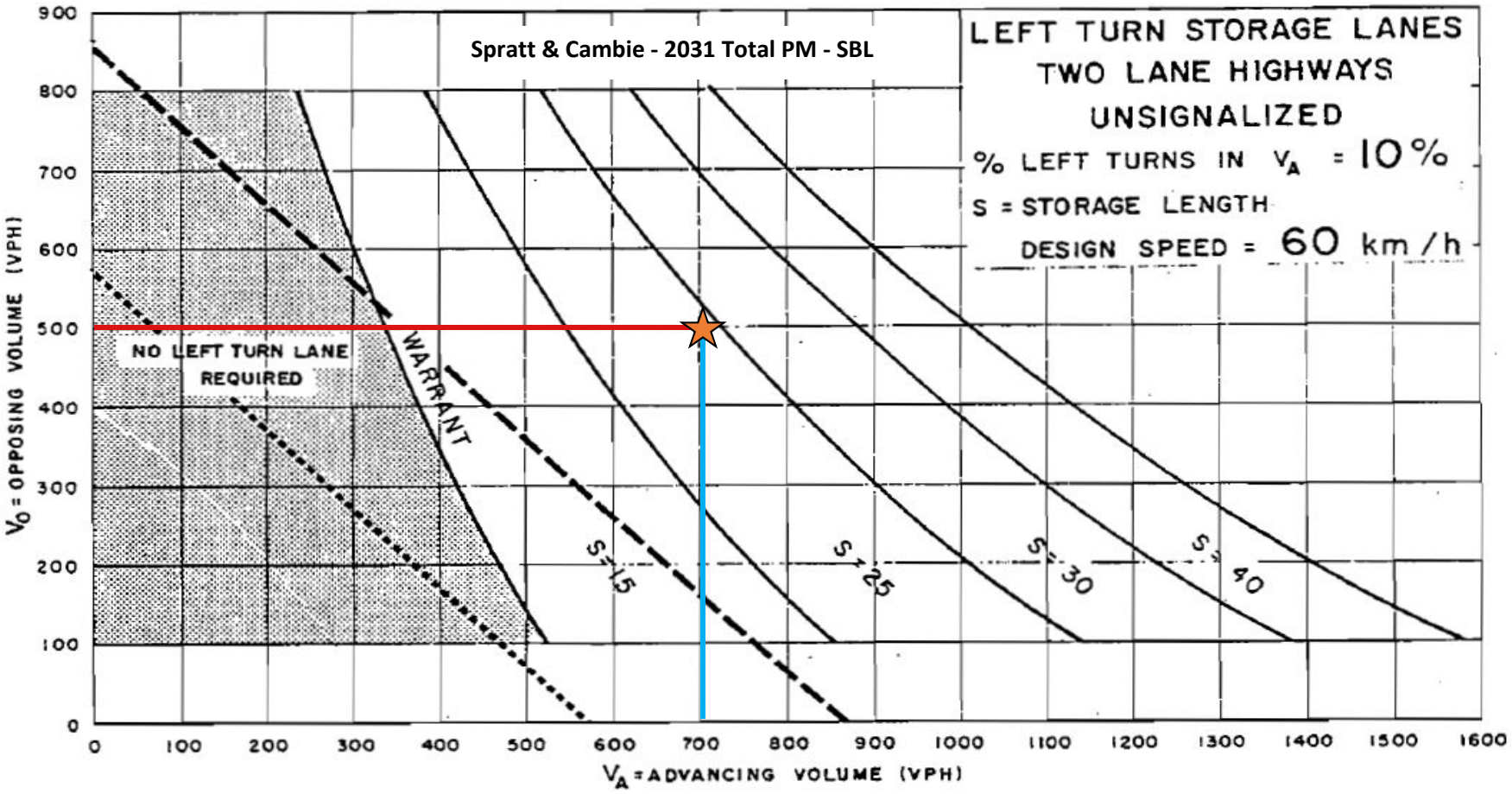


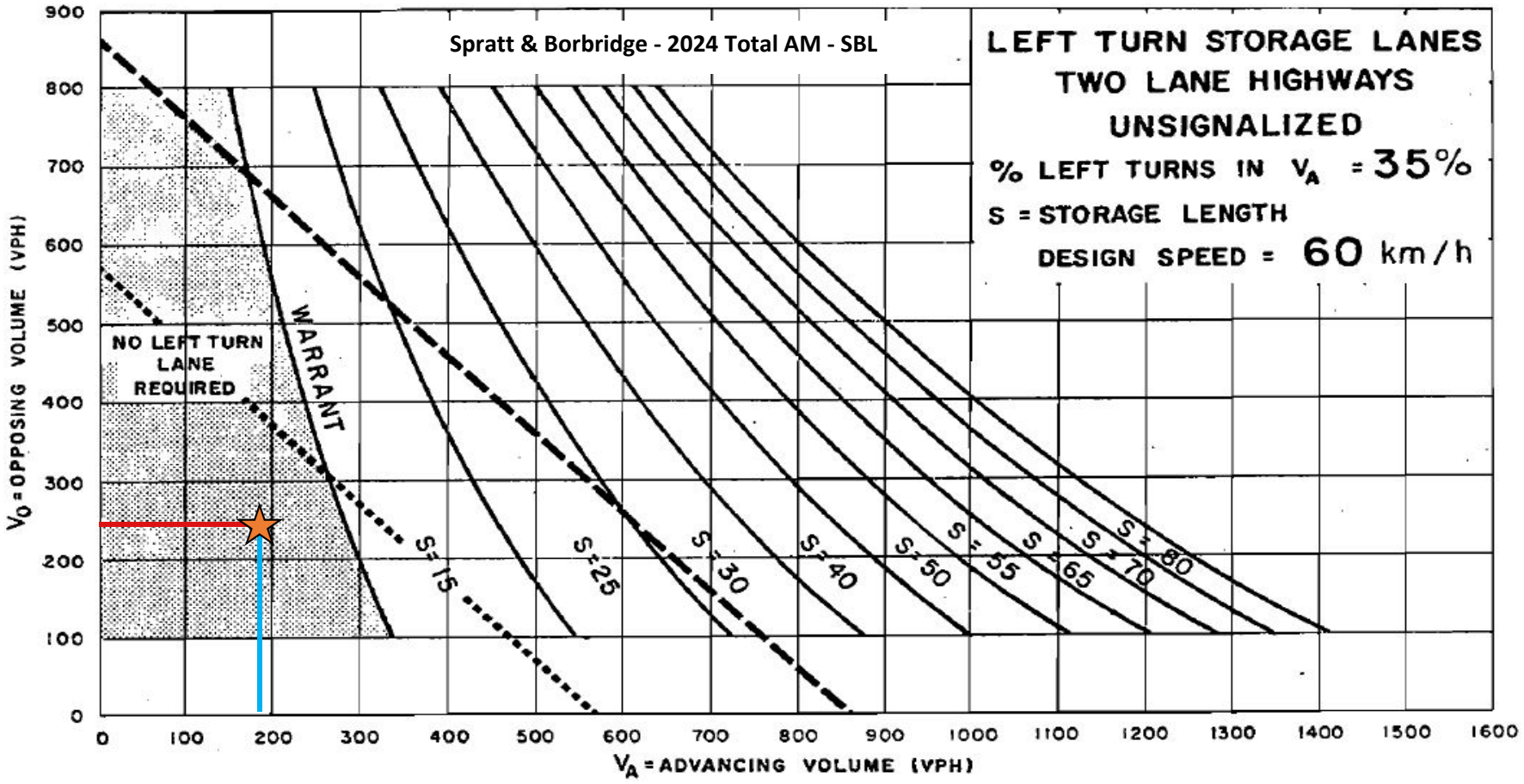
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

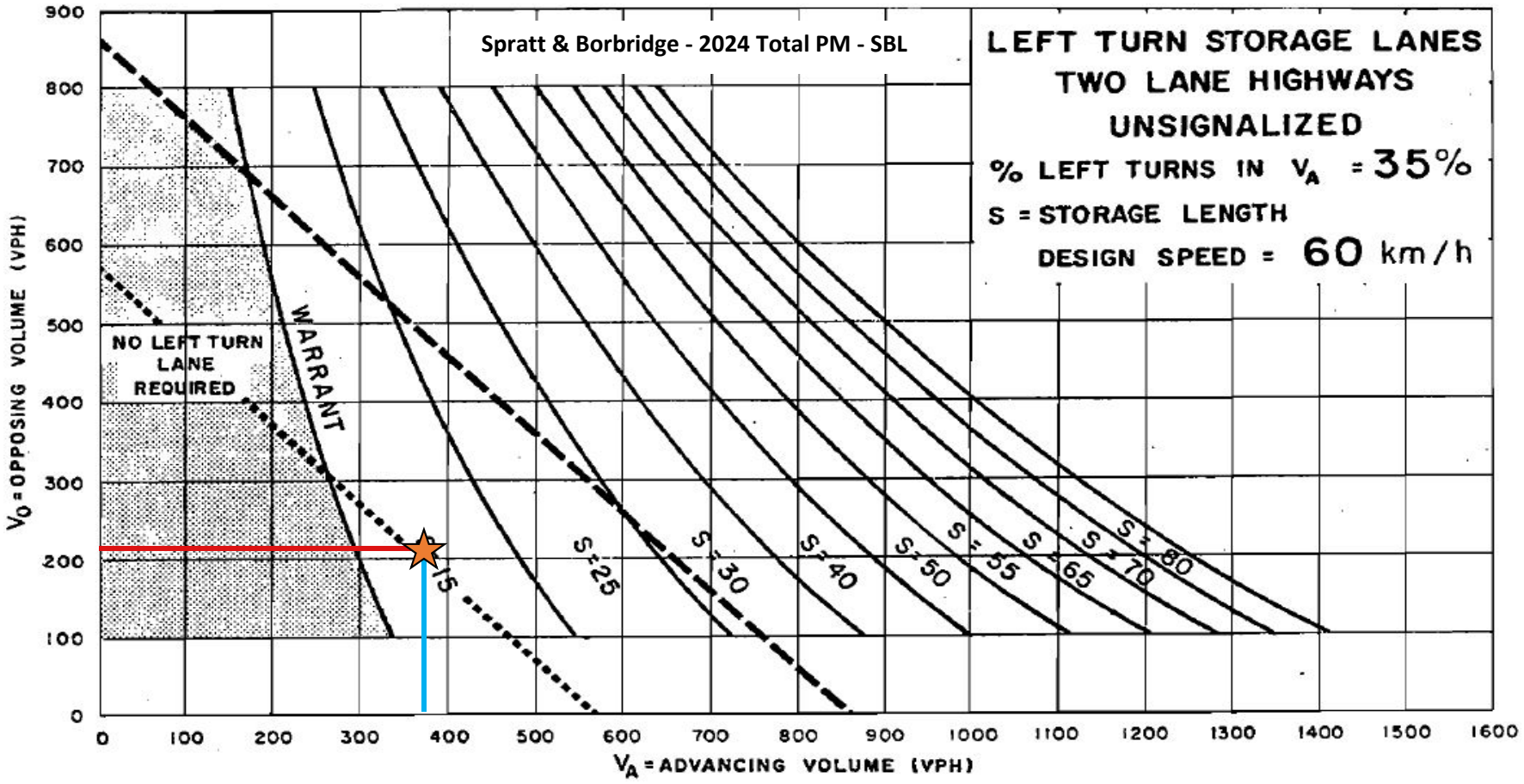
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

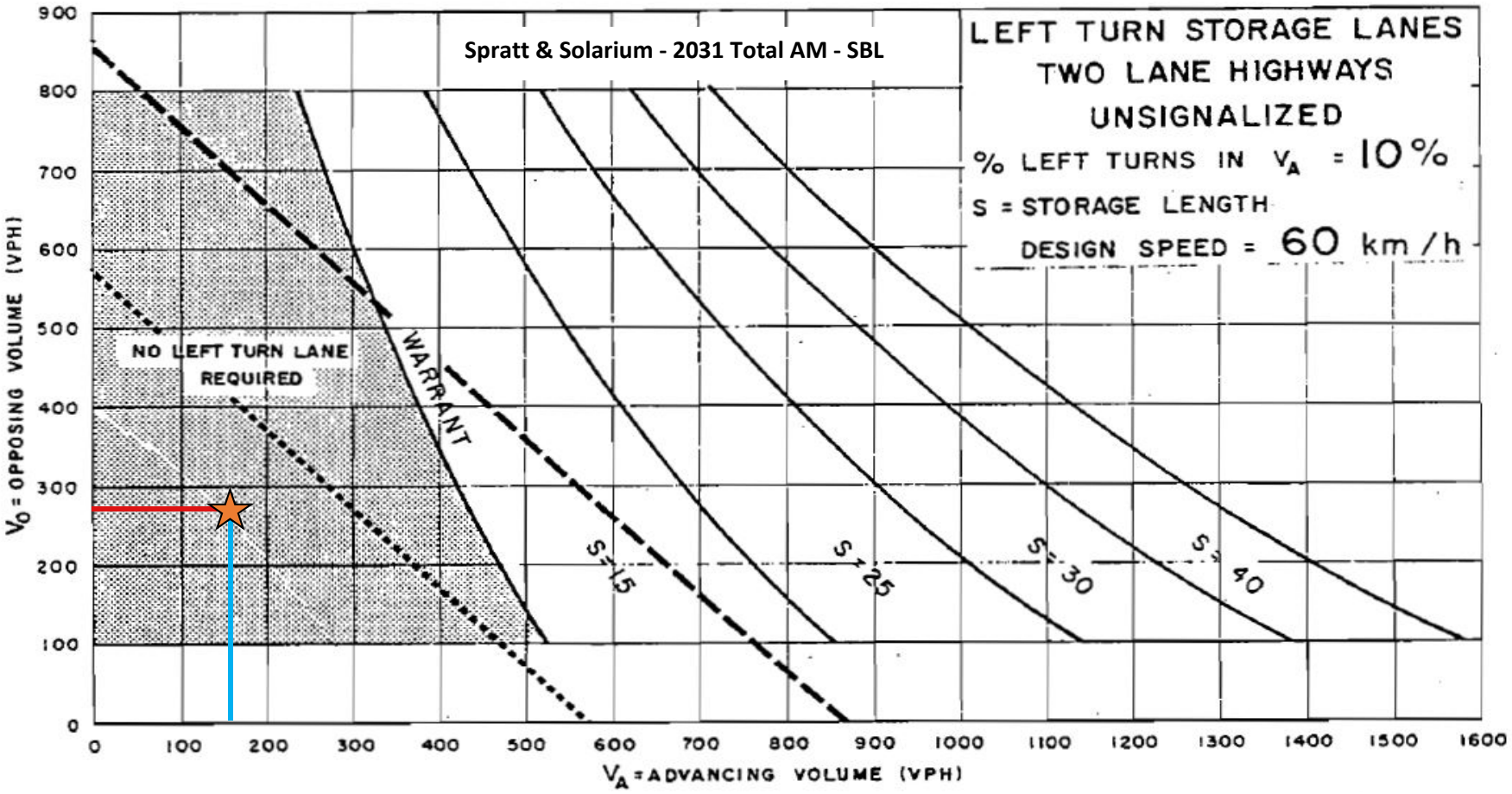
Opposing Volume

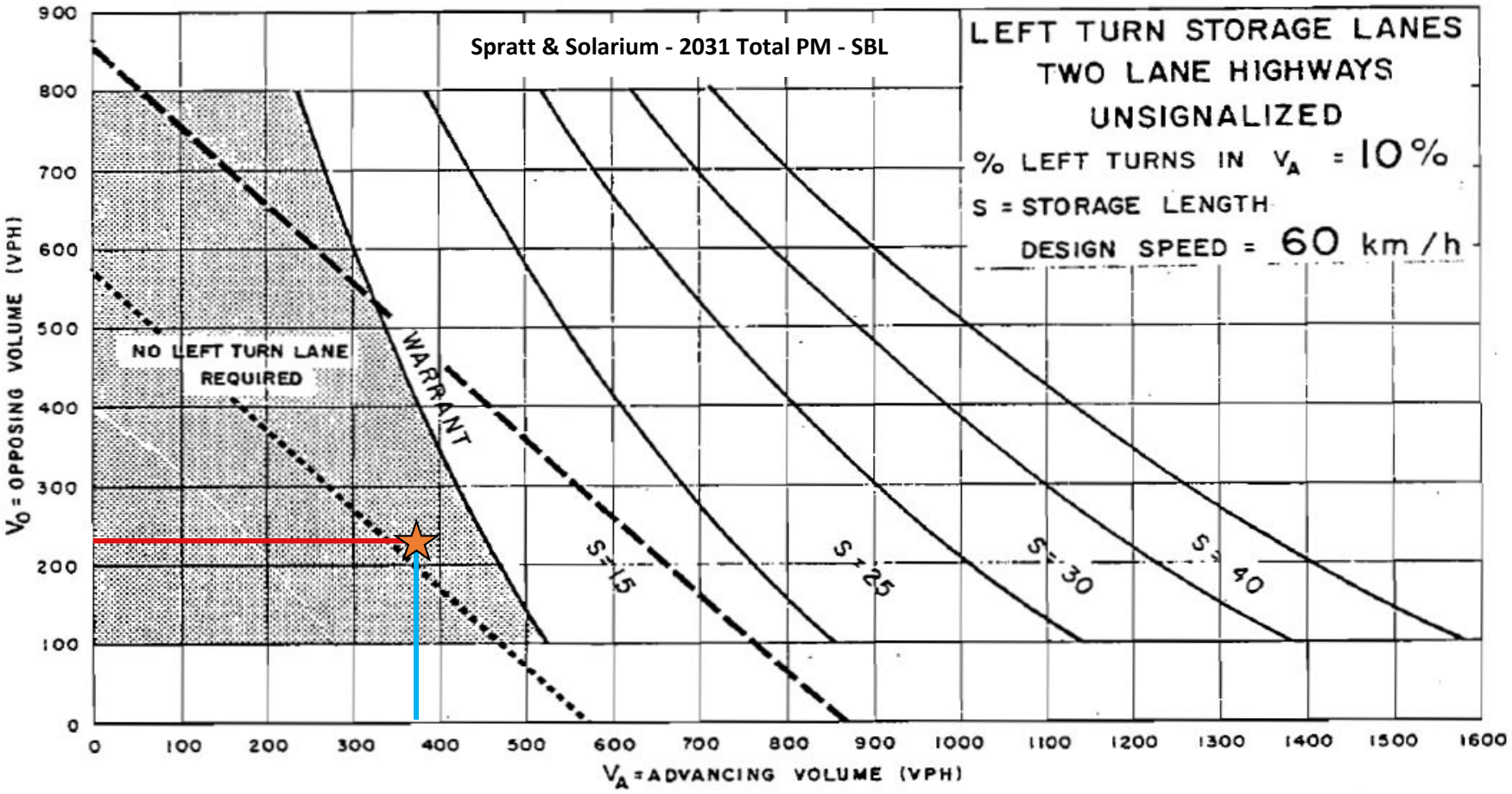
Advancing Volume


Spratt & Cambie - 2031 Total PM - SBL
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10%
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
Opposing Volume
Advancing Volume


Spratt & Borbridge - 2024 Total AM - SBL
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 35%
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
S=50
S=55
S=65
S=70
S=80
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
Opposing Volume
Advancing Volume


Spratt & Borbridge - 2024 Total PM - SBL
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 35%
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=25
S=30
S=40
S=50
S=55
S=65
S=70
S=80
15
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
Opposing Volume
Advancing Volume


Spratt & Solarium - 2031 Total AM - SBL
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10%
S = STORAGE LENGTH
DESIGN SPEED = 60 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
Opposing Volume
Advancing Volume



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

Opposing Volume

Advancing Volume