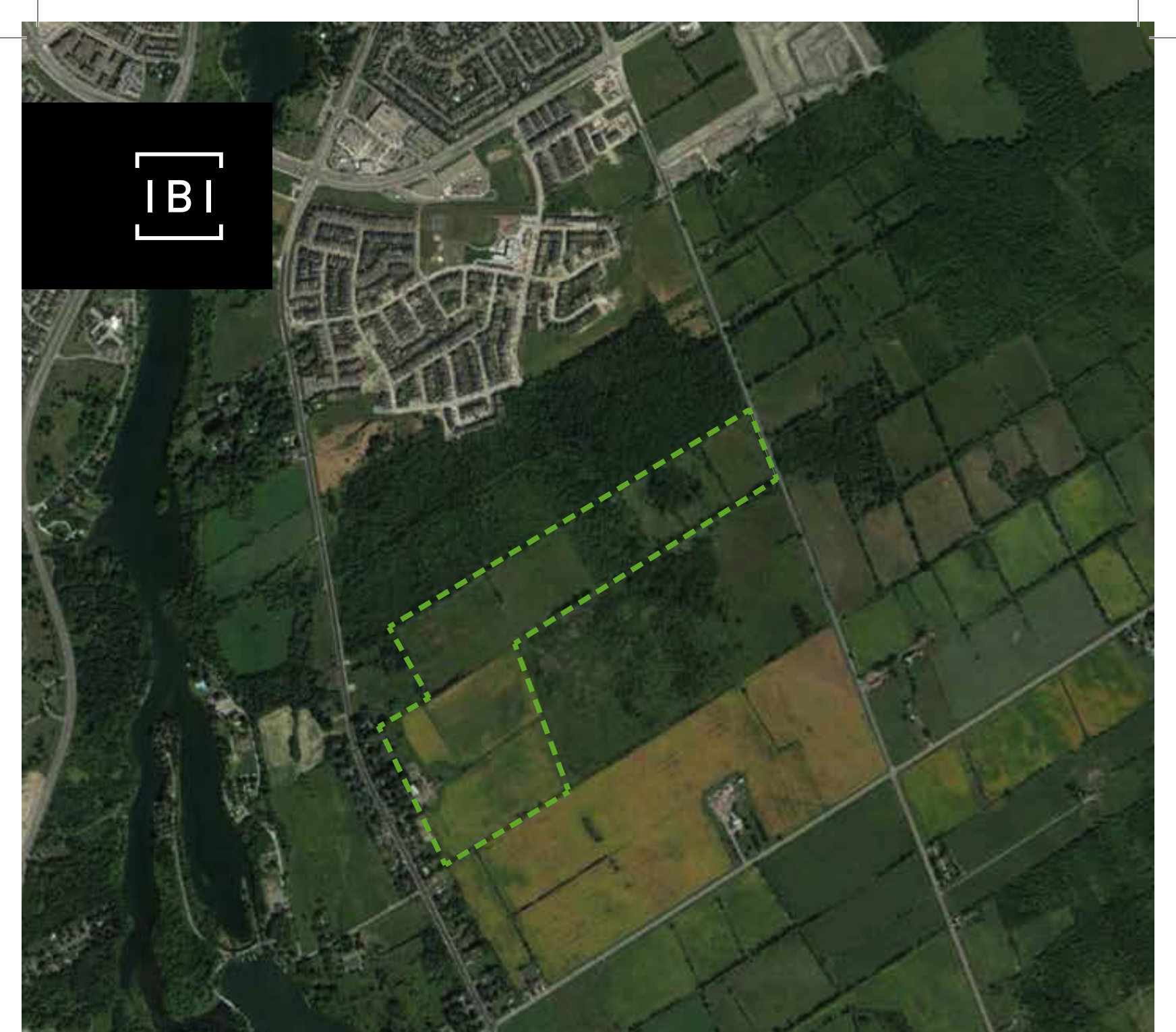


The background of the top half of the page is an aerial photograph. It shows a river on the left side, flowing towards the bottom. To the right of the river is a large, dark green area of trees. Further to the right is a residential area with many small, light-colored houses. To the right of the residential area is a large, rectangular area outlined with a dashed yellow line. This area contains a mix of green fields and some trees. The bottom half of the page is a solid dark grey color.

Transportation Impact Assessment Riverside South Phase 2 Final Report

Prepared for Claridge Homes
by IBI Group
November 2017



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 licensed¹ or registered¹ 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 _____ this ____ day of November, 2017.
(City)

Name: Austin Shih, M.A.Sc., P.Eng.

Professional Title: Project Engineer



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

Office Contact Information (Please Print)
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Stamp



EXECUTIVE SUMMARY

IBI Group (IBI) was retained by Claridge Homes to complete a Transportation Impact Assessment (TIA) in support of the Riverside South Phase 2 residential subdivision in the City of Ottawa. The lands consist of two adjacent parcels with frontage on Spratt Road and River Road. The proposed development consists of two abutting parcels of land with frontage on Spratt Road and River Road. These properties combined are approximately 40 hectares in size, and are bounded by the proposed Riverside South Phase 15 residential development by Urbandale Homes to the north and south, Spratt Road to the east and River Road to the west.

Claridge Homes intends to develop approximately 750 residential units and a school. The size and specifics of the school facility was not known at the time of this study. The proposed development was assumed to be completed in two phases.

The general methodology used in this study was based on the City of Ottawa Transportation Impact Assessment Guidelines (2017). All four steps of the TIA process have been followed and approved by the City. This report represents Step 5 of the process, the Final Submission.

The overall conclusion of this TIA is that the traffic generated by the Riverside South Phase 2 Development can be accommodated on the adjacent transportation network with the appropriate actions and modifications in place. Claridge Homes shall be responsible for constructing all required access intersections and internal transportation facilities as dictated by the proposed draft plan.

The key findings and recommendations from this TIA are as follows:

Riverside South Phase 2 Development Characteristics

- The proposed rights-of-way for internal roads within the Riverside South Phase 2 development will be as follows:
 - o Local Roads – 18.0m or 20.0m
 - o Collector Roads – 26m
 - Brian Good Avenue
 - Street 1
- Proposed collector roads within the development lands can support transit, which will be necessary to maximize the number of residents within 400m of daily service.
- Collector and some local roadways will have sidewalks to provide connections to local parks and pathways. No dedicated cycling facilities have been proposed within the development lands.
- TDM and non-auto mode provisions will be reinforced. Appropriate connections, both internal and to the regional network, have been provided to accommodate active transportation.
- The proposed development is expected to be constructed in two phases. Phase 1 was assumed to be occupied by 2021 and full buildout by 2026.

Existing Conditions Analysis

- The study area included the following existing intersections:
 - o River Road and Earl Armstrong Road
 - o River Road and Summerhill Street
 - o Earl Armstrong Road and Brian Good Avenue
 - o Earl Armstrong Road and Spratt Road

o Spratt Road and Cambie Road

- A review of the reported collisions showed the majority a pattern of rear-end collisions at the Earl Armstrong Road and River Road intersection. The 8 recorded rear-end collisions was likely caused by the high number of southbound right-turning vehicles in the afternoon peak hour. The only mitigation measure is to reduce traffic volumes on the observed movement. City policies are attempting to accomplish this over time, as more supportive or alternative infrastructure projects are completed, such as the widening of Prince of Wales and completion of the Trillium Line South extension to Limebank Road. As implementation gradually occurs, traffic volumes and the reported number of collisions will decrease.
- There are three existing transit service routes operating within the study area: 94, 99 and 189. The 94 and 99 provide daily service; the 189 operates only on weekdays.
- Dedicated cycling lanes and concrete sidewalks are provided on both sides of River Road for 150m north of Earl Armstrong Road and on both sides of Earl Armstrong Road through the study area. Paved and gravel shoulders on River Road south of Earl Armstrong Road are able to accommodate cyclists. There are existing multi-use pathways (MUPs) that run along the west side of the Rideau River both north and south of the study area. There is also an existing multi-use pathways on the east side of the Rideau River north of Earl Armstrong Road.
- All existing study area intersections with the exception of the Earl Armstrong and River Road were shown to operate within City standards in 2017. These results coincided with previous traffic studies completed in the study area and field observations showing significant traffic queues during the morning and afternoon peak periods at the Earl Armstrong and River Road intersection.

Future Background Traffic Demand

- Three future analysis horizons were established based on the expected development phases: 2021, 2026 and 2031.
- A 1.5% background traffic growth rate was applied to the following existing traffic movements within the study:
 - o Earl Armstrong Road, through movements between Brian Good Avenue and Spratt Road, turning movements at Spratt Road
 - o River Road, through movements between Summerhill Street and Street 1
 - o Spratt Road, through movements between Earl Armstrong Road and Street 1, turning movements at Earl Armstrong Road

The rate was derived from approved transportation impact assessments completed within the study area, primarily by Dillon Consulting.

- Side street traffic from minor collector and local roadways within the study area were not factored since they provide access to local developments; all adjacent developments were accounted for separately in this analysis.
- A reduced background growth rate of 0.5% was applied to all movements at the Earl Armstrong Road and River Road intersection except for the eastbound through in morning peak hour and the westbound through in the afternoon peak hour, which were factored by the accepted 1.5% background growth rate. This reduction was supported by historical traffic counts at the Earl Armstrong and River Road intersection.

- Five known adjacent developments were accounted for in the future background traffic volumes. The unit counts and characteristics for each development were based on traffic studies that supported the development application.

Riverside South Phase 2 Generated Traffic Volumes

- Development generated traffic volumes were derived using ITE Trip Generation Rates and converted to person trips according to the TIA Guidelines. The City OD Survey mode share for the South Gloucester/ Leirim District was applied to determine the trips by mode.
- Transit Modal Share projections were adjusted and applied to development generated demand (for the proposed and adjacent developments) as follows:

Year 2021 & 2026:

- o Residential TMS = 16% (TMP 2031 target)
- o Commercial TMS = 9% (TMP 2031 Target)

Year 2031

- o Residential TMS = 21%
- o Commercial TMS = 14% (TMP 2031 Target)

These adjustments were based on City TMP targets and the recent City announcement that the Phase 2 LRT Trillium Line will be extended west from the currently planned terminus at the Earl Armstrong/ Bowesville LRT Station, to Limebank Road by 2021.

- The RSS Ph2 development is expected to generate the following peak hour trips at each future horizon:
 - o 2021 - Auto Driver: 212 morning peak hour trips; 281 afternoon peak hour trips
Transit: 57 morning peak hour trips; 72 afternoon peak hour trips
 - o 2026 - Auto: 341 morning peak hour trips; 446 afternoon peak hour trips
Transit: 91 morning peak hour trips; 115 afternoon peak hour trips
 - o 2031 - Auto: 312 morning peak hour trips; 412 afternoon peak hour trips
Transit: 119 morning peak hour trips; 149 afternoon peak hour trips

Earl Armstrong and River Road Diversion

- To account for the impact of all future network modifications, the eastbound left-turn lane in the morning peak hour and the southbound right-turn in the afternoon peak hour were both reduced by 25% in the 2021 horizon year to account for the current intersection modifications and optimizations being completed by the City near the Riverside South Community. These movements were reduced by an additional 25% (50% in total) in the 2026 and 2031 horizon years to account for future the Prince of Wales widening and growth in adjacent screenline capacity.

Future Intersection Analysis

- Earl Armstrong Road and River Road:
The Earl Armstrong Road and River Road intersection is presently operating above its theoretical capacity, due to heavy cross commuter traffic from Barrhaven South in the morning and afternoon peak periods, respectively. The intersection is significantly impacted by the pedestrian requirements for crossing time, which has been sacrificed to accommodate additional vehicular capacity in dual left-turn lanes and exclusive bus lanes. Additionally, the intersection of Earl Armstrong Road and River Road is adjacent to the newly

opened Vimy Memorial Bridge, which provides one of the few east-west crossings over the Rideau River for the City of Ottawa that contributes to the bottleneck.

Increasing capacity through roadway modifications is not feasible; the intersection was only recently modified to its ultimate configuration according to the TMP Network Concept as part of the Vimy Memorial Bridge construction. The intersection should be monitored during each phase of development within the Riverside South Community to ensure that these capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach. The intersection capacity analysis completed for this study showed the 95th percentile queue lengths were not expected to exceed the available storage lengths for any of the left-turn or right-turn auxiliary lanes at the Earl Armstrong Road and River Road intersection in the 2031 total traffic condition.

- Earl Armstrong Road and Brian Good Avenue:

The Earl Armstrong Road and Brian Good Avenue intersection was shown to operate below City standards in the existing 2017 horizon. Traffic signals were required to allow traffic from the minor roads to complete their turning movements without excessive delays. With this modification, the intersection was shown to operate within City standards through to the 2031 total traffic condition.

- Earl Armstrong Road and Spratt Road:

The Earl Armstrong Road and Spratt Road was shown to operate within City standards through to the 2031 total traffic condition. Additional storage may be required on the east, west and northbound approaches to accommodate future traffic demand, however these movements should be monitored as traffic patterns continue to adjust after the Vimy Memorial Bridge opening and upcoming City infrastructure projects.

- River Road and Summerhill Street

The River Road and Summerhill Street intersection was shown to operate within City standards in the 2017 and the 2021 background traffic condition. By the 2026 background or 2031 total traffic conditions, traffic signals would be required to allow traffic from the minor roads to complete their turning movements without excessive delays. With this modification, the intersection was shown to operate within City standards through to the 2031 total traffic condition.

- Spratt Road and Cambie Road

The Spratt Road and Cambie Street intersection was shown to operate within City standards in both morning and afternoon peak periods through to the 2031 total traffic condition.

- Street 1 and River Road; Street 1 and Spratt Road

Both Street 1 access intersections, at River Road and Spratt Road, were shown to operate within City standards through to the 2031 total traffic condition. It was assumed the Street 1 approach at both intersections was kept as a shared single lane approach; however, there is sufficient right-of-way to accommodate two separate left and right turning lanes if required in the future.

The Street 1 and River Road intersection required a southbound left-turn with 70m of storage, not including deceleration or taper requirements. Shared lanes were considered acceptable on all other movements.

The Street 1 and Spratt Road intersection did not trigger any auxiliary turning lane requirements. The initial assumption of shared lanes on all approaches was considered acceptable.

The geometric requirements for both intersections should be reviewed and confirmed during detailed design for both intersections.

Geometric Analysis Results

- Geometric evaluations revealed no sight distance or corner clearance issues. Proper care should be taken to ensure no obstructions are placed in the line-of-sight in the vicinity of the proposed access points. The future access locations to the commercial blocks are expected to follow these guidelines, and will be assessed during the site plan application when more details are available.
- All auxiliary lane and storage length requirements at signalized intersections were in Section 7.3 of this study. New access intersections should be constructed as per City standards with required turning lanes.
- All geometric recommendations should be reviewed and confirmed during detailed design for each individual development.

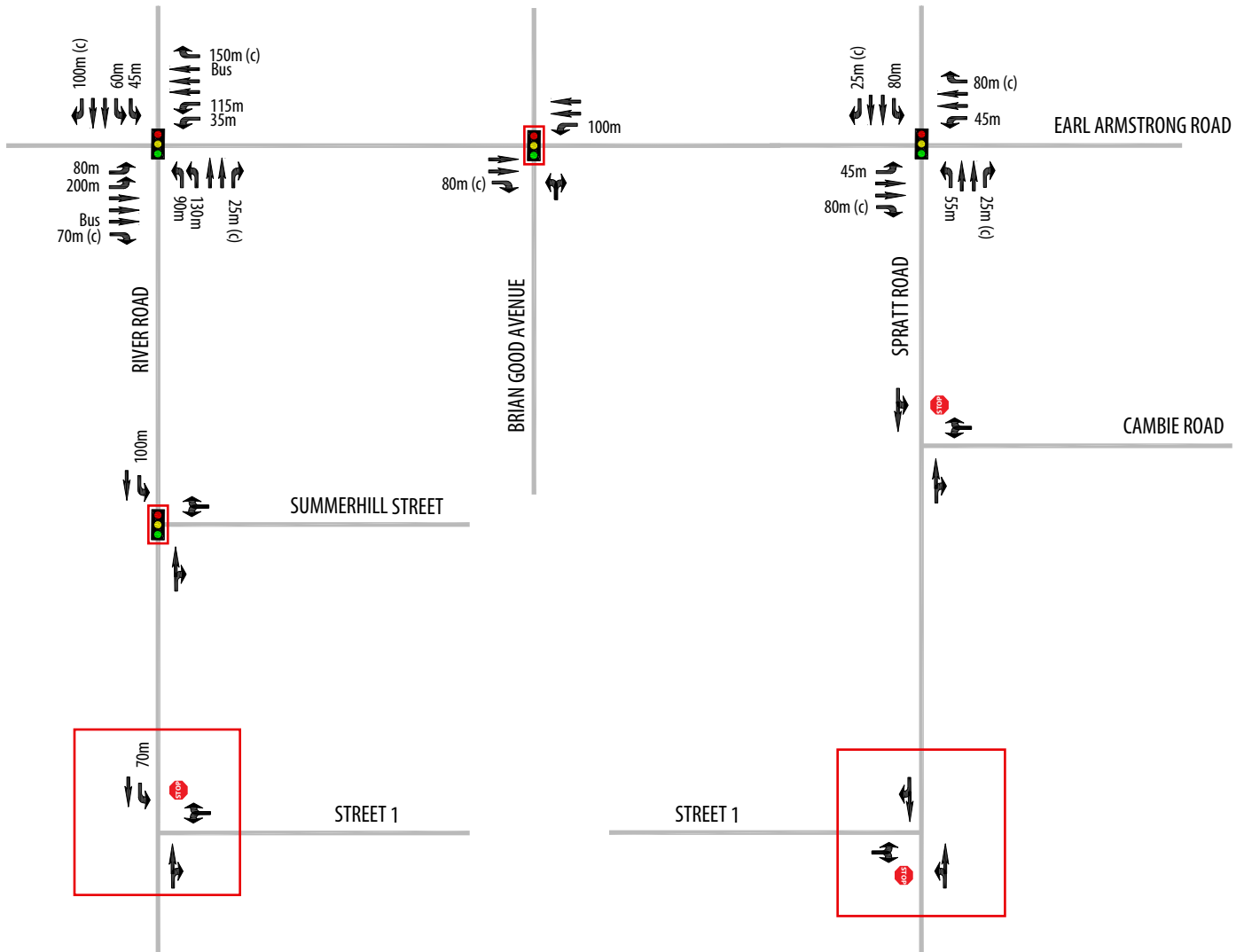
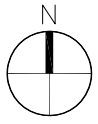
SUMMARY OF RECOMMENDATIONS

The following table outlines the staging of modifications for each intersection by horizon year up to 2031. The recommended design of Bank Street in the future (2031) horizon year based on the results of the Leitrim Community MTS has been provided in **Exhibit ES-1**.

TABLE ES-1 – Summary of Recommended Actions/ Modifications

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
Existing (2017)	Earl Armstrong and River Road: • Traffic demand exceeds capacity – does not meet City operational guidelines. • Intersection at ultimate configuration as per 2013 TMP • Queues exceed storage on the SBR movement in the afternoon peak period • Monitor annually to ensure capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach. Earl Armstrong and Brian Good Avenue • Implement Traffic Control Signals
Future (2021) Background – No RSSPh2 Traffic	Assume all actions and modifications from the Existing (2017) traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong River Road: • Monitor annually to ensure capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach River Road and Summerhill Street: • Implement Traffic Control Signals
Future (2021) Total – With RSSPh2 Traffic	Assume all actions and modifications from the Existing (2017) traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong and River Road: • Monitor annually to ensure capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach River Road and Street 1: • Claridge Homes - Construct unsignalized access intersection • Westbound stop controlled • Construct southbound left-turn lane with 70m storage • Shared through-turn lanes on north and westbound approaches
Future (2026) Background – No RSSPh2 Traffic	Assume all actions and modifications from the Future (2021) Background traffic conditions remain. Optimize all traffic signal timings.
Future (2026) Total – With RSSPh2 Traffic	Assume all actions and modifications from the Future (2021) Total traffic conditions remain. Optimize all traffic signal timings.

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
	Spratt Road and Street 1: • Urbandale Homes - Construct unsignalized access intersection • Eastbound stop controlled • Shared through-turn lanes on all approaches
Future (2031) Background – No RSSPh2 Traffic	Assume all actions and modifications from the Future (2026) Background traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong and Spratt Road: • Development growth expected to add strain to existing auxiliary turn lane storage capacity. Monitor to determine if existing storage can accommodate peak hour queues.
Future (2031) Total – With RSSPh2 Traffic	Assume all actions and modifications from the Future (2026) Total traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong and Spratt Road: • Monitor annually to ensure existing storage lengths are sufficient to accommodate queue lengths





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November 2, 2017

Asad Yousfani, M.Eng, P.Eng.
110 Laurier Avenue West
Ottawa, ON
K2P-2H9

Dear Mr. Yousfani:

**RE: CLARIDGE HOMES – RIVERSIDE SOUTH PHASE 2
TIA SCREENING LETTER**

The following Screening Letter was prepared on behalf of Claridge Homes in support of the Riverside South Phase 2 (RSS Ph2) draft plan application. The purpose of the Screening Letter is to demonstrate the need to carry out the Traffic Impact Assessment Process, as described in the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines.

Module 1.1 – Description of Proposed Development

IBI Group (IBI) was retained by Claridge Homes to complete a Transportation Impact Assessment (TIA) in support of the RSS Ph2 residential subdivision located in Riverside South in the City of Ottawa. The lands consist of two adjacent parcels with frontage on Spratt Road and River Road. The subject lands are municipally known as 4720 Spratt Road and 807 River Road, and combined are approximately 40 acres in size. The subject site is generally bounded to the north and south by an adjacent residential development, Riverside South Phase 15 by Urbandale Homes. To the east is Spratt Road and to the west is River Road.

Proposed Accesses:

The RSS Ph2 development proposes one (1) new access off River Road as part of Phase 1, which will also serve as an access for Riverside South Phase 15 (Urbandale).

The proposed development is divided into two (2) phases:

- Phase 1 is expected to be built and fully-occupied by 2021;
- Phase 2 is expected to be achieve full buildout and occupancy by 2026.

Module 1.2 - Trip Generation Trigger

The following table summarizes the proposed land uses and residential unit breakdown for each phase of development. **Table 1** summarizes the breakdown of units by type:

Asad Yousfani, M.Eng, P.Eng. – November 2, 2017

TABLE 1 – Land Use Statistics

PHASE	LAND USE	SIZE (# OF UNITS)
Phase 1	Townhome/ Semi-Detached Residential	172 units
	Single Family Homes	268 units
Phase 2	Townhome/ Semi-Detached Residential	237 units
	Single Family Homes	78 units

According to Table 2 in the 2017 Transportation Impact Analysis (TIA) Guidelines, the combined number of residential units proposed for this subdivision exceeds the minimum number of units required to trigger a Transportation Impact Assessment (TIA) Report; therefore, the Trip Generation Trigger is satisfied. A residential development containing a minimum of 40 single-family homes or 90 townhome/ semi-detached units will trigger Steps 2 to 5 in the Transportation Impact Assessment Process.

Conclusion: The Trip Generation Trigger is satisfied.

Module 1.3 – Location Triggers

The development does not propose a driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Cycling Networks.

The development was also confirmed not to be located in a Design Priority Area (DPA) or Transit-oriented Development (TOD) Zone.

Conclusion: The Location Trigger is not satisfied.

Module 1.4 – Safety Triggers

The following factors could cause an elevated potential for traffic operational safety concerns:

- The posted speed limits on Earl Armstrong Road, River Road and Spratt Road are all 60km/hr or greater:
 - o Earl Armstrong Road has a posted speed limit of 70km/h through the study area;
 - o River Road has a posted speed limit of 60km/h at the north and south approaches to Earl Armstrong Road. The speed limit along River Road increases to 80km/h as the road transitions to a two-lane rural cross-section south of Earl Armstrong Road;
 - o Spratt Road has a speed limit of 80km/h within the study area.

The following factors were reviewed and were likely determined not to result in traffic operational safety concerns:

- No significant horizontal or vertical curves exist on River Road or Spratt Road that would obstruct the view of a driver exiting the site. Proper care should be taken to ensure no obstructions be placed in the line-of-sight in the vicinity of the proposed access points.
- There are no proposed accesses that will make use of a median break that serves an existing access.
- Collision data from the last 5 years suggests that there are no traffic operations or safety concerns on any of the boundary streets located within 500m of the proposed development lands.
- There are no drive-thru facilities being proposed as part of this development.

Asad Yousfani, M.Eng, P.Eng. – November 2, 2017

Conclusion: The Safety Trigger is satisfied.

Conclusions and Recommendations:

Overall, the subject development satisfies the Trip Generation Trigger and Safety Trigger outlined in Step 1 of the 2017 Transportation Impact Assessment (TIA) Guidelines, as summarized in Table 2. Therefore, the next step in the TIA process will be initiated, i.e. the Scoping Form.

TABLE 2 – Screening Table Results

RESULTS OF SCREENING	YES	NO
Development satisfies the Trip Generation Trigger	X	
Development satisfies the Location Trigger		X
Development satisfies the Safety Trigger	X	

If you have any questions regarding this Transportation Impact Assessment (TIA) Screening Form, please do not hesitate to contact me at 613-225-1311.

Sincerely,



Austin Shih, P.Eng.
Project Engineer



Transportation Impact Assessment

Riverside South Phase 2

SCOPING REPORT



Prepared for Claridge Homes
by IBI Group

November 2017

Document Control Page

CLIENT:	Claridge Homes
PROJECT NAME:	Riverside South Phase 2 Lands TIA
REPORT TITLE:	TIA Scoping Report
IBI REFERENCE:	112842
VERSION:	2.0
DIGITAL MASTER:	J:\112842_RVSDPh2TIA\5.2 Reports\5.2.4 Transportation\5.2.4.5 Traffic Impact\TIA Submissions\2-Riverside South Ph2 - Scoping Report (Claridge)\TTR-Scoping-Claridge Riverside South Ph2-2017-10-30.docx\2017-11-04
ORIGINATOR:	Austin Shih, M.A.Sc, P.Eng.
REVIEWER:	
AUTHORIZATION:	Justin Date, P.Eng.
CIRCULATION LIST:	Asad Yousfani, M.Eng, P.Eng.
HISTORY:	1.0. Scoping Report to City of Ottawa – September 2017 2.0. Final Report Submission – November 2017

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1 Introduction

The following Scoping Report has been prepared on behalf of Claridge Homes in support of the Riverside South Phase 2 (RSS Ph2) draft plan of subdivision application. The format of the Scoping Report was based on the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. The purpose of the Scoping Report is to identify "the range of analyses required to understand how well the development proposal aligns with City of Ottawa policies and objectives and if the transportation network requires modification to offset development impacts." ¹

Once the Scoping Report is approved by City staff, the next stage of the TIA process will be to complete the Forecasting Report.

1.1 Background

IBI Group (IBI) was retained by Claridge Homes to complete a Transportation Impact Assessment (TIA) in support of the Riverside South Phase 2 residential subdivision in the City of Ottawa. The lands consist of two adjacent parcels with frontage on Spratt Road and River Road. The subject lands are municipally known as 4720 Spratt Road and 807 River Road, and combined are approximately 40 acres in size.

In following the recently updated City of Ottawa TIA Guidelines, the initial Screening Form was completed to demonstrate the need to complete the full Traffic Impact Assessment process. This form confirmed both the Trip Generation and Safety criteria were triggered, meaning the full TIA process must be completed to support the application.

If the Scoping Report is accepted by the City, the next step in the process would be to complete a Forecasting Report.

1.2 Methodology

The contents of the Scoping Report was based on the requirements set in the City of Ottawa TIA Guidelines. The following parameters were followed in this report:

- Existing and Planned Conditions;
- Key parameters including the study area, time periods for analysis and time horizons; and,
- Any scope exemptions that would eliminate elements of work not relevant to the development proposal, based on consultation with City staff.

1.3 Reference Material

The following reference material was used in the preparation of this report:

- City of Ottawa Transportation Impact Assessment Guidelines (2017)
- City of Ottawa Transportation Master Plan (2013)
- Development Charges Amendment Background Study: Transit, Roads and Related Services (2017)
- Riverside South Community Design Plan (2016)
- Riverside South Phase 9 TIS, Dillon Consulting, (2010)
- Riverside South Phase 13 TIS, Dillon Consulting (2014)
- Riverside South Phase 8 TIS Update, Dillon Consulting (2015)

¹ City of Ottawa TIA Guidelines (2017), 19.

2 Description of Proposed Development

2.1 Site Location

The proposed RSS Ph2 residential development is municipally known as part of lands 4720 Spratt Road and 807 River Road, in the Riverside South Community. The proposed development consists of two abutting parcels of land with frontage on Spratt Road and River Road. These properties combined are approximately 40 hectares in size, and are bounded by the proposed Riverside South Phase 15 residential development by Urbandale Homes to the north and south, Spratt Road to the east and River Road to the west.

The subject site location is shown in **Exhibit 1**.

2.2 Land Use and Phasing

The proposed draft plan for the subject site is shown in **Exhibit 2**. The proposed development will contain a mix of low and medium density residential land uses. The Riverside South Community Design Plan (RSS CDP) confirms the current land use plan for the subject site is meant for low and medium density residential uses. For the purposes of this study, the RSS Ph2 development was expected to be constructed in two phases. Phase 1 will be constructed and occupied by 2021 and Phase 2 by 2026. However, the assumed buildout horizon year is highly dependent on market forces, and it is possible buildout and full occupancy won't be achieved by these horizon years.

Table 1 summarizes the proposed land uses and densities.

TABLE 1 – Land Use Statistics

PHASE	LAND USE	SIZE (# OF UNITS)	FULL BUILDOUT/ OCCUPANCY
Phase 1	Townhome/ Semi-Detached Residential	172 units	2021
	Single Family Homes	268 units	2021
Phase 2	Townhome/ Semi-Detached Residential	237 units	2026
	Single Family Homes	78 units	2026

2.3 Site Layout

The subject site proposes two (2) new access intersections:

- River Road and Street 1 (expected by 2021 horizon year)
- Spratt Road and Street 1 (expected by 2026 horizon year)

Street 1 will be a 2-lane urban collector road with a 26m right-of-way (ROW) that will ultimately extend from River Road to Spratt Road within the study area. For Phase 1, Street 1 will extend east from River Road and end at the Phase 1 property limit, which aligns with the future extension of Brian Good Avenue. The extension of Brian Good Avenue to Street 1 is not expected by the 2021 horizon year, meaning Street 1 will temporarily end at the property limit.

The intersection of River Road and Street 1 is proposed within the adjacent Riverside South Ph15 lands owned by Urbandale Homes. At the time of this study, it was understood that Claridge Homes would construct the River Road and Street 1 intersection, as part of Phase 1 for the proposed development. This assumption should be confirmed prior to assigning conditions of approval for each draft plan application.

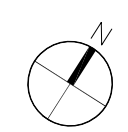
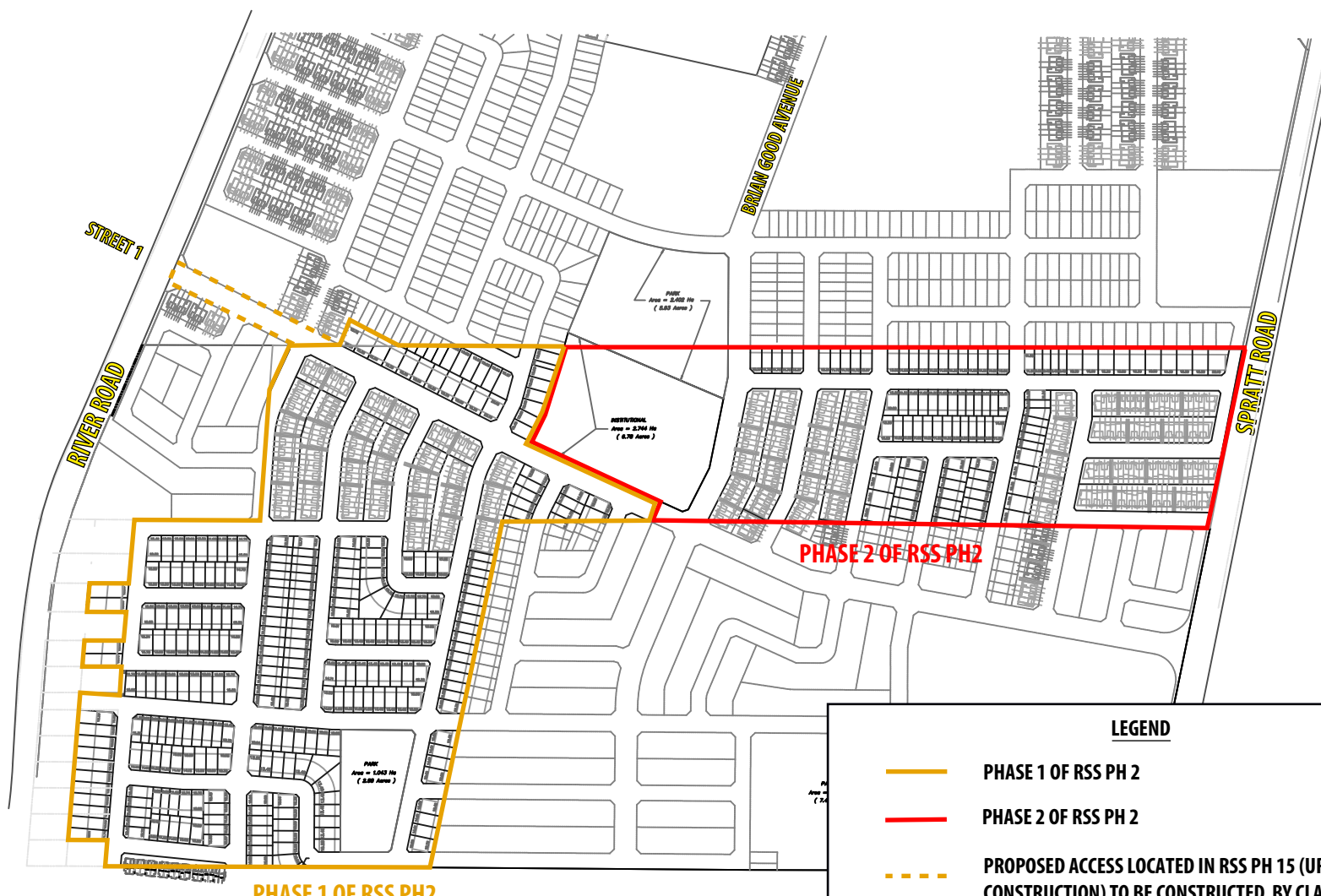


Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 1
Site Location

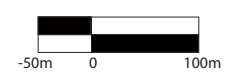
PROJECT No.: 112842
DATE: NOVEMBER 2017
SCALE:





LEGEND

- PHASE 1 OF RSS PH 2
- PHASE 2 OF RSS PH 2
- - - PROPOSED ACCESS LOCATED IN RSS PH 15 (URBAN DALE CONSTRUCTION) TO BE CONSTRUCTED BY CLARIDGE HOMES



For access to Phase 2 of the RSS Ph2 development, it was confirmed by Urbandale Homes that the section of Street 1 from Brian Good Avenue to Spratt Road, located within the adjacent Riverside South Ph15 lands, would be constructed by Urbandale to permit access by the 2026 horizon year.

The intersections of River Road and Street 1, and Spratt Road and Street 1 will permit all-turn movements.

3 Existing Conditions

3.1 Existing Road Network

3.1.1 Roadways

Earl Armstrong Road is designated as an urban arterial road with a 44.5m ROW in the City of Ottawa Official Plan. Earl Armstrong Road is oriented east-west from River Road in the west to High Road in the east. Further west, across the Vimy Memorial Bridge, Earl Armstrong Road transitions to Strandherd Drive, which is also designated as an urban arterial road with a similar ROW. Earl Armstrong Road has a 4-lane urban cross-section from Riverview Station to just east of Limebank Road and a four lane urban cross-section with two additional dedicated bus lanes from Riverview Park and Ride Station to Strandherd Drive. On Strandherd Drive the 4-lane urban cross-section with two additional bus lanes continues to just west of Cresthaven Drive. The posted speed limit on Earl Armstrong Road is 70km/h west of Riverview Station, and 80km/h east of Riverview Station.

River Road is a 2-lane urban arterial roadway with a ROW of 37.5m that runs along the Rideau River from Riverside Drive/ Limebank Road south beyond the City limits. River Road has a 4-lane urban cross section at the intersection with Earl Armstrong Road. The posted speed limit on River Road is 60 km/h at the north and south approaches to Earl Armstrong Road, and increases to 80km/h south of Earl Armstrong Road as the road transitions to a 2-lane rural cross-section.

Spratt Road is a 2-lane collector road with a ROW of 26m that extends from Limebank Road to Mitch Owens Road. North of Earl Armstrong Road, Spratt Road has an urban cross-section and a 60 km/h posted speed limit, but transitions to a rural cross-section south of Earl Armstrong Road with a posted speed limit of 80 km/h.

Brian Good Avenue is a north-south 2-lane urban collector road with a ROW of 26m that provides access to the the Riverside South communities south of Earl Armstrong Road. The road currently extends approximately 750m south of Earl Armstrong Road, and is expected to continue south as development proceeds in the area. The posted speed limit is 50km/h.

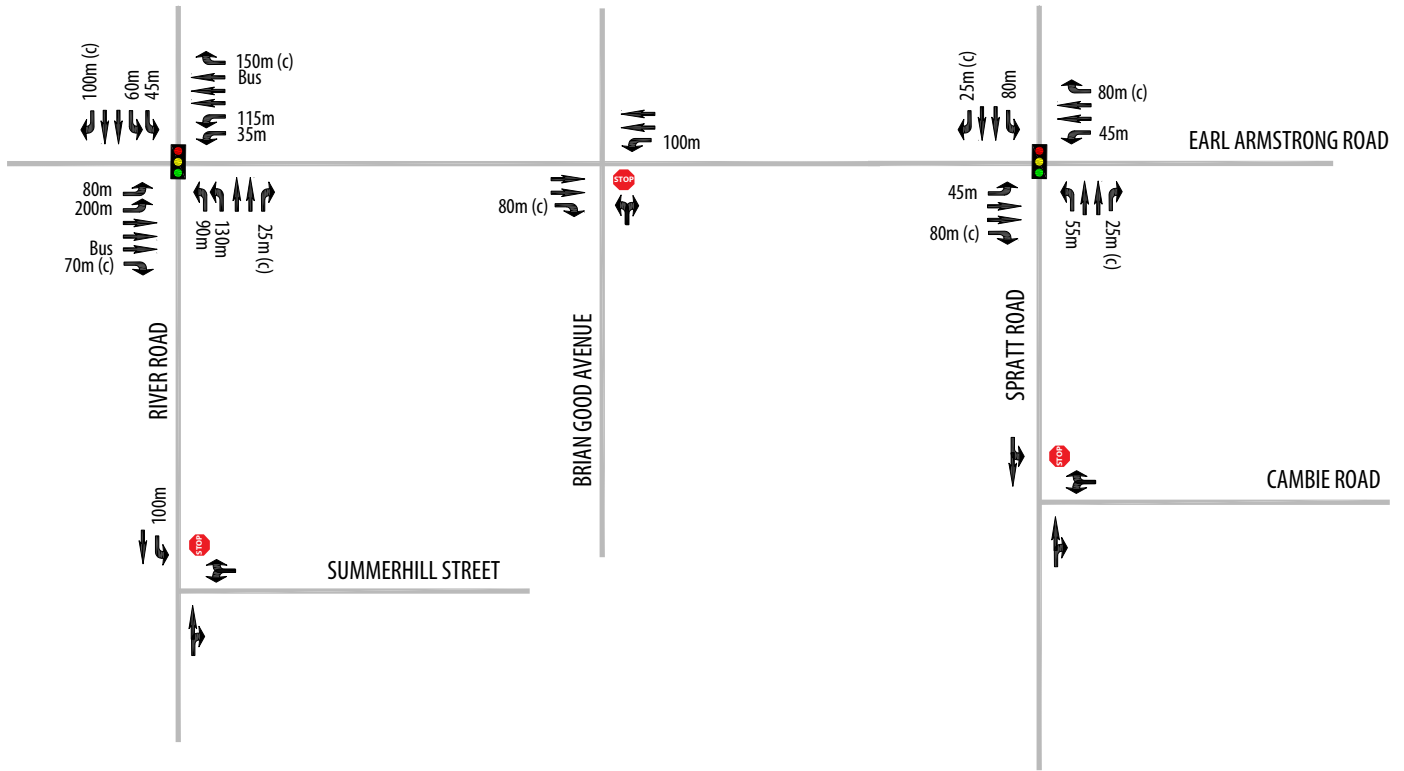
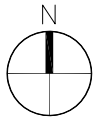
Summerhill Street and Cambie Street are east-west 2-lane urban local roads with a ROW of 20m that provide access to the Riverside South Phase 9 and Riverside South Phase 8/13 communities respectively. The speed limit on both roadways is 50km/h.

3.1.2 Study Area Intersections

The following existing intersections will be evaluated in this report.

- Earl Armstrong Road and River Road
- Earl Armstrong Road and Spratt Road
- Earl Armstrong Road and Brian Good Avenue
- River Road and Summerhill Street
- Spratt Road and Cambie Road

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



LEGEND

- TRAVEL LANES AND PERMITTED MOVEMENTS
- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- CHANNELIZATION
- AUXILIARY STORAGE LENGTH (in metres)
DOES NOT INCLUDE TAPER LENGTH



3.1.3 Traffic Management Measures

There are currently no existing traffic management or traffic calming measures on any of the boundary roads located within the study area.

3.2 Existing Traffic Volumes

Weekday morning and afternoon peak hour turning movement counts were obtained from the City of Ottawa at the following study area intersections. Where City data was not available, IBI Group completed the necessary traffic counts.

- Earl Armstrong Road and River Road (City of Ottawa, June 2016)
- Earl Armstrong Road and Spratt Road (City of Ottawa, August 2015)
- Earl Armstrong Road and Brian Good Avenue – Side Street Traffic Only (IBI Group, August 2017)
- River Road and Summerhill Street – (City of Ottawa, August 2017)
- Spratt Road and Cambie Road – Side Street Traffic Only (IBI Group, August 2017)

The turning movement counts completed at Earl Armstrong Road and Brian Good Avenue, and at Spratt Road and Cambie Road only counted the side street traffic volumes. The City turning movement count at Earl Armstrong and Spratt Road was used to determine main street volumes, which were then balanced between adjacent intersections.

A 1.5% linear growth rate was applied to historical intersection turning movement counts to estimate existing 2017 horizon year. The 1.5% growth rate was based on previously approved traffic impact studies by Dillon Consulting, completed for adjacent developments within the Riverside South Community.

The existing (2017) peak hour traffic volumes are shown in **Exhibit 4**. Traffic count data is provided in **Appendix A**.

3.3 Existing Bicycle and Pedestrian Facilities

Dedicated cycling lanes exist on both sides of River Road for 150m north of Earl Armstrong Road and on both sides of Earl Armstrong Road through the study area. Paved and gravel shoulders on River Road south of Earl Armstrong Road are able to accommodate cyclists.

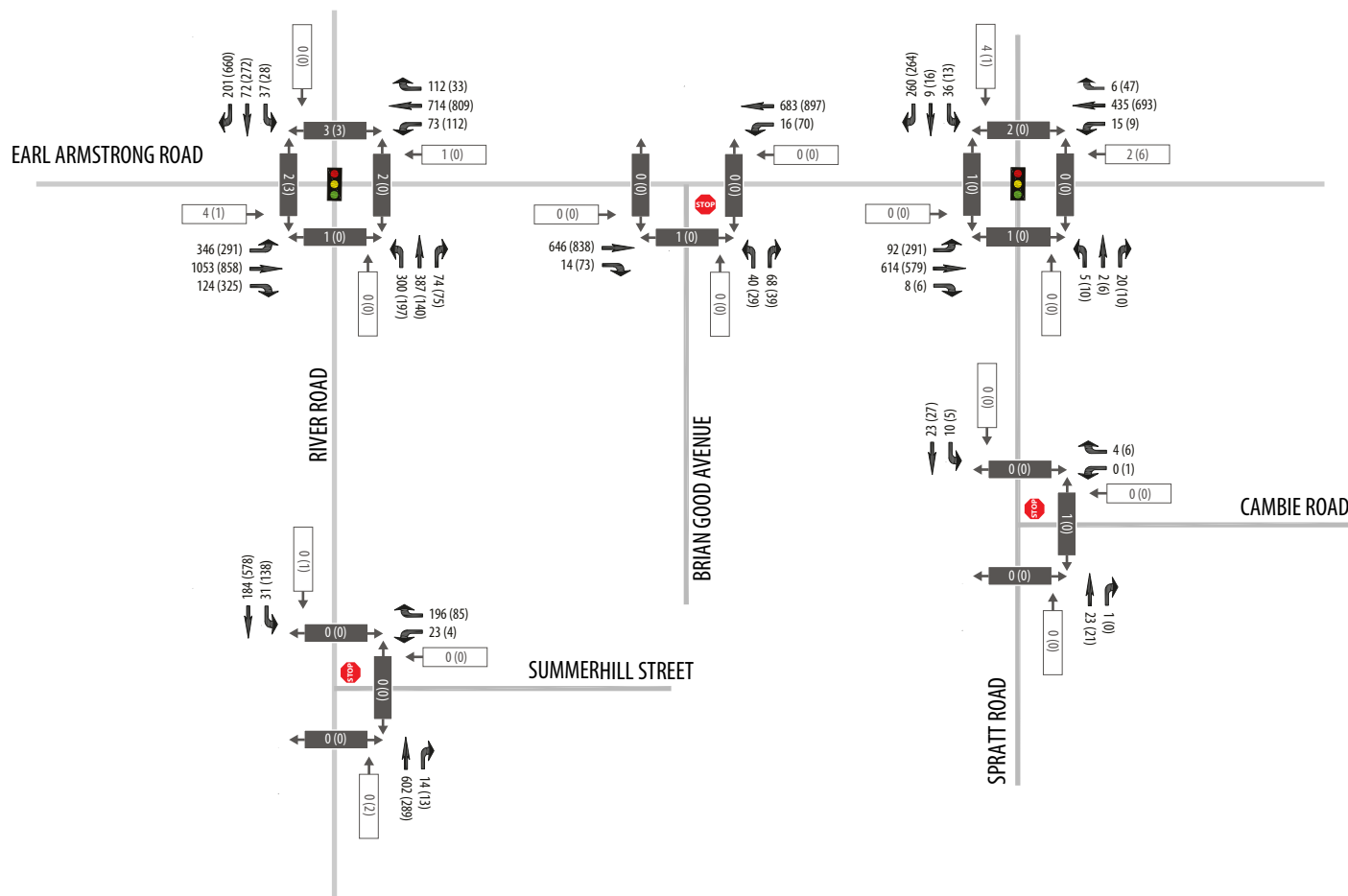
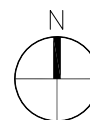
Concrete sidewalks exist on both sides of Earl Armstrong Road and on the east side of River Road for 150m north of Earl Armstrong Road. There are no sidewalks along River Road or along Spratt Road south of Earl Armstrong Road.

There are existing multi-use pathways (MUPs) that run along the west side of the Rideau River both north and south of the study area. There is also an existing multi-use pathways on the east side of the Rideau River north of Earl Armstrong Road.

3.4 Existing Transit Facilities and Service

Earl Armstrong Road provides exclusive transit lanes from the Riverview Park and Ride Station west across the Vimy Memorial Bridge. There are currently three (3) OC Transpo service routes that run through the study area.

- Route #94 is a regular/all-day 15-minute headway service route that operates between Millennium Station and the Riverview Park and Ride. On weekends service is reduced to 30-minute headway. Buses enter/ exit the study area via Strandherd Drive.
- Route #99 is a regular/all-day 15-minute on-peak, 30 minute off-peak headway service route that operates between South Keys station and the Riverview Park and Ride. During the morning and afternoon peak hours on weekdays, service is extended to Lebreton Station and to Manotick. On weekends service is reduced to 30-minute headway.



LEGEND



STOP CONTROL



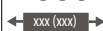
TRAFFIC CONTROL SIGNAL



TRAVEL LANES AND PERMITTED MOVEMENTS



AM & PM PEAK HOUR VOLUMES



AM & PM PEAK HOUR PEDESTRIAN VOLUMES



AM & PM PEAK HOUR CYCLING VOLUMES



Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 4
Existing 2017 Auto, Cycling and Pedestrian
AM & PM Peak Hour Traffic Volumes

PROJECT No.: 112842
DATE: NOVEMBER 2017
SCALE: NTS

- Route #189 is a peak period weekday service route that operates between South Keys station and the Riverview Park and Ride. There is no bus service on weekends. Buses enter/ exit the study area via River Road.

The Riverview Park and Ride was completed in August 2010 and is located approximately 1km north of the proposed development. This facility currently contains approximately 400 parking spaces. Transit service maps for the above routes have been provided in **Appendix B**. The Riverview Park and Ride Station is shown below in **Exhibit 5**. The existing transit stops within the study area are shown in **Exhibit 6**.

EXHIBIT 5 – Riverview Transit Station and Park & Ride

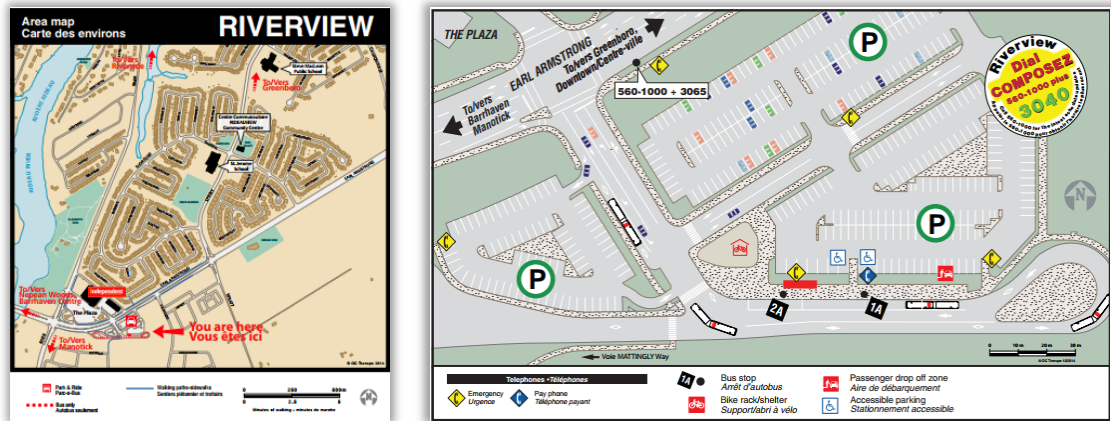
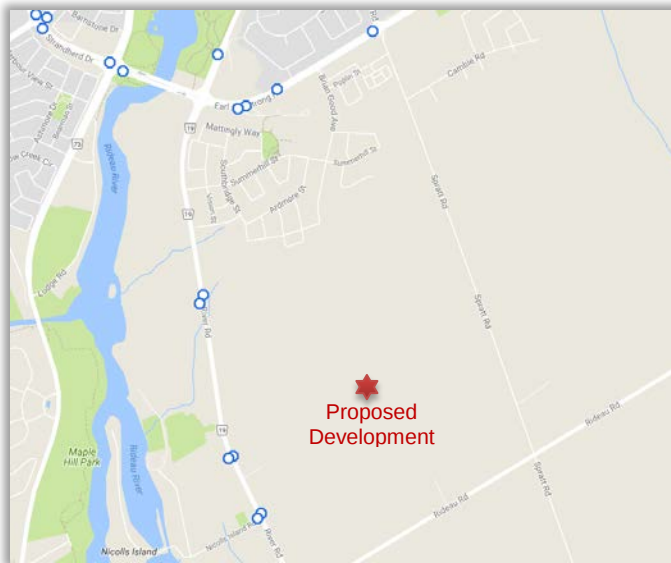


EXHIBIT 6 – Existing Transit Stops



3.5 Collision Analysis

A review of historical collision data has been provided. The City requires 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, 2011 and January 1, 2016.

TABLE 2 – Reported Collisions within Study Area

LOCATION	# OF REPORTED COLLISIONS
Earl Armstrong Road and River Road	33
Earl Armstrong Road and Spratt Road	12
Earl Armstrong Road and Brian Good Avenue	2
Earl Armstrong Road, River Road to Spratt Road	3

Based on Table 2, collisions at Earl Armstrong Road and River Road required further analysis to determine if there is a discernible collision pattern at the intersection. A copy of the City collision records is available in **Appendix C**.

Earl Armstrong Road and River Road

- 8 rear-end collisions of southbound vehicles turning right from River Road onto the Vimy Memorial Bridge were recorded between January 1, 2011 and January 1, 2016.

The 8 recorded rear-end collisions was likely caused by the high number of southbound right-turning vehicles at the River Road and Earl Armstrong Road intersection in the afternoon peak hour. The 2017 existing turning movement count show over 600 southbound right-turning vehicles in the afternoon peak hour, which is well above what is normally observed at a major intersection. These vehicles are required to yield to over 1,000 westbound through vehicles. It is expected that rear-end collisions may occur at this level of traffic intensity. The only mitigation measure is to reduce traffic volumes on the observed movement. City policies are attempting to accomplish this over time, as more supportive infrastructure projects are completed, such as the widening of Prince of Wales and completion of the Trillium Line South extension to Limebank Road. As implementation gradually occurs, traffic volumes and the reported number of collisions will decrease.

4 Planned Conditions

4.1 Changes to the Study Area Transportation Network

4.1.1 Future Road Network Projects

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

- Earl Armstrong Road widening – Widen from 2 to 4-lanes between Limebank Road and Bowesville Road and a new 2-lane road between Bowesville Road and Bank Street (Phase 3: 2026-2031)
- Prince of Wales Drive widening – Widen from 2 to 4-lanes between Merivale Road and West Hunt Club Road (Phase 3: 2026-2031)

It should also be noted that Prince of Wales Drive is currently undergoing intersection modifications and coordinated network modifications from Strandherd Drive to West Hunt Club Road. These road modifications are anticipated to be complete by the end of 2017. Road closures are scheduled to occur in off-peak times only; commuters travelling during the AM and PM peak periods are not expected to be affected by these closures.

Exhibit 7 shows the road network projects in the vicinity of the study area that are part of the affordable plan.

The Development Charges Amendment Background Study: Transit and Roads and Related Services (March 24, 2017) identified that funds were being put aside for the Earl Armstrong Road widening to occur sometime between 2030 and

2031, and that funds were also being put aside for the future Prince of Wales Drive widening to occur sometime between 2026 and 2031.

EXHIBIT 7 – Future Road Network Projects

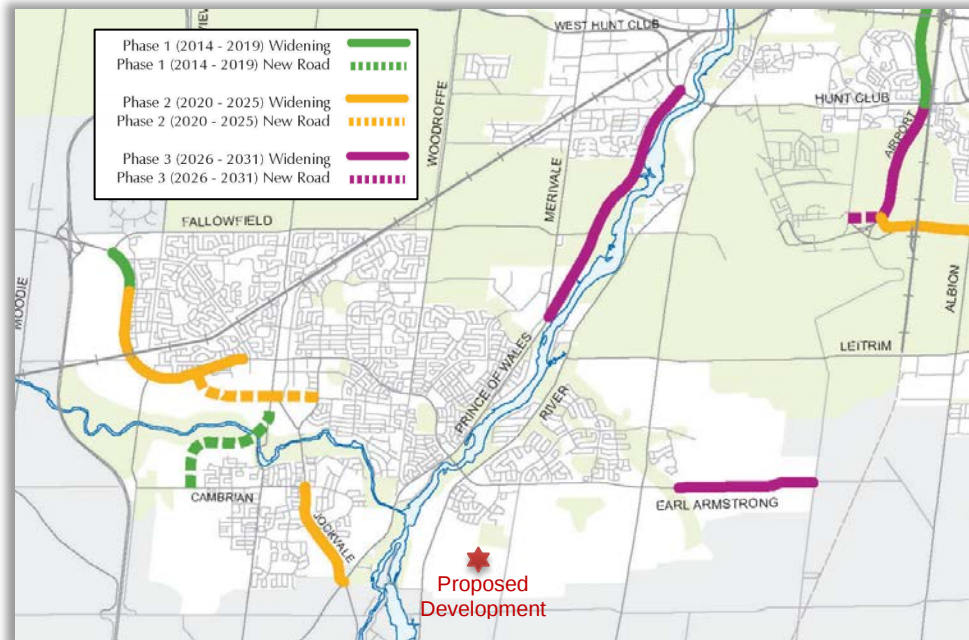
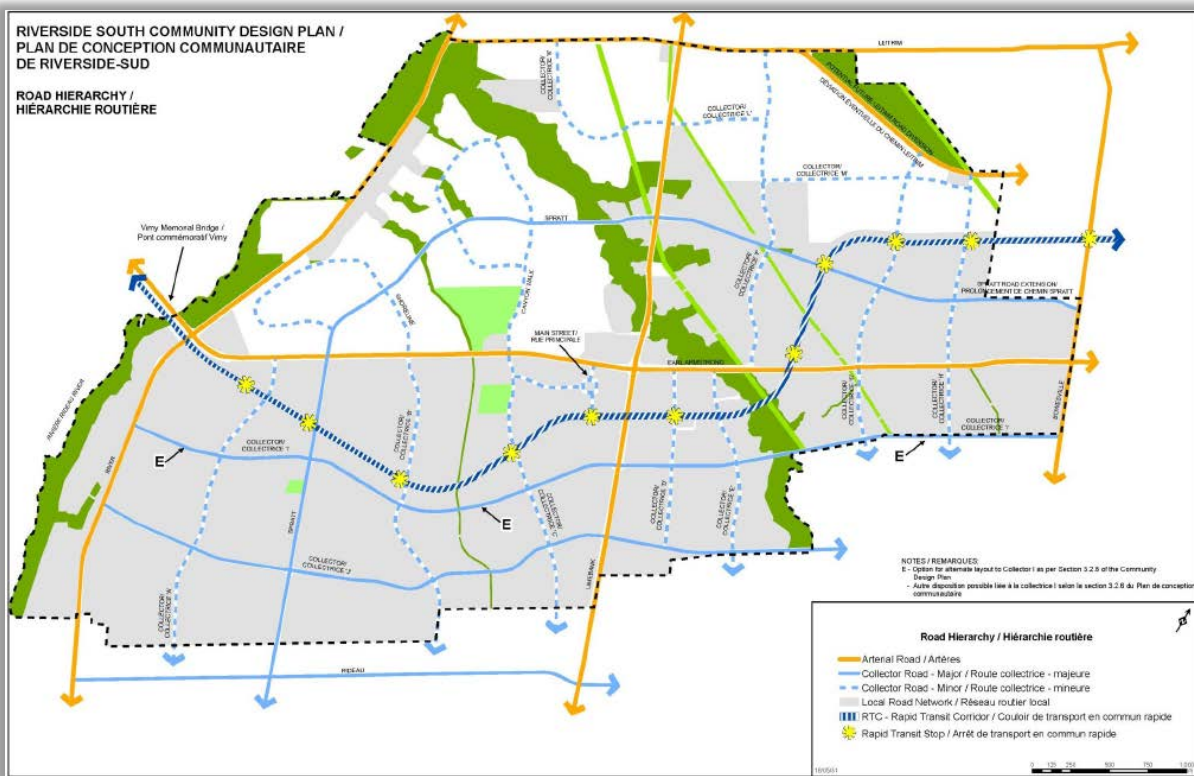


EXHIBIT 8 – Riverside South Community Design Plan – Network Concept



The Riverside South (RSS) Community Design Plan (CDP) proposes two major east-west collector roads. The first runs north of the proposed development called Borbridge Avenue, which already has a small segment constructed. The second is Street 1 on the proposed draft plan that runs through the RSS Ph2 development.

The CDP also indicates that Brian Good Avenue will be extended south to Rideau Road, bisecting Phase 1 and 2. The planned RSS CDP transportation network is shown in **Exhibit 8**.

4.1.2 Future Transit Facilities and Services

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

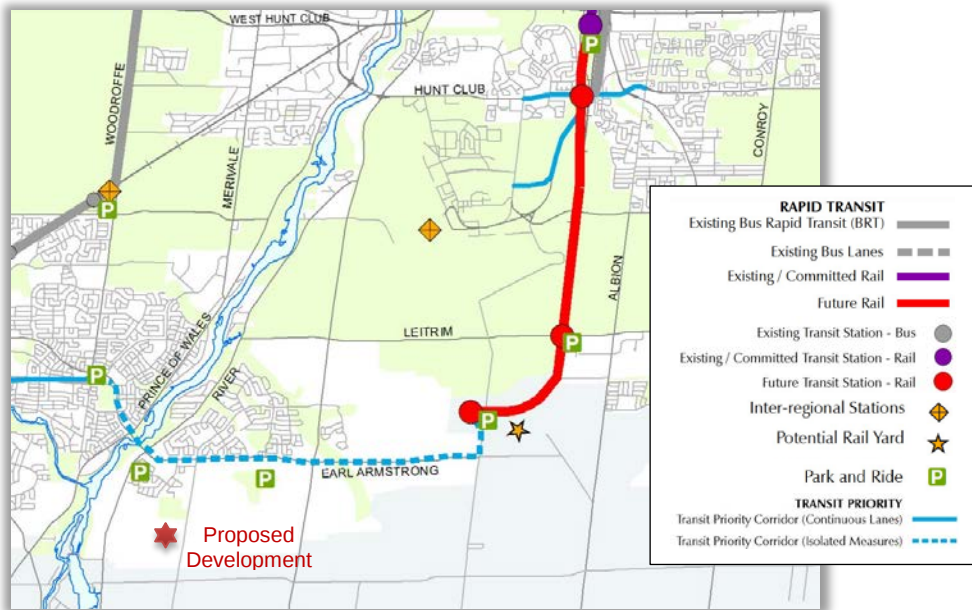
- O-Train Trillium Line South – Extension of the O-Train from Greenboro Station to Bowesville, including new stations at Gladstone, Walkley, South Keys and Leirtrim (2021);
- The Chapman Mills/ Strandherd Drive/ Earl Armstrong Road - The corridor is expected to be upgraded with transit signal priority and queue jump lanes between the Barrhaven Town Centre Station and Bowesville Station.

The following project was noted in the '2031 Network Concept' that may have an impact on study area traffic:

- South Transitway: Barrhaven – Riverside South Rapid Transit Corridor – At-grade BRT corridor between Southwest Transitway and Riverside South Town Centre.

Exhibit 9 shows the transit infrastructure projects in the vicinity of the study area that are part of the affordable plan.

EXHIBIT 9 – Future 'Affordable RTTP Network Projects'



The Development Charges Amendment Background Study: Transit and Roads and Related Services (March 24, 2017) identified that funds were being reserved for the extension of the O-Train (Trillium Line South) from Greenboro Station to Bowesville sometime between 2018 and 2023 (current estimated completion by 2021 on LRT2 website), but did not identify any funds specifically being set aside for the Chapman Mills/ Strandherd Drive/ Earl Armstrong Road transit priority corridor, nor the Barrhaven – Riverside South Rapid Transit Corridor.

The RSS CDP also identifies the eventual construction of a Rapid Transit Corridor to the north of the proposed development. The plan previously shown in **Exhibit 8** outlines the corridor passing just to the south of the existing Riverside Park and Ride Station.

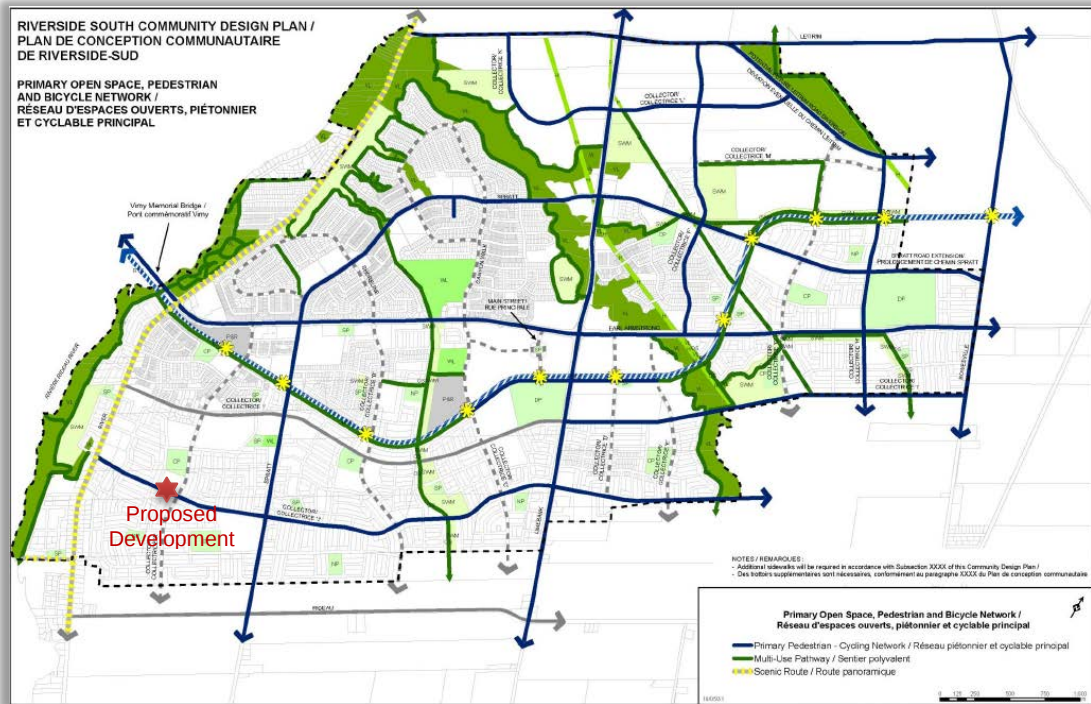
4.1.3 Future Cycling and Pedestrian Facilities

The Transportation Master Plan (TMP) designates River Road and Earl Armstrong Road as "Spine" or "City-wide Cycling Routes," which form part of a system linking the commercial, employment, institutional, residential and educational nodes throughout the City of Ottawa, and designate Spratt Road as a "Local Route". Multi-use pathways (major pathways) are currently provided along the west side of the Rideau River and north of Earl Armstrong Road, which tie into the existing urban pedestrian network.

The RSS CDP provided further detail on proposed active transportation facilities within the general area. It included the construction of a multi-use pathway along the shore of the Rideau River and along the Rapid Transit Corridor. Furthermore, it shows Earl Armstrong Road, Spratt Road and Street 1 as being part of the "Primary Pedestrian – Cycling Network" and River Road as part of the "Scenic Route".

The planned cycling and pedestrian network from the CDP are shown below in **Exhibit 10**.

EXHIBIT 10 – Riverside South Community Design Plan – Cycling and Pedestrian Network



4.2 Future Adjacent Developments

The City of Ottawa Transportation Impact Assessment (TIA) Guidelines specifies all significant developments within the study area which are likely to occur within the horizon years must be identified and taken into consideration in all Traffic Impact Assessment (TIA) reports. Since the traffic generated by these developments was not captured in the background traffic growth calculation, they must be added separately.

There are five (5) known significant developments in the vicinity of the study area that are either in the development application approval process, have already been approved and in pre-construction, or are currently under construction. The unit counts and characteristics for each development were based on previous traffic studies completed by Dillon Consulting Limited on behalf of the Riverside South Development Corporation. All unoccupied units would be accounted for in the TIA process, using the same trip generation process as the proposed development, and added separately as required in the TIA Guidelines. Any occupied units would be discounted from the analysis.

The adjacent developments have been summarized in **Table 3**, and their approximate locations in relation to RSS Ph2 is shown in **Exhibit 11**.



Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 11
Future Adjacent Developments

PROJECT No. 112842
DATE: NOVEMBER 2017
SCALE: -100m 0 400m

TABLE 3 – Future Adjacent Development Statistics

DEVELOPMENT NAME	LAND USE	DEVELOPMENT SIZE (UNITS or SQFT)	UNITS or BUILDINGS NOT BUILT/ OCCUPIED ¹	EXPECTED FULL BUILDOUT/ OCCUPANCY DATE
Phase 8	Single Family Residential Units	176	134	2018
	Townhome Units	256	228	2018
	Stacked Townhome Units	146	0	2018
Phase 9 (South)	Single Family Residential Units	414	22	2018
	Townhome Units	760	0	Complete
	Stacked Townhome Units	181	0	Complete
	Shopping Centre	101,000 sqft	101,000 sqft	2018
Phase 9 (Northeast)	Stacked Townhome Units	181	34	2018
Phase 9 (Southeast)	Single Family Residential Units	22	22	2018
	Townhome Units	114	114	2018
Riverside South Phase 13	Single Family Residential Units	282	282	2018
	Townhome Units	190	190	2018
Urbandale Phase 15 (1A, 1B)	Single Family Residential Units	215	215	2021
	Townhome Units	373	373	2021
Urbandale Phase 15 (2 & 3)	Single Family Residential Units	293	293	2026
	Townhome Units	192	192	2026
Block K	Stacked Townhomes Units	84	84	2023
	Shopping Centre	143,000 sqft	143,000 sqft	2023

¹ Occupancy rates are based on a site visit conducted by IBI Group staff on August 17, 2017.

4.3 Network Concept Screenline

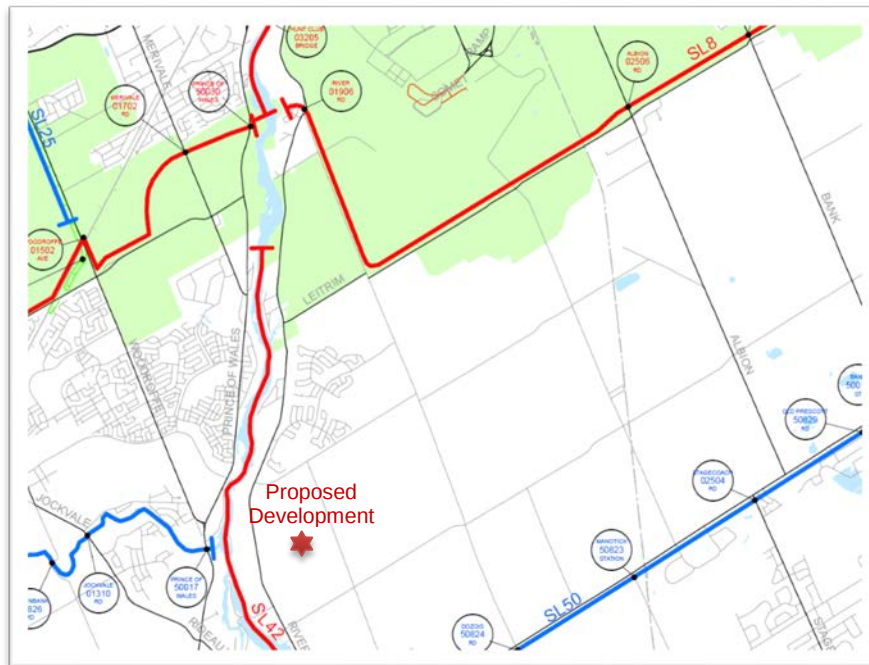
A screenline is an imaginary line made up of a number of stations to count east/west or north/south travel within a particular area. Screenlines are typically located along geographical barriers such as rivers, rail lines or within the greenbelt. To be truly representative of the flow, there is a station at each intersecting road crossing the screenline.

As specified in Module 4.8 of the 2017 TIA Guidelines, the latest Network Concept will be reviewed with to ensure that the nearest strategic planning screenlines adjacent to the development are considered in the screenline analysis.

- **SL8 – Leitrim** – This is the nearest east/west screenline to 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 (3) 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 changes to Riverside Drive.
- **SL42 – Rideau River (Manotick)** – This is the closest 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 **Exhibit 12**, as determined from the City of Ottawa's Road Network Development Report (2013), a supporting document to the 2013 Transportation Master Plan (TMP).

EXHIBIT 12 – Closest North/South & East/West Screenlines to Study Area



5 Study Parameters

5.1 Proposed Study Area

Based on the review of the nearest screenlines, transit routes and active transportation facilities, the proposed study area will be defined by River Road to the west, Earl Armstrong Road to the north, Spratt Road to the east and proposed development lands by Urbandale Homes, Riverside South Phase 15, to the south.

The following intersections will be assessed as part of this TIA:

- Earl Armstrong Road and River Road
- Earl Armstrong Road and Brian Good Avenue
- Earl Armstrong Road and Spratt Road
- River Road and Summerhill Street
- Spratt Road and Cambie Road
- River Road and Street 1
- Spratt Road and Street 1

5.2 Time Periods

Since this is a residential development, traffic generated during the morning and afternoon peak hour are expected to result in the most significant impact to traffic operations on the adjacent network in terms of development-generated and background traffic. They will be used for operational analysis in the TIA.

5.3 Horizon Years

Three (3) future horizons are proposed for analysis in the Transportation Impact Analysis (TIA) Report:

- Year 2021 – Opening Day; Full occupancy of Phase 1 of RSS Ph2
- Year 2026 – Opening Day; Full occupancy of Phases 2 of RSS Ph2;
- Year 2031 – Fully Buildout/ Occupancy plus 5 years for RSS Ph2

5.4 Exemptions Review

Table 4 of the Transportation Impact Assessment (TIA) Guidelines provides exemption considerations for both the Design Review Component and Network Impact Component. Upon reviewing this list, the Circulation and Access and Parking components were exempted from the TIA analysis, as the proposed development application is for draft plan and not site plan approval. No other exemptions were considered for the TIA.



Riverside South Phase 2

Transportation Impact Assessment Scoping Report

Appendix A: Traffic Data

November 2017





Turning Movement Count - 15 Minute Summary Report

EARL ARMSTRONG RD @ RIVER RD

Survey Date: Tuesday, March 08, 2016

Total Observed U-Turns

Northbound: 3 Southbound: 1
Eastbound: 0 Westbound: 1

		RIVER RD									EARL ARMSTRONG RD											
		Northbound			N TOT	Southbound			S TOT	STR TOT	Eastbound			E TOT	Westbound			W TOT	STR TOT	Grand Total		
Time Period		LT	ST	RT		LT	ST	RT			LT	ST	RT		LT	ST	RT					
07:00	07:15	61	123	15	199	6	15	28	49	248	113	225	15	353	8	141	13	162	515	763		
07:15	07:30	69	98	19	186	9	6	32	47	233	94	247	26	367	9	153	24	186	553	786		
07:30	07:45	71	101	21	193	6	16	37	59	252	108	284	21	413	12	150	24	186	599	851		
07:45	08:00	54	83	15	152	9	5	31	45	197	98	230	26	354	23	183	24	230	584	781		
08:00	08:15	64	100	19	183	14	21	40	75	258	102	201	25	328	9	143	17	169	497	755		
08:15	08:30	64	65	22	151	10	9	49	68	219	94	196	16	306	12	170	24	207	513	732		
08:30	08:45	48	57	8	113	6	22	57	85	198	105	158	22	285	6	148	17	171	456	654		
08:45	09:00	44	48	12	104	8	19	37	64	168	79	131	19	229	21	148	14	183	412	580		
09:00	09:15	47	48	17	112	3	10	39	52	164	84	130	21	235	11	119	7	137	372	536		
09:15	09:30	37	59	15	111	3	12	31	46	157	65	95	16	176	14	107	8	129	305	462		
09:30	09:45	40	40	12	92	4	22	21	47	139	65	76	15	156	14	108	8	130	286	425		
09:45	10:00	33	37	12	82	4	9	34	47	129	50	82	18	150	10	94	5	109	259	388		
11:30	11:45	23	33	9	66	3	13	44	60	126	31	87	18	136	10	75	7	92	228	354		
11:45	12:00	31	31	14	77	3	27	35	65	142	35	87	31	153	6	76	1	83	236	378		
12:00	12:15	26	26	15	67	3	18	40	61	128	36	109	22	167	13	73	4	90	257	385		
12:15	12:30	36	31	9	76	4	22	32	58	134	39	70	22	131	14	91	4	109	240	374		
12:30	12:45	29	27	11	67	4	10	46	60	127	45	81	22	148	23	82	6	111	259	386		
12:45	13:00	23	23	10	56	4	22	32	58	114	38	87	31	156	12	54	4	70	226	340		
13:00	13:15	22	43	14	79	4	20	42	66	145	46	91	27	164	8	68	4	80	244	389		
13:15	13:30	21	25	12	58	4	23	28	55	113	43	84	36	163	21	113	5	139	302	415		
15:00	15:15	20	29	9	58	5	45	66	116	174	55	118	49	222	26	104	9	139	361	535		
15:15	15:30	37	21	11	69	9	37	129	175	244	44	120	48	212	25	149	4	178	390	634		
15:30	15:45	37	17	21	75	7	62	136	205	280	67	168	61	296	25	153	5	183	479	759		
15:45	16:00	35	30	15	80	8	62	129	199	279	59	149	56	264	24	172	8	204	468	747		
16:00	16:15	46	27	15	88	5	95	141	241	329	75	157	58	290	27	195	6	228	518	847		
16:15	16:30	29	17	12	59	7	53	159	219	278	62	190	62	314	31	211	5	247	561	839		
16:30	16:45	34	25	16	75	7	68	165	240	315	63	181	71	315	25	204	6	235	550	865		
16:45	17:00	38	27	20	85	3	48	168	219	304	53	180	66	299	31	213	5	249	548	852		
17:00	17:15	44	29	12	85	5	62	148	215	300	76	184	66	326	25	202	3	230	556	856		
17:15	17:30	35	18	10	63	4	49	136	189	252	47	188	68	303	22	200	8	230	533	785		
17:30	17:45	36	17	15	68	6	59	162	228	296	64	146	61	271	25	196	10	231	502	798		
17:45	18:00	25	24	14	63	7	54	166	227	290	49	133	67	249	22	158	7	187	436	726		
TOTAL:		1259	1379	451	3092	184	1015	2440	3640	6732	2084	4665	1182	7931	564	4453	296	5314	13245	19977		

Note: U-Turns are included in Totals.

Comment:

Turning Movement Count - Full Study Summary Report

EARL ARMSTRONG RD @ RIVER RD

Survey Date: Tuesday, March 08, 2016

Total Observed U-Turns

Northbound:	3	Southbound:	1
Eastbound:	0	Westbound:	1

AADT Factor

1.00

Full Study

RIVER RD										EARL ARMSTRONG RD											
Northbound					Southbound					Eastbound					Westbound					STR TOT	Grand Total
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT				
07:00 08:00	255	405	70	730	30	42	128	200	930	413	986	88	1487	52	627	85	764	2251	3181		
08:00 09:00	220	270	61	551	38	71	183	292	843	380	686	82	1148	48	609	72	729	1877	2720		
09:00 10:00	157	184	56	397	14	53	125	192	589	264	383	70	717	49	428	28	505	1222	1811		
11:30 12:30	116	121	47	284	13	80	151	244	528	141	353	93	587	43	315	16	374	961	1489		
12:30 13:30	95	118	47	260	16	75	148	239	499	172	343	116	631	64	317	19	400	1031	1530		
15:00 16:00	129	97	56	282	29	206	460	695	977	225	555	214	994	100	578	26	704	1698	2675		
16:00 17:00	147	96	63	306	22	264	633	919	1225	253	708	257	1218	114	823	22	959	2177	3402		
17:00 18:00	140	88	51	279	22	224	612	858	1137	236	651	262	1149	94	756	28	878	2027	3164		
Sub Total	1259	1379	451	3089	184	1015	2440	3639	6728	2084	4665	1182	7931	564	4453	296	5313	13244	19972		
U Turns				3				1	4				0				1	1	5		
Total	1259	1379	451	3092	184	1015	2440	3640	6732	2084	4665	1182	7931	564	4453	296	5314	13245	19977		
EQ 12Hr	1750	1917	627	4298	256	1411	3392	5060	9358	2897	6484	1643	11024	784	6190	411	7386	18410	27768		
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													1.39								
AVG 12Hr	1750	1917	627	4298	256	1411	3392	5060	9358	2897	6484	1643	11024	784	6190	411	7386	18410	27768		
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													1.00								
AVG 24Hr	2293	2511	821	5630	335	1848	4443	6628	12258	3795	8494	2152	14442	1027	8108	539	9676	24118	36376		
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													1.31								

Comments:

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



Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

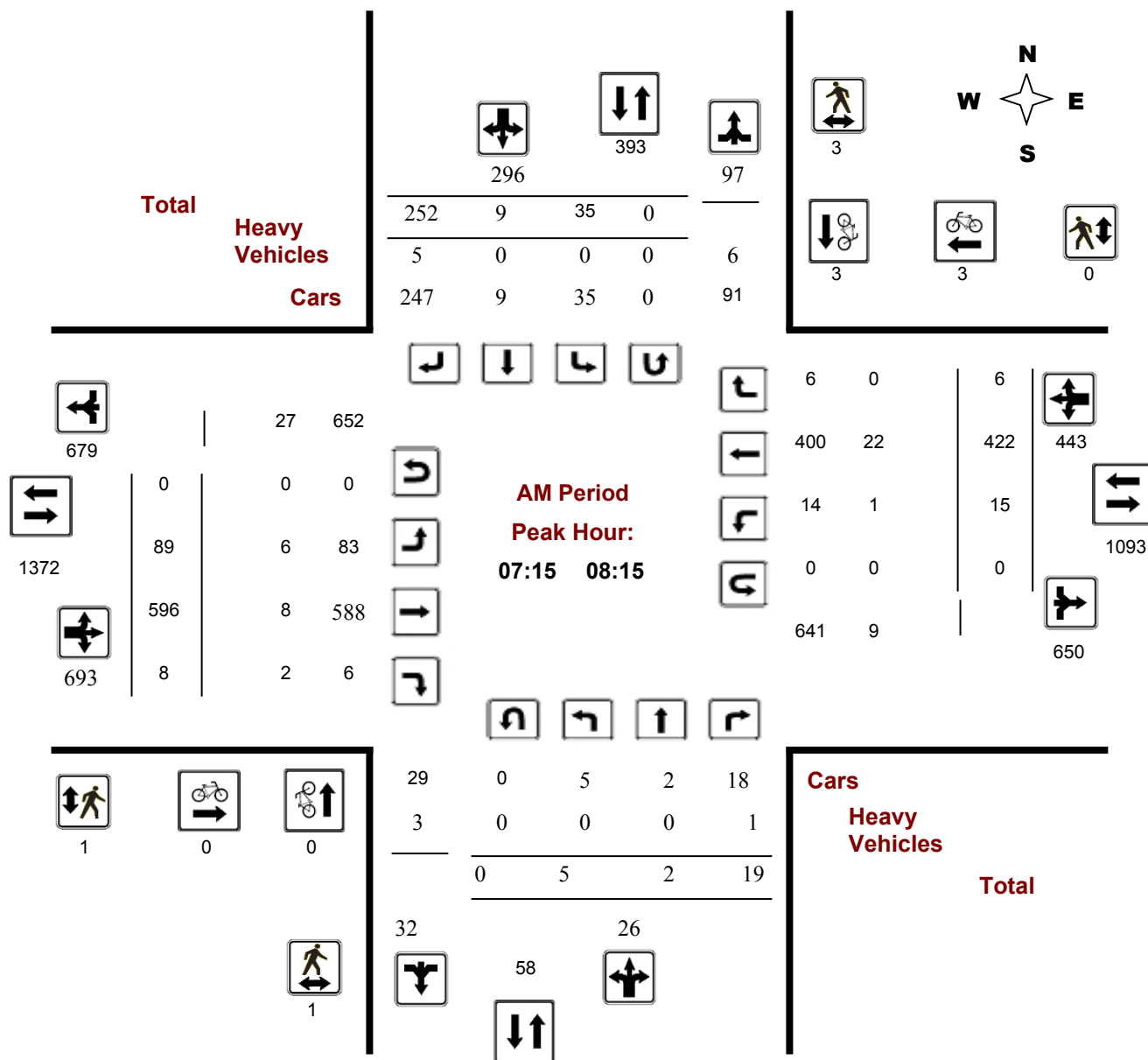
EARL ARMSTRONG RD @ SPRATT RD

Survey Date: Monday, August 17, 2015

Start Time: 07:00

WO No: 35250

Device: Jamar Technologies, Inc





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

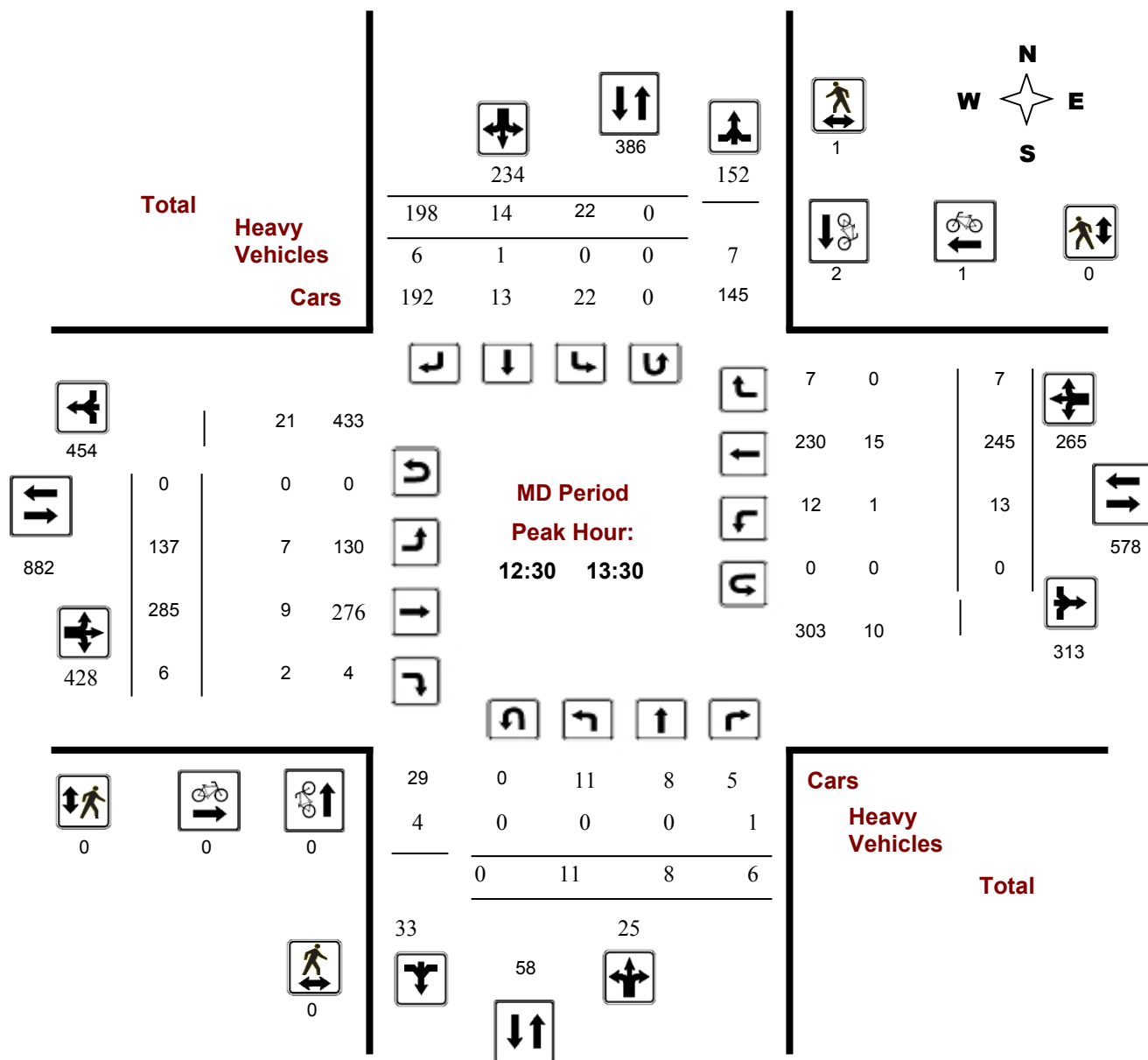
EARL ARMSTRONG RD @ SPRATT RD

Survey Date: Monday, August 17, 2015

Start Time: 07:00

WO No: 35250

Device: Jamar Technologies, Inc





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

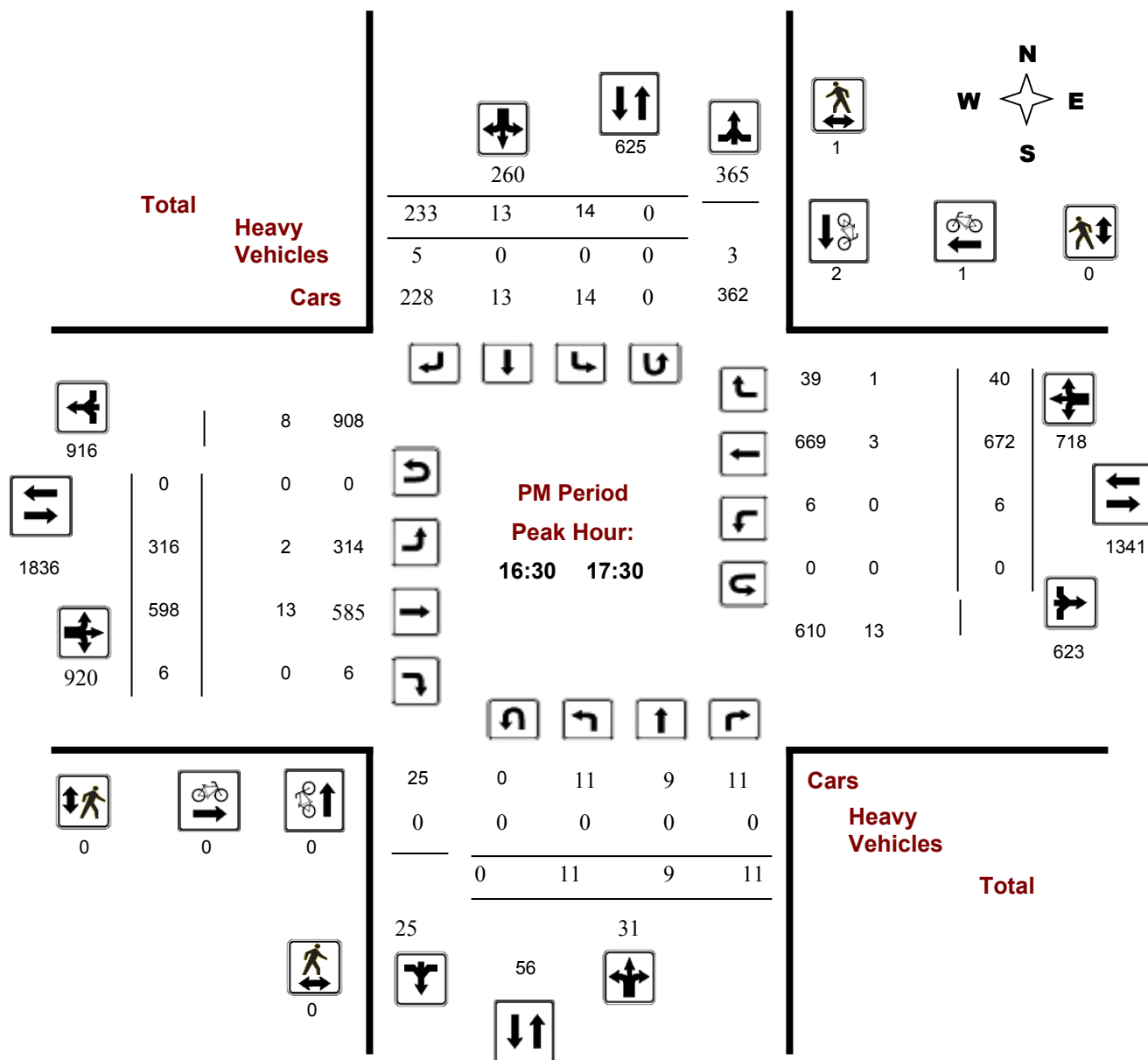
EARL ARMSTRONG RD @ SPRATT RD

Survey Date: Monday, August 17, 2015

Start Time: 07:00

WO No: 35250

Device: Jamar Technologies, Inc





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

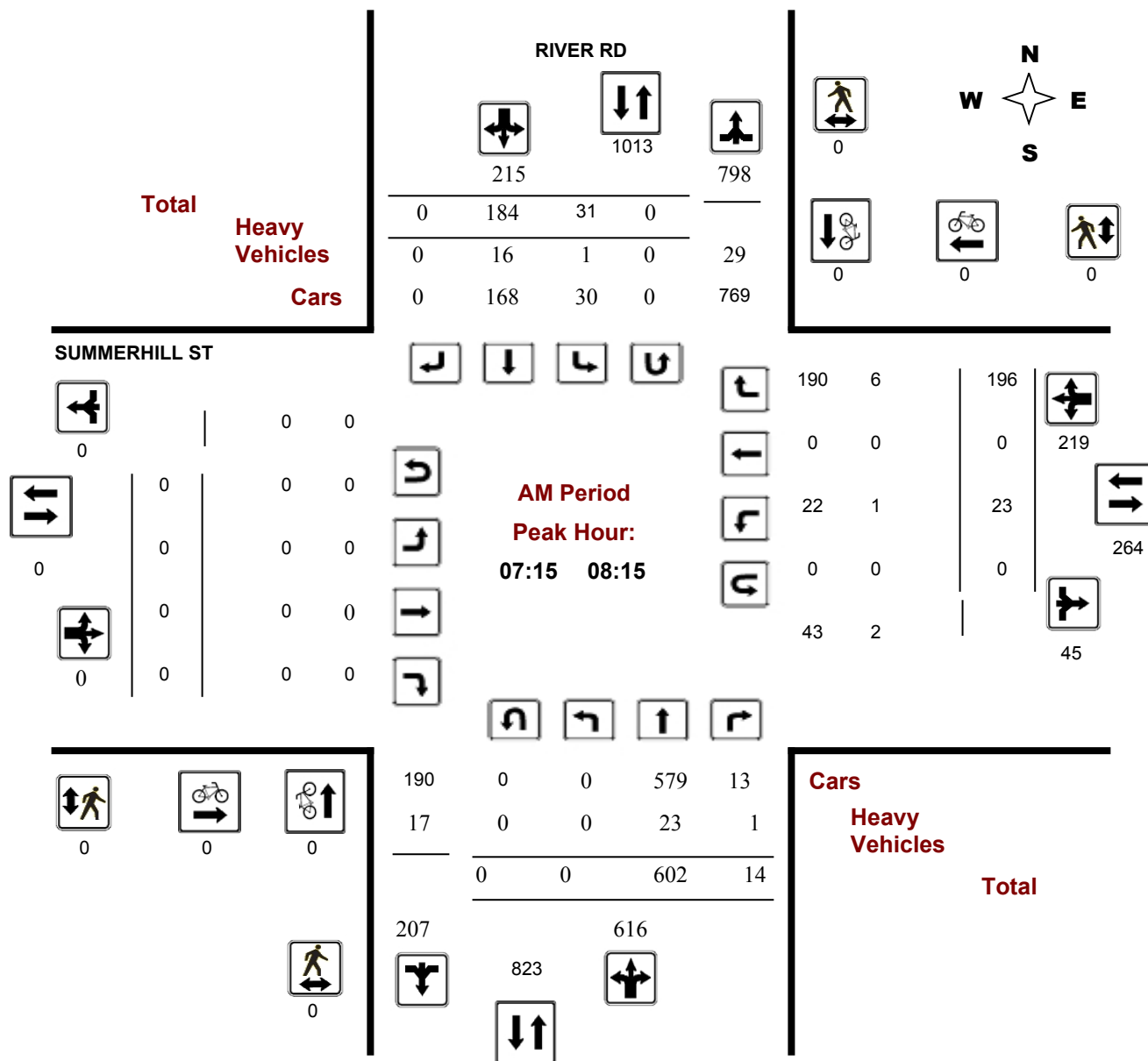
RIVER RD @ SUMMERHILL ST

Survey Date: Thursday, April 20, 2017

Start Time: 07:00

WO No: 36934

Device: Miovision





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

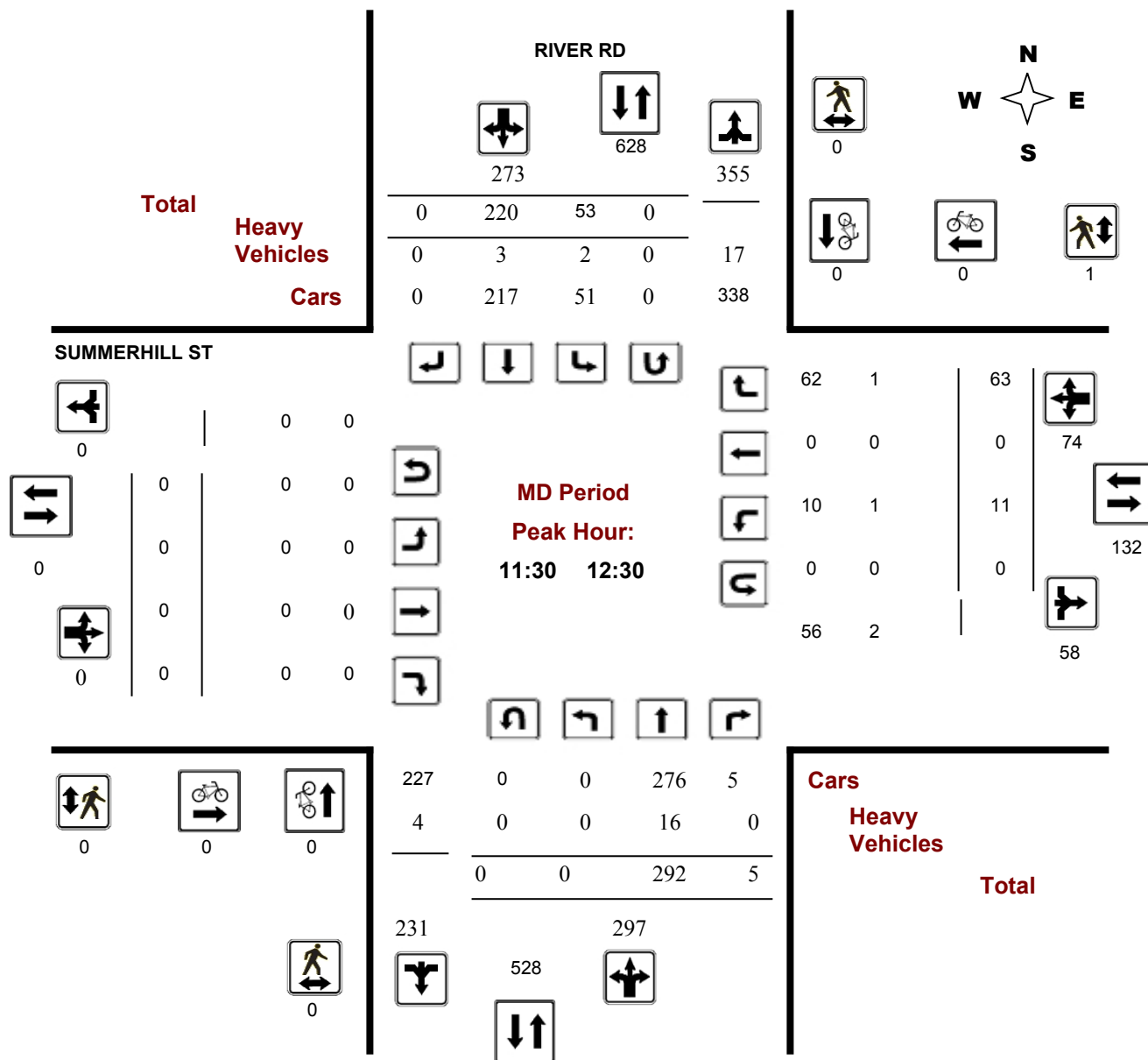
RIVER RD @ SUMMERHILL ST

Survey Date: Thursday, April 20, 2017

Start Time: 07:00

WO No: 36934

Device: Miovision





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

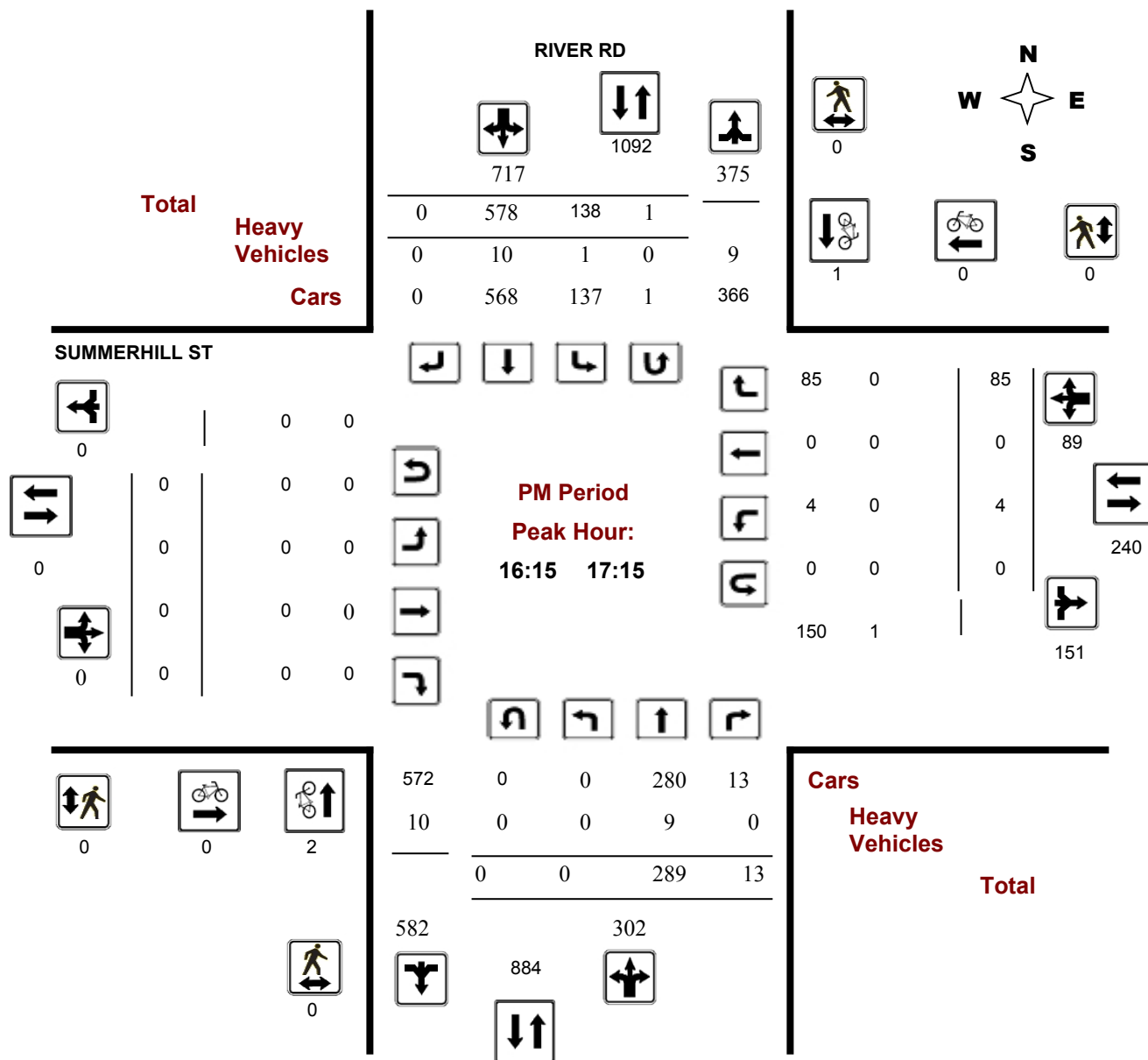
RIVER RD @ SUMMERHILL ST

Survey Date: Thursday, April 20, 2017

Start Time: 07:00

WO No: 36934

Device: Miovision



Survey Date: Thursday August 17 2017
Weather: Wet

NB (South Leg) Street Name: Brian Good
SB (North Leg) Street Name:

EB (West Leg) Street Name: Earl Armstrong
WB (East Leg) Street Name: Earl Armstrong



Start Time (AM Peak): 7:00
End Time (AM Peak): 10:00

The AM Peak Hour is from 7:45 AM to 8:45 AM
AADT Factor: 0.9

Turning Movement Count - 15 Minute Vehicle Summary Report (AM Peak)

Time Period	Brian Good Northbound					0 Southbound					N/S STREET TOTAL	Earl Armstrong Eastbound					Earl Armstrong Westbound					E/W STREET TOTAL	Grand TOTAL	1 Hour Traffic Volumes (All Scenarios)
	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 7:15	6		11		17					0	17	2				2			9		9	11	28	
7:15 7:30	11		22		33					0	33	5				5			6		6	11	44	
7:30 7:45	8		7		15					0	15	2				2			2		2	4	19	
7:45 8:00	14		16		30					0	30	8				8			1		1	9	39	
8:00 8:15	7		23		30					0	30	1				1			5		5	6	36	
8:15 8:30	10		13		23					0	23	7				7			5		5	12	35	
8:30 8:45	12		21		33					0	33	7				7			4		4	11	44	
8:45 9:00	9		8		17					0	17	6				6			5		5	11	28	
9:00 9:15	8		9		17					0	17	6				6			3		3	9	26	
9:15 9:30	6		6		12					0	12	10				10			7		7	17	29	
9:30 9:45	5		9		14					0	14	3				3			8		8	11	25	
9:45 10:00	12		6		18					0	18	3				3			7		7	10	28	
TOTAL:	108	0	151	0	259	0	0	0	0	0	259	60	0	0	0	60	0	0	62	0	62	122	381	

Start Time (MD Peak): 11:30
End Time (MD Peak): 13:30

The Mid-day Peak Hour is from 11:45 AM to 12:45 PM

Turning Movement Count - 15 Minute Vehicle Summary Report (Mid-Day Peak)

Time Period	Brian Good Northbound					0 Southbound					N/S STREET TOTAL	Earl Armstrong Eastbound					Earl Armstrong Westbound					E/W STREET TOTAL	Grand TOTAL	1 Hour Traffic Volumes (All Scenarios)
	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			
11:30 11:45	3		3		6					0	6	2				2			5		5	7	13	
11:45 12:00	9		4		13					0	13	6				6			17		17	23	36	
12:00 12:15	5		1		6					0	6	3				3			10		10	13	19	
12:15 12:30	3		9		12					0	12	10				10			14		14	24	36	
12:30 12:45	8		6		14					0	14	3				3			6		6	9	23	
12:45 13:00	7		4		11					0	11	6				6			6		6	12	23	
13:00 13:15			2		2					0	2	1				1			5		5	6	8	
13:15 13:30	6		7		13					0	13	2				2			2		2	4	17	
TOTAL:	41	0	36	0	77	0	0	0	0	0	77	33	0	0	0	33	0	0	65	0	65	98	175	

Start Time (PM Peak): 15:00
End Time (PM Peak): 18:00

The PM Peak Hour is from 4:15 PM to 5:15 PM

Turning Movement Count - 15 Minute Vehicle Summary Report (PM Peak)

Time Period	Brian Good Northbound					0 Southbound					N/S STR TOTAL	Earl Armstrong Eastbound					Earl Armstrong Westbound					E/W STR TOTAL	Grand TOTAL	1 Hour Traffic Volumes (All Scenarios)
	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			
15:00 15:15	6		10		16					0	16	5				5			7		7	12	28	
15:15 15:30	3		12		15					0	15	10				10			7		7	17	32	
15:30 15:45	3		8		11					0	11	13				13			10		10	23	34	
15:45 16:00	4		3		7					0	7	11				11			13		13	24	31	
16:00 16:15	9		7		16					0	16	13				13			15		15	28	44	
16:15 16:30	10		8		18					0	18	16				16			18		18	34	52	
16:30 16:45	10		9		19					0	19	11				11			21		21	32	51	
16:45 17:00	4		12		16					0	16	23				23			20		20	43	59	
17:00 17:15	5		10		15					0	15	20				20			14		14	34	49	
17:15 17:30	6		9		15					0	15	17				17			17		17	34	49	
17:30 17:45	7		7		14					0	14	16				16			17		17	33	47	
17:45 18:00	4		11		15					0	15	13				13			10		10	23	38	
TOTAL:	71	0	106	0	177	0	0	0	0	0	177	168	0	0	0	168	0	0	169	0	169	337	514	

Survey Date: Thursday August 17 2017
Weather: Dry

NB (South Leg) Street Name: Spratt
SB (North Leg) Street Name: Spratt

EB (West Leg) Street Name: Cambie
WB (East Leg) Street Name: Cambie



Start Time (AM Peak): 7:00
End Time (AM Peak): 10:00
The AM Peak Hour is from 7:00 AM to 8:00 AM
AADT Factor: 0.9

In this case, AM Peak Hour is based on the AM Peak Hour from the Earl Armstrong & River Road intersection, as this is the critical within the study area

Turning Movement Count - 15 Minute Vehicle Summary Report (AM Peak)

Time Period	Spratt Northbound					Spratt Southbound					N/S STREET TOTAL	0 Eastbound					Cambie Westbound					E/W STREET TOTAL	Grand TOTAL	1 Hour Traffic Volumes (All Scenarios)
	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 7:15			2		2	22				22	24					0			19		19	19	43	
7:15 7:30			1		1	13				13	14					0			5		5	5	19	
7:30 7:45			1		1	22				22	23					0			6		6	6	29	
7:45 8:00			1		1	10				10	11					0			7		7	7	18	
8:00 8:15			1		1	8				8	9					0			9		9	9	18	
8:15 8:30			2		2	7				7	9					0			9		9	9	18	
8:30 8:45					0	5				5	5					0			17		17	17	22	
8:45 9:00			1		1	6				6	7					0	1		5		6	6	13	
9:00 9:15					0	7				7	7					0			7		7	7	14	
9:15 9:30			1		1	15				15	16					0			5		5	5	21	
9:30 9:45					0	11				11	11					0	3		15		18	18	29	
9:45 10:00			2		2	9				9	11					0			11		11	11	22	
TOTAL:	0	0	12	0	12	135	0	0	0	135	147	0	0	0	0	0	4	0	115	0	119	119	266	

Start Time (MD Peak): 11:30
End Time (MD Peak): 13:30
The Mid-day Peak Hour is from 11:30 AM to 12:30 PM

Turning Movement Count - 15 Minute Vehicle Summary Report (Mid-Day Peak)

Time Period	Spratt Northbound					Spratt Southbound					N/S STREET TOTAL	0 Eastbound					Cambie Westbound					E/W STREET TOTAL	Grand TOTAL	1 Hour Traffic Volumes (All Scenarios)
	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			
11:30 11:45					0	14				14	14					0			12		12	12	26	
11:45 12:00					0	11				11	11					0	1		11		12	12	23	
12:00 12:15					0	14				14	14					0			19		19	19	33	
12:15 12:30			2		2	7				7	9					0			9		9	9	18	
12:30 12:45					0	10				10	10					0			6		6	6	16	
12:45 13:00			1		1	8				8	9					0	2		10		12	12	21	
13:00 13:15					0	14				14	14					0	1		10		11	11	25	
13:15 13:30					0	11				11	11					0			4		4	4	15	
TOTAL:	0	0	3	0	3	89	0	0	0	89	92	0	0	0	0	0	4	0	81	0	85	85	177	

Start Time (PM Peak): 15:00
End Time (PM Peak): 18:00
The PM Peak Hour is from 3:45 PM to 4:45 PM

Turning Movement Count - 15 Minute Vehicle Summary Report (PM Peak)

Time Period	Spratt Northbound					Spratt Southbound					N/S STR TOTAL	0 Eastbound					Cambie Westbound					E/W STR TOTAL	Grand TOTAL	1 Hour Traffic Volumes (All Scenarios)
	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			
15:00 15:15					0	8				8	8					0			8		8	8	16	
15:15 15:30			1		1	3				3	4					0			11		11	11	15	
15:30 15:45			2		2	5				5	7					0			3		3	3	10	
15:45 16:00					0	6				6	6					0	1		7		8	8	14	
16:00 16:15					0	4				4	4					0	1		13		14	14	18	
16:15 16:30			1		1	11				11	12					0	1		14		15	15	27	
16:30 16:45			1		1	4				4	5					0	1		8		9	9	14	
16:45 17:00					0	7				7	7					0	1		6		7	7	14	
17:00 17:15			1		1	5				5	6					0			3		3	3	9	
17:15 17:30					0	5				5	5					0			2		2	2	7	
17:30 17:45					0	8				8	8					0			4		4	4	12	
17:45 18:00					0	6				6	6					0	2		5		7	7	13	
TOTAL:	0	0	6	0	6	72	0	0	0	72	78	0	0	0	0	0	7	0	84	0	91	91	169	



Riverside South Phase 2

Transportation Impact Assessment Scoping Report

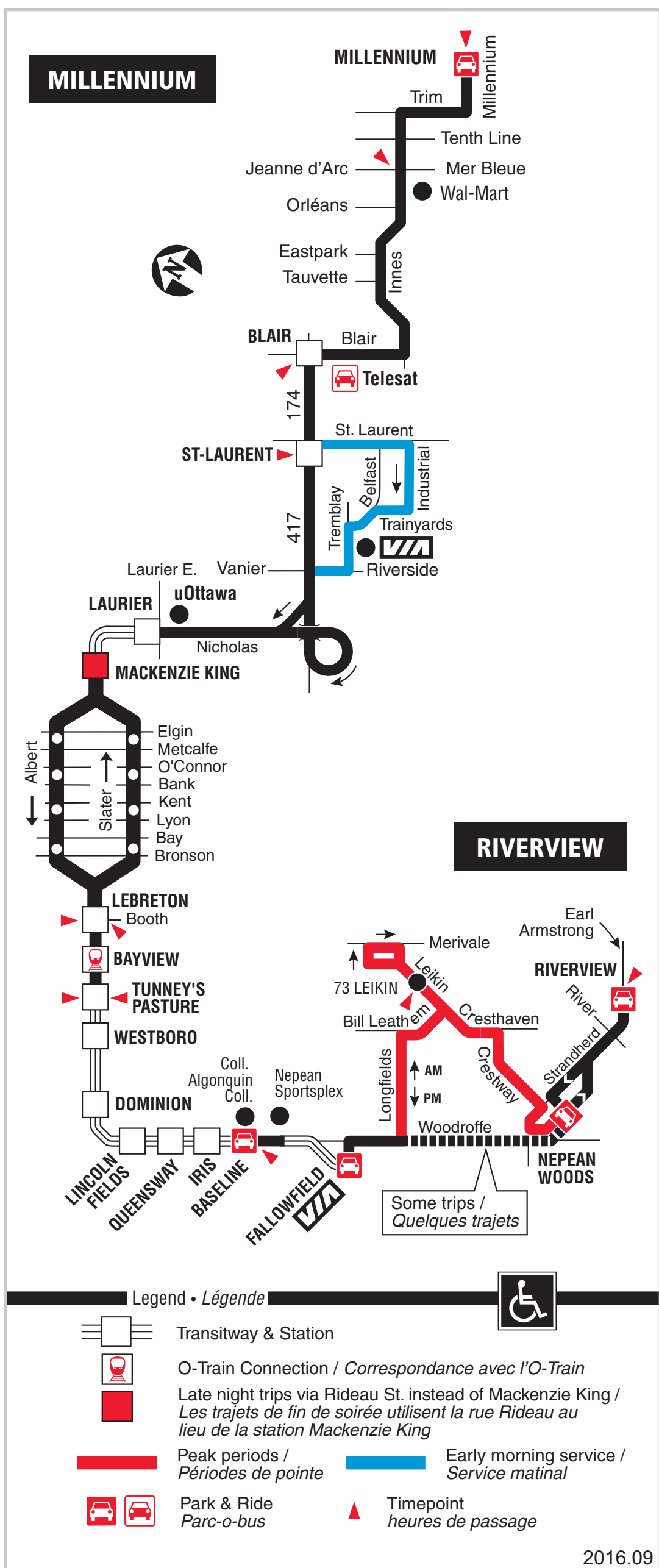
Appendix B: OC Transpo Maps

November 2017



94 MILLENNIUM RIVERVIEW

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



Information / Renseignement.....**613-741-4390**

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

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

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

Text / Texto**560560**

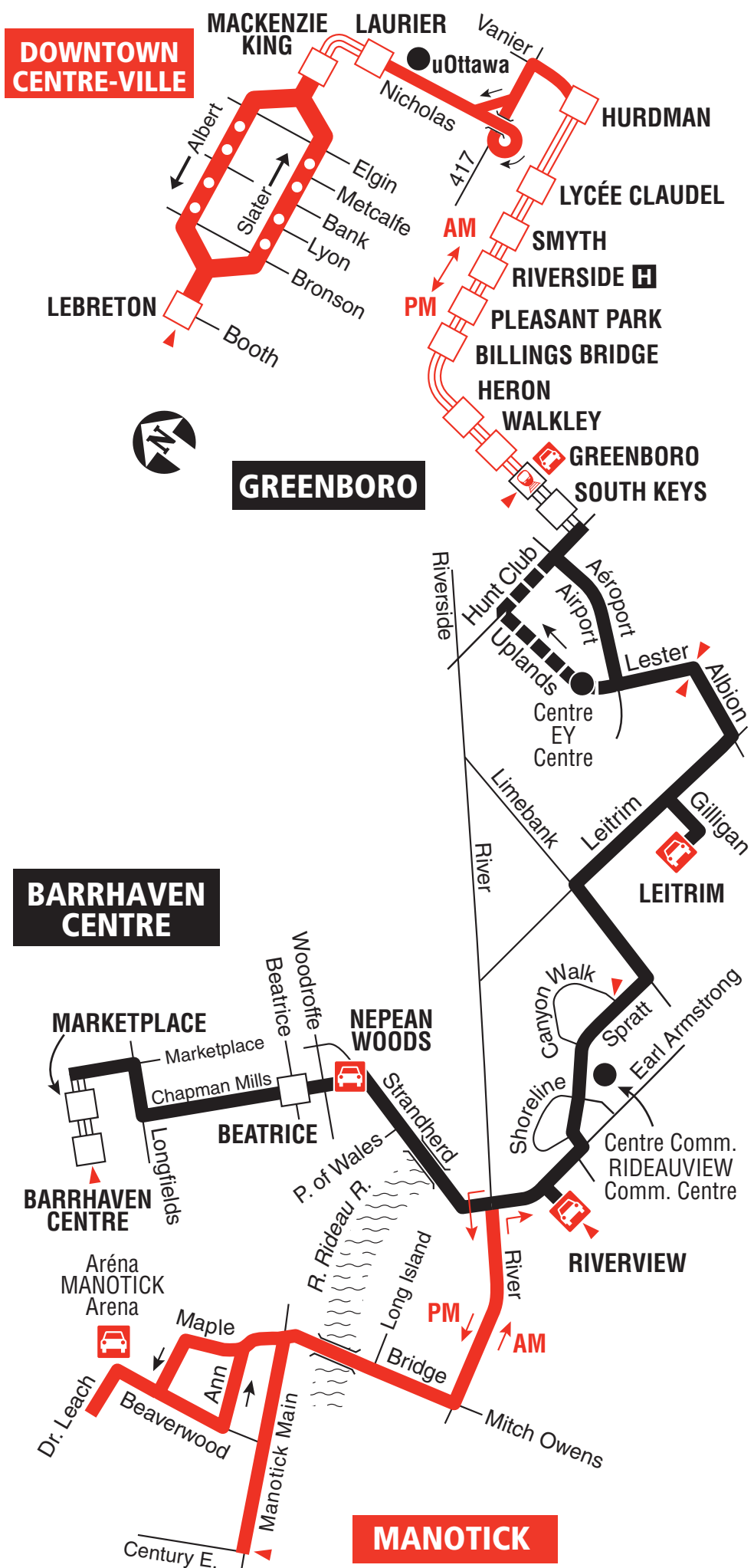
plus your four digit bus stop number / plus votre numéro d'arrêt à quatre chiffres

Effective / En vigueur Sept. 4 sept. 2016

99

GREENBORO BARRHAVEN CENTRE MANOTICK

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



2016.09

Information / Renseignement.....**613-741-4390**

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

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

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

Text / Texto**560560**

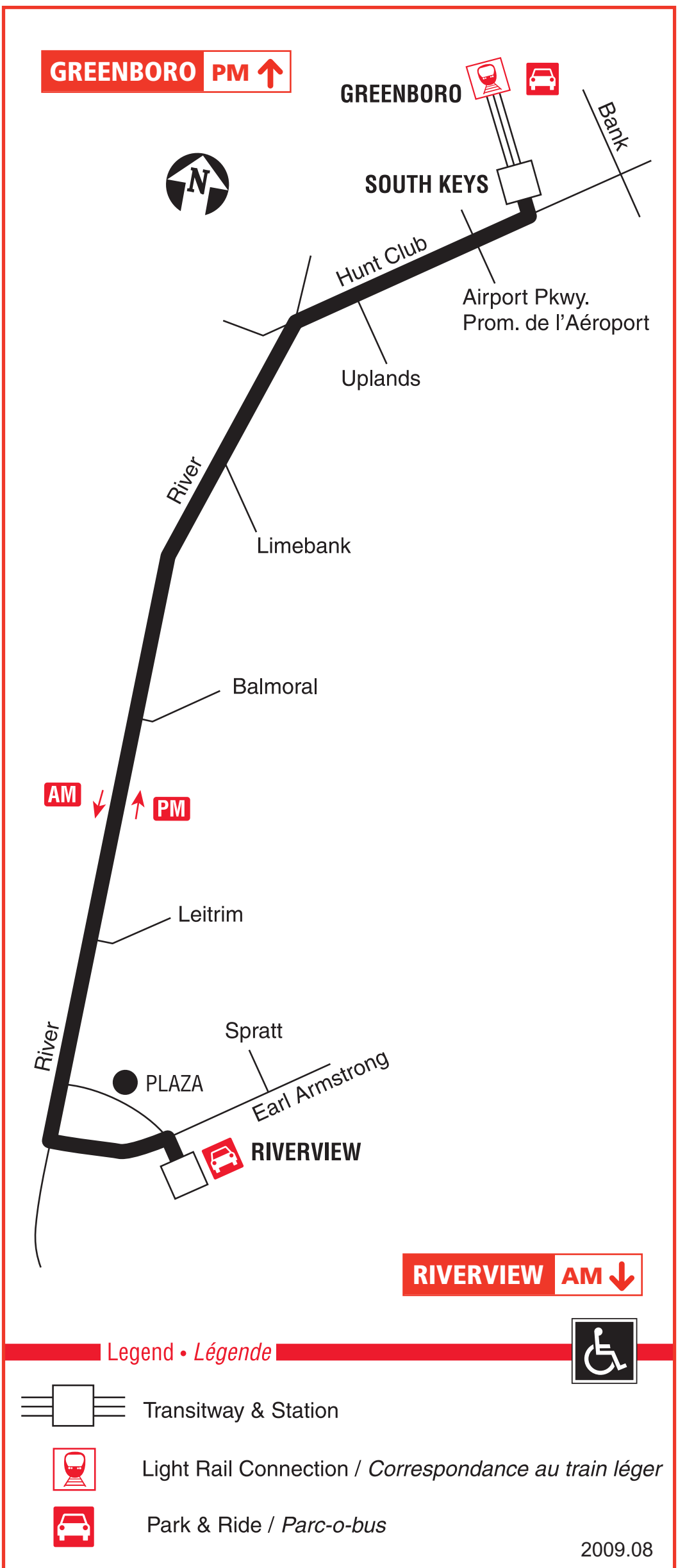
plus your four digit bus stop number / plus votre numéro d'arrêt à quatre chiffres

Effective / En vigueur Sept. 4 sept. 2016

613-741-4390 octranspo.com

189 RIVERVIEW GREENBORO

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



Information

Renseignement **613-741-4390**

Customer service

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

Lost and Found

Objets perdus **613-563-4011**

Schedule

Horaire **613-560-1000**

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

Effective / En vigueur Sept 8 sept 2009





Riverside South Phase 2

Transportation Impact Assessment Scoping Report

Appendix C: Collision Data

November 2017





City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** January 1, 2016

Location: BRIAN GOOD AVE @ EARL ARMSTRONG RD

Traffic Control: Stop sign

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2015-Aug-26, Wed,23:48	Clear	Angle	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Oct-11, Sun,11:48	Clear	Angle	Non-fatal injury	Dry	North	Turning left	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: EARL ARMSTRONG RD @ PARK N RIDE/295 E OF RIVER RD

Traffic Control: Traffic signal

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2015-Sep-17, Thu,12:12	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	

Location: EARL ARMSTRONG RD @ RIVER RD

Traffic Control: Traffic signal

Total Collisions: 27

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2014-Feb-05, Wed,16:55	Snow	Angle	P.D. only	Loose snow	North	Slowing or stopping	Pick-up truck	Other motor vehicle	

					West	Turning left	Passenger van	Other motor vehicle
2014-Mar-27, Thu,07:45	Clear	Rear end	Non-reportable	Dry	North	Turning right	Passenger van	Other motor vehicle
					North	Turning right	Passenger van	Other motor vehicle
2014-Jul-18, Fri,21:01	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2014-Aug-19, Tue,19:51	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Motorcycle	Debris on road
2014-Nov-07, Fri,09:31	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2014-Nov-07, Fri,20:10	Clear	Rear end	P.D. only	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2014-Oct-25, Sat,14:08	Rain	Rear end	P.D. only	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2014-Nov-15, Sat,10:48	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Slowing or stopping	Pick-up truck	Other motor vehicle

2014-Dec-20, Sat,19:39	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Passenger van	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Mar-31, Tue,15:32	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2015-Feb-08, Sun,10:30	Snow	Rear end	P.D. only	Packed snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Jun-25, Thu,16:01	Clear	Rear end	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle
2015-Oct-01, Thu,14:39	Clear	Rear end	Non-fatal injury	Dry	South	Slowing or stopping	Passenger van	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2015-May-01, Fri,07:12	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Feb-13, Fri,07:30	Clear	Rear end	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Turning left	Pick-up truck	Other motor vehicle
2015-Feb-26, Thu,15:30	Clear	Rear end	P.D. only	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle

					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Jul-27, Mon,16:03	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Motor home	Other motor vehicle
					East	Going ahead	Municipal transit bus	Other motor vehicle
2015-Jun-09, Tue,16:13	Clear	Rear end	P.D. only	Wet	West	Turning right	Passenger van	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle
2015-Aug-12, Wed,08:25	Clear	Rear end	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2015-Aug-11, Tue,16:17	Clear	Rear end	P.D. only	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Feb-12, Thu,12:53	Snow	Rear end	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2015-Oct-20, Tue,15:00	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Sep-08, Tue,12:00	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Pick-up truck	Other motor vehicle
					South	Slowing or stopping	Pick-up truck	Other motor vehicle

2015-Sep-30, Wed,13:00	Clear	SMV other	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Pedestrian	1
2015-Dec-04, Fri,16:57	Clear	Rear end	Non-fatal injury	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle	
					North	Turning right	Automobile, station wagon	Other motor vehicle	
2015-Oct-24, Sat,21:30	Rain	Rear end	P.D. only	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Turning left	Pick-up truck	Other motor vehicle	
2015-Dec-05, Sat,11:49	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Slowing or stopping	Pick-up truck	Other motor vehicle	

Location: EARL ARMSTRONG RD @ SPRATT RD

Traffic Control: Traffic signal

Total Collisions: 10

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

Location: EARL ARMSTRONG RD btwn RIVER RD & SPRATT RD

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2015-Nov-27, Fri,17:14	Rain	SMV other	Non-fatal injury	Wet	West	Going ahead	Automobile, station wagon	Pedestrian	1

Location: RIVER RD btwn EARL ARMSTRONG RD & NICOLLS ISLAND RD

Traffic Control: No control

Total Collisions: 6

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2014-Mar-12, Wed,16:39	Snow	Approaching	P.D. only	Loose snow	South	Going ahead	Automobile, station wagon	Skidding/sliding	
					North	Going ahead	Pick-up truck	Other motor vehicle	
2014-Mar-13, Thu,08:25	Clear	Approaching	Non-fatal injury	Packed snow	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Aug-14, Thu,11:51	Clear	SMV other	P.D. only	Dry	South	Going ahead	Truck - dump	Other	
2014-Aug-14, Thu,11:51	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other	
2015-Feb-02, Mon,12:47	Clear	Rear end	P.D. only	Loose snow	North	Going ahead	Truck - open	Other motor vehicle	
					North	Stopped	Pick-up truck	Other motor vehicle	
2016-Jan-01, Fri,02:33	Snow	SMV other	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Skidding/sliding	

Location: SPRATT RD btwn EARL ARMSTRONG RD & RIDEAU RD

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Sep-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	

Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2011-01-01 TO: 2014-01-01

EARL ARMSTRONG RD & RIVER RD

Former Municipality: Gloucester

Traffic Control: Traffic signal

Number of Collisions: 6

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
1	2011-03-14	Mo	08:51	Clear	Daylight	Rear end	P.D. only	V1 N V2 N	Dry Dry	Slowing or Stopped	Passenger van Delivery van	Other motor vehicle Other motor vehicle	0
2	2011-06-28	Tue	09:51	Clear	Daylight	Turning	Non-fatal	V1 S V2 N	Dry Dry	Turning left Going ahead	Automobile, station Automobile, station	Other motor vehicle Other motor vehicle	0
3	2011-11-29	Tue	08:00	Rain	Daylight	Rear end	P.D. only	V1 N V2 N	Wet Wet	Going ahead Stopped	Pick-up truck Automobile, station	Other motor vehicle Other motor vehicle	0
4	2013-02-17	Sun	14:08	Clear	Daylight	Rear end	Non-fatal	V1 W V2 W	Dry Dry	Going ahead Stopped	Automobile, station Automobile, station	Other motor vehicle Other motor vehicle	0
5	2013-03-06	We	14:44	Clear	Daylight	Single vehicle	Non-fatal	V1 N	Wet	Turning right	Truck - dump	Roll over	0
6	2013-06-27	Thu	10:31	Clear	Daylight	Rear end	P.D. only	V1 S V2 S	Dry Dry	Going ahead Stopped	Delivery van Automobile, station	Other motor vehicle Other motor vehicle	0

EARL ARMSTRONG RD, RIVER RD to SPRATT RD

Former Municipality: Gloucester

Traffic Control: No control

Number of Collisions: 2

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
7	2011-12-09	Fri	11:35	Snow	Daylight	Single vehicle	Non-fatal	V1 W	Wet	Going ahead	Passenger van	Curb	0
8	2012-02-21	Tue	08:45	Clear	Daylight	Rear end	P.D. only	V1 W V2 W	Dry Dry	Going ahead Going ahead	Automobile, station Pick-up truck	Other motor vehicle Other motor vehicle	0

EARL ARMSTRONG RD & SPRATT RD

Former Municipality: Gloucester

Traffic Control: Traffic signal

Number of Collisions: 8

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
9	2011-05-03	Tue	15:43	Rain	Daylight	Turning	P.D. only	V1 W V2 E	Wet Wet	Going ahead Turning left	Pick-up truck Passenger van	Other motor vehicle Other motor vehicle	0
10	2011-12-14	We	19:20	Clear	Dark	Turning	P.D. only	V1 W V2 E	Dry Dry	Going ahead Turning left	Unknown Automobile, station	Other motor vehicle Other motor vehicle	0

(Note: Time of Day = "00:00" represents unknown collision time)

Friday, August 11, 2017

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Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2011-01-01 TO: 2014-01-01

11	2012-05-16	We	07:25	Clear	Daylight	Turning	Non-fatal	V1 E	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2 W	Dry	Going ahead	Passenger van	Other motor vehicle	
12	2012-11-25	Sun	17:00	Clear	Dusk	Rear end	P.D. only	V1 N	Dry	Turning right	Automobile, station	Other motor vehicle	0
								V2 N	Dry	Turning right	Automobile, station	Other motor vehicle	
13	2013-02-28	Thu	08:02	Snow	Daylight	Angle	Non-fatal	V1 W	Packed snow	Going ahead	Automobile, station	Other motor vehicle	0
								V2 N	Packed snow	Turning left	Pick-up truck	Other motor vehicle	
14	2013-11-01	Fri	01:30	Clear	Dark	Single vehicle	P.D. only	V1 E	Wet	Turning left	Automobile, station	Curb	0
15	2013-11-14	Thu	18:03	Clear	Dark	Turning	P.D. only	V1 N	Dry	Turning left	Pick-up truck	Other motor vehicle	0
								V2 S	Dry	Going ahead	Automobile, station	Other motor vehicle	
16	2013-11-17	Sun	13:27	Clear	Daylight	Turning	P.D. only	V1 E	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2 W	Dry	Going ahead	Automobile, station	Other motor vehicle	

RIVER RD, EARL ARMSTRONG RD to NICOLLS ISLAND RD

Former Municipality: Gloucester

Traffic Control: No control

Number of Collisions: 7

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
17	2011-06-06	Mo	09:14	Clear	Daylight	Single vehicle	P.D. only	V1 N	Dry	Going ahead	Passenger van	Animal - wild	0
18	2011-10-11	Tue	17:35	Clear	Dark	Angle	P.D. only	V1 W	Dry	Going ahead	Automobile, station	Other motor vehicle	0
								V2 N	Dry	Going ahead	Automobile, station	Other motor vehicle	
19	2011-11-07	Mo	17:20	Clear	Dusk	Rear end	P.D. only	V1 N	Dry	Going ahead	Pick-up truck	Other motor vehicle	0
								V2 N	Dry	Slowing or	Automobile, station	Other motor vehicle	
								V3 N	Dry	Slowing or	Automobile, station	Other motor vehicle	
20	2012-03-01	Thu	08:36	Snow	Daylight	Approaching	Non-fatal	V1 S	Loose snow	Going ahead	Pick-up truck	Other motor vehicle	0
								V2 N	Loose snow	Going ahead	Pick-up truck	Other motor vehicle	
21	2012-07-08	Sun	04:40	Clear	Dark	Single vehicle	P.D. only	V1 N	Dry	Going ahead	Pick-up truck	Animal - wild	0
22	2013-05-11	Sat	21:00	Clear	Dark	Single vehicle	P.D. only	V1 S	Dry	Going ahead	Automobile, station	Animal - wild	0
23	2013-06-13	Thu	00:50	Clear	Dark	Single vehicle	P.D. only	V1 N	Dry	Going ahead	Automobile, station	Animal - wild	0

(Note: Time of Day = "00:00" represents unknown collision time)

Friday, August 11, 2017

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Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2011-01-01 TO: 2014-01-01

SPRATT RD, EARL ARMSTRONG RD to RIDEAU RD

Former Municipality: Gloucester

Traffic Control: No control

Number of Collisions: 3

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
24	2011-10-29	Sat	12:00	Clear	Daylight	Single vehicle	P.D. only	V1 S	Dry	Going ahead	Pick-up truck	Animal - wild	0
25	2012-05-30	We	16:46	Clear	Daylight	Single vehicle	P.D. only	V1 N	Dry	Going ahead	Automobile, station	Curb	0
COMMENTS: EXACT LOCATION UNKNOWN													
26	2013-02-14	Thu	20:16	Snow	Dark	Single vehicle	P.D. only	V1 N	Wet	Going ahead	Automobile, station	Ran off road	0

EARL ARMSTRONG & PARK AND RIDE

Former Municipality: Gloucester

Traffic Control: Traffic signal

Number of Collisions: 1

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
27	2011-01-24	Mo	08:45	Clear	Daylight	Sideswipe	P.D. only	V1 E V2 E	Dry Dry	Changing lanes Going ahead	Automobile, station Automobile, station	Other motor vehicle Other motor vehicle	0

RIVER RD & SUMMERHILL ST

Former Municipality: Gloucester

Traffic Control: Stop sign

Number of Collisions: 1

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
28	2013-12-19	Thu	13:03	Snow	Daylight	Rear end	P.D. only	V1 N V2 N	Slush Slush	Going ahead Turning right	Pick-up truck Pick-up truck	Other motor vehicle Other motor vehicle	0

(Note: Time of Day = "00:00" represents unknown collision time)

Friday, August 11, 2017

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Transportation Impact Assessment

Riverside South Phase 2

FORECASTING REPORT



Prepared for Claridge Homes
by IBI Group

November 2017



Document Control Page

CLIENT:	Claridge Homes
PROJECT NAME:	Riverside South Phase 2 Lands TIA
REPORT TITLE:	TIA Forecasting Report
IBI REFERENCE:	112842
VERSION:	2.0
DIGITAL MASTER:	J:\112842_RVSDPh2TIA\5.2 Reports\5.2.4 Transportation\5.2.4.5 Traffic Impact\TIA Submissions\3-Riverside South Ph2 - Forecasting Report (Claridge)\TTR-Forecasting-Claridge Riverside South Ph 2-2017-10-30.docx\2017-11-04
ORIGINATOR:	Austin Shih, M.A.Sc, P.Eng.
REVIEWER:	
AUTHORIZATION:	Justin Date, P.Eng.
CIRCULATION LIST:	Asad Yousfani, M.Eng, P.Eng.
HISTORY:	1.0. Forecasting Report to City of Ottawa – October 2017 2.0. Final Submission to City of Ottawa – November 2017



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Appendix C – Historical Traffic Data



1 Introduction

The following Forecasting Report has been prepared on behalf of Claridge Homes in support of the Riverside South Phase 2 (RSS Ph2) draft plan application. The format of the Forecasting Report is based on the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. The purpose of the Forecasting Report is to identify appropriate "generate the future transportation demand number required to analyze pre and post-development network performance to determine if a network modification is required to offset development impacts."

Upon acceptance of the Forecasting Report, this will trigger the next stage of the TIA process, the TIA Strategy Report. The site location and proposed draft plan are shown in **Exhibits 1** and **2**, respectively.

2 Development Generated Traffic

2.1 Trip Generation Methodology

Peak hour development generated traffic volumes were developed using Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition, 2012. The Transportation Impact Assessment (TIA) Guidelines require ITE vehicle-trip rates to be adjusted to better reflect local travel patterns. The ITE trip generation rates are based on data collected from traffic surveys conducted across North America, but mostly in suburban areas of the United States where the level of transit use is traditionally very low (estimates show that ITE rates average approximately 96% auto mode split). This statistic is not representative of the City of Ottawa that has a well-established transit system and pedestrian/ cycling network.

The City recommends the ITE vehicle-trip rates be converted to person-trips split based on representative mode share proportions. This conversion factor was based on a recommended average vehicle occupancy of 1.15 and a 10% non-auto mode share. The person-trips were then split based on representative mode share percentages to determine the number of vehicle, transit, pedestrian, cycling and other trip types.

Local mode shares were based on the TRANS Committee: 2011 Origin-Destination (OD) Survey completed for the City of Ottawa. The OD Survey has mode share breakdowns for specific zones throughout the City; the South Gloucester/Leitrim Zone contained the subject site and was applied in this analysis.

2.2 Trip Generation Results

2.2.1 ITE Vehicle Trip Generation

The peak hour vehicular traffic volumes from the RSS Ph2 development were determined using peak hour trip generation rates from the ITE Manual. A summary of the vehicular trip generation results for the proposed development has been summarized in Table 1.

The relevant extracts from the ITE Manual have been provided in Appendix A.

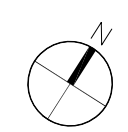
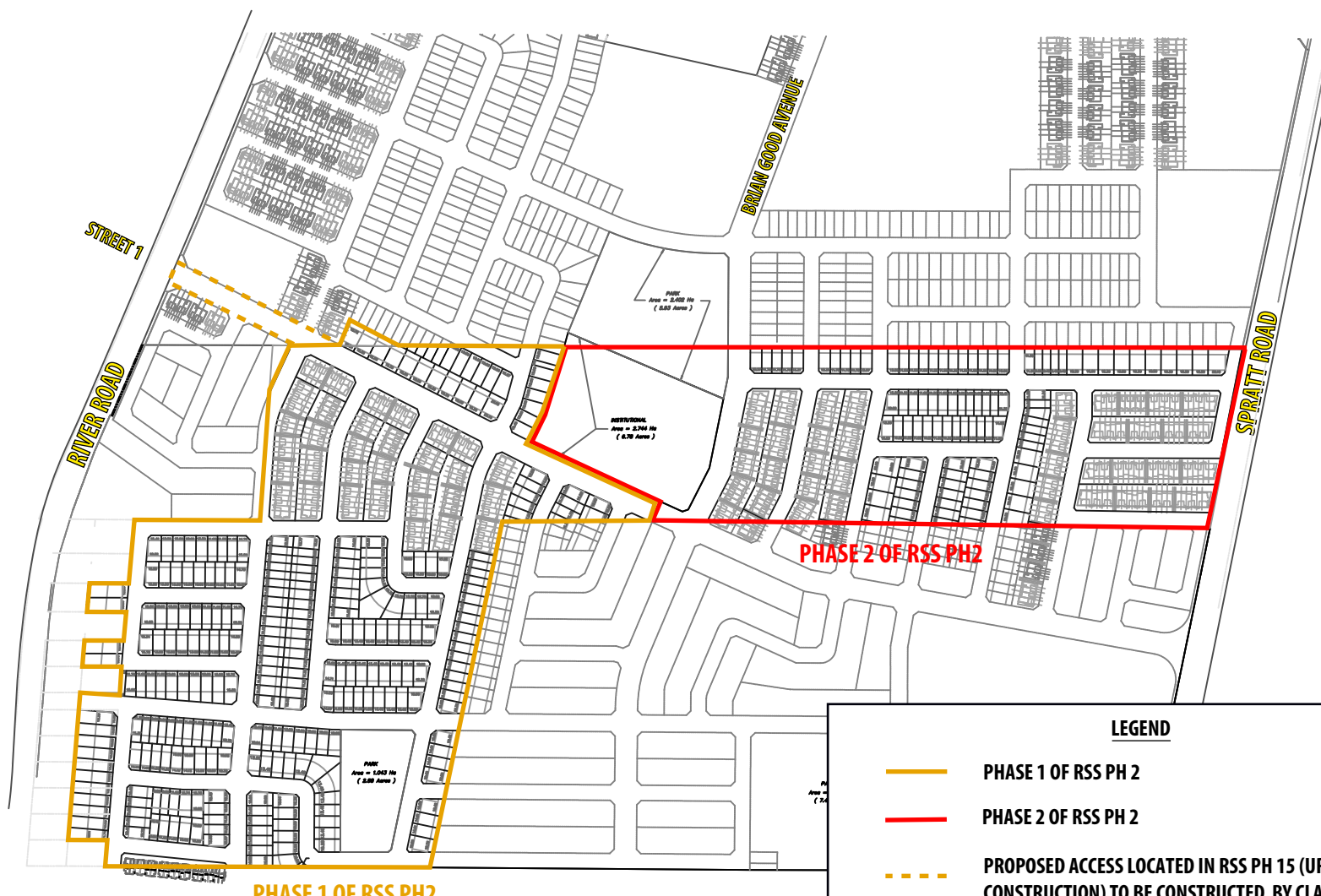


Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 1
Site Location

PROJECT No.: 112842
DATE: NOVEMBER 2017
SCALE:





LEGEND

- PHASE 1 OF RSS PH 2
- PHASE 2 OF RSS PH 2
- - - PROPOSED ACCESS LOCATED IN RSS PH 15 (URBAN DALE CONSTRUCTION) TO BE CONSTRUCTED BY CLARIDGE HOMES

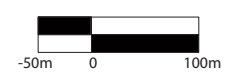




TABLE 1 – ITE Development Trip Generation Results

DEVELOPMENT	BUILDOUT YEAR	LAND USE (ITE CODE)	SIZE (DU)	PERIOD	GENERATED TRIPS (VPH)		
					IN	OUT	TOTAL
Phase 1	2021	Single Detached Housing (210)	268	AM	49	148	197
				PM	161	94	255
		Townhouse (230)	172	AM	14	66	80
				PM	63	31	94
Phase 2	2026	Single Detached Housing (210)	78	AM	16	48	64
				PM	53	31	84
		Townhouse (230)	237	AM	18	85	103
				PM	82	40	122
TOTAL				AM	97	347	444
				PM	359	196	555

Notes: DU = Dwelling Units

vph = vehicles per hour; DU = Dwelling Units

Formula Rate and Splits for Single Detached Homes

AM T = $0.7(X) + 9.74$ IN: 25%; OUT: 75%PM T = $e^{(0.9 \ln(X) + 0.51)}$ IN: 63%; OUT: 37%

Formula Rate and Splits for Townhomes

AM T = $e^{(0.80 \ln(X) + 0.26)}$ IN: 17%; OUT: 83%PM T = $e^{(0.82 \ln(X) + 0.51)}$ IN: 67%; OUT: 33%

2.2.2 Person Trip Generation

The ITE vehicle-trip to person-trip conversion factor of 1.28 based on an average vehicle occupancy of 1.15 and a default 10% non-auto mode share was applied to vehicle-trip results in Table 1. The results after applying this factor have been summarized in Table 2.

TABLE 2 – Development Person Trip Generation Results

DEVELOPMENT	BUILDOUT YEAR	PERIOD	VEHICLE TRIPS (VPH)			FACTOR	PERSON TRIPS (PPH)		
			IN	OUT	TOTAL		IN	OUT	TOTAL
Phase 1	2021	AM	49	148	197	1.28	63	189	252
		PM	161	94	255		206	21	226
		AM	14	66	80		17	85	102
		PM	63	31	94		80	40	120
Phase 2	2026	AM	16	48	64		21	62	83
		PM	53	31	84		68	40	108
		AM	18	85	103		22	109	131
		PM	82	40	122		105	51	156
TOTAL		AM	97	347	444		123	444	568
		PM	359	196	555		459	251	710

Notes:

vph = vehicles per hour; pph = persons per hour; DU = dwelling units

2.2.3 Mode Share Proportions

The total person trips generated by the proposed development were stratified by mode, based on mode share proportions in the 2011 Origin-Destination (OD) Survey for the South Gloucester/ Leitrim Traffic Assessment Zone (TAZ). The relevant extracts from the 2011 OD Survey has been provided in Appendix B.

Adjustments were made to the transit modal split in future horizons to better reflect the impact of transit infrastructure projects planned in the TMP. The methodology for these adjustments has been provided in Section 4.2: Adjustments to Development Generated Demand.



No adjustments were made to other sustainable modes of transportation such as walking and cycling for future planning horizons. This approach should be considered conservative.

The existing and proposed mode share targets for the South Gloucester/ Leirim TAZ for each of the analysis horizons are outlined in Table 3.

TABLE 3 – Existing and Proposed Mode Shares for South Gloucester/ Leirim (2011 OD Survey)

TRAVEL MODE	MODE SHARE BY HORIZON YEAR					
	2011 (OD SURVEY)		2021 & 2026		2031	
	AM	PM	AM	PM	AM	PM
Auto Driver	64%	68%	60%	63%	55%	58%
Transit	12%	11%	16%	16%	21%	21%
Auto Passenger	17%	15%	No Change			
Cycling	1%	1%				
Walking	0%	0%				
Other	6%	5%				

2.2.4 Trip Generation by Mode

The mode share targets were then applied to the person trips from Table 2 to determine the number of development generated trips by mode, as shown in Tables 4 and 5, which includes a small increase in transit modal split for each future horizon.

TABLE 4 – Phase 1 Development Generated Traffic, by Mode and Horizon Year

TRAVEL MODE	PEAK PERIOD TRIPS BY MODE AND HORIZON YEAR							
	2021 & 2026				2031			
	AM		PM		AM		PM	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Auto Driver	48	164	180	101	44	150	166	93
Transit	13	44	46	26	17	57	60	34
Auto Passenger	14	47	43	24	No Change			
Cycling	1	3	3	2				
Walking	0	0	0	0				
Other	5	16	14	8				



TABLE 5 – Phase 2 Development Generated Traffic, by Mode and Horizon Year

TRAVEL MODE	PEAK PERIOD TRIPS BY MODE AND HORIZON YEAR							
	2026				2031			
	AM		PM		AM		PM	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Auto Driver	26	103	108	57	24	94	100	53
Transit	7	27	28	15	9	36	36	19
Auto Passenger	7	29	26	14	No Change			
Cycling	0	2	2	1				
Walking	0	0	0	0				
Other	3	10	9	5				

TABLE 6 – Summary of 2031 Development Generated Auto Driver and Transit Traffic

TRAVEL MODE	PERIOD	DEVELOPMENT GENERATED PEAK HOUR DEMAND		
		IN	OUT	TOTAL
Auto Driver	AM	68	244	312
	PM	266	146	412
Transit	AM	26	93	119
	PM	96	53	149

The proposed development is expected to generate approximately 310 morning and 410 afternoon peak hour vehicular trips at full buildout by the 2031 horizon year.

2.3 Trip Distribution and Assignment

A regional trip distribution was applied to the site generated traffic within the study area. The expected travel routes to and from the study area were as follows:

- West on Earl Armstrong Road over the Vimy Memorial Bridge
- East on Earl Armstrong Road at Spratt Road
- North on River Road or Spratt Road at Earl Armstrong Road

The estimated trip distributions were based on assumptions made in approved traffic studies completed in the study area and engineering judgment. Multiple trip distributions were created, one for each peak period for each horizon year. Each trip distribution included minor adjustments to account for differences in travel patterns between morning and afternoon peak period travel behaviour, and took into account the implementation of new roadway connections from adjacent developments and the proposed development.

A summary of the ranges for trip distribution proportions applied to site generated trips is as follows:

- 30% to 40% - West on Earl Armstrong Road over the Vimy Memorial Bridge
- 15% to 30% - East on Earl Armstrong Road at Spratt Road
- 30% to 40% - North on River Road or Spratt Road at Earl Armstrong Road
- 5% - South on River Road



The intersection level trip distribution was based on existing turning movement counts. The above methodology was applied to site generated peak hour traffic volumes in the 2021, 2026 and 2031 horizon years from Tables 4 and 5. The resulting development generated morning and afternoon peak hour traffic volumes in the 2021, 2026 and 2031 horizon years have been provided in **Exhibits 3, 4 and 5** respectively.

3 Background Network Traffic

3.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, it is imperative that all anticipated changes to the transportation network over time are accounted for, particularly road and transit route components. These changes would then be reflected in the future background demand volumes to develop an appropriate foundation for the TIA.

The Scoping Report outlined anticipated changes to the study area transportation network based on City approved plans and the latest DC Study. None of these changes were shown to occur within the study area. Locally, there are a number of anticipated transportation network changes triggered by development the surrounding Riverside South Community. A summary of the relevant local transportation network changes has been provided below:

- New Collector Road (Street 1) within proposed development will connect between River Road and Spratt Road, forming two new T-intersections
- Borbridge Drive, an existing collector road, will be extended to River Road and Spratt Road, forming two new T-intersections, triggered by adjacent developments to the north
- Brian Good Avenue will be extended south of Street 1 to provide access to the Riverside South Community.

No changes were expected to existing transit routes.

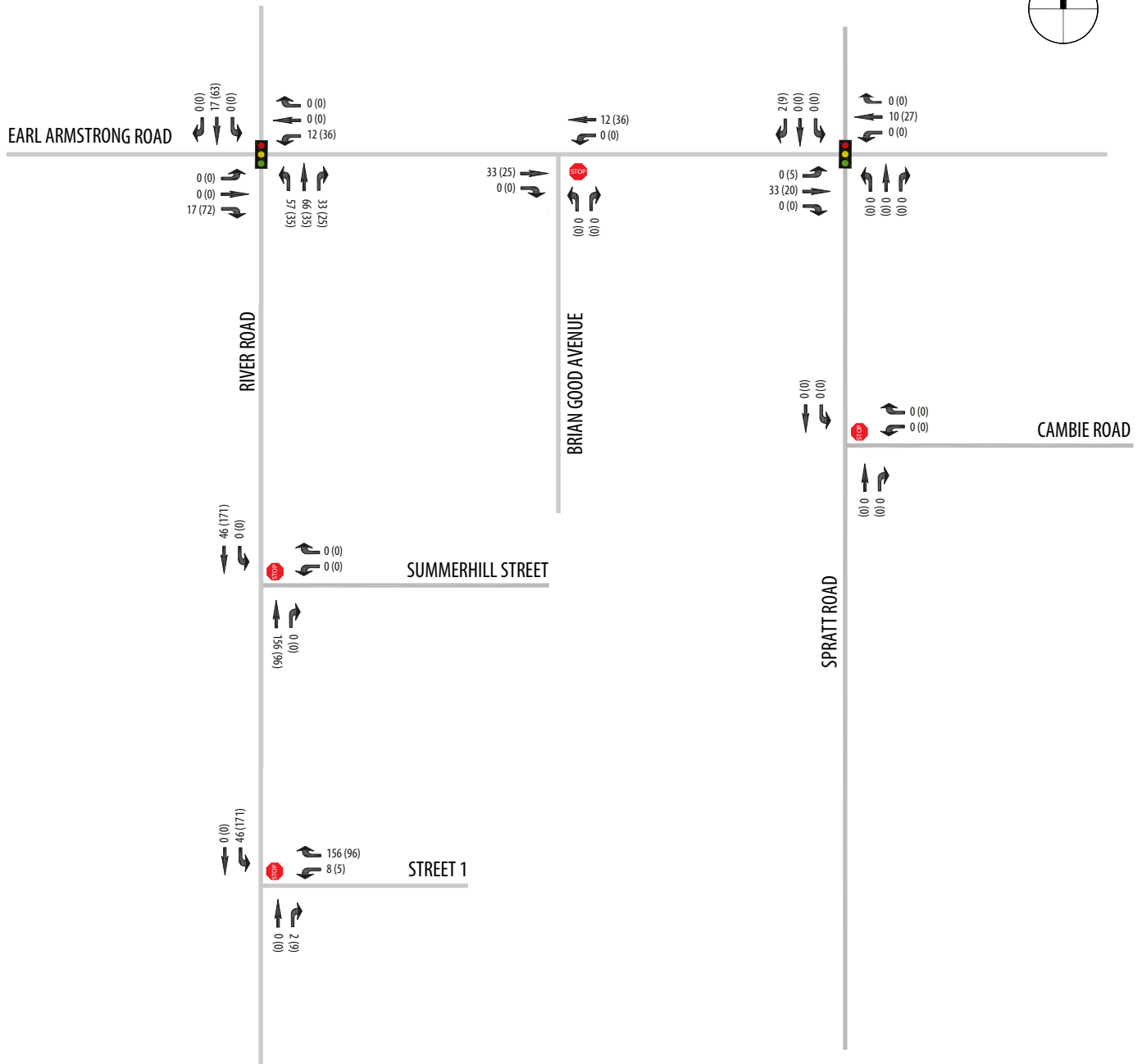
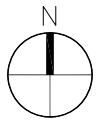
3.2 General Background Growth Rates

The background growth rate is meant to represent regional growth, outside the study area, along the adjacent road network. Approved transportation impact assessments completed within the study area, primarily by Dillon Consulting, applied a linear growth rate of 1.5% per annum to existing traffic volumes to estimate future traffic volumes. The same growth rate was applied to the following movements in this study:

- Earl Armstrong Road, through movements between Brian Good Avenue and Spratt Road, turning movements at Spratt Road
- River Road, through movements between Summerhill Street and Street 1
- Spratt Road, through movements between Earl Armstrong Road and Street 1, turning movements at Earl Armstrong Road

Side street traffic from minor collector and local roadways within the study area were not factored since they provide access to local developments; all adjacent developments were accounted for separately in this analysis (see Section 3.3. Other Developments). To do so would risk double counting and overestimation of future traffic volumes that may lead to construction of unnecessary and costly modifications.

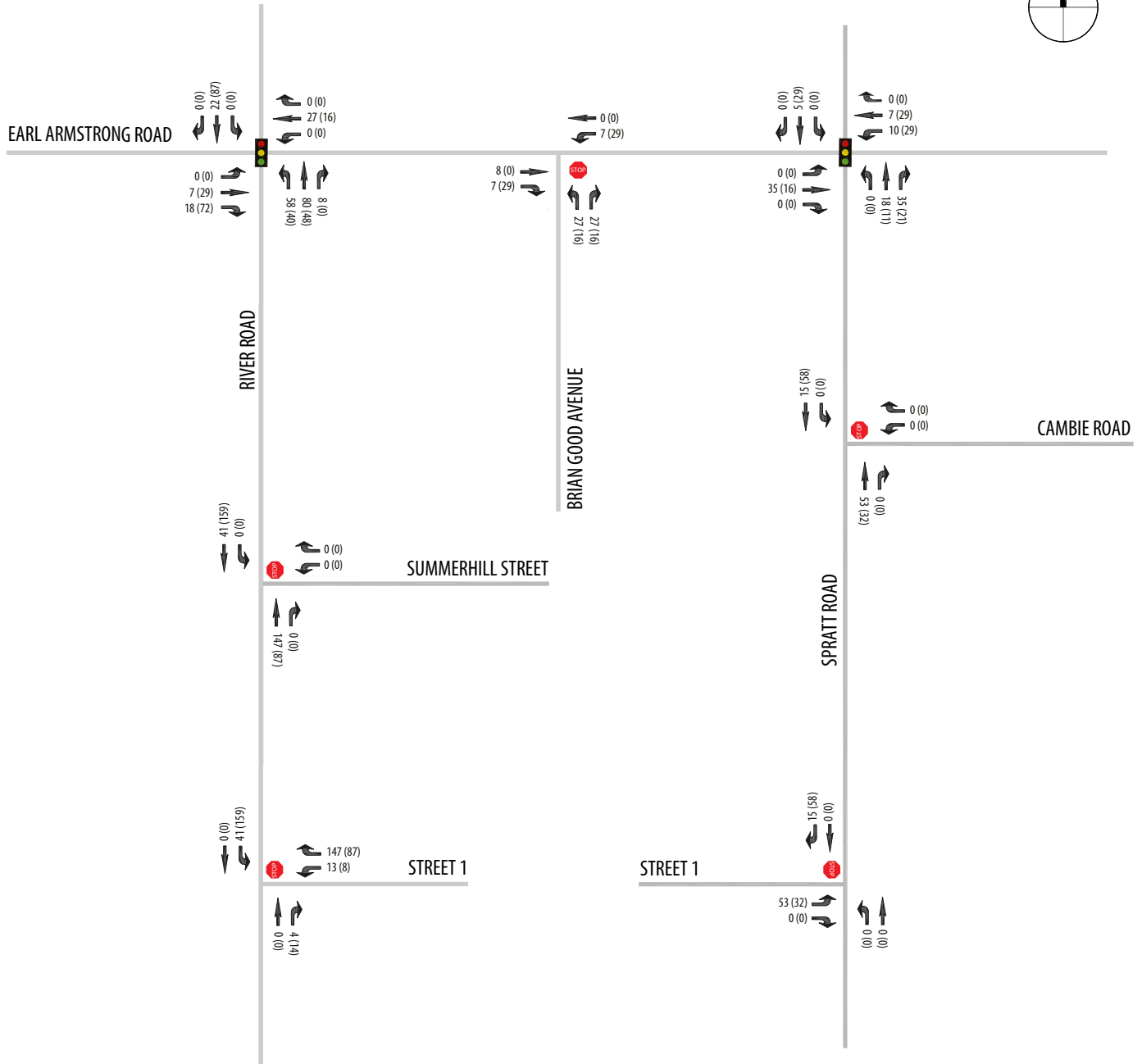
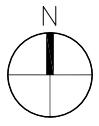
A reduced background growth rate of 0.5% was applied to certain movements at the Earl Armstrong Road and River Road intersection. Only the eastbound through in morning peak hour and the westbound through in the afternoon peak hour were factored by the accepted 1.5% background growth rate. The justification for this approach has been provided in Section 4.3. Adjustment to Background Network Demands.



LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES

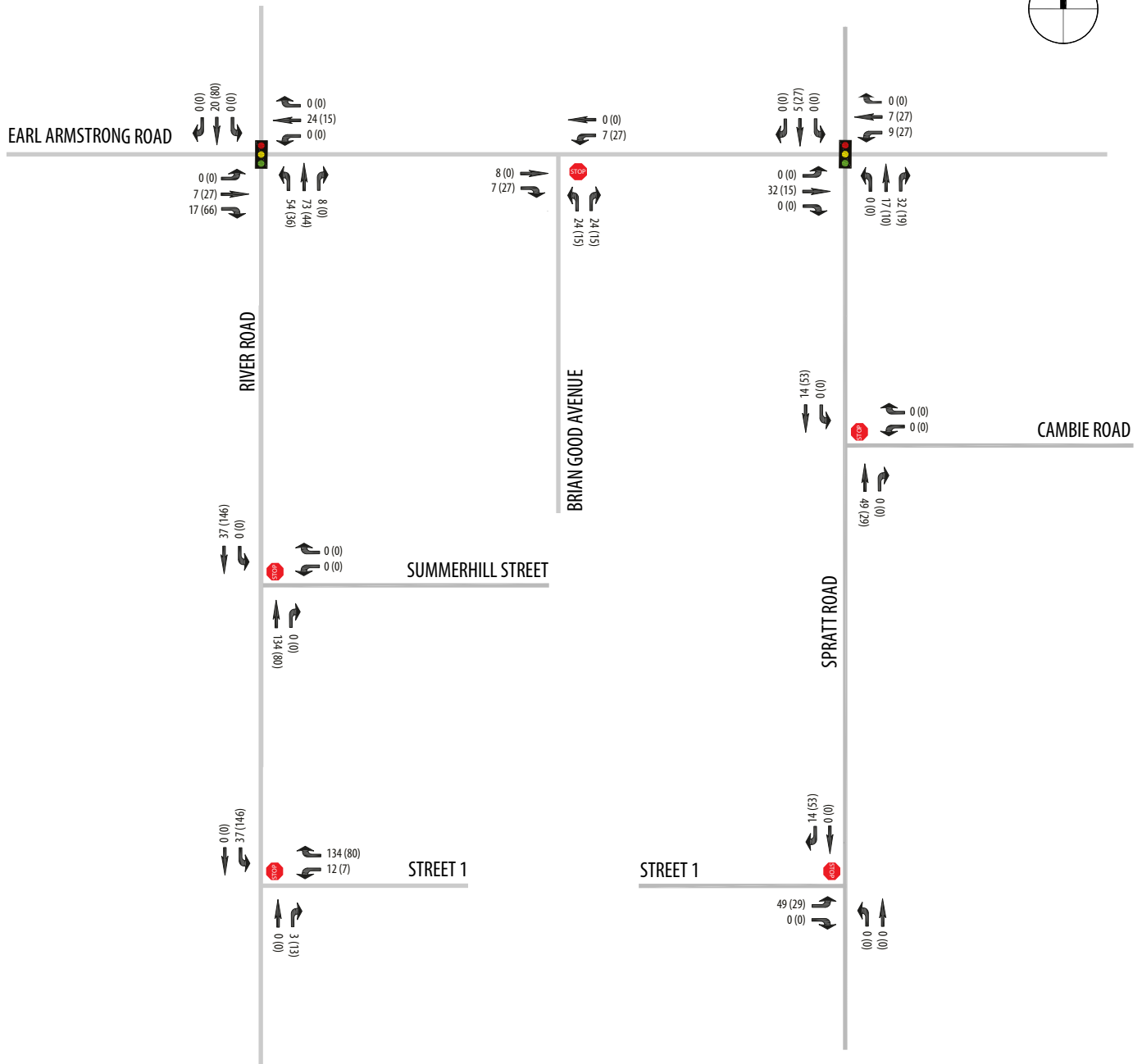
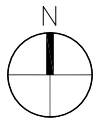




LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES





LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES





3.3 Other Area Development

The City of Ottawa TIA Guidelines specifies all significant developments within the study area which are likely to occur within the horizon years must be identified and taken into consideration in all TIA reports. Since the traffic generated by these developments was not captured in the background traffic growth calculation, they must be added separately.

There are five known adjacent developments within the study area. These developments are currently in the development application approval process, have already been approved and in pre-construction, or are currently under construction. The unit counts and characteristics for each development were based on traffic studies that supported the development application. All adjacent development traffic studies were completed by Dillon Consulting Limited.

A site survey was completed documenting all occupied units within these development lands. All unoccupied units were accounted for using the same trip generation process as the proposed development, and added separately as required in the TIA Guidelines. Any occupied units would be discounted from the analysis since they would be captured in the existing turning movement counts.

The adjacent developments have been summarized in Table 7, and their approximate locations in relation to RSS Ph2 is shown in **Exhibit 6**.



Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 6
Future Adjacent Developments

PROJECT No. 112842
DATE: NOVEMBER 2017
SCALE: -100m 0 400m



TABLE 7 – Future Adjacent Developments

DEVELOPMENT NAME	LAND USE	DEVELOPMENT SIZE (DU or SQ.FT.)	UNITS or BUILDINGS NOT BUILT/ OCCUPIED	EXPECTED FULL BUILDOUT/ OCCUPANCY DATE ¹
Phase 8	Single Family Residential Units	176	134	2018
	Townhome Units	256	228	2018
	Stacked Townhome Units	146	0	2018
Phase 9 (South)	Single Family Residential Units	414	22	2018
	Townhome Units	760	0	Complete
	Stacked Townhome Units	181	0	Complete
	Shopping Centre	101,000 sq.ft.	101,000 sq.ft.	2018
Phase 9 (Northeast)	Stacked Townhome Units	181	34	2018
Phase 9 (Southeast)	Single Family Residential Units	22	22	2018
	Townhome Units	114	114	2018
Riverside South Phase 13	Single Family Residential Units	282	282	2018
	Townhome Units	190	190	2018
Urbandale Phase 15 (Ph 1)	Single Family Residential Units	288	288	2021
	Townhome Units	369	369	2021
Urbandale Phase 15 (Ph 2)	Single Family Residential Units	291	291	2026
	Townhome Units	230	230	2026
Block K	Stacked Townhomes Units	84	84	2023
	Shopping Centre	143,000 sq.ft.	143,000 sq.ft.	2023

Notes:

vph = vehicles per hour; DU = Dwelling Units

1. Buildout Dates based on supporting traffic study by Dillon Consulting.

4 Demand Rationalization

The following section summarizes any adjustments made to future travel demands in the study area to account for capacity limitations of the transportation network.

4.1 Description of Capacity Issues

The Earl Armstrong Road and River Road intersection has operated below City standards since the Vimy Memorial Bridge opened in 2014, based on recent traffic studies by Dillon Consulting. The new river crossing between the Barrhaven and the Riverside South Communities led to a sharp increase in traffic across the Bridge, beyond what was forecasted prior to construction, which has resulted in heavy congestion at the intersection in both morning and afternoon peak hours. This congestion has occurred despite the City upgrading the intersection to its ultimate



configuration with a 4-lane cross section, dual left-turn lanes on all approaches, channelized right-turn lanes and exclusive bus and cycling lanes. There is no space to add lanes to increase capacity due to the proximity of the Bridge and limited right-of-way.

There are, however, viable alternative routes available to local traffic to avoid this bottleneck in the transportation network, such as Limebank Road and Prince of Wales Drive. According to the Needs and Opportunities Report (2013), the Leitrim Screenline (SL 8) has additional morning peak inbound capacity to accommodate vehicles trips that may need to be diverted away from the Earl Armstrong Road and River Road intersection to ensure that the theoretical capacity of the intersection is not exceeded in the future analysis scenarios.

4.1.1 Earl Armstrong and River Road Diversion

Prince of Wales Drive is currently undergoing intersection modifications and coordinated network modifications from 480m north of Strandherd Drive to West Hunt Club Road in order to improve traffic flow for vehicles, pedestrians and cyclists. The purpose of which is to add capacity to the corridor and address capacity deficiencies at the CNR West screenline.

According to Development Background Charges Study (2014), Prince of Wales Drive is expected to be widened from 2 to 4-lanes between Colonnade Road to south of West Hunt Club Road as part of the Transportation Master Plan (TMP) "Affordable Network" Concept between 2026 and 2031. The Network Concept proposes to extend the widening to Strandherd Drive.

The proposed widening of Earl Armstrong Road from Limebank Road to Bowesville and the extension to Bank Street will provide better access to adjacent north-south routes such as Bowesville and Albion Road. The widening of Bank Street which is currently undergoing detailed design will also help alleviate capacity constraints on the Leitrim Screenline.

To account for all the above network modifications, the eastbound left-turn lane in the morning peak hour and the southbound right-turn in the afternoon peak hour were both reduced by 25% in the 2021 horizon year to account for the current intersection modifications and optimizations being completed by the City. These movements were reduced by an additional **25%** (50% in total) in the 2026 and 2031 horizon years to account for future the Prince of Wales widening and growth in adjacent screenline capacity.

4.2 Adjustment to Development Generated Demands

Development generated demand sometimes has to be adjusted over time to reflect changes in 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 TMP. Transit is expected to play a significant role, and will have an impact within the study area.

Although pedestrian and cycling facilities have expanded within the Riverside South Community, the impact on development generated traffic demand was not considered sufficient to warrant consideration in this analysis.

4.2.1 Transit Modal Share

The trip generation results in Tables 4 and 5 were adjusted to account for future increases in transit mode share. The TMP noted the transit mode share in the morning peak period from Riverside South/ Leitrim area to all other areas in the City was 9% in 2011 with a transit mode share target at 16% by 2031. Similarly, the transit mode share from all areas of the City to Riverside South/ Leitrim was 2% in 2011 with a transit mode share target of 9% by 2031. Therefore,



the transit modal share is expected to increase by 7% in both scenarios between 2011 and 2031, which represents a 5% increase from 2017.

This 5% increase in TMS is based on expected Rapid Transit and Transit Priority projects outlined in the “Affordable Network” Concept in the City TMP. Within the Riverside South Community specifically, the TMP notes that transit priority measures to be implemented along Earl Armstrong Road that connects the Town Centres of Barrhaven South and Riverside South.

However, the City announced in July 2017 that the Phase 2 LRT Trillium Line is going to be extended west from the currently planned terminus at the Earl Armstrong/ Bowesville LRT Station, to Limebank Road by 2021. This means the LRT system will soon have a LRT station and significant transit hub within the Riverside South Community.

The impact on travel behaviour from the extension was not accounted for in the City’s TMP projections. Therefore, the TMS projections were adjusted and applied to development generated demand (for the proposed and adjacent developments) as follows:

- Year 2021 & 2026:
 - o Residential TMS = 16% (TMP 2031 target)
 - o Commercial TMS = 9% (TMP 2031 Target)
- Year 2031
 - o Residential TMS = 21%
 - o Commercial TMS = 14% (TMP 2031 Target)

4.3 Adjustments to Background Network Demands

4.3.1 Growth Rate Reductions

As discussed in Section 3.2. General Background Growth Rates, a regional background growth rate of 1.5% was applied to select movements along arterial and major collector roadways within the study area. This growth rate was based on previously approved traffic studies prepared by Dillon Consulting within the study area. Local side street traffic volumes were exempt from this process since all future adjacent development traffic volumes were added separately in the analysis.

At the intersection of Earl Armstrong Road and River Road intersection, a growth rate of 0.5% was applied to all movements except the eastbound through in the morning peak period and the westbound through in the afternoon peak period. These two movements maintained the 1.5% background growth rate. The reason for the reduction to the remaining movements can be summarized as follows:

1. The Vimy Memorial Bridge crossing was opened in late 2014 and traffic volumes at the Earl Armstrong Road and River Road intersection increased significantly in the first 2 years of operation. However, this initial growth is unsustainable nor representative of future background growth. Therefore, the historical trends prior to the bridge opening were used to define future background growth for all movements to and from River Road. This approach was considered to be a more representative predictor of future background growth since the transportation network in the local area in the years prior to the Bridge opening was stable. The results of this analysis has been summarized in Table 8, which show flat to negative growth for nearly all movements during this period.
2. The Earl Armstrong Road and River Road intersection is currently operating above its theoretical capacity despite being constructed to its ultimate configuration. It was considered



unreasonable to assume a constant 1.5% growth rate through to the 2031 horizon year. Traffic should be expected to redirect to other routes to avoid this bottleneck.

3. Table 9 summarizes the post-bridge annual traffic volume trends. The results showed significant growth on major commuter movements e.g. the EBT and WBT, as expected. However, on minor movements, i.e. the EBR, WBL, NBL and NBR, growth was less significant and could be attributed to new local residents from the ongoing development of the Riverside South Community. These movements would be logical access and egress routes for local trips. As previously noted, all local adjacent development traffic was accounted for separately in this analysis. Therefore, applying an additional growth rate to these movements may constitute double counting of future trips generated by the local community.

TABLE 8 – Earl Armstrong Road and River Road Historical Peak Hour Traffic Volumes – Pre Bridge

COUNT DATE	COMBINED AM & PM TRAFFIC VOLUMES BY MOVEMENT					
	WBL	WBR	NBT	NBR	SBL	SBT
June 2006	304	240	799	266	123	643
May 2007	284	271	756	231	138	610
May 2008	342	156	659	301	127	535
June 2009	370	209	761	231	175	610
July 2013	349	97	620	166	88	470
July 2014	356	168	794	222	88	567
Trend	+ ¹	-	-	-	-	-

Notes: EB/WB/NB/SB – eastbound, westbound, northbound, southbound; L/T/R = left/through/right

1 - Positive growth from 2006 but showed near flat growth from 2008 to 2014.

(-) - Indicates flat or negative growth trend

TABLE 9 – Earl Armstrong Road and River Road Historical Peak Hour Traffic Volumes – Post Bridge

COUNT DATE	COMBINED AM & PM TRAFFIC VOLUMES BY MOVEMENT											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
August 2014 ¹	695	1124	248	148	1040	106	305	535	127	54	396	652
September 2015	722	1769	380	174	1399	150	430	516	133	59	318	922
March 2016	667	1721	353	164	1457	104	400	503	130	52	273	768
June 2016	643	1836	415	181	1512	139	502	498	144	60	335	898
Trend	-	+	+	/	+	-	+	-	/	-	-	-

Notes: EB/WB/NB/SB – eastbound, westbound, northbound, southbound; L/T/R = left/through/right

1 - Count completed shortly after Vimy Memorial Bridge opened, expected to be low and was considered an outlier

(+) - Indicates growth trend

(-) - Indicates flat or negative growth trend

(/) - Indicates marginal growth trend, greater than 1.5% but less than 10 vph

The historical traffic trends noted in Tables 7 and 8 support the 0.5% background growth rate assumptions at the Earl Armstrong Road and River Road intersection. The only exceptions to the 0.5% growth rate were the eastbound through in the morning peak period and the westbound through in the afternoon peak period. Cross traffic between the Barrhaven South and Riverside South communities is expected to continue growing as City infrastructure projects come onstream in Phases 2 and 3 of the TMP network timetable, such as the extension of the Trillium Line to Limebank Road and the planned widening and extension of Earl Armstrong Road east of Limebank Road. Therefore, the 1.5% background growth rate applied to these two movements was considered reasonable.



Note, a 0.5% background growth rate was also applied to movements that showed flat or declining trends. The historical turning movement counts have been provided in Appendix C.

4.3.2 Pass-By Trip Reductions

There are undeveloped commercial land uses proposed within adjacent lands that were accounted for in preparation of background traffic demand. The commercial trips were separated into new trips and pass-by trips by the application of pass-by proportions determined from the ITE Trip Generation Manual, 9th Edition. Pass-by trips are trips made as an intermediate stop on the way from an origin to a primary destination (e.g. retail, service, fast-food restaurant). They are assumed to enter the site and then resume travel in the same direction. Therefore, pass-by trips are not new trips, but existing trips that have made a temporary detour.

Pass-by proportions were determined using the for the Block K and Phase 9 North adjacent developments, based on the Shopping Centre land use, and the square-footage of Gross Leasable Area (GLA). Earl Armstrong Road is a heavily utilized commuter route, and any commercial uses along or adjacent to Earl Armstrong Road are expected to generate a high proportion of pass-by trips during these peaks, rather than new trips. Based on the pass-by trips interpolated from Figure 5.5 in the ITE Trip Generation Manual, 35% of trips were assumed to be pass-by trips in the PM Peak Hour for the Block K Shopping Centre development with an expected GLA of 143,000 sqft. For the Phase 9 North Shopping Centre development, 39% was determined to be an appropriate pass-by rate, based on the anticipated size of the residential development, which is expected to have a Gross Leasable Area (GLA) of 101,000 square feet.

The distributions used for the pass-by trips are shown in Table 10. Previously approved studies were referenced for pass-by data, and new distribution were developed to reflect changes to traffic patterns due to the opening of the Vimy Memorial Bridge.

TABLE 10 – Pass-by Distributions (Block K & Phase 9 North)

DIRECTION	PASS-BY DISTRIBUTION	
	PM IN	PM OUT
To/ From West on Earl Armstrong Road	50%	50%
To/ From North on Spratt Road	15%	15%
To/ From East on Earl Armstrong Road	35%	35%
To/ From South on River Road	0%	0%

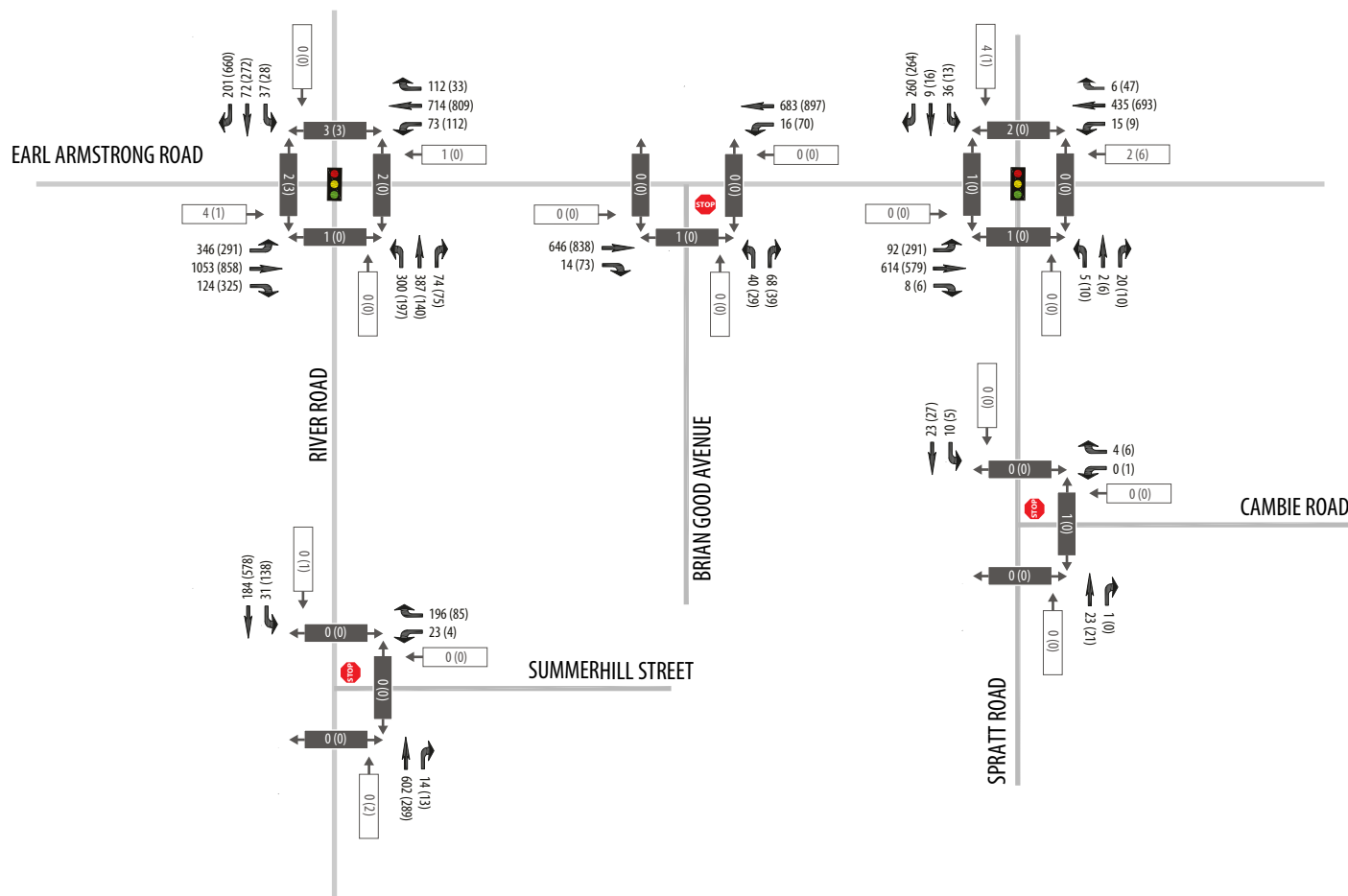
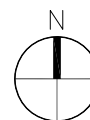
5 Traffic Volume Summary

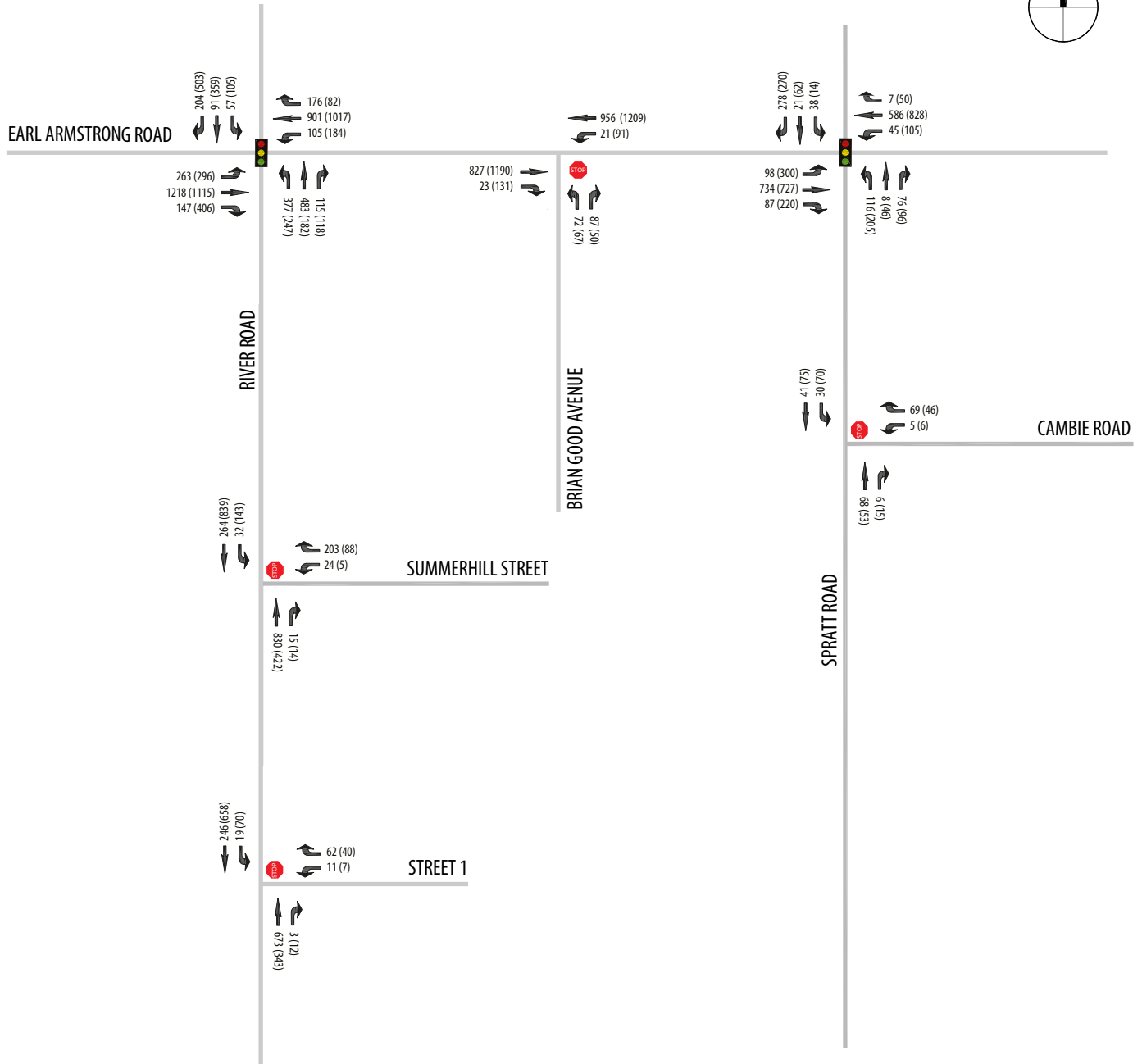
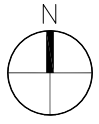
5.1 Future Background Traffic Volumes

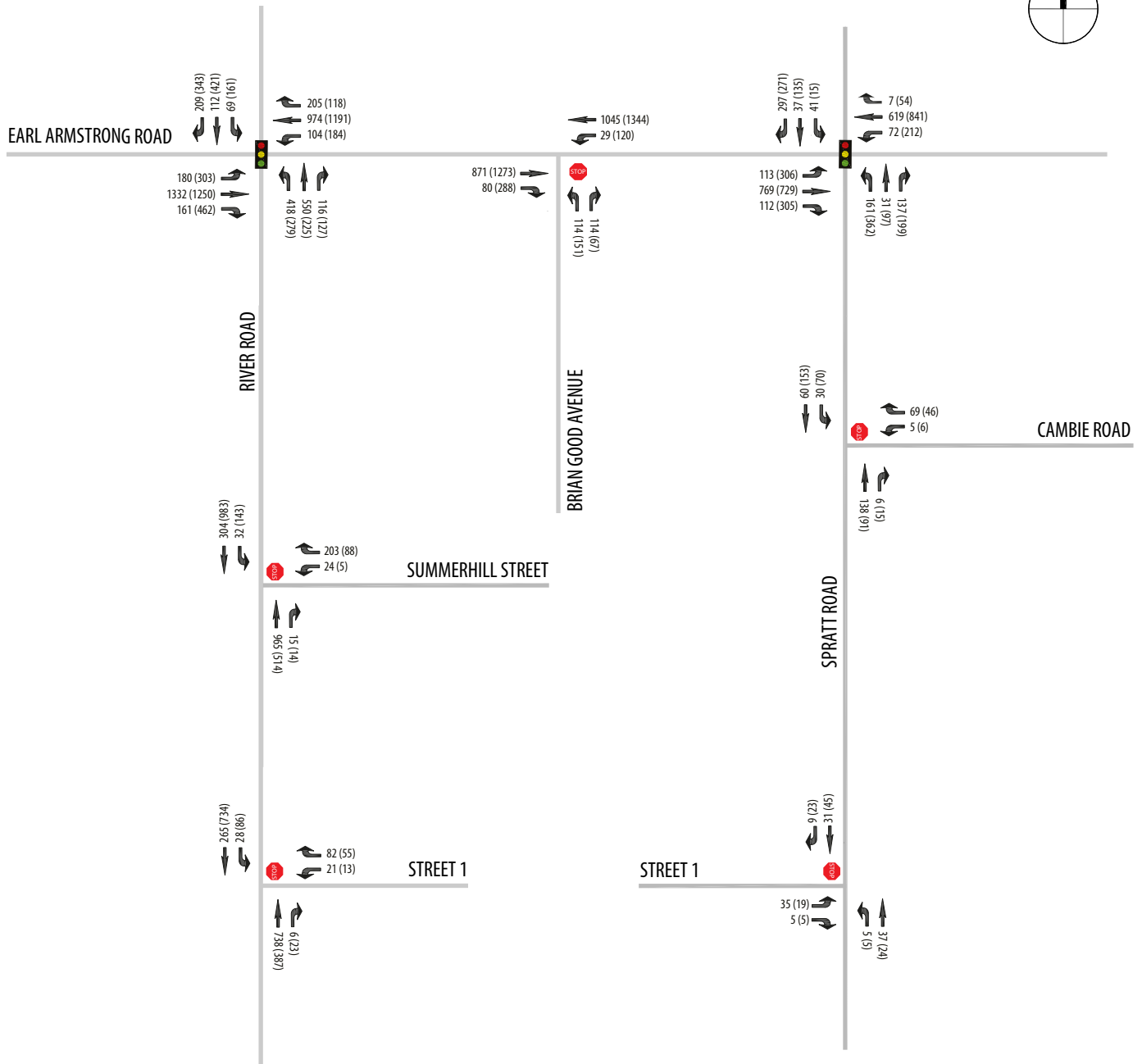
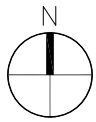
The existing 2017 peak hour traffic volumes from the Scoping Report has been provided in **Exhibit 7**. The future background traffic volumes developed in Section 3: Background Network Traffic for the 2021, 2026 and 2031 horizons have been provided in **Exhibits 8, 9 and 10** respectively.

5.2 Future Total Traffic Volumes

The site generated peak hour traffic volumes from **Exhibits 3, 4 and 5** were added to corresponding background traffic volumes to create background plus site generated or total peak hour traffic volumes for the 2021, 2026 and 2031 horizon years, as shown in **Exhibits 11, 12 and 13** respectively.



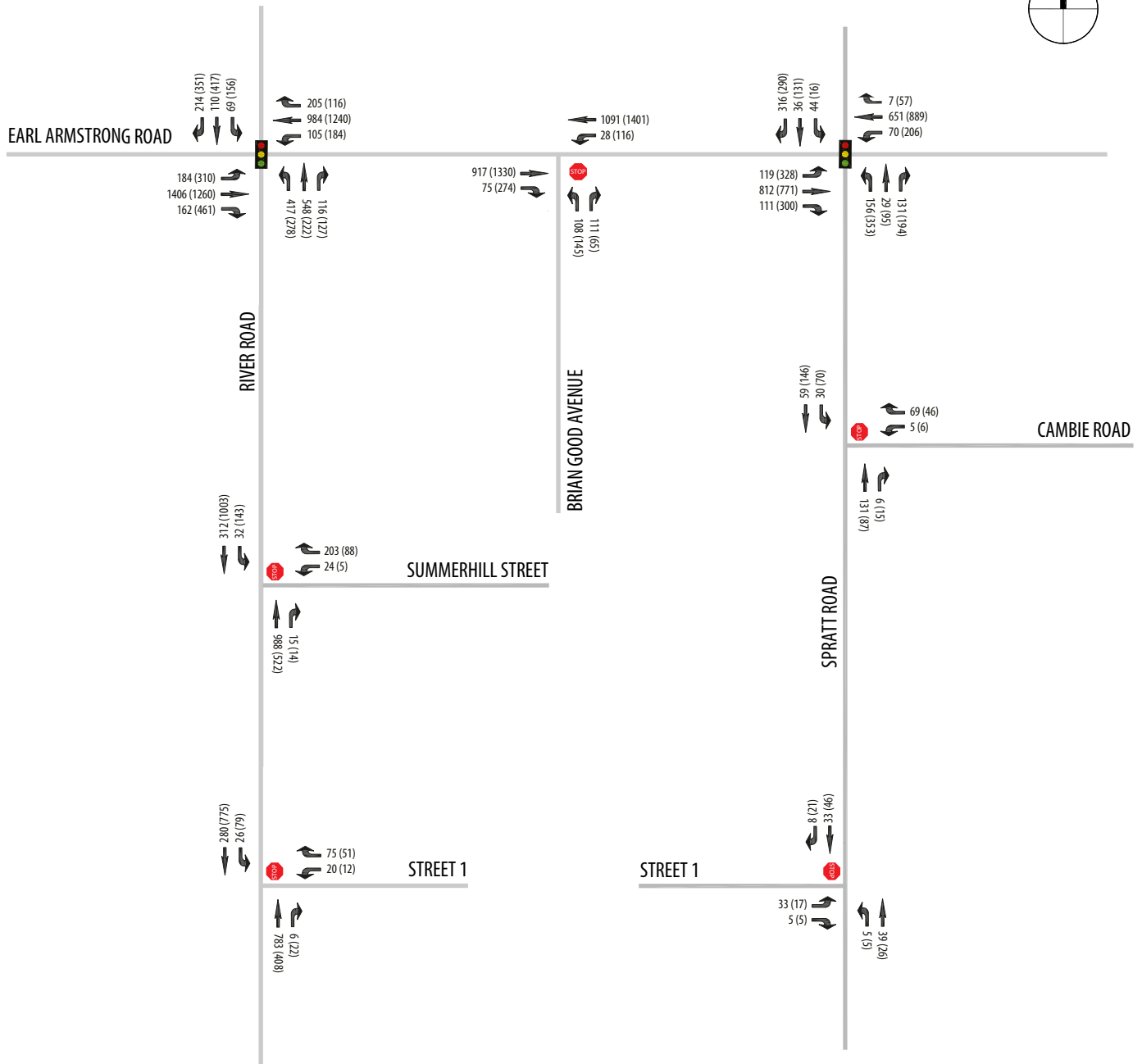
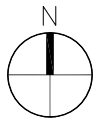




LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES

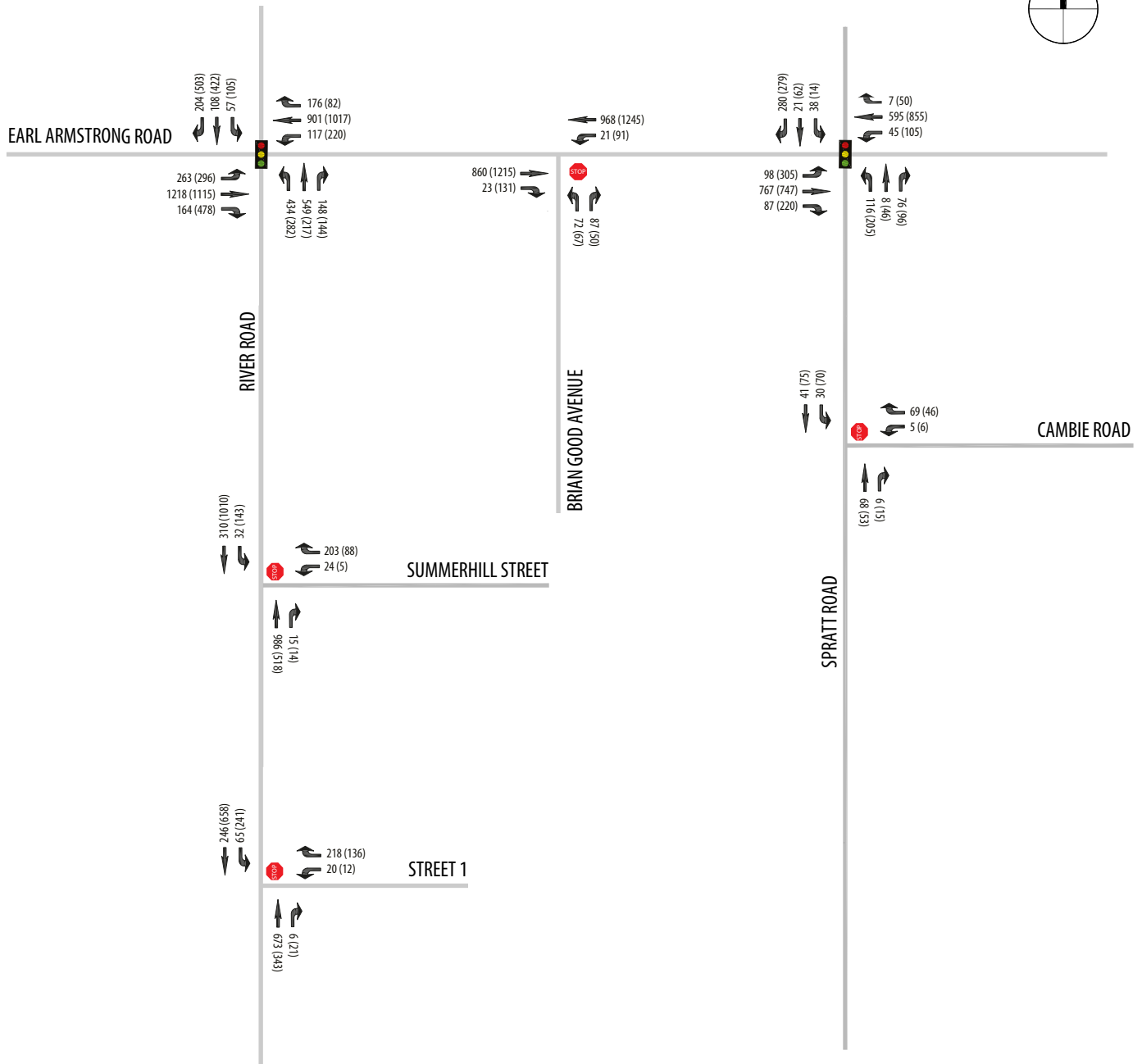
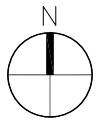




LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
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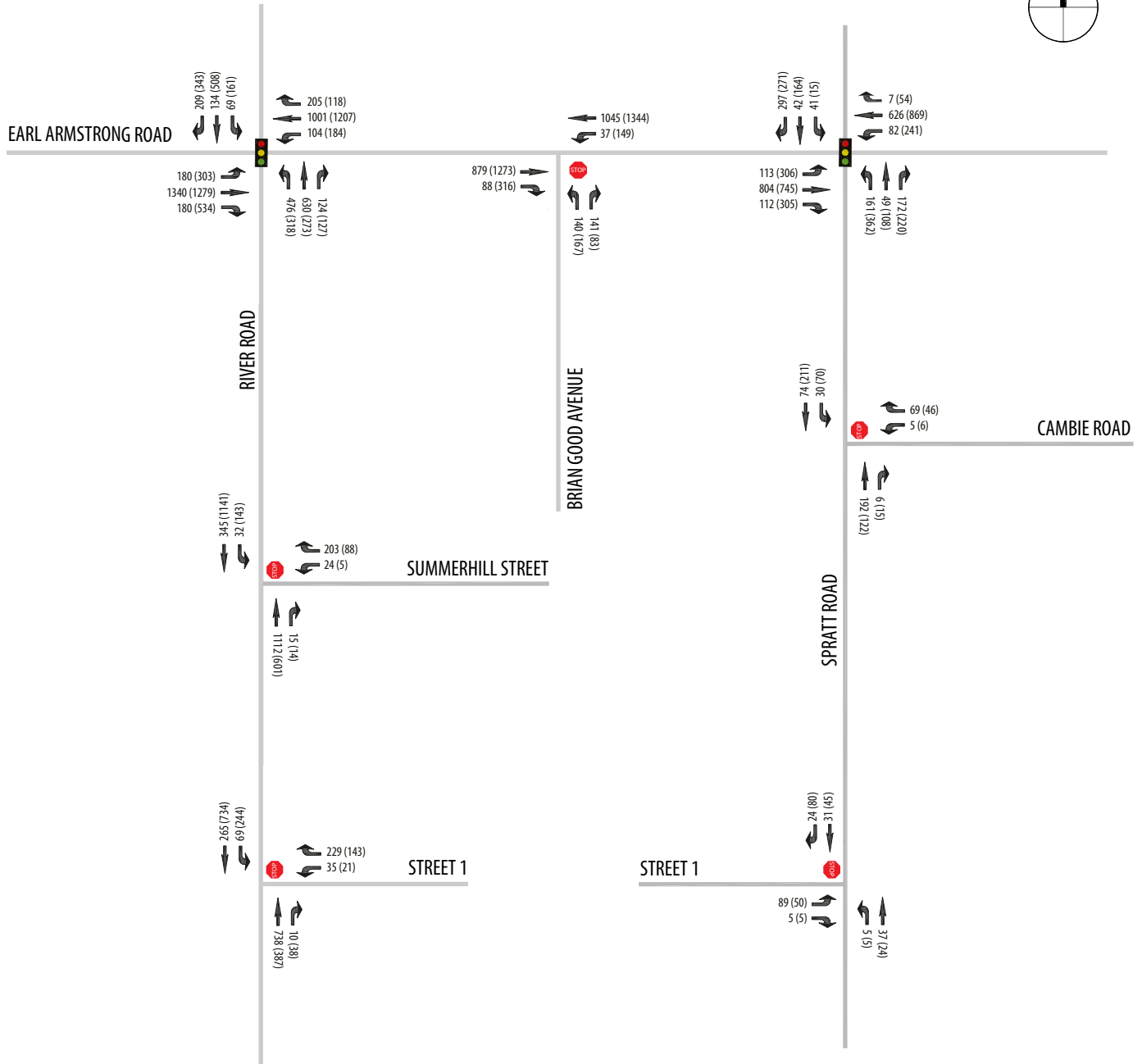
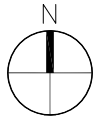




LEGEND

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- TRAVEL LANES AND PERMITTED MOVEMENTS
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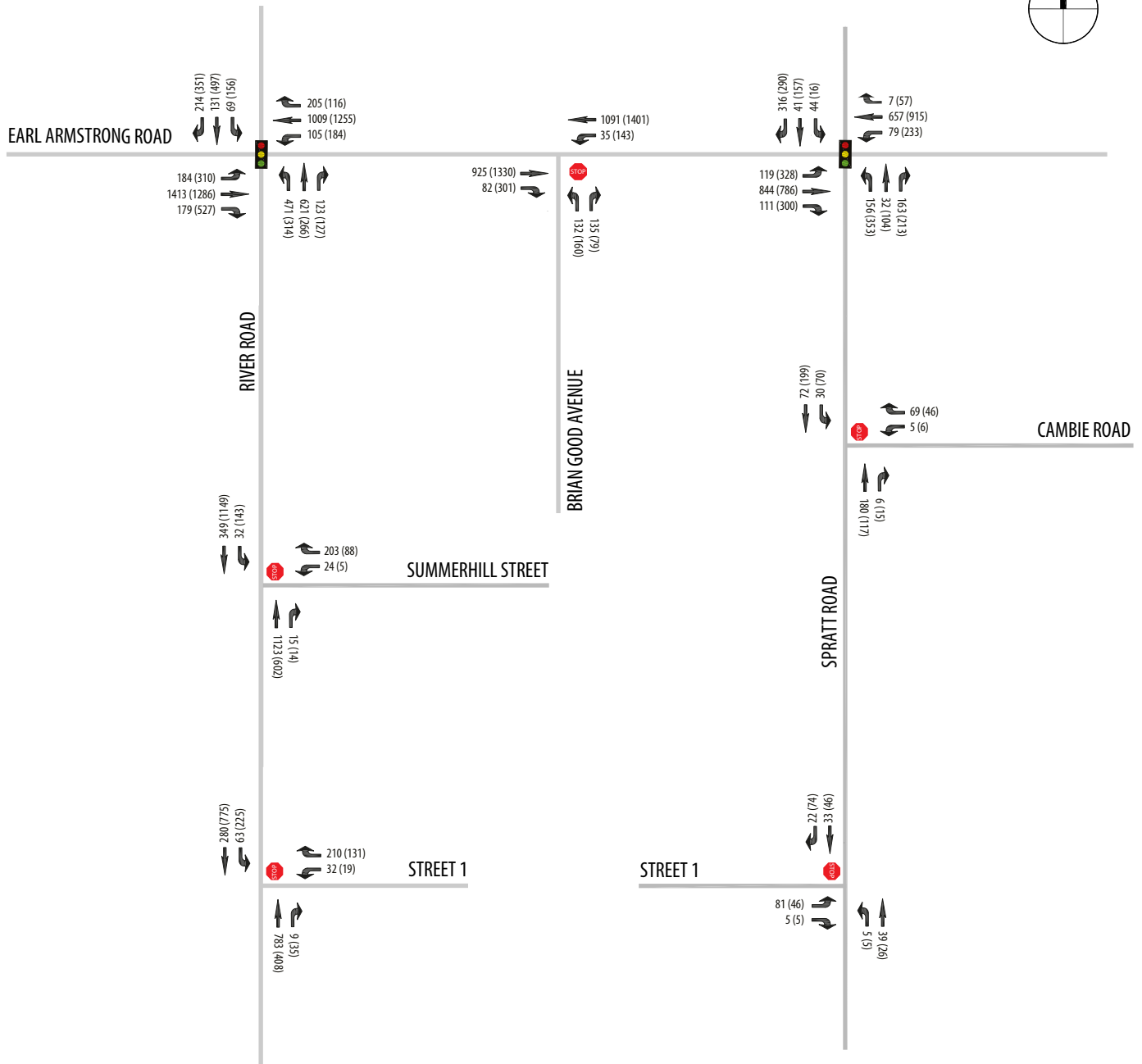
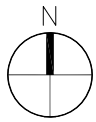




LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES





LEGEND

- STOP CONTROL
- TRAFFIC CONTROL SIGNAL
- TRAVEL LANES AND PERMITTED MOVEMENTS
- AM & PM PEAK HOUR VEHICULAR VOLUMES





Riverside South Phase 2

Transportation Impact Assessment Forecasting Report

Appendix A: ITE Trip Generation Data

November 2017



Residential Condominium/Townhouse (230)

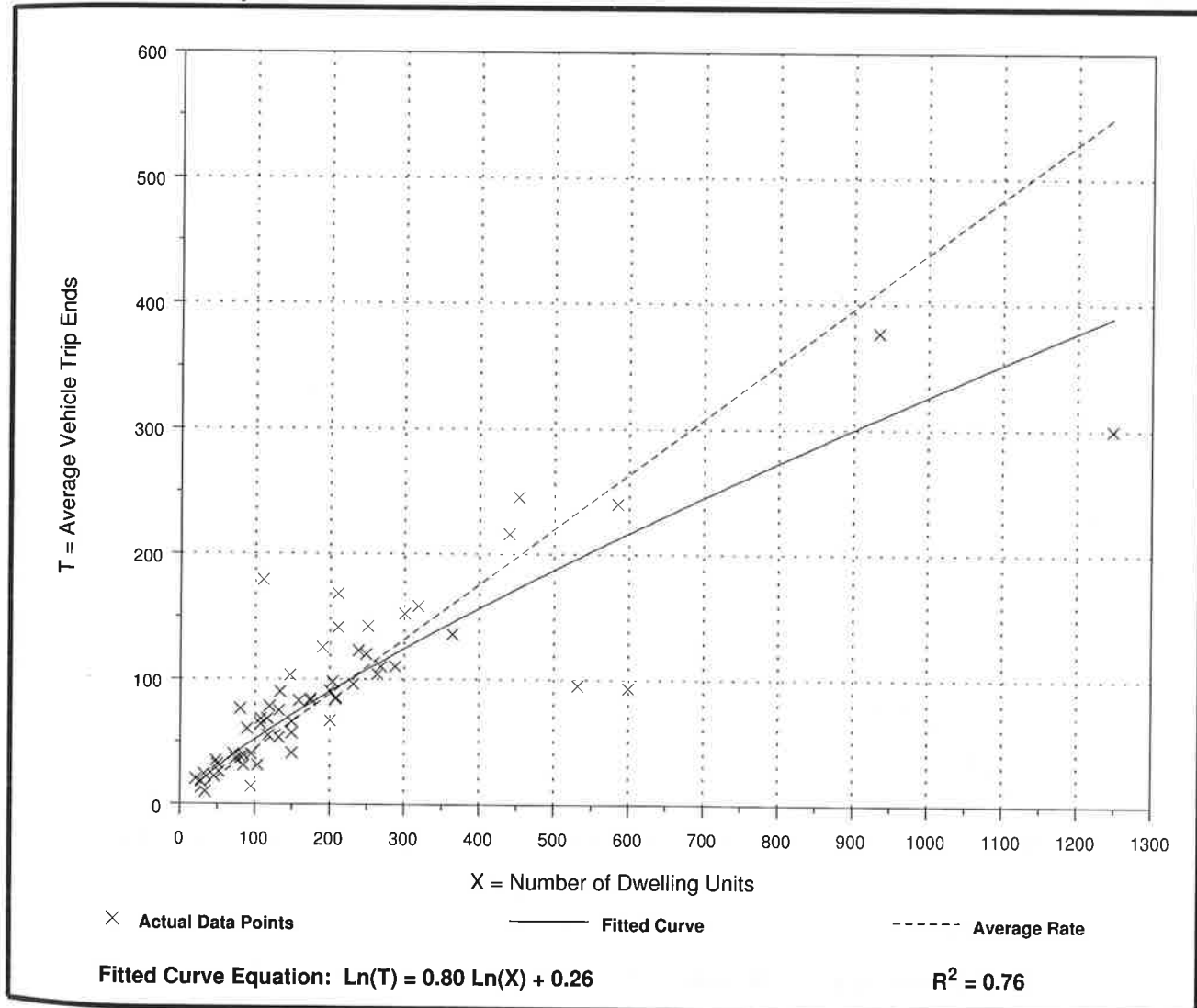
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 59
 Avg. Number of Dwelling Units: 213
 Directional Distribution: 17% entering, 83% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.61	0.69

Data Plot and Equation



Residential Condominium/Townhouse (230)

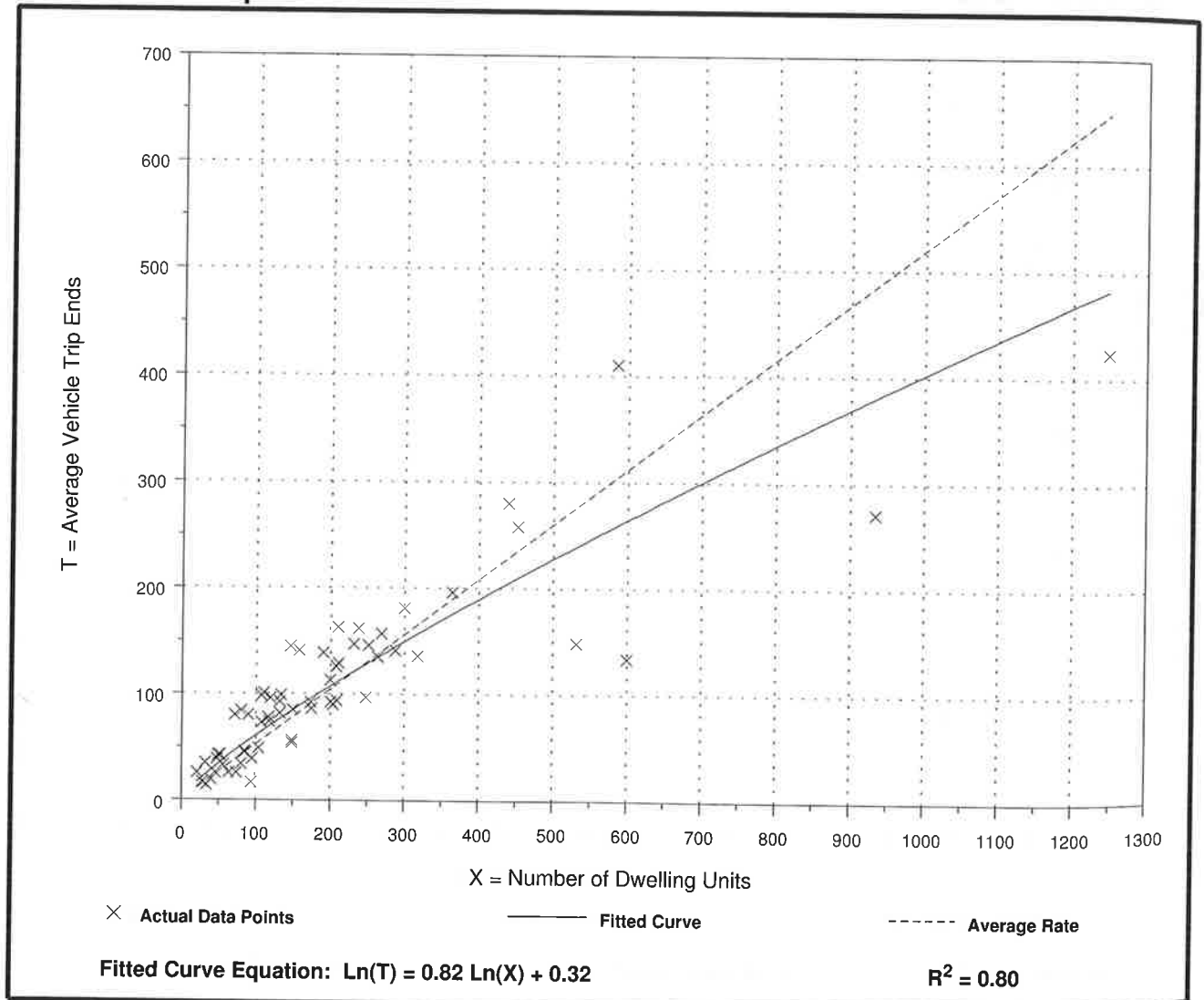
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 62
 Avg. Number of Dwelling Units: 205
 Directional Distribution: 67% entering, 33% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.52	0.18 - 1.24	0.75

Data Plot and Equation



Single-Family Detached Housing (210)

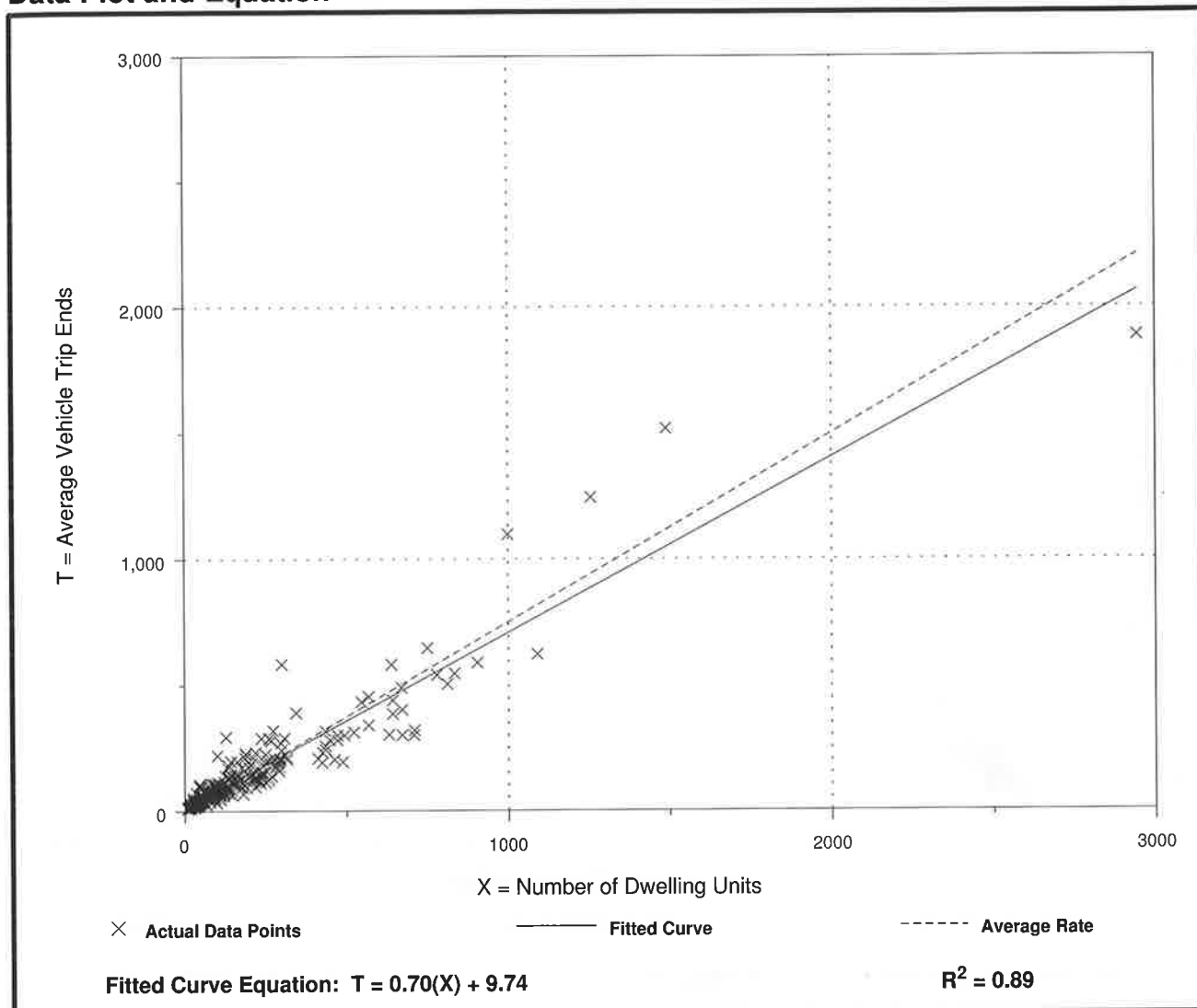
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 292
 Avg. Number of Dwelling Units: 194
 Directional Distribution: 25% entering, 75% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.75	0.33 - 2.27	0.90

Data Plot and Equation



Single-Family Detached Housing (210)

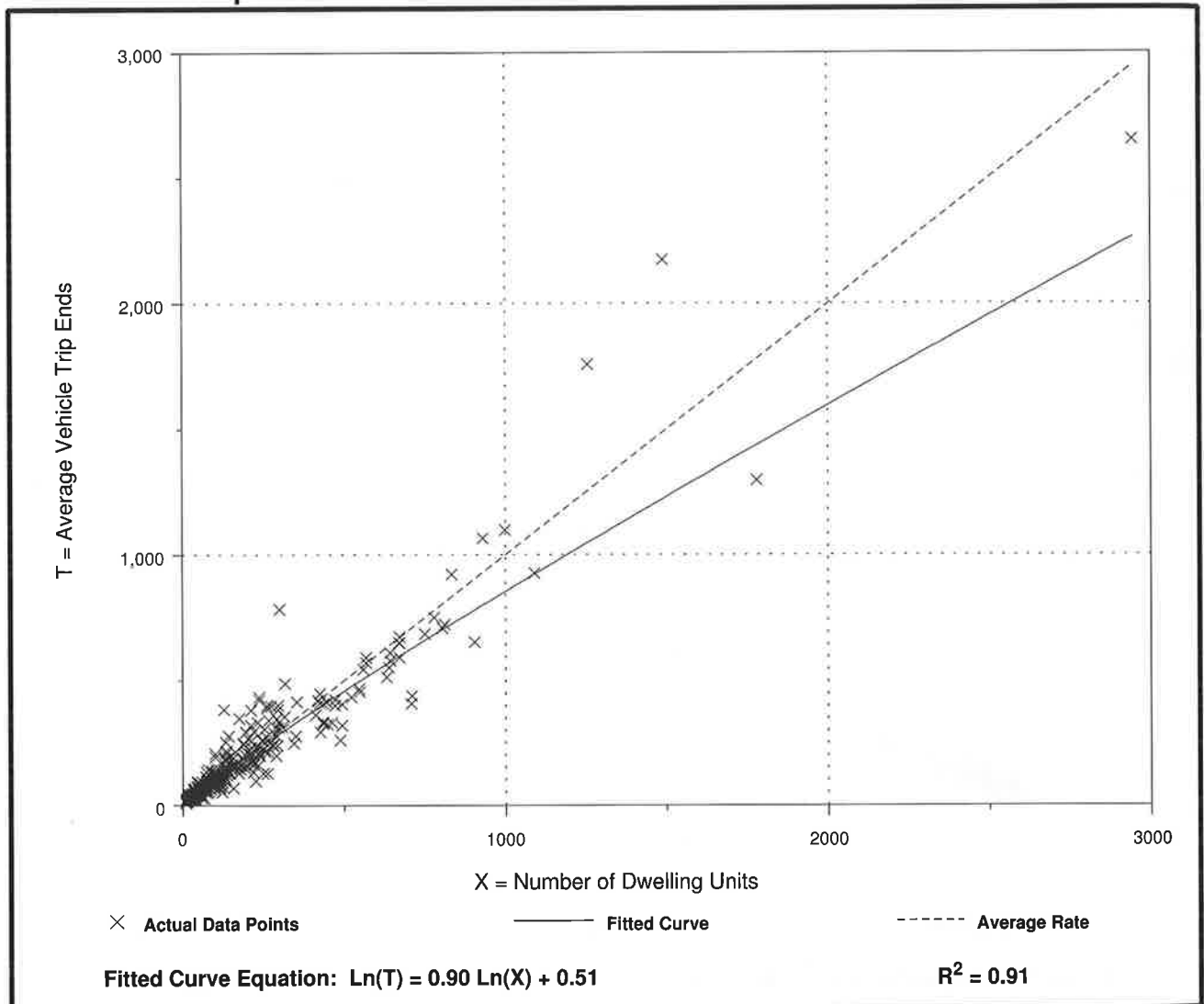
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 321
 Avg. Number of Dwelling Units: 207
 Directional Distribution: 63% entering, 37% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.00	0.42 - 2.98	1.05

Data Plot and Equation





Riverside South Phase 2

Transportation Impact Assessment Forecasting Report

Appendix B: 2011 OD Survey – South Gloucester/ Leirim

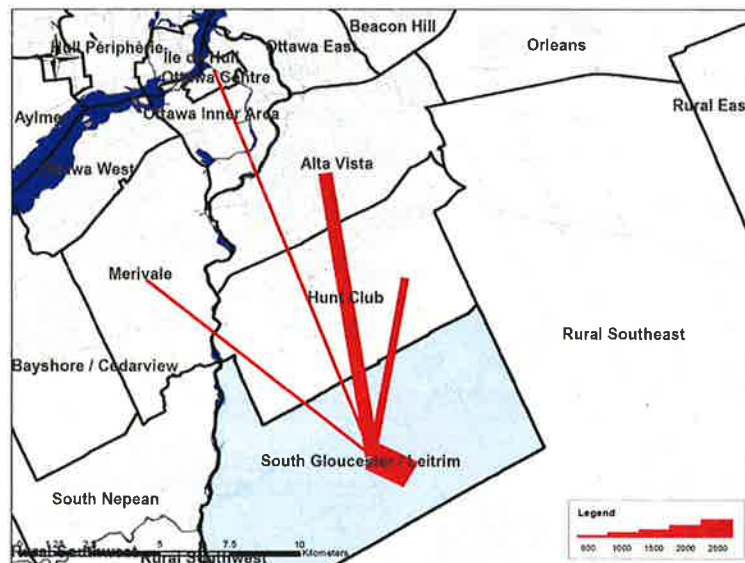
November 2017



Travel Patterns

Top Five Destinations of Trips from South Gloucester / Leirtrim

AM Peak Period



Summary of Trips to and from South Gloucester / Leirtrim

Districts	Destinations of Trips From		Origins of Trips To	
	District	% Total	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 / Leirtrim	3,680	34%	3,680	55%
South Nepean	310	3%	100	1%
Rural Southwest	120	1%	220	3%
Kanata / Stittsville	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%	



Riverside South Phase 2

Transportation Impact Assessment Forecasting Report

Appendix C: Historical Traffic Data

November 2017



Turning Movement Count - 15 Minute Summary Report

EARL ARMSTRONG RD @ RIVER RD

Survey Date: Tuesday, June 07, 2016

Total Observed U-Turns

Northbound: 5 Southbound: 2
Eastbound: 7 Westbound: 10

RIVER RD										EARL ARMSTRONG RD										Grand Total
Northbound					Southbound					Eastbound					Westbound					
Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT		
07:00 07:15	79	104	11	194	11	10	39	60	254	85	224	22	331	12	132	11	155	486	740	
07:15 07:30	72	100	20	192	8	13	39	60	252	83	298	26	407	14	172	23	209	616	868	
07:30 07:45	92	112	17	221	8	18	39	65	286	78	261	31	371	21	166	25	212	583	869	
07:45 08:00	68	83	16	167	12	16	54	82	249	87	261	38	386	24	182	31	237	623	872	
08:00 08:15	67	90	21	178	9	25	68	103	281	96	217	28	341	14	190	32	236	577	858	
08:15 08:30	63	71	28	162	7	24	65	96	258	98	211	33	342	19	156	26	201	543	801	
08:30 08:45	53	83	22	158	11	17	34	62	220	94	184	33	311	22	176	12	210	521	741	
08:45 09:00	65	58	31	154	5	20	44	69	223	99	153	32	284	31	147	11	190	474	697	
09:00 09:15	47	57	18	122	1	18	40	59	181	80	129	21	230	9	145	13	167	397	578	
09:15 09:30	45	47	18	110	0	10	43	53	163	76	105	27	209	20	105	9	134	343	506	
09:30 09:45	31	36	16	83	1	24	59	84	167	59	97	29	185	26	95	11	134	319	486	
09:45 10:00	53	33	14	100	6	15	63	84	184	46	93	30	169	29	93	7	129	298	482	
10:00 10:15	32	30	15	77	10	14	34	58	135	45	72	19	136	16	81	6	103	239	374	
10:15 10:30	28	39	18	85	4	14	29	47	132	41	79	30	150	21	95	9	125	275	407	
10:30 10:45	33	31	25	89	9	32	40	81	170	54	78	27	159	18	77	4	99	258	428	
10:45 11:00	36	29	12	77	5	24	27	56	133	59	77	27	164	15	94	10	119	283	416	
11:00 11:15	39	23	21	83	7	25	35	67	150	36	69	27	132	17	111	5	133	265	415	
11:15 11:30	32	18	19	69	5	30	30	65	134	36	92	25	153	16	74	6	96	249	383	
11:30 11:45	30	28	17	75	7	22	45	74	149	41	108	36	185	18	76	10	104	289	438	
11:45 12:00	39	25	13	77	6	21	41	68	145	40	100	29	169	15	80	4	99	268	413	
12:00 12:15	24	46	17	87	0	34	50	84	171	54	94	43	191	25	79	9	113	304	475	
12:15 12:30	28	43	19	90	0	28	48	76	166	36	95	33	165	14	103	6	123	288	454	
12:30 12:45	26	25	13	66	0	31	51	82	148	51	95	22	168	25	103	5	136	304	452	
12:45 13:00	28	28	20	76	0	38	74	113	189	35	109	41	185	16	84	12	113	298	487	
13:00 13:15	23	33	19	75	14	21	31	66	141	44	86	49	179	24	72	4	100	279	420	
13:15 13:30	30	36	16	82	6	23	58	87	169	47	80	26	153	19	93	6	118	271	440	
13:30 13:45	40	30	23	93	9	25	47	81	174	27	102	28	158	16	89	11	116	274	448	
13:45 14:00	29	34	13	76	11	33	48	92	168	48	89	49	187	26	71	5	102	289	457	
14:00 14:15	24	31	22	78	6	31	53	90	168	45	93	30	168	16	94	8	118	286	454	
14:15 14:30	30	13	14	57	9	36	59	104	161	46	106	37	189	20	103	7	130	319	480	
14:30 14:45	33	25	18	76	6	46	49	101	177	51	113	39	203	15	104	11	130	333	510	
14:45 15:00	31	20	23	74	18	29	97	144	218	55	109	47	211	17	135	8	161	372	590	
15:00 15:15	13	12	24	49	6	36	96	138	187	57	145	40	242	23	126	9	159	401	588	
15:15 15:30	22	29	18	69	4	51	137	192	261	61	176	44	281	25	195	8	228	509	770	

RIVER RD										EARL ARMSTRONG RD											
Northbound					Southbound					Eastbound					Westbound						
Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total		
15:30	15:45	45	23	22	91	11	75	146	232	323	65	158	67	290	27	186	7	220	510	833	
15:45	16:00	24	43	23	90	6	63	164	233	323	76	193	65	334	32	209	10	251	585	908	
16:00	16:15	62	37	17	116	9	59	159	227	343	48	201	80	329	27	193	6	226	555	898	
16:15	16:30	45	51	22	118	6	56	131	193	311	67	240	88	395	29	213	10	253	648	959	
16:30	16:45	45	24	16	86	9	81	166	256	342	80	195	88	363	20	176	6	202	565	907	
16:45	17:00	54	21	23	98	5	62	175	242	340	67	230	67	364	28	203	9	240	604	944	
17:00	17:15	52	43	14	109	8	72	185	265	374	76	189	80	345	33	205	8	246	591	965	
17:15	17:30	52	25	17	94	7	51	178	236	330	80	212	69	361	28	233	8	269	630	960	
17:30	17:45	49	23	15	87	10	70	190	270	357	80	171	61	312	19	210	8	237	549	906	
17:45	18:00	52	36	15	103	9	46	181	236	339	99	151	76	326	26	203	9	238	564	903	
18:00	18:15	58	22	16	96	10	69	160	239	335	48	139	55	242	31	214	9	254	496	831	
18:15	18:30	30	42	24	96	9	53	151	213	309	61	138	63	263	42	213	4	259	522	831	
18:30	18:45	47	26	20	93	8	50	106	164	257	54	120	44	218	26	131	5	162	380	637	
18:45	19:00	28	15	17	60	0	29	90	119	179	42	127	42	211	23	118	7	148	359	538	
TOTAL:		2028	1933	892	4858	328	1690	3948	5968	10826	2933	6864	2043	11847	1049	6605	480	8144	19991	30817	

Note: U-Turns are included in Totals.

Comment:



Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

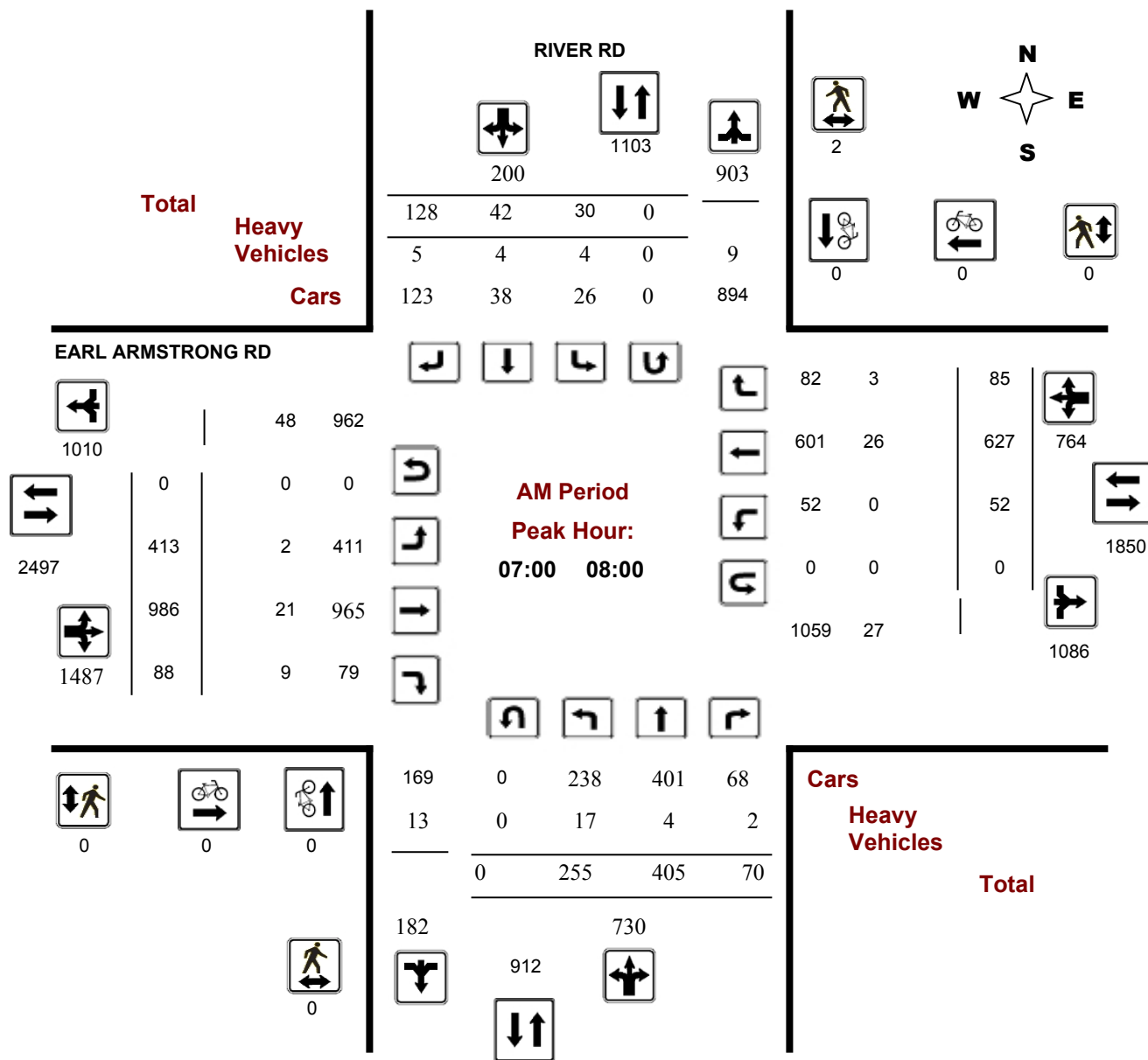
EARL ARMSTRONG RD @ RIVER RD

Survey Date: Tuesday, March 08, 2016

Start Time: 07:00

WO No: 35792

Device: Miovision





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

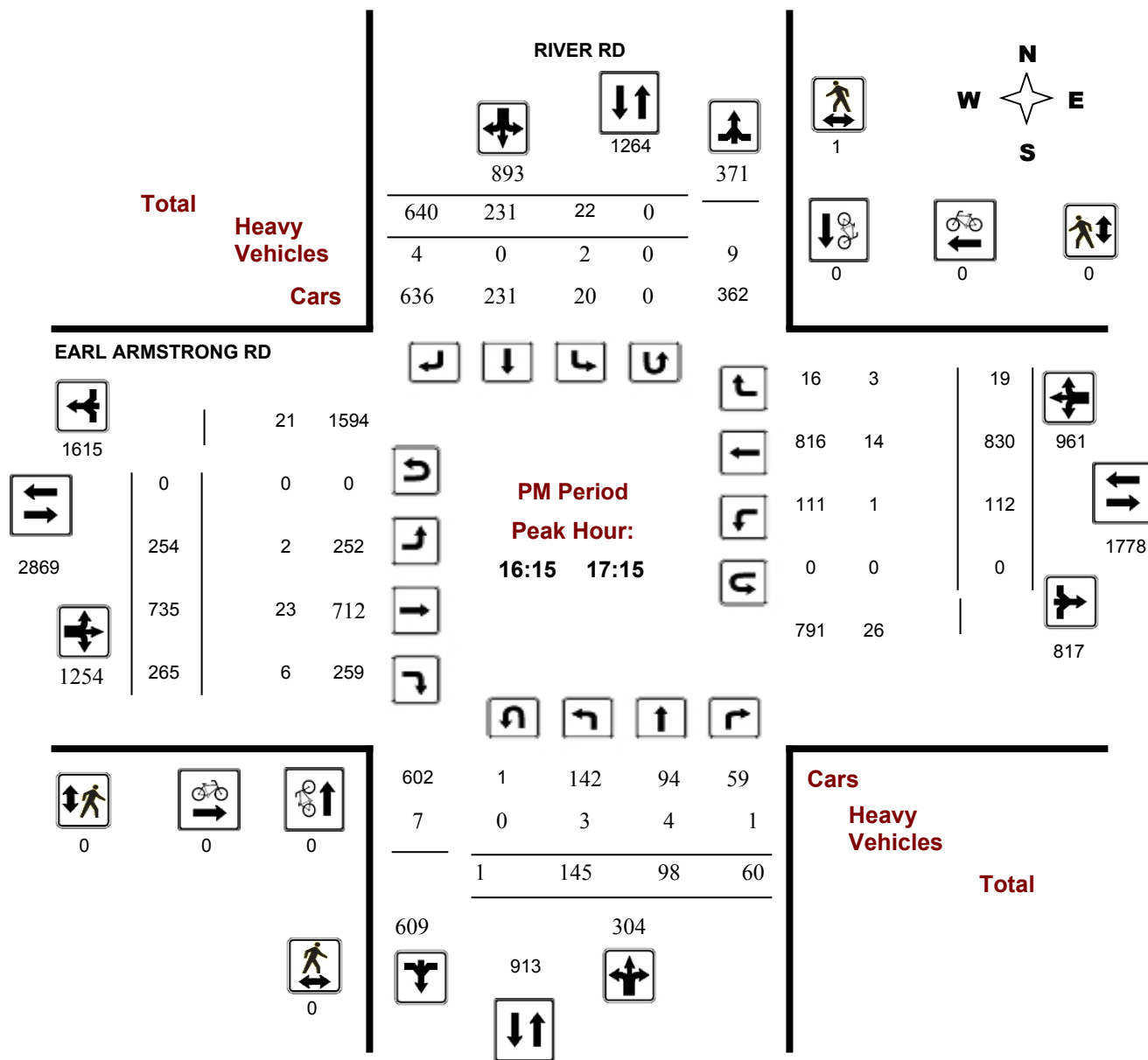
EARL ARMSTRONG RD @ RIVER RD

Survey Date: Tuesday, March 08, 2016

Start Time: 07:00

WO No: 35792

Device: Miovision

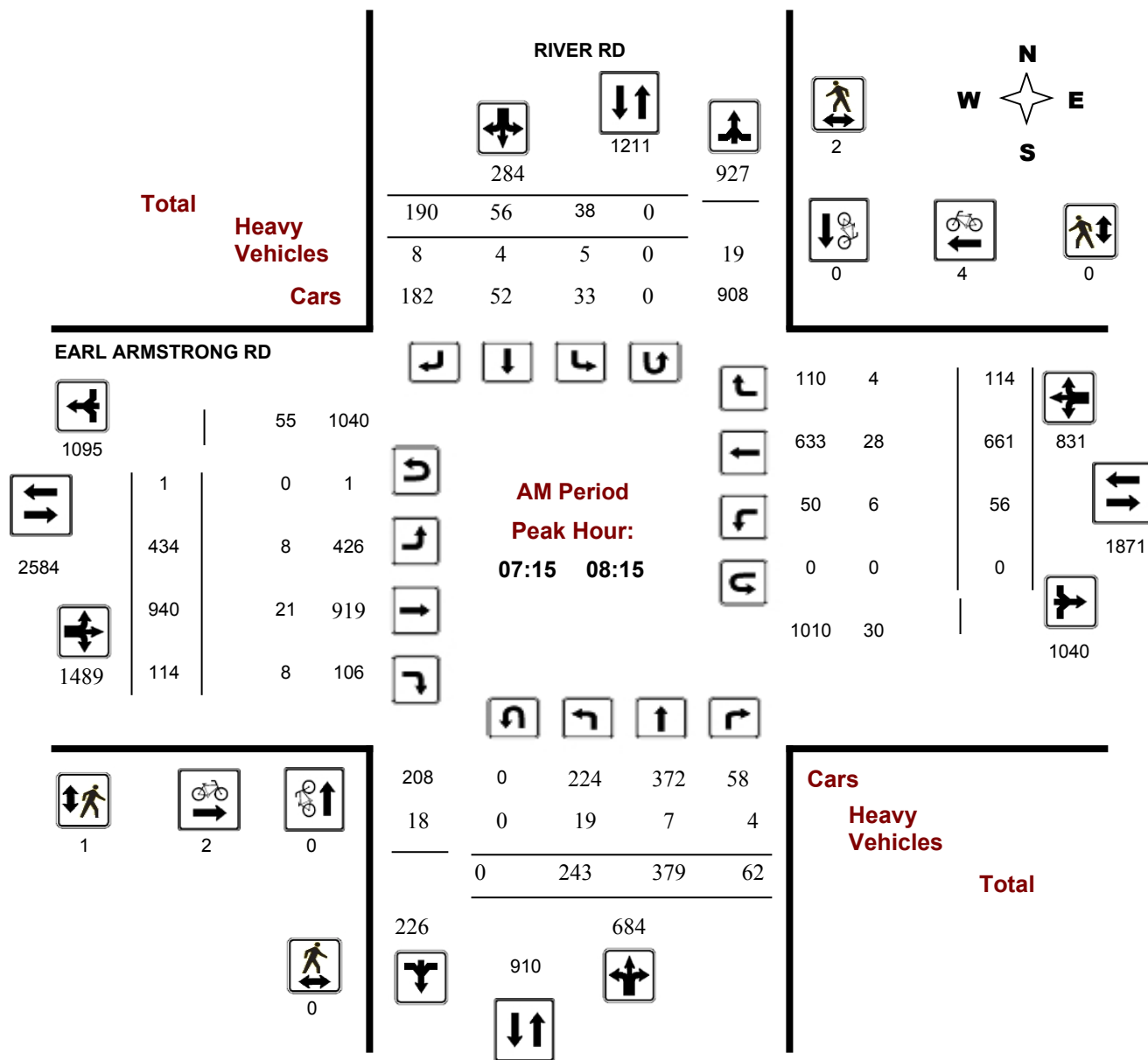


Survey Date: Wednesday, September 30, 2015

Start Time: 07:00

WO No: 35435

Device: Miovision



Turning Movement Count - Full Study Peak Hour Diagram

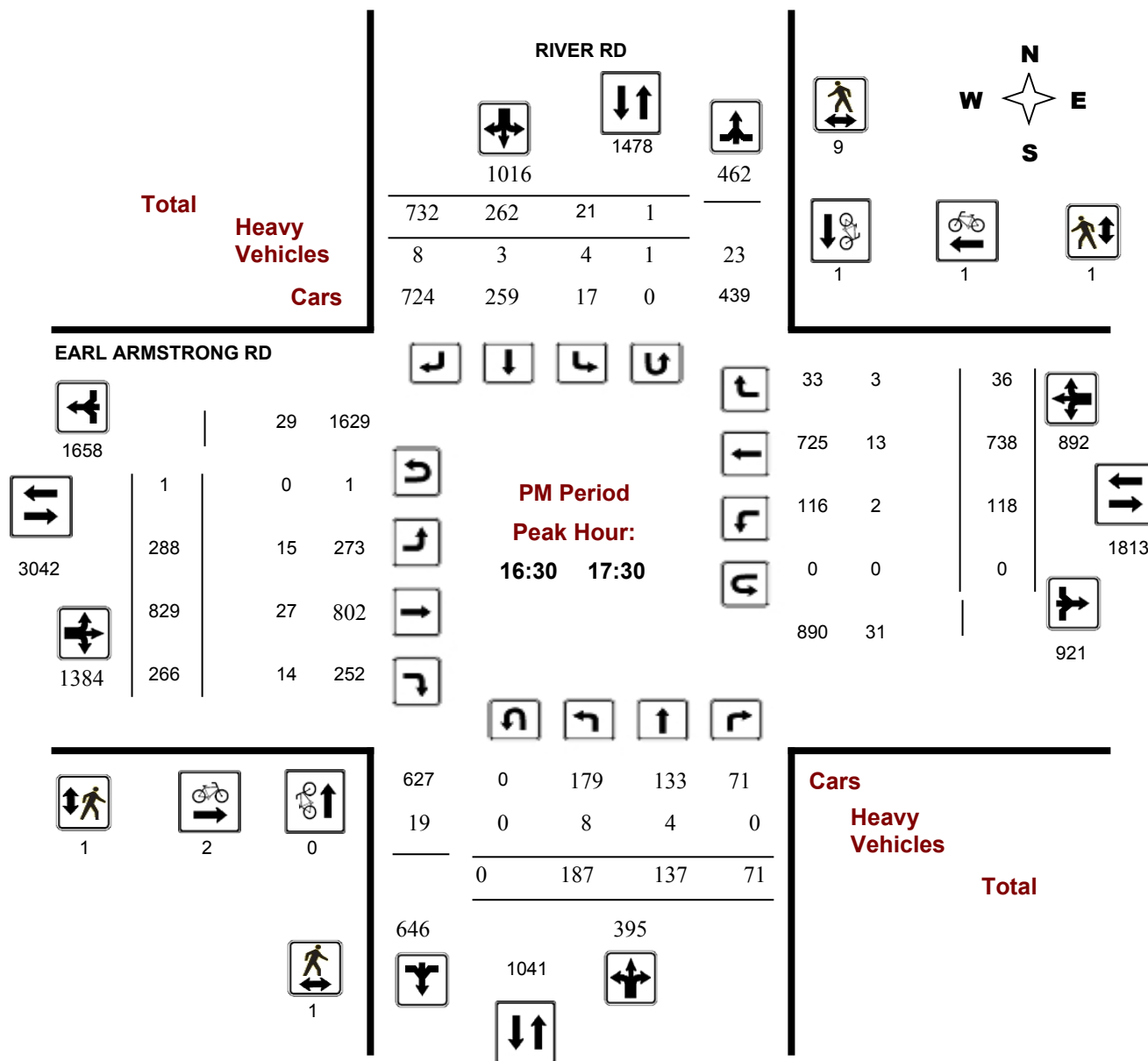
EARL ARMSTRONG RD @ RIVER RD

Survey Date: Wednesday, September 30, 2015

Start Time: 07:00

WO No: 35435

Device: Miovision



Comments

Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

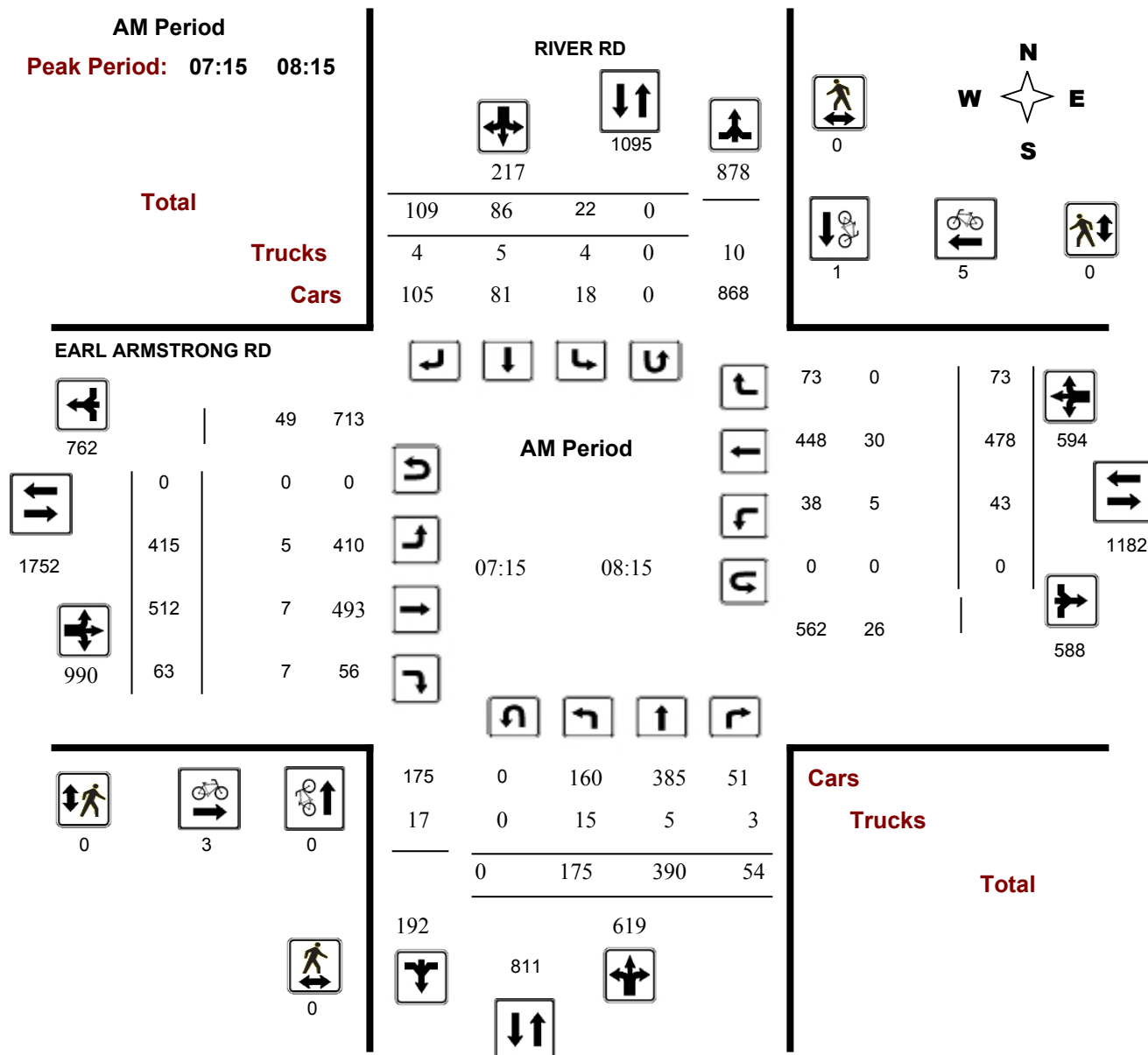
EARL ARMSTRONG RD @ RIVER RD

Survey Date: Thursday, August 28, 2014

Start Time: 07:00

WO No: 29590

Device: Miovision





Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

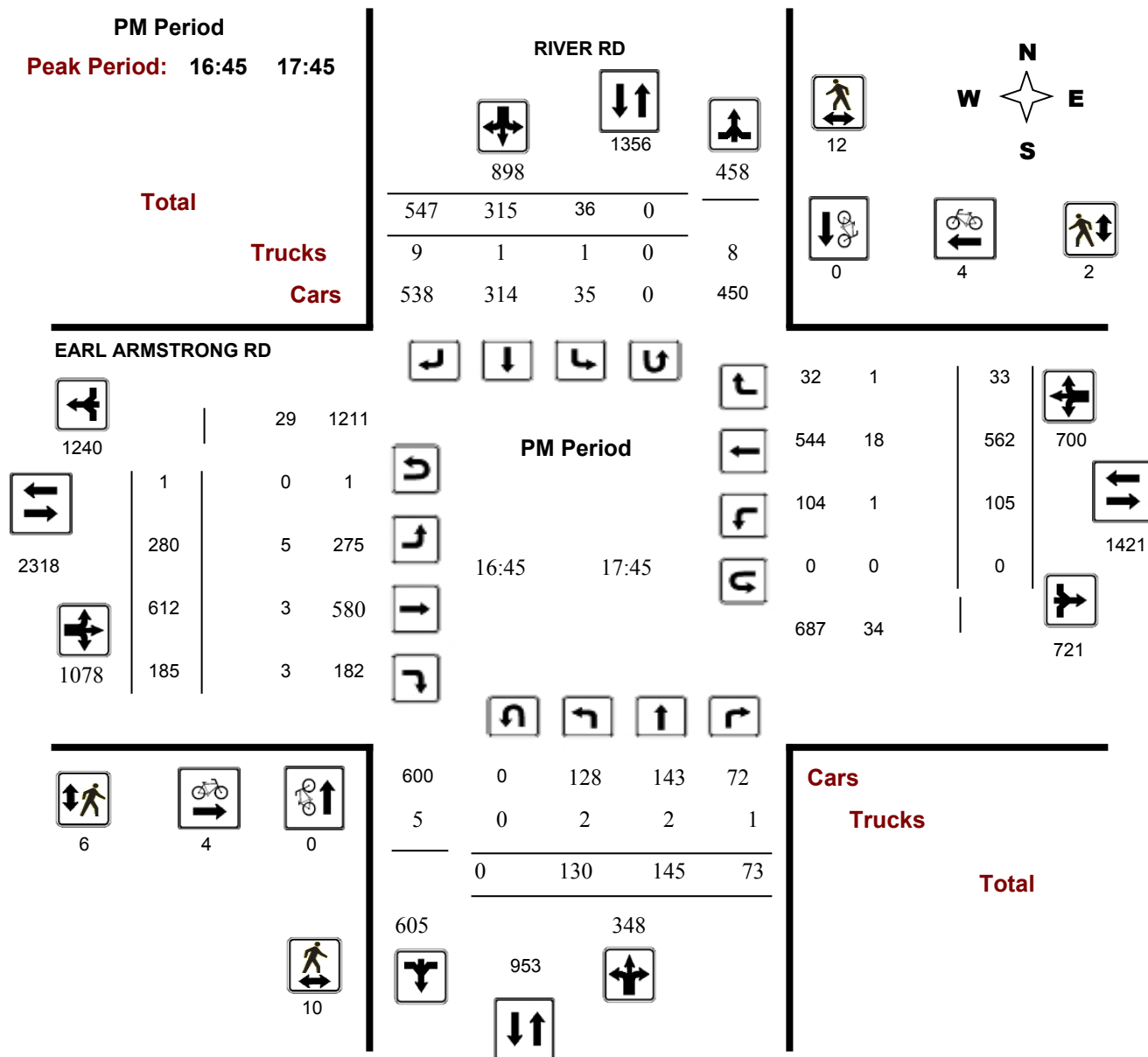
EARL ARMSTRONG RD @ RIVER RD

Survey Date: Thursday, August 28, 2014

Start Time: 07:00

WO No: 29590

Device: Miovision



Validation Note: Results generated Sep 26, 2014. All records still in violation were set to Edited.

RIVER RD and EARL ARMSTRONG RD

(ULRS Listing RR- 19 & EARL ARM)

Survey Date: Thursday 25 July 2013

Conditions: dry

Start Time: 0700

Total Observed U-Turns

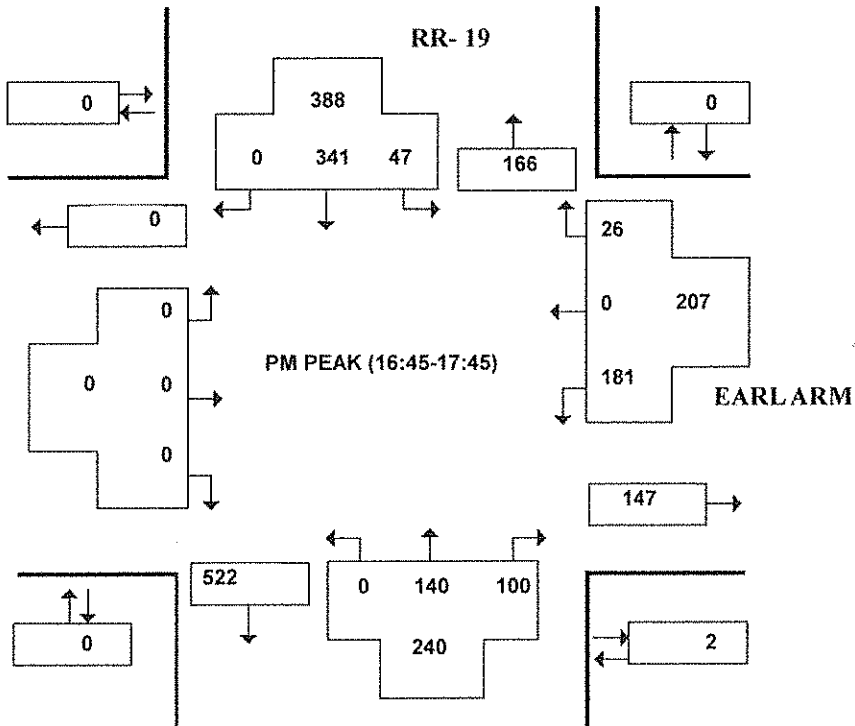
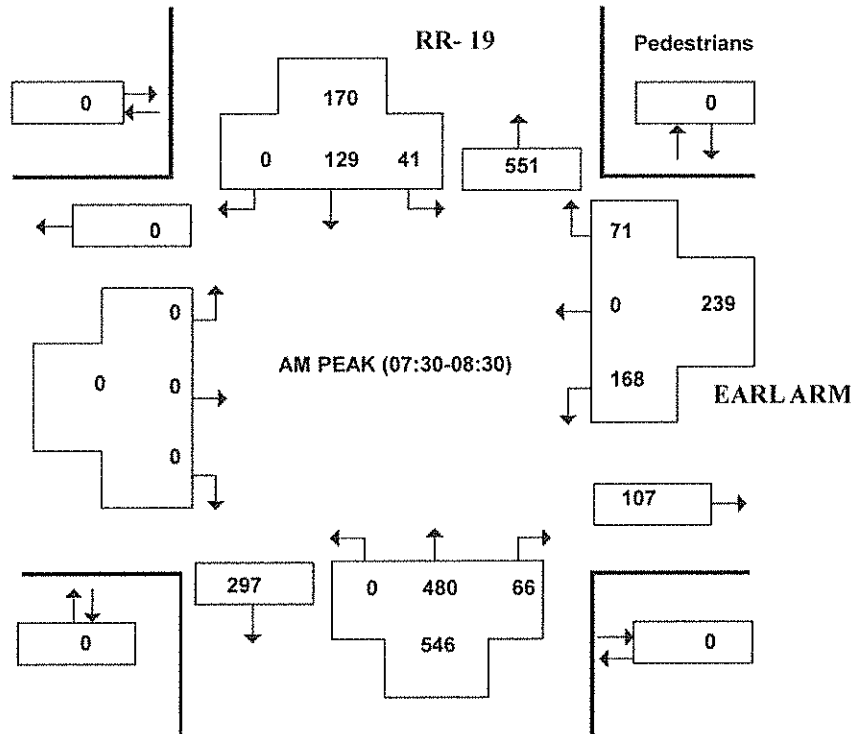
Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

Thursday in July is

0.9





Public Works and Services Department

Count ID 26209

RIVER RD and EARL ARMSTRONG RD

(ULRS Listing RR- 19 & EARL ARM)

Survey Date: Monday 15 June 2009

Conditions: dry

Start Time: 0700

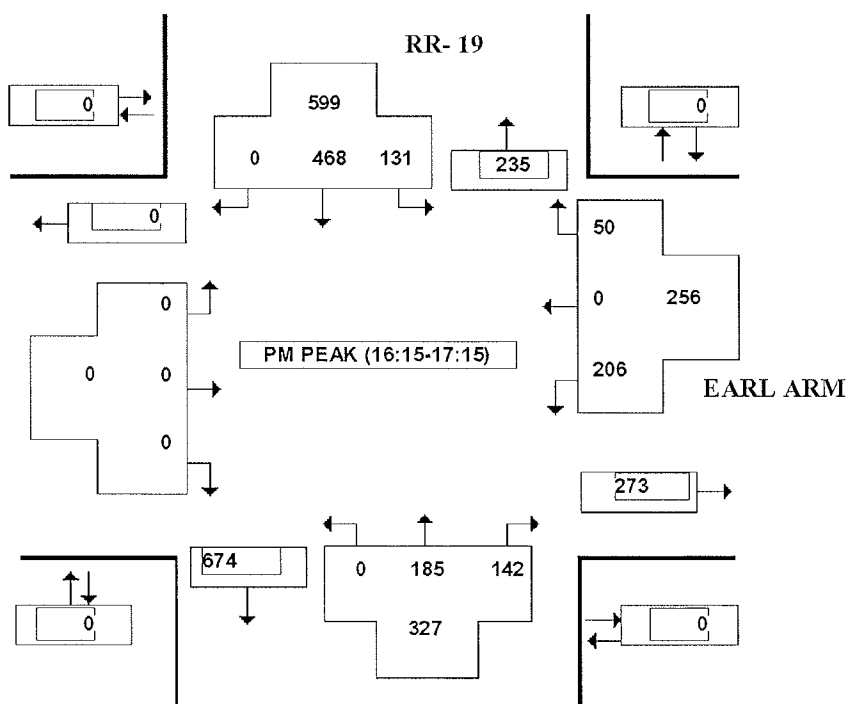
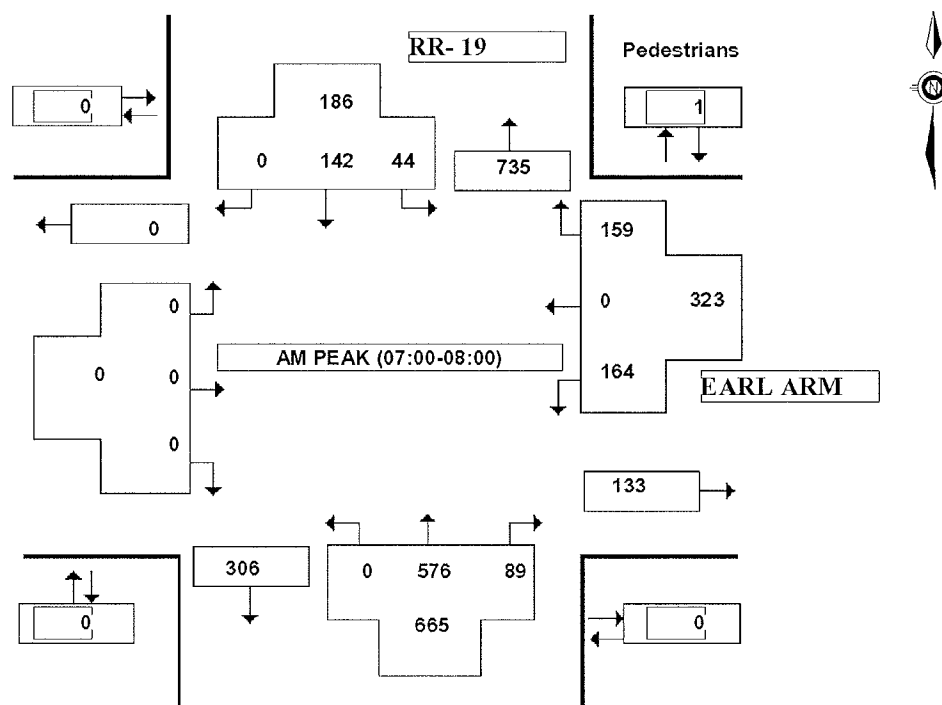
Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor

Monday in June is

0.9



Approved by: KC

Printed on: 01/12/2010



Public Works and Services Department

Count ID 25100

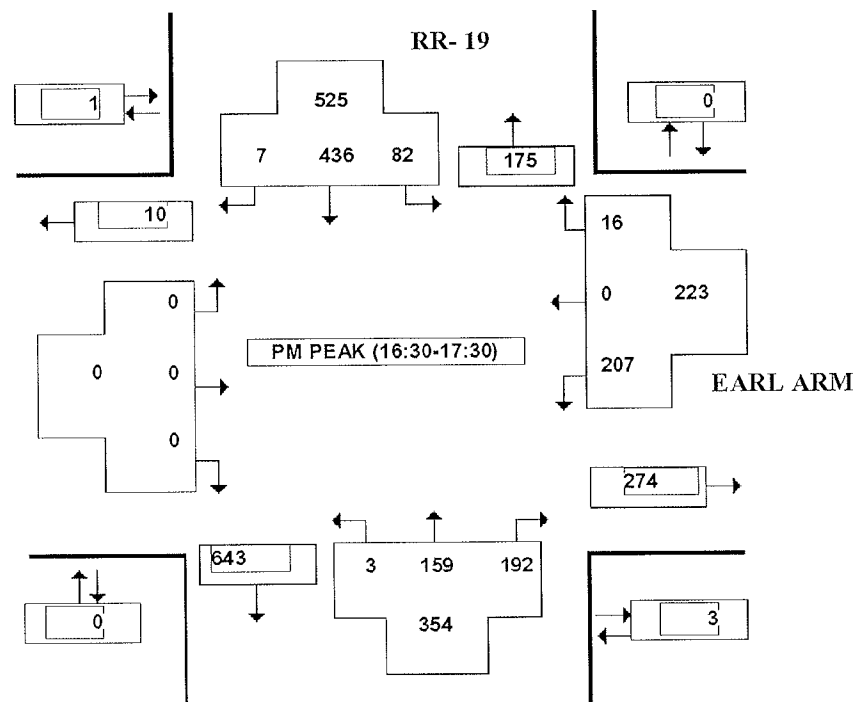
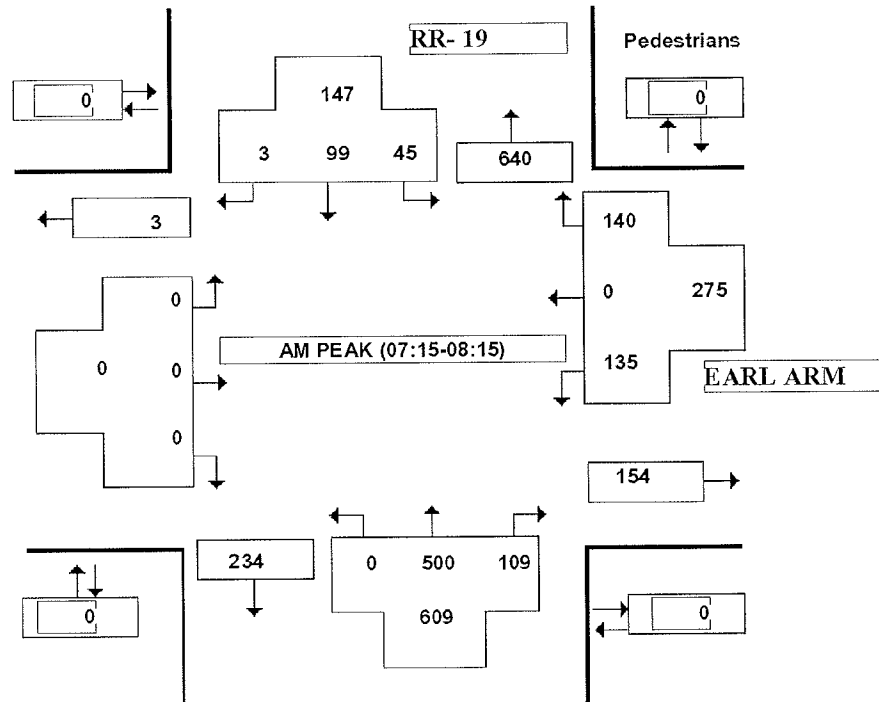
RIVER RD and EARL ARMSTRONG RD

(ULRS Listing RR- 19 & EARL ARM)

Survey Date: Friday 30 May 2008
Conditions: DRY
Start Time: 0700

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

AADT Factor
Friday in May is
0.8



Approved by : GZ

Printed on : 01/12/2010



Public Works and Services Department

Count ID 22437

RIVER RD and EARL ARMSTRONG RD

(ULRS Listing RR- 19 & EARL ARM)

Survey Date: Wednesday 2 May 2007

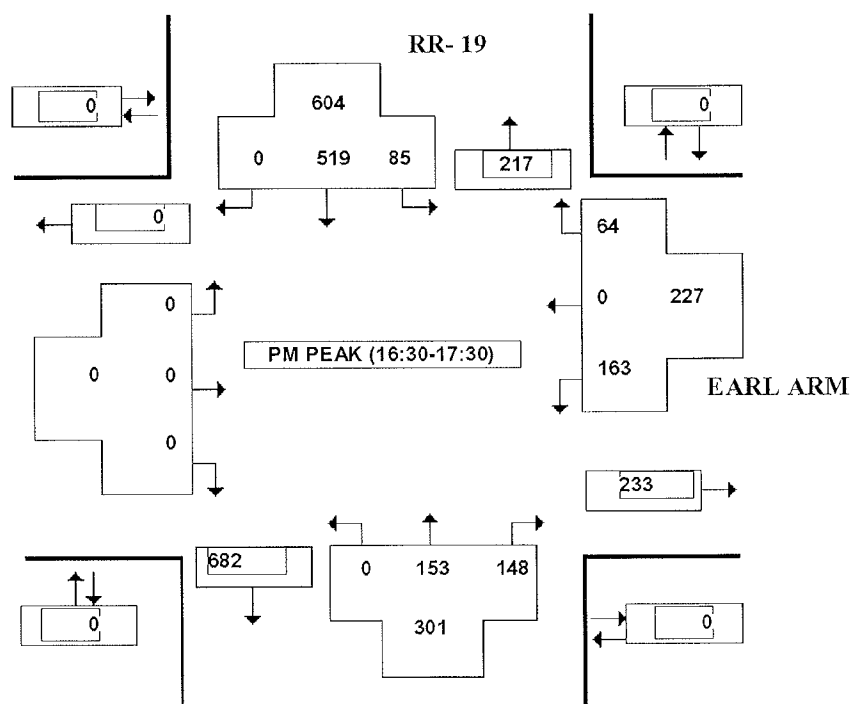
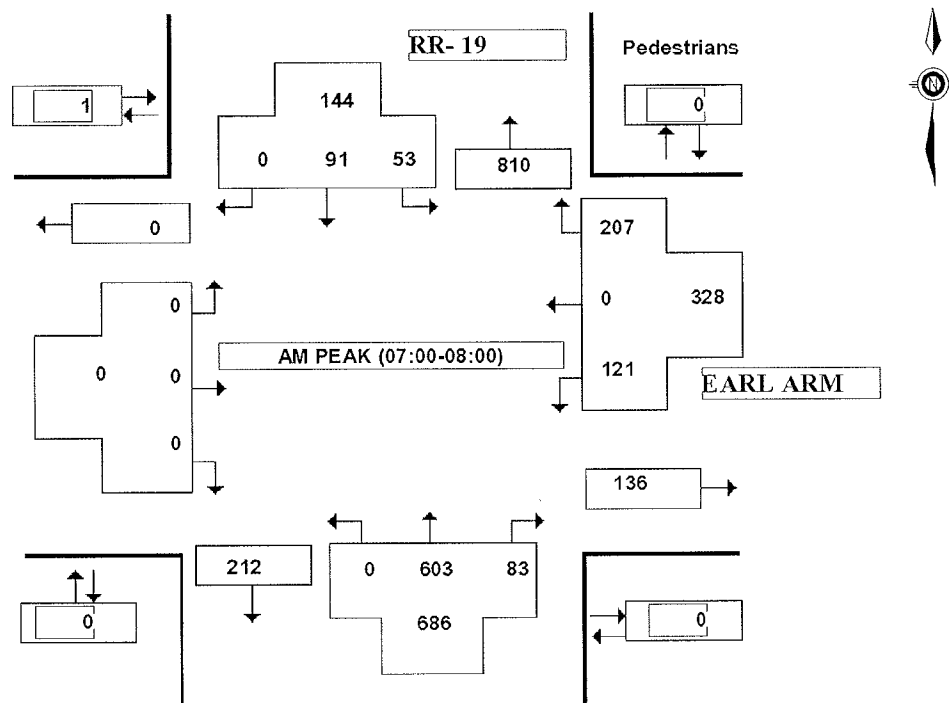
Conditions: DRY

Start Time: 0700

Total Observed U-Turns

Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor

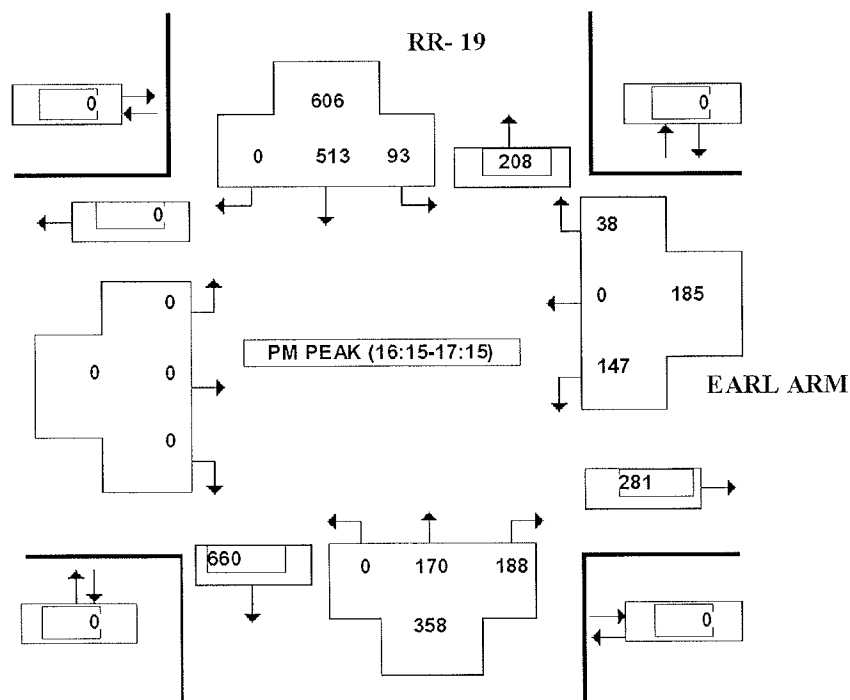
Wednesday in May is
0.9


Approved by : DT

Printed on : 01/12/2010

(ULRS Listing RR- 19 & EARL ARM)

Wednesday in June is
0.9





Transportation Impact Assessment

Riverside South Phase 2

STRATEGY REPORT



Prepared for Claridge Homes
by IBI Group

November 2017



Document Control Page

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PROJECT NAME:	Riverside South Phase 2 Lands TIA
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IBI REFERENCE:	112842
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ORIGINATOR:	Austin Shih, M.A.Sc, P.Eng.
REVIEWER:	
AUTHORIZATION:	Justin Date, P.Eng.
CIRCULATION LIST:	Asad Yousfani, M.Eng, P.Eng.
HISTORY:	1.0. Strategy Report to City of Ottawa – October 2017 2.0. Final Submission to City of Ottawa – November 2017



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1 Introduction

The following Strategy Report has been prepared on behalf of Claridge Homes in support of the Riverside South Phase 2 (RSS Ph2) draft plan application. The format of the Strategy Report is based on the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. The purpose of the Strategy Report is to "assess the alignment between the transportation elements of the proposed development and the City of Ottawa's city-building objectives and identify any opportunities to improve alignment. It also evaluates the post-development performance of the planned transportation network based on the City's established performance measures and targets and identifies potential mitigation measures to off-set development impacts" ¹

Upon acceptance of the Strategy Report, this will trigger the next stage of the TIA process, the compilation of the TIA Report. The site location and proposed draft plan are shown in **Exhibits 1 and 2**, respectively.

2 Development Design

2.1 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 be extended along Street 1, with strategically placed stops, to capture nearly 90% of units/ doors within 400m walking distance, as shown in **Exhibit 3**. For Phase 1, a cul-du-sac would be required at the end of Street 1 to enable buses turnaround movements if the Brian Good Avenue extension to Street 1 is not complete.

In the future, as development progresses south and future east-west collectors are constructed, transit routes can be extended to these roadways and River Road to ensure all proposed development units are within 400m of a transit stop. Additionally, the Riverview Transit Station is located approximately 1 km north of the proposed development. The station includes a Park and Ride facility and drop off areas for commuters. Direct routes to the transit station will be accessible to pedestrians and cyclists from within the Riverside South Community.

It is expected that as the Riverside South Community continues to build out, any gaps in the pedestrian and cycling network along River Road, Brian Good Avenue and internal collector roadways will be filled. Internal collector roadways and some local roadways will provide sidewalk on at least one side of the roadway to facilitate connections to local parks, pathways and community attractions.

Paved shoulders currently exist on River Road up to Summerhill Street, where it transitions to gravel shoulders south through the study area. Paved shoulders will be constructed within the limits of the future River Road and Street 1 intersection. There are currently no sidewalks or cycling facilities of any kind along Spratt Road at the proposed development frontage. It is expected that the proposed Spratt Road and Street 1 intersection will include pedestrian facilities and gravel or paved shoulders. The design of these intersections should be reviewed and confirmed during detailed design.

¹ City of Ottawa TIA Guidelines (2017), 35.

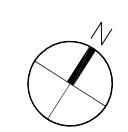
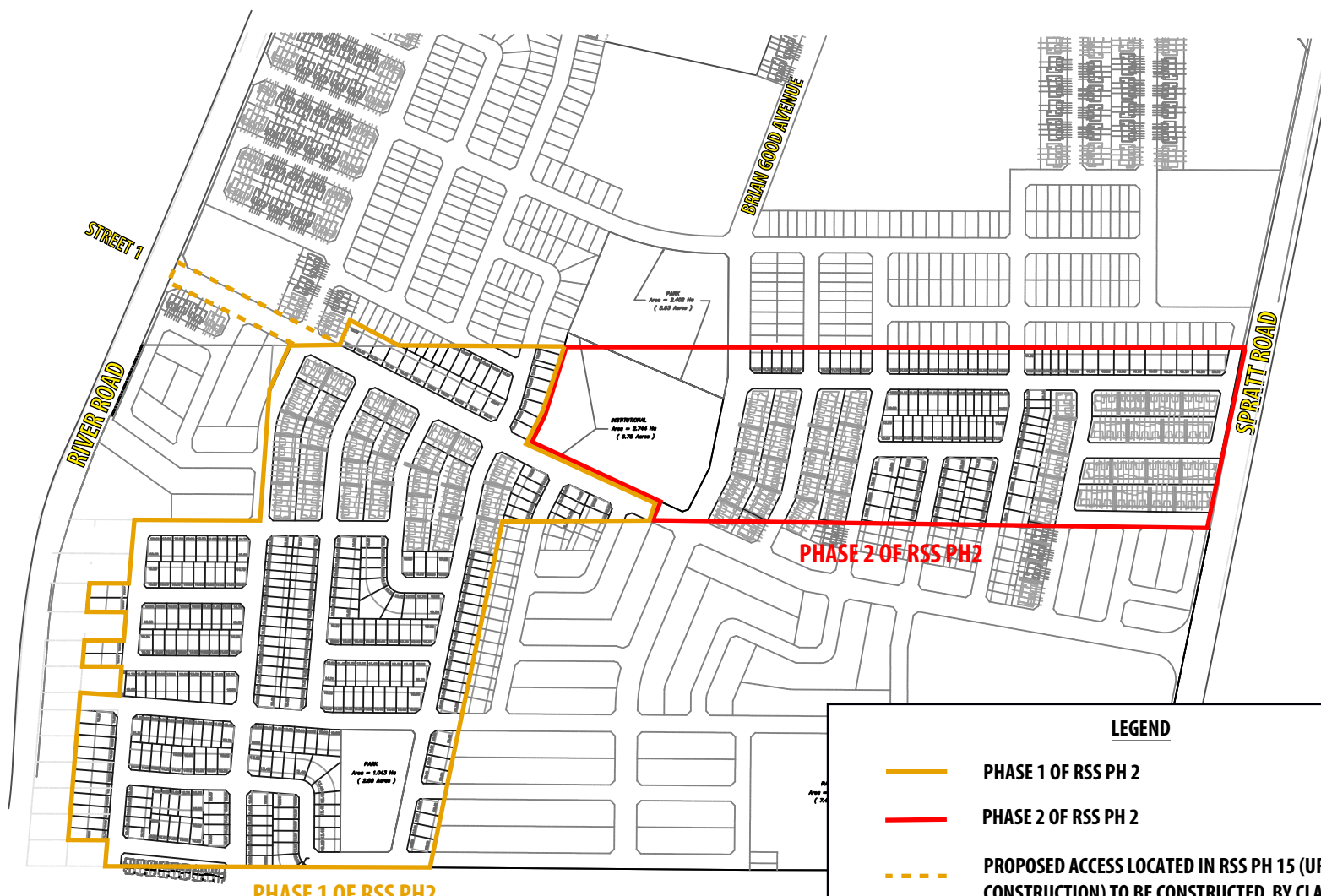


Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 1
Site Location

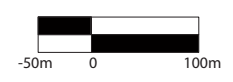
PROJECT No.: 112842
DATE: NOVEMBER 2017
SCALE:

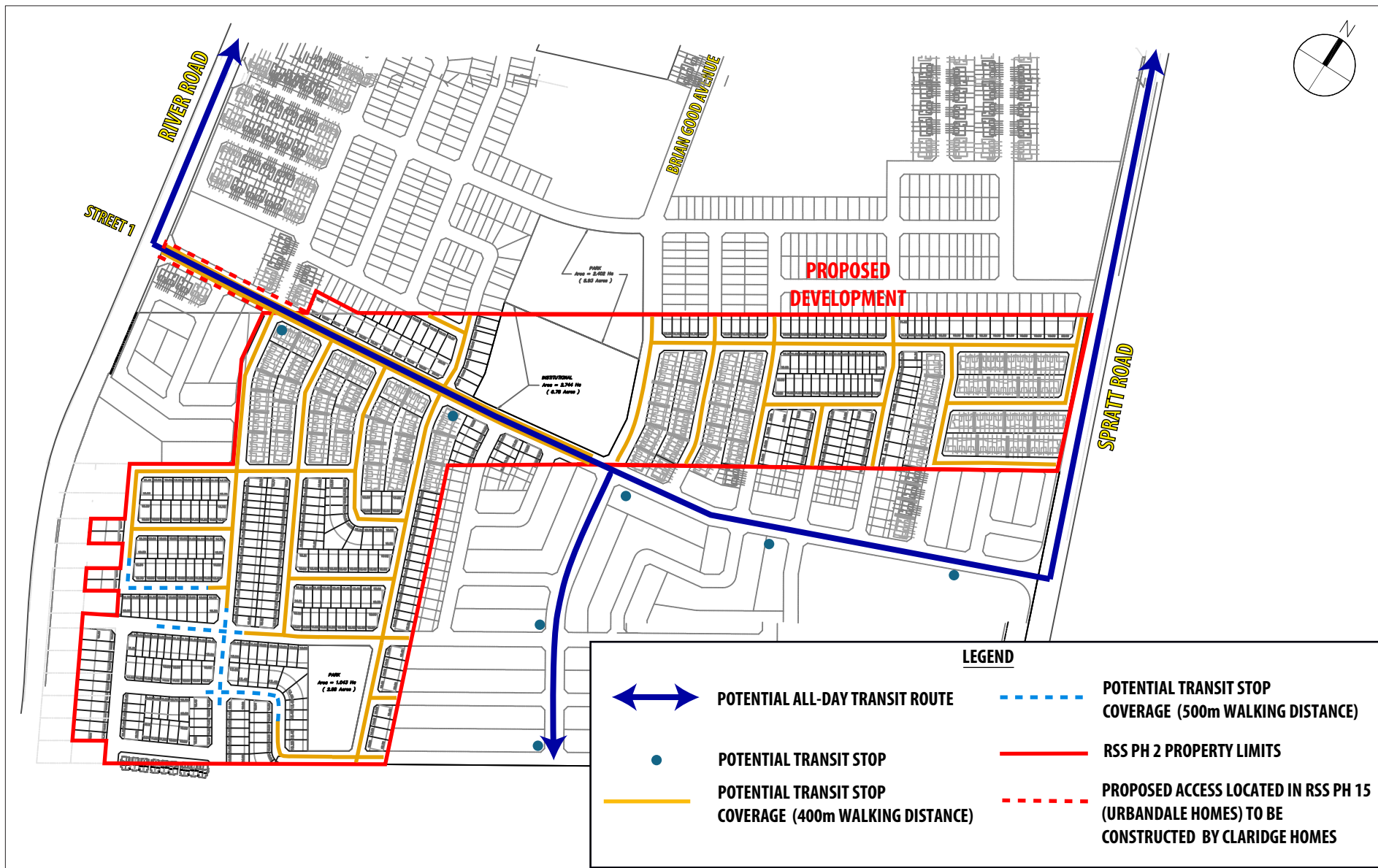




LEGEND

- PHASE 1 OF RSS PH 2
- PHASE 2 OF RSS PH 2
- - - PROPOSED ACCESS LOCATED IN RSS PH 15 (URBAN DALE CONSTRUCTION) TO BE CONSTRUCTED BY CLARIDGE HOMES

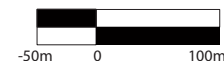




Riverside South Phase 2
Transportation Impact Assessment

EXHIBIT 3
Potential Transit Routes and Bus
Stop Locations

PROJECT No.: 112842
DATE: NOVEMBER 2017
SCALE:





2.2 New Street Networks

The proposed development includes a new east-west collector roadway, Street 1, between River Road and Spratt Road. Street 1 will have a 24m right-of-way to accommodate transit service. Street 1 will be bisected by Brian Good Avenue, an existing north-south collector road.

The proposed Street 1 and Brian Good Avenue intersection will cross both Claridge and Urbandale properties. For the purposes of this study, it was assumed the roadway sections in Urbandale lands would be constructed and no gaps will exist in the collector road network in the ultimate horizon year. The existing Brian Good Avenue collector road will be extended south from its current terminus to the southern boundary of Urbandale Phase 15, and Street 1 will be extended from its terminus just west of Brian Good Avenue in 2021 to Spratt Road in 2026.

A future school is proposed in Phase 2 of the proposed development, on the northwest corner of the future Street 1 and Brian Good Avenue intersection. Traffic calming measures, such as curb extensions, midblock crossings and reduced speed zones with appropriate signage may be considered along the boundary streets to reduce speeds and improve safety surrounding the school. Specialized pedestrian facilities, such as Pedestrian Crossovers may also be considered.

3 Boundary Streets

3.1 Mobility

The boundary streets to the proposed development are River Road and Spratt Road. At the time of this study, there were no complete street concepts developed by the City for either roadway. Both roadways currently possess rural cross-sections along the proposed development frontage, with no sidewalks, no transit service and only gravel shoulders. The TMP network concept confirmed neither boundary street along the proposed development frontage will be urbanized or modified within the study horizons. Therefore, the Multi-Modal Level of Service segment analysis was exempted, since the results were expected show poor to failing levels of service.

3.2 Road Safety

Collision analysis within the study area was completed in Section 3.5: Collision Analysis of the Scoping Report. The analysis identified a collision pattern at the Earl Armstrong Road and River Road intersection. There were 8 recorded rear-end collisions was likely caused by the high number of southbound right-turning vehicles at the River Road and Earl Armstrong Road intersection in the afternoon peak hour.

The 2017 existing turning movement count show over 600 southbound right-turning vehicles in the afternoon peak hour, which is well above what is normally observed at a major intersection. These vehicles are required to yield to over 1,000 westbound through vehicles. It is expected that rear-end collisions may occur at this level of traffic intensity. The only mitigation measure is to reduce traffic volumes on the observed movement. City policies are attempting to accomplish this over time, as more supportive infrastructure projects are completed, such as the widening of Prince of Wales and completion of the Trillium Line South extension to Limebank Road. As implementation gradually occurs, traffic volumes and the reported number of collisions will decrease.



4 Access Intersections

The Access Intersection Module was completed as part of Section 9: Intersection Design and Section 10: Geometric Analysis. There are no private driveway access proposed along boundary streets.

5 Transportation Demand Management

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a City-wide basis in an effort to reduce the automobile dependence of Ottawa residents, 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.

Mode shares used to estimate future development traffic were based on the 2011 TRANS OD Survey for the Traffic Assessment Zone (TAZ) where the proposed development is located. The active transportation mode shares were left constant in the future, which was a conservative assumption.

The development will conform to the City's TDM principles by providing direct connections to adjacent pedestrian, cycling and transit facilities. The proposed school is located on the corner of two collector roadways, which provides sufficient access for all modes. Appropriate end of trip facilities, such as bike storage lockers/ racks, shower/change rooms etc. will be provided to promote alternate modes of travel. The collector roads have been designed with sufficient right-of-way width to accommodate the routing of buses through the developments. Sidewalks and appropriate pedestrian connections have been provided on collector and local roadways where necessary to facilitate access to the school, local amenities, pathways and the adjacent road network.

6 Neighbourhood Traffic Management

6.1 Adjacent Neighbourhoods

The primary access routes for the proposed development are Street 1 and Brian Good Avenue. The expected volumes on each roadway compared to the City thresholds have been summarized in **Table 1**. The estimated demand was based on the 2031 total peak hour traffic volumes.

Street 1 was considered collector roadway with 300 vph capacity. Brian Good Avenue in the vicinity of Street 1 was also considered a collector roadway. Approaching Earl Armstrong Road, Brian Good Avenue transitions to a major collector roadway, with a 600 vphpl capacity, as exhibited by stricter access management where direct residential frontage is no longer permitted.

TABLE 1 – Collector Road Capacity

STREET	SEGMENT	CAPACITY (VPHPL)	PEAK HOUR DEMAND IN PEAK DIRECTION (VPHPL)	
			AM	PM
Street 1	East of River Road	300	242	260
	West of River Road		81	74
Brian Good Avenue	North of Street 1	300	107	91
	South of Earl Armstrong Road	600	267	444

Notes: vph = vehicles per hour



All roadways within the proposed development limits were shown to provide sufficient capacity to accommodate future traffic. The overall impact of congestion at the intersection approach is not expected to adversely impact the role or function of the roadway.

7 Transit

7.1 Route Capacity

The estimated future 2031 total transit passenger demand within the study area was provided in Section 2.2.4: Trip Generation by Mode of the Forecasting Report. The results have been summarized in **Table 2**.

TABLE 2 – 2031 Development Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	26	93
PM	96	53

By the 2031 horizon year, the newly proposed extension of the LRT Trillium Line to Limebank Road combined with local transit service passing through Riverview Station is expected to provide sufficient transit capacity to accommodate future demand. Additional capacity and service improvements via transit priority measures were not deemed necessary.

8 Review of Network Concept

Section 4.3: Network Concept Screenline from the Scoping Report outlined the nearby screenlines to the subject site, SL8 – Leitrim; and SL42 – Rideau River (Manotick), shown in **Exhibit 4**. A summary comparison of the City 2031 Network Concept demand and capacity has been provided in **Table 3**.

TABLE 3 – 2031 Development Generated Traffic Demand

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:

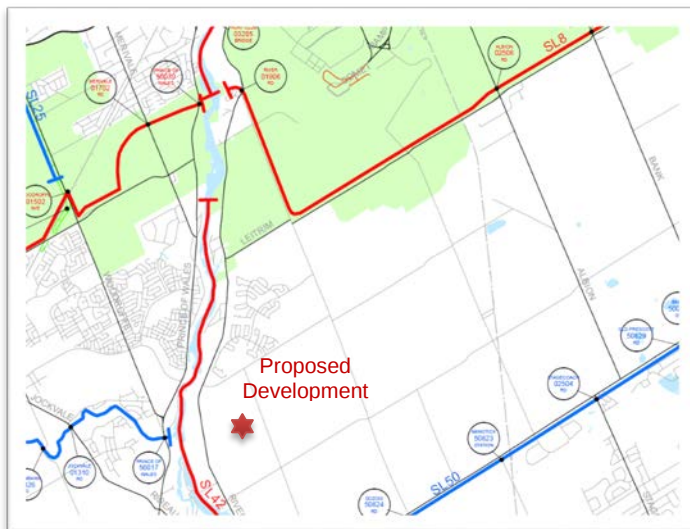
Table results from Final Report: Road Network Development Report

Proposed development traffic does not trigger any capacity deficiencies along nearby screenlines in the 2031 total traffic condition.

These results rely heavily on planned capital projects noted in the TMP. It is imperative that the City maintain its investment in local infrastructure, namely transit facilities and roadway modifications outlined in the TMP. The City has already increased transit investment in the local area with the recent announcement of a new LRT Station on Limebank Road, extending the Trillium LRT Line into the Riverside South Community.

The future road widenings of Prince of Wales Drive, Bank Street and Earl Armstrong Road from 2 to 4-lanes should be completed on schedule to reduce or spread traffic demand along nearby screenlines and help mitigate local traffic bottlenecks.

EXHIBIT 4 – Nearest TRANS Screenlines



9 Intersection Design

The study area intersections were evaluated in the morning and afternoon peak hour traffic conditions at the following horizons:

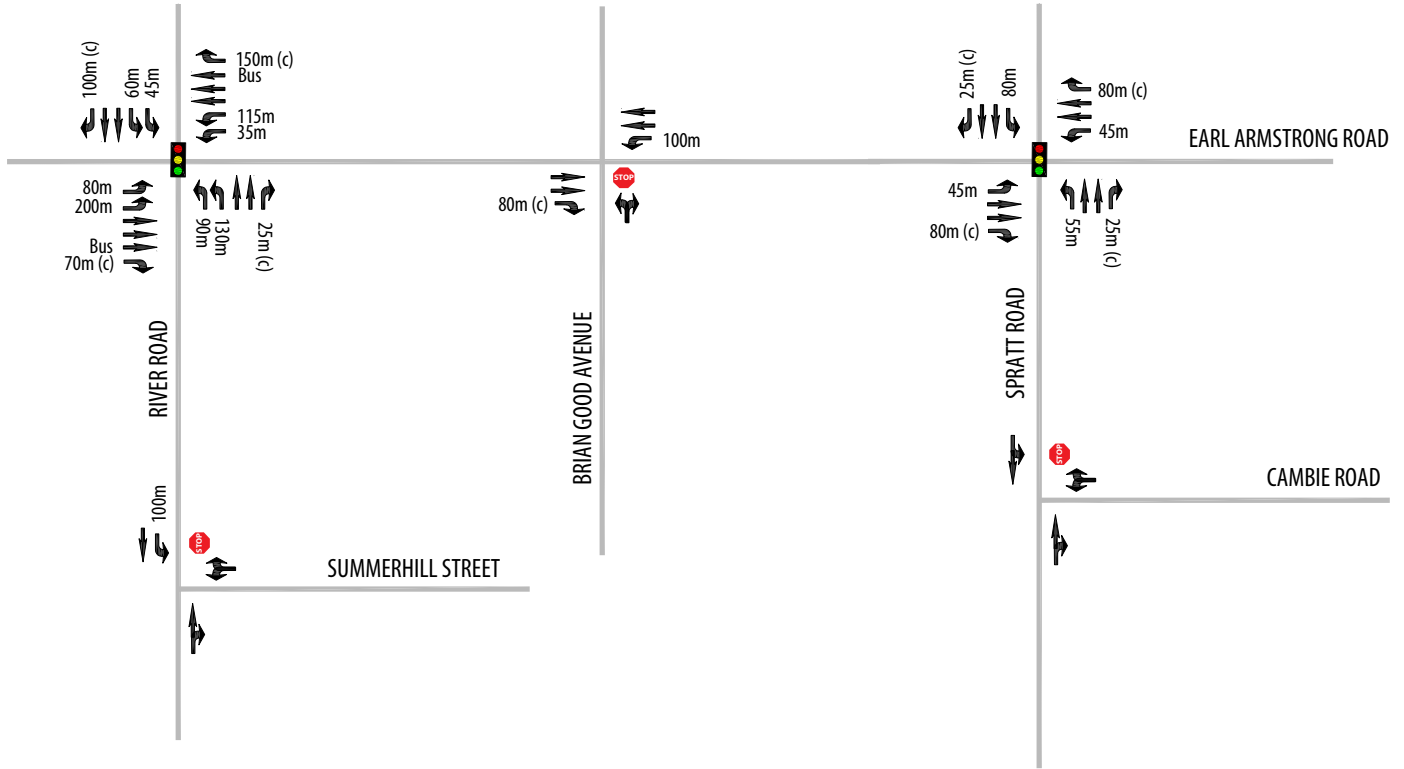
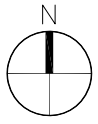
- Existing Traffic (2017)
- Future (2021) Background Traffic
- Future (2026) Background Traffic
- Future (2031) Background Traffic
- Future (2021) Total Traffic
- Future (2026) Total Traffic
- Future (2031) Total Traffic

The following intersections were included in this analysis:

- Earl Armstrong Road and River Road
- Earl Armstrong Road and Brian Good Avenue
- Earl Armstrong Road and Spratt Road
- River Road and Summerhill Street
- Spratt Road and Cambie Road
- River Road and Street 1 (New Intersection)
- Spratt Road and Street 1 (New Intersection)

9.1 Base Road Network

The base road network configuration for existing intersections in each horizon year was based on the existing road network, as shown in **Exhibit 5**. There were no future roadway modifications noted in the Transportation Master Plan (TMP) "Affordable Network," DC Background Study or Capital Budget Forecasts within the study area.



LEGEND

-  TRAVEL LANES AND PERMITTED MOVEMENTS
-  STOP CONTROL
-  TRAFFIC CONTROL SIGNAL
-  CHANNELIZATION
-  AUXILIARY STORAGE LENGTH (in metres)
DOES NOT INCLUDE TAPER LENGTH





The proposed draft plan includes two new intersections from the main east-west collector road, Street 1. The River Road intersection would be constructed by the 2021 horizon year. The second access will be constructed at Spratt Road by the 2026 horizon year. It was assumed that both intersections would have shared through-turn lanes on all approaches.

Roundabouts were not considered on proposed development intersections along River Road or Spratt Road. Both roadways have a posted speed limit of 80km/h along the development frontage and do not have sufficient right-of-way to accommodate a roundabout at this speed.

Further discussion on the geometric requirements for auxiliary turn lanes and storage lengths at proposed access intersections has been provided in Section 11.2: Auxiliary Lane Analysis.

9.2 Intersection Analysis Criteria

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 4 – 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.

9.2.2 Unsignalized Intersections

The capacity of an unsignalized intersection can also be expressed in terms of the LOS it provides. For an un-signalized 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 5**.

TABLE 5 – 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 conditions, 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.

9.3 Intersection Control

9.3.1 Traffic Signal Warrant Methodology

Traffic control signal warrants were completed for all unsignalized stop or yield controlled intersections. The warrant procedures for both existing and future conditions were based on the established methodology outlined in the Ontario Traffic Manual, Book 12, Ministry of Transportation Ontario (MTO), 2012.

For existing intersections, the highest 8-hour turning movement counts and up to 5 years of collision data are compiled into a spreadsheet. The outcome of each "justification" is summarized.

For future traffic conditions, a different methodology is used. An Average Hourly Volume (AHV) for each intersection approach is estimated using the following equation and applied to the warrant procedure:

$$\text{Average Hourly Volume} = \frac{(\text{AM Peak Hour Volume} + \text{PM Peak Hour Volume})}{4}$$

9.3.2 Traffic Signal Warrant Results

The existing intersections at River Road and Summerhill Street, and Earl Armstrong Road and Brian Good Avenue did not trigger the existing traffic signal warrant.

The Earl Armstrong Road and Brian Good Avenue intersection triggered the future traffic signal warrant in both the 2026 background and total traffic conditions.



The River Road intersections at Street 1 and Summerhill Street, and the Spratt Road and Street 1 intersections did not trigger the traffic signal warrant in the 2031 total traffic condition.

Details of the traffic signal warrants analyses described above are included in Appendix A.

9.4 Intersection Design (Operations)

9.4.1 Intersection Analysis Methodology

Using the established intersection capacity analysis criteria described above, the existing and future conditions were analyzed during the weekday peak hour traffic volumes derived in the previous sections of this report.

The worst/ critical observed LOS movement at each study area intersection was recorded; if the LOS was E or lower, it was compared to the intersection LOS. If the intersection LOS was also indicated to be below City standards, potential roadway modifications or measures were considered and the intersection was re-evaluated. Any recommended modifications would be carried forward to the following horizon.

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

The existing and future peak hour traffic volumes were derived and presented in the Forecasting Report.

9.4.2 Existing (2017) Traffic Results

The existing (2017) intersection capacity analysis was based on morning and afternoon peak hour traffic volumes. Existing signal timing plans were provided by the City of Ottawa and provided in Appendix C. A summary of the results has been provided in **Table 6**.

TABLE 6 – Intersection Capacity Analysis: Existing (2017) Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	1.02	0.76	F	C
		PM	1.15	1.05	F	F
Earl Armstrong Road and Brian Good Avenue	NB Stop	AM	0.36	-	C	-
		PM	0.46	-	E	-
	Traffic Signals	AM	0.54	-	A	-
		PM	0.62	-	B	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.71	-	C	-
		PM	0.72	-	C	-
River Road & Summerhill Street	WB Stop	AM	0.58	-	C	-
		PM	0.16	-	B	-
Spratt Road and Cambie Road	WB Stop	AM	0.01	-	A	-
		PM	0.01	-	A	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound

Summary of Modifications:

- 1 - Implement traffic signals at the intersection of Brian Good Avenue and Earl Armstrong Road



9.4.3 2021 Background Traffic Results

The 2021 background traffic condition intersection capacity analysis for total background traffic was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the Existing (2017) traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 7**.

TABLE 7 – Intersection Capacity Analysis: 2021 Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	0.86	-	D	-
		PM	0.95	0.94	E	E
Earl Armstrong Road and Brian Good Avenue	Traffic Signals	AM	0.63	-	B	-
		PM	0.74	-	C	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.64	-	B	-
		PM	0.81	-	D	-
River Road & Summerhill Street	WB Stop	AM	0.67	-	E	-
		PM	0.19	-	B	-
	Traffic Signals	AM	0.83	-	D	-
		PM	0.69	-	B	-
Spratt Road and Cambie Road	WB Stop	AM	0.08	-	A	-
		PM	0.06	-	A	-
River Road and Street 1	WB Stop	AM	0.18	-	C	-
		PM	0.09	-	B	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound

Summary of Modifications:

- 1 - Add traffic signals at River Road and Summerhill Street
- 2 - Construct the following access intersection:
 - a. River Road and Street 1

9.4.4 2026 Background Traffic Results

The 2026 background traffic condition intersection capacity for total background traffic analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2021 background traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 8**.



TABLE 8 – Intersection Capacity Analysis: 2026 Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	0.94	0.93	E	E
		PM	0.97	0.95	E	E
Earl Armstrong Road and Brian Good Avenue	Traffic Signals	AM	0.68	-	B	-
		PM	0.69	-	B	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.69	-	B	-
		PM	0.90	-	D	-
River Road and Summerhill Street	Traffic Signals	AM	0.85	-	D	-
		PM	0.76	-	C	-
Spratt Road and Cambie Road	WB Stop	AM	0.08	-	A	-
		PM	0.06	-	A	-
River Road and Street 1	WB Stop	AM	0.29	-	C	-
		PM	0.17	-	C	-
Spratt Road and Street 1	EB Stop	AM	0.04	-	A	-
		PM	0.03	-	A	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound

Summary of Modifications:

- 1 - Construct the following accesses intersection:
 - a. Spratt Road and Street 1

9.4.5 2031 Background Traffic Results

The 2031 background traffic condition intersection capacity analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2026 background traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 9**.

TABLE 9 – Intersection Capacity Analysis: 2031 Background Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	1.01	0.99	F	E
		PM	0.98	0.96	E	E
Earl Armstrong Road and Brian Good Avenue	Traffic Signals	AM	0.63	-	B	-
		PM	0.69	-	B	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.66	-	B	-
		PM	0.90	-	D	-
River Road and Summerhill Street	Traffic Signals	AM	0.86	-	D	-
		PM	0.73	-	C	-
Spratt Road and Cambie Road	WB Stop	AM	0.08	-	A	-
		PM	0.06	-	A	-
River Road and Street 1	WB Stop	AM	0.28	-	C	-
		PM	0.16	-	C	-
Spratt Road and Street 1	EB Stop	AM	0.04	-	A	-
		PM	0.03	-	A	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound

9.4.6 2021 Total Traffic Results

The 2021 total traffic condition intersection capacity analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the Existing (2017) traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 10**.

TABLE 10 – Intersection Capacity Analysis: 2021 Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	0.88	-	D	-
		PM	0.95	0.94	E	E
Earl Armstrong Road and Brian Good Avenue	Traffic Signals	AM	0.48	-	A	-
		PM	0.59	-	A	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.66	-	B	-
		PM	0.78	-	C	-
River Road and Summerhill Street	WB Stop	AM	0.84	-	F	-
		PM	0.23	-	C	-
	Traffic Signals	AM	0.86	-	D	-
		PM	0.78	-	C	-
Spratt Road and Cambie Road	WB Stop	AM	0.08	-	A	-
		PM	0.06	-	A	-
River Road and Street 1	WB Stop	AM	0.57	-	C	-
		PM	0.33	-	C	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound

Summary of Modifications:

- 1 - Implement traffic signals at the intersection of River Road and Summerhill Street
- 2 - Construct the River Road and Street 1 intersection with 70m SBL storage lane

9.4.7 2026 Total Traffic Results

The 2026 total traffic condition intersection capacity analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2021 total traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 11**.



TABLE 11 – Intersection Capacity Analysis: 2026 Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	1.02	1.01	F	F
		PM	1.02	1.01	F	F
Earl Armstrong Road and Brian Good Avenue	Traffic Signals	AM	0.67	-	B	-
		PM	0.85	-	D	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.69	-	B	-
		PM	0.90	-	D	-
River Road and Summerhill Street	Traffic Signals	AM	0.90	-	D	-
		PM	0.88	-	D	-
Spratt Road and Cambie Road	WB Stop	AM	0.08	-	A	-
		PM	0.06	-	A	-
River Road and Street 1	WB Stop	AM	0.70	-	D	-
		PM	0.52	-	D	-
Spratt Road and Street 1	EB Stop	AM	0.10	-	A	-
		PM	0.06	-	A	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound

Summary of Modifications:

1 - Construct the Spratt Road and Street 1 intersection

9.4.8 2031 Total Traffic Results

The 2031 total traffic condition intersection capacity analysis was completed using morning and afternoon peak hour traffic volumes. All recommended modifications from the 2026 total traffic condition have been carried forward to this horizon. A summary of the results has been provided in **Table 12**.

TABLE 12 – Intersection Capacity Analysis: 2031 Total Traffic

INTERSECTION	CONTROL	PEAK HOUR	V/C RATIO		LEVEL OF SERVICE (LOS)	
			CRITICAL MOVEMENT	INTERSECTION	CRITICAL MOVEMENT	INTERSECTION
Earl Armstrong Road and River Road	Traffic Signals	AM	1.07	1.06	F	F
		PM	1.02	1.01	F	F
Earl Armstrong Road and Brian Good Avenue	Traffic Signals	AM	0.69	-	B	-
		PM	0.89	-	D	-
Earl Armstrong Road and Spratt Road	Traffic Signals	AM	0.70	-	B	-
		PM	0.90	-	D	-
River Road and Summerhill Street	Traffic Signals	AM	0.90	-	D	-
		PM	0.83	-	D	-
Spratt Road and Cambie Road	WB Stop	AM	0.11	-	A	-
		PM	0.06	-	A	-
River Road and Street 1	WB Stop	AM	0.68	-	D	-
		PM	0.48	-	D	-
Spratt Road and Street 1	EB Stop	AM	0.10	-	A	-
		PM	0.06	-	A	-

Notes: EB = eastbound; WB = westbound; SB – southbound; NB = northbound



9.5 Intersection Design (MMLOS)

The MMLOS Guidelines provide guidance on how to assess the various LOS for the different modes of transportation and what the specific target service levels for each mode should be given the location and context of the transportation project. This all-in-one evaluation tool will allow comparisons using similar performance metrics for each non-auto mode. The MMLOS procedure is only applied to signalized intersections and the worst performing approach at the intersection for any mode represents the overall intersection MMLOS for that mode.

Appendix D provides all detailed results broken down by each approach for all intersections. The existing intersection results for each boundary street have been summarized in **Table 13**. The MMLOS results in all future background and total traffic conditions have been summarized in **Table 14**.

TABLE 13 – Intersection MMLOS – Existing Conditions

INTERSECTION	LEVEL OF SERVICE			
	PLOS	BLOS	TLOS	TKLOS
Earl Armstrong Road and River Road	F	F	F	D
Earl Armstrong Road and Spratt Road	F	F	D	B

Notes: PLOS = Pedestrian LOS; BLOS = Bicycle LOS; TLOS = Transit LOS; TKLOS = Truck LOS

TABLE 14 – Intersection MMLOS – Future Background and Total Results

INTERSECTION	SCENARIO	LEVEL OF SERVICE											
		2021				2026				2031			
		P	B	T	TK	P	B	T	TK	P	B	T	TK
Earl Armstrong and River	Future BG	F	F	F	D	F	F	F	D	F	F	F	D
	Future BGSG	F	F	F	D	F	F	F	D	F	F	F	D
Earl Armstrong and Brian Good	Future BG ¹	N/A	N/A	N/A	N/A	D	F	C	F	D	F	D	F
	Future BGSG	D	F	C	F	D	F	D	F	D	F	D	F
Earl Armstrong and Spratt	Future BG	F	F	D	B	F	F	E	B	F	F	E	B
	Future BGSG	F	F	D	B	F	F	E	B	F	F	F	B
River and Summerhill	Future BG ¹	N/A	N/A	N/A	N/A	D	F	C	F	D	F	C	F
	Future BGSG	D	F	C	F	D	F	C	F	D	F	C	F

Notes:

LOS = Level of Service; P = Pedestrian LOS; B = Bicycle LOS; T = Transit LOS; TK = Truck LOS

Future BG = Future Background Traffic; Future BGSG = Future Background and Site-Generated Traffic

No LOS results were produced for Earl Armstrong Road and Brian Good Ave or River Road and Summerhill Street, as these intersections did not require signals for the 2021 Background planning horizon. MMLOS warrants only applies to signalized intersections.

As expected, the MMLOS results for study area intersections in the existing and future traffic conditions show poor levels of service for all non-auto modes. Despite recent modifications to Earl Armstrong Road within the study area to include exclusive bus lanes, full pedestrian facilities and bicycle lanes, the number of lanes and high vehicular traffic during the peak periods contribute to overall poor levels of service.

Further discussion on each MMLOS result has been provided below.



9.5.1 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 is C.

The results of the analysis indicate that both the Earl Armstrong Road and River Road intersection and the Earl Armstrong Road and Spratt Road intersection are currently experiencing a PLOS of 'F' primarily due to the number of lanes that pedestrians must cross at each approach. Earl Armstrong Road and River Road has been constructed to its ultimate design dual left-turn lanes and channelized right-turn lanes on all approaches, cycling facilities and exclusive transit lanes along Earl Armstrong Road, which contributes to a significantly wider roadway cross-section. Therefore, the PLOS was compromised in this situation to allow for the more efficient flow of buses and vehicular traffic at this intersection. The poor results remain in all future traffic conditions.

The Earl Armstrong Road and Brian Good Avenue intersection, as well as the River Road and Summerhill Street intersection were shown to operate at a PLOS of 'D', due to the lower cycle lengths and fewer travel lanes for pedestrians to cross on any given approach, when compared with the Earl Armstrong Road and River Road intersection.

9.5.2 Intersection Bicycle Level of Service (BLOS)

The BLOS at intersections is dependent on the number of lanes that the cyclist is required to cross to make a left-turn or on the presence of a dedicated right-turn lane on the approach, as well as the operating speed of each approach. The City target for BLOS is 'C'.

Similar to the PLOS results, all analyzed intersections were shown to operate at a BLOS 'F', due to the high operating speeds along River Road and Earl Armstrong Road (i.e. 60 km/h or greater), as well as the number of lanes that cyclists must cross to make a left-turn.

9.5.3 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 is C.

Intersection TLOS is based on the average signal delay experienced by transit vehicles at each intersection. The results of the analysis indicate that the most severe delays to transit occur along River Road at the intersection of Earl Armstrong Road, which reduces the overall TLOS significantly despite the majority of buses operate on dedicated east-west transit lanes along Earl Armstrong Road, resulting in TLOS of 'B' on the east and west approaches.

9.5.4 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 target for TKLOS is 'D'.

Both the Earl Armstrong Road and River Road, and Earl Armstrong Road and Spratt Road meet the City Standards with a TKLOS of 'D'. The Summerhill Street and River Road, and the Brian Good Avenue and Earl Armstrong Road intersections were determined to be operating at a TKLOS of 'F', which is attributed to the tighter turning radii and single-receiving lanes. However, given that these collector roads are not designated truck routes, the volumes of truck traffic will be negligible.



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 E.

10.1 Sight Distance and Corner Clearances

The proposed development access intersections are located along sections with no significant horizontal or vertical alignment constraints. Sight distance and corner clearances are not expected to be a concern. All geometric design requirements should be reviewed and confirmed during detailed design.

10.2 Auxiliary Lane Analysis

Auxiliary turning lane lengths for all study area intersections were evaluated for signalized and unsignalized intersections.

10.2.1 Unsignalized Auxiliary Left-Turn Lane Requirements

Auxiliary left-turn lane analysis for all study area unsignalized intersections was completed under 2031 total traffic conditions.

The MTO Geometric Design Standards for Ontario Highways left-turn warrant was applied to main street approaches at all unsignalized intersections using the highest left-turn volume from either the morning or afternoon peak hour. The results have been summarized below in **Table 15**.

TABLE 15 – Auxiliary Left-Turn Lane Analysis at Unsignalized Intersections

INTERSECTION	MOVEMENT	POSTED SPEED (KM/H)	DESIGN SPEED (KM/H)	LEFT-TURN VOLUME (VPH)	APPROACH VOLUME (VPH)	OPPOSING VOLUME (VPH)	LEFT-TURN STORAGE (M)
River Road and Street 1	SBL	80	90	202	980	441	70
Spratt Road and Street 1	NBL	80	90	1	26	112	Not Required

Notes:

Recommended storage lengths do not account for deceleration lane and taper lane lengths.

1 - Required storage exceeds graph margins. Requirement should be confirmed during detailed design. Estimate 80m required.

The MTO left-turn warrant for unsignalized intersections was triggered at the River Road and Street 1. A southbound left-turn lane with at least 70m storage is recommended.

10.2.2 Signalized Auxiliary Left-Turn Lane Requirements

A review of auxiliary left-turn lane storage requirements was completed at all signalized intersections within the study area in the 2031 total traffic condition. 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:

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

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 (3600 seconds per hour/cycle length)

For dual left-turn lanes, the City recommends a 45%/55% distribution of traffic between lanes². The results of the auxiliary left-turn lane analysis are summarized below in **Table 16**.

TABLE 16 – Recommended Auxiliary Left-Turn Storage Lengths at Signalized Intersections

INTERSECTION	APPROACH	95TH %ILE QUEUE LENGTH (M)	CITY QUEUE LENGTH (M)	EXISTING STORAGE LENGTH (M)	RECOMMENDED ADDITIONAL STORAGE LENGTH (M)
Earl Armstrong Road and River Road	NB	#95 (D)	80	130	-
	SB	#35 (D)	30	60	-
	EB	#70 (D)	55	80 (D) 200 (S)	-
	WB	#45 (D)	35	35 (D) 115 (S)	-
Earl Armstrong Road and Brian Good Avenue	WB	35	45	100	-
Earl Armstrong Road and Spratt Road	NB	#115	120	55	65
	SB	10	15	80	-
	EB	#105	110	45	65
	WB	40	80	45	35
River Road and Summerhill Street	SB	40	50	100	-

Notes: (D) = Dual left-turn lanes; (S) = Single left-turn lane

Recommended storage lengths do not include deceleration lane and taper lengths. Units rounded to nearest 5m.

- Synchro extrapolated queue length at congested intersections. From Synchro 9 User Guide "In practice, 95th percentile queue shown will rarely be exceeded and the queues shown with the # footnote are acceptable for the design of storage bays."

The auxiliary left-turn lane analysis for signalized intersections showed additional storage may be required at the Earl Armstrong Road and Spratt Road intersection to accommodate future traffic demand. However, peak hour traffic volumes along the Earl Armstrong corridor through the study area are still in flux since the construction of the Vimy Memorial Bridge. This intersection should be monitored as development continues in the Riverside South Community to determine if additional storage capacity is required.

The recommended left-turn storage lengths at proposed development access intersections above should be reviewed and confirmed during detailed design.

10.2.3 Auxiliary Right-Turn Lane Requirements

Synchro analysis results indicated that a northbound right-turn lane may be required at the Earl Armstrong Road and Brian Good Avenue intersection once signalization is implemented. No other new right-turn lanes were required at remaining study area intersections.

The requirement for auxiliary right-turn lanes at proposed development access intersections should be reviewed and confirmed during detailed design.

² City of Ottawa TIA Guidelines (2017), 76.



11 Summary of Improvements Indicated and Modification Options

11.1 Earl Armstrong Road and River Road

The Earl Armstrong Road and River Road intersection is presently operating above its theoretical capacity, due to heavy cross commuter traffic from Barrhaven South in the morning and afternoon peak periods, respectively. The traffic demand on the eastbound left-turn in the morning peak hour and the southbound right-turn in the afternoon peak hour both greatly exceed capacity. In addition, moderate-to-high left-turn traffic volumes from local community traffic on River Road also contribute to intersection congestion.

The intersection is significantly impacted by the pedestrian requirements for crossing time, which has been sacrificed to accommodate additional vehicular capacity in dual left-turn lanes and exclusive bus lanes. Additionally, the intersection of Earl Armstrong Road and River Road is adjacent to the newly opened Vimy Memorial Bridge, which provides one of the few east-west crossings over the Rideau River for the City of Ottawa. The Bridge is a focal point for commuters and the close proximity of the two gateway intersections contributes to the traffic bottleneck during peak periods.

Increasing capacity through roadway modifications was not feasible; the intersection was only recently modified to its ultimate configuration according to the TMP Network Concept as part of the Vimy Memorial Bridge construction. As discussed in the Forecasting Report and in prior sections of this report, it is imperative that the City proceed with planned transit and roadway projects outlined in the TMP. Nearby screenlines suggest there is available capacity on alternate routes to accommodate future development traffic, however, reducing auto demand by improving active transportation mode shares will be crucial in improving levels-of-service at this intersection.

Therefore, the intersection should be monitored during each phase of development within the Riverside South Community to ensure that these capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach. The intersection capacity analysis completed for this study showed the 95th percentile queue lengths were not expected to exceed the available storage lengths for any of the left-turn or right-turn auxiliary lanes at the Earl Armstrong Road and River Road intersection in the 2031 total traffic condition.

11.2 Earl Armstrong Road and Brian Good Avenue

The Earl Armstrong Road and Brian Good Avenue intersection did not operate within City standards in the existing 2017 horizon, with an observed LOS 'E' on the minor approach during the afternoon peak hour period.

Traffic signals were required to allow traffic from the minor roads to complete their turning movements without excessive delays. With this modification, the intersection was shown to operate within City standards through to the 2031 total traffic condition.

11.3 Earl Armstrong Road and Spratt Road

The Earl Armstrong Road and Spratt Road was shown to operate within City standards through to the 2031 total traffic condition. The auxiliary left-turn lane analysis showed additional storage may be required on the east, west and northbound approaches to accommodate future traffic demand.



Peak hour traffic volumes along the Earl Armstrong corridor through the study area are still in flux since the construction of the Vimy Memorial Bridge, which triggered a spike in cross community traffic. Peak hour traffic volumes are expected to change as residents alter traffic patterns to avoid congestion and the City has made addressing congestion in and out of the community as a priority. Short term measures may be implemented to curtail left-turn queues. This intersection should be monitored as development continues in the Riverside South Community to determine if additional storage capacity is required.

11.4 River Road and Summerhill Street

The River Road and Summerhill Street intersection was shown to operate within City standards in the 2017 and the 2021 background traffic condition.

By the 2026 background or 2021 total traffic conditions, traffic signals would be required to allow traffic from the minor roads to complete their turning movements without excessive delays. With this modification, the intersection was shown to operate within City standards through to the 2031 total traffic condition.

11.5 Spratt Road and Cambie Road

The Spratt Road and Cambie Street intersection was shown to operate within City standards in both morning and afternoon peak periods through to the 2031 total traffic condition.

11.6 Street 1 and River Road; Street 1 and Spratt Road

Both Street 1 access intersections, at River Road and Spratt Road, were shown to operate within City standards through to the 2031 total traffic condition. It was assumed the Street 1 approach at both intersections was kept as a shared single lane approach; however, there is sufficient right-of-way to accommodate two separate left and right turning lanes if required in the future.

The geometric assessment of the Street 1 and River Road intersection showed that a southbound left-turn with 70m of storage is warranted, according to the MTO left-turn warrant procedure. This storage length recommendation does not include deceleration or taper requirements. Shared lanes were considered acceptable on all other movements.

The Street 1 and Spratt Road intersection did not trigger any auxiliary turning lane requirements. The initial assumption of shared lanes on all approaches was considered acceptable.

The geometric requirements for both intersections should be reviewed and confirmed during detailed design for both intersections.

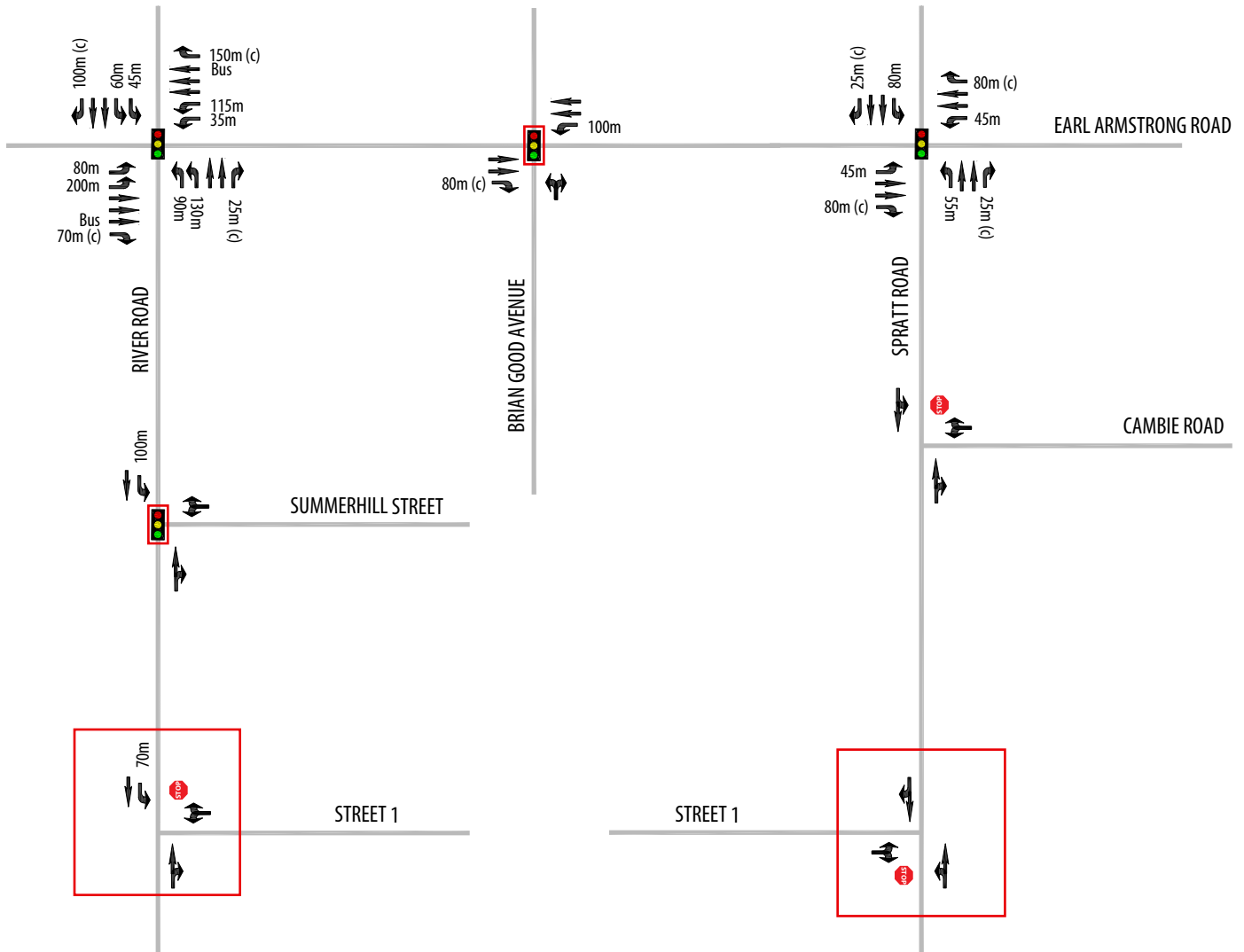
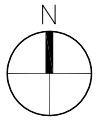
11.7 Recommendations

A summary of recommended actions/ modifications has been provided in Table 17. The recommended design for all off-site roadway modifications in the 2031 total traffic has been provided in Exhibit 6.



TABLE 17 – Summary of Recommended Actions/ Modifications

HORIZON	RECOMMENDED ACTIONS/ MODIFICATIONS
Existing (2017)	Earl Armstrong and River Road: - Traffic demand exceeds capacity – does not meet City operational guidelines. - Intersection at ultimate configuration as per 2013 TMP - Queues exceed storage on the SBR movement in the afternoon peak period - Monitor annually to ensure capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach. Earl Armstrong and Brian Good Avenue - Implement Traffic Control Signals
Future (2021) Background – No RSSPh2 Traffic	Assume all actions and modifications from the Existing (2017) traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong River Road: - Monitor annually to ensure capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach River Road and Summerhill Street: - Implement Traffic Control Signals
Future (2021) Total – With RSSPh2 Traffic	Assume all actions and modifications from the Existing (2017) traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong and River Road: - Monitor annually to ensure capacity issues do not cause excessive delay, increased accidents, or queue spill back beyond the available storage lanes at each approach River Road and Street 1: - Claridge Homes - Construct unsignalized access intersection - Westbound stop controlled - Construct southbound left-turn lane with 70m storage - Shared through-turn lanes on north and westbound approaches
Future (2026) Background – No RSSPh2 Traffic	Assume all actions and modifications from the Future (2021) Background traffic conditions remain. Optimize all traffic signal timings.
Future (2026) Total – With RSSPh2 Traffic	Assume all actions and modifications from the Future (2021) Total traffic conditions remain. Optimize all traffic signal timings. Spratt Road and Street 1: - Urbandale Homes - Construct unsignalized access intersection - Eastbound stop controlled - Shared through-turn lanes on all approaches
Future (2031) Background – No RSSPh2 Traffic	Assume all actions and modifications from the Future (2026) Background traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong and Spratt Road: Development growth expected to add strain to existing auxiliary turn lane storage capacity. Monitor to determine if existing storage can accommodate peak hour queues.
Future (2031) Total – With RSSPh2 Traffic	Assume all actions and modifications from the Future (2026) Total traffic conditions remain. Optimize all traffic signal timings. Earl Armstrong and Spratt Road: Monitor annually to ensure existing storage lengths are sufficient to accommodate queue lengths





Riverside South Phase 2

Transportation Impact Assessment Strategy Report

Appendix A: Traffic Signal Warrants

November 2017



Input Data Sheet

[Analysis Sheet](#)
[Results Sheet](#)
[Proposed Collision](#)
[GO TO Justification:](#)

What are the intersecting roadways?

East-West Road and North-South Avenue

What is the direction of the Main Road street?

East-West

When was the data collected?

2015 and 2017

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road?

2 or more

b.- Number of lanes on the Minor Road?

1

c.- How many approaches?

3

d.- What is the operating environment?

Urban

Population >= 10,000

AND

Speed < 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00		687	18	39		56	17	607					0
8:00		606	19	38		68	21	641					1
9:00		414	25	31		30	22	493					0
10:00		401	46	20		73	21	416					0
15:00		428	19	21		65	12	442					0
16:00		659	37	16		51	39	592					0
17:00		800	74	33		44	63	833					0
18:00		869	58	22		32	66	790					0
Total	0	4,864	296	220	0	419	261	4,814	0	0	0	0	1

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	
13-24	2
25-36	

* Include only collisions that are susceptible to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Factored 8 hour pedestrian volume	120		15		7		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									128
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	120		15		7		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									128
Net 8 Hour Volume of Delayed Pedestrians									34

Results Sheet

[Input Sheet](#)
[Analysis Sheet](#)
[Proposed Collision](#)
[GO TO Justification:](#)

Intersection: Earl Armstrong Road / Brian Good Avenue

Count Date: 2015 and 2017

Summary Results

Justification		Compliance		Signal Justified?	
				YES	NO
1. Minimum Vehicular Volume	A Total Volume	100	%	☐	☒
	B Crossing Volume	31	%	☐	☒
2. Delay to Cross Traffic	A Main Road	100	%	☐	☒
	B Crossing Road	37	%	☐	☒
3. Combination	A Justificaton 1	31	%	☐	☒
	B Justification 2	37	%	☐	☒
4. 4-Hr Volume		64	%	☐	☒

5. Collision Experience	13	%	☐	☒
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6. Pedestrians	A Volume	Justification not met	☐	☒
	B Delay	Justification not met	☐	☒

Input Data Sheet

[Analysis Sheet](#)
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[GO TO Justification:](#)

What are the intersecting roadways?

River Road / Summerhill Street

What is the direction of the Main Road street?

North-South

When was the data collected?

2017-04-20 2017-04-20

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road?

1

b.- Number of lanes on the Minor Road?

1

c.- How many approaches?

3

d.- What is the operating environment?

Rural

Population < 10,000

AND

Speed >= 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	0	619	9	0	0	0	31	168	0	17	0	167	0
8:00	0	472	16	0	0	0	27	203	0	15	0	165	0
9:00	0	374	7	0	0	0	30	199	0	5	0	83	1
10:00	0	292	5	0	0	0	53	220	0	11	0	63	0
15:00	0	250	7	0	0	0	66	238	0	8	0	60	0
16:00	0	220	10	0	0	0	87	439	0	6	0	74	0
17:00	0	289	9	0	0	0	126	575	0	4	0	72	3
18:00	0	284	17	0	0	0	128	518	0	9	0	100	1
Total	0	2,800	80	0	0	0	548	2,560	0	75	0	784	5

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	1

* Include only collisions that are susceptible to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Factored 8 hour pedestrian volume	120		15		7		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									128
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	120		15		7		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									128
Net 8 Hour Volume of Delayed Pedestrians									34

Results Sheet

[Input Sheet](#)
[Analysis Sheet](#)
[Proposed Collision](#)
[GO TO Justification:](#)

Intersection: River Road / Summerhill Street

Count Date: 2017-04-20

Summary Results

Justification		Compliance		Signal Justified?	
				YES	NO
1. Minimum Vehicular Volume	A Total Volume	100	%	☐	☒
	B Crossing Volume	59	%	☐	☒
2. Delay to Cross Traffic	A Main Road	100	%	☐	☒
	B Crossing Road	20	%	☐	☒
3. Combination	A Justificaton 1	59	%	☐	☒
	B Justification 2	20	%	☐	☒
4. 4-Hr Volume		73	%	☐	☒

5. Collision Experience	7	%	☐	☒
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6. Pedestrians	A Volume	Justification not met	☐	☒
	B Delay	Justification not met	☐	☒



MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNALS USING PROJECTED VOLUMES*

Project: Riverside South Phase 2

Date: Nov 2017

Project # 112842

Location Earl Armstrong Road
(Roadway)

at Brian Good Avenue
(Intersecting Roadway)

Municipality Riverside South

Projected Volume Future (2021) Total

Peak Hour AM & PM

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL		ENTIRE %
						Number	%	
1. VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	1210	112%	18%
	B. Vehicle volume along minor roads (Average Hour)	120	170	270	383	70	18%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	1140	106%	68%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	77	68%	

Projected Traffic Volumes:

Approach Volume Input (vph)			
Artery V1	Artery V2	Minor V3	Minor V4
558	582	70	

Average Hourly Volume (AHV) = $PHV/2$ or $(amPHV + pmPHV)/4$
PHV = Either AM or PM Peak Hour Volume

Notes and Adjustment Factors:

1. Vehicle volume warrants (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.

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.

3. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

4. The lowest sectional percentage governs the entire warrant.

5. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

6. 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.

7. The crossing volumes are defined as:

(a) Left-turns from both minor road approaches.

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

© 50% of the heavier left turn movement from major road when both of the following are met:

(i) the left-turn volume >120 vph

(ii) the left-turn volume plus the opposing volume >720 vph

(d) Pedestrians crossing the main road.

Adj. Factors
1.25
1.5
1.2
0

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

* Ontario Traffic Manual, Book 12", Ontario Ministry of Transportation.



MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNALS USING PROJECTED VOLUMES*

Project: Riverside South Phase 2

Date: Nov 2017

Project # 112842

Location Earl Armstrong Road
(Roadway)

at Brian Good Avenue
(Intersecting Roadway)

Municipality Riverside South

Projected Volume Future (2026) Total

Peak Hour AM & PM

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL		ENTIRE %
						Number	%	
1. VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	1375	127%	29%
	B. Vehicle volume along minor roads (Average Hour)	120	170	270	383	112	29%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	1263	117%	117%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	156	139%	

Projected Traffic Volumes:

Approach Volume Input (vph)			
Artery V1	Artery V2	Minor V3	Minor V4
628	635	112	

Average Hourly Volume (AHV) = PHV/2 or (amPHV + pmPHV)/4
PHV = Either AM or PM Peak Hour Volume

Notes and Adjustment Factors:

1. Vehicle volume warrants (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.

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.

3. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

4. The lowest sectional percentage governs the entire warrant.

5. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

6. 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.

7. The crossing volumes are defined as:

(a) Left-turns from both minor road approaches.

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

© 50% of the heavier left turn movement from major road when both of the following are met:

(i) the left-turn volume >120 vph

(ii) the left-turn volume plus the opposing volume >720 vph

(d) Pedestrians crossing the main road.

Adj. Factors
1.25
1.5
1.2
0

CONCLUSION: The intersection meets the minimum warrants for traffic control signals.

* Ontario Traffic Manual, Book 12", Ontario Ministry of Transportation.



MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNALS USING PROJECTED VOLUMES*

Project: Riverside South Phase 2

Date: Nov 2017

Project # 112842

Location River Road
(Roadway)

at Street 1
(Intersecting Roadway)

Municipality Riverside South

Projected Volume Future (2031) Total

Peak Hour AM & PM

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL		ENTIRE %
						Number	%	
1. VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	743	103%	36%
	B. Vehicle volume along minor roads (Average Hour)	120	170	270	383	98	36%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	645	90%	49%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	37	49%	

Projected Traffic Volumes:

Approach Volume Input (vph)			
Artery V1	Artery V2	Minor V3	Minor V4
336	309	98	

Average Hourly Volume (AHV) = PHV/2 or (amPHV + pmPHV)/4
PHV = Either AM or PM Peak Hour Volume

Notes and Adjustment Factors:

1. Vehicle volume warrants (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.

No

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.

Yes

3. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

No

4. The lowest sectional percentage governs the entire warrant.

5. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

Yes

6. 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

7. The crossing volumes are defined as:

(a) Left-turns from both minor road approaches.

32

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

0

© 50% of the heavier left turn movement from major road when both of the following are met:

225

(i) the left-turn volume >120 vph

Yes

(ii) the left-turn volume plus the opposing volume >720 vph

No

(d) Pedestrians crossing the main road.

5

Adj. Factors
1
1.5
1.5
0

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

* Ontario Traffic Manual, Book 12", Ontario Ministry of Transportation.



MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNALS USING PROJECTED VOLUMES*

Project: Riverside South Phase 2

Date: Nov 2017

Project # 112842

Location River Road
(Roadway)

at Summerhill Street
(Intersecting Roadway)

Municipality Riverside South

Projected Volume Future (2031) Total

Peak Hour AM & PM

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL		ENTIRE %
						Number	%	
1. VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	576	864	937	163%	37%
	B. Vehicle volume along minor roads (Average Hour)	120	170	216	306	80	37%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	576	864	857	149%	48%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	60	90	29	48%	

Projected Traffic Volumes:

Approach Volume Input (vph)			
Artery V1	Artery V2	Minor V3	Minor V4
418	439	80	

Average Hourly Volume (AHV) = PHV/2 or (amPHV + pmPHV)/4
PHV = Either AM or PM Peak Hour Volume

Notes and Adjustment Factors:

1. Vehicle volume warrants (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.

No

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.

Yes

3. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

No

4. The lowest sectional percentage governs the entire warrant.

5. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

Yes

6. 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.

Existing

7. The crossing volumes are defined as:

(a) Left-turns from both minor road approaches.

24
0

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

0

© 50% of the heavier left turn movement from major road when both of the following are met:

143

(i) the left-turn volume >120 vph

Yes

(ii) the left-turn volume plus the opposing volume >720 vph

No

(d) Pedestrians crossing the main road.

5

Adj. Factors
1
1.5
1.2
0

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

* Ontario Traffic Manual, Book 12", Ontario Ministry of Transportation.



MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNALS USING PROJECTED VOLUMES*

Project: Riverside South Phase 2

Date: Nov 2017

Project # 112842

Location Spratt Road at Street 1
(Roadway) (Intersecting Roadway)

Municipality Riverside South Projected Volume Future (2031) Total
Peak Hour AM & PM

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL		ENTIRE %
						Number	%	
1. VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	1080	92	13%	12%
	B. Vehicle volume along minor roads (Average Hour)	120	170	270	383	32	12%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	1080	60	8%	8%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	113	86	115%	

Projected Traffic Volumes:

Approach Volume Input (vph)				Average Hourly Volume (AHV) = PHV/2 or (amPHV + pmPHV)/4 PHV = Either AM or PM Peak Hour Volume
Artery V1	Artery V2	Minor V3	Minor V4	
44	16	32		

Notes and Adjustment Factors:

1. Vehicle volume warrants (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.	No	Adj. Factors
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.	Yes	
3. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.	No	1
4. The lowest sectional percentage governs the entire warrant.		
5. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).	Yes	1.5
6. 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	1.5
7. The crossing volumes are defined as:		0
(a) Left-turns from both minor road approaches.	81	
(b) The heaviest through volume from the minor road.	0	
© 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.	5	

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

* Ontario Traffic Manual, Book 12", Ontario Ministry of Transportation.



Riverside South Phase 2

Transportation Impact Assessment Strategy Report

Appendix B: Synchro Output Files

November 2017



Existing (2017)

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Existing (2017) - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	346	1053	124	73	714	112	300	387	74	37	72	201
Future Volume (vph)	346	1053	124	73	714	112	300	387	74	37	72	201
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3281	3390	1421	3048	3293	1409	3155	3390	1374	2537	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			216			278			216			277
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	384	1170	138	81	793	124	333	430	82	41	80	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	384	1170	138	81	793	124	333	430	82	41	80	223
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	21.1	45.5	45.5	11.8	36.2	36.2	19.1	50.8	50.8	11.9	43.6	43.6
Total Split (%)	17.6%	37.9%	37.9%	9.8%	30.2%	30.2%	15.9%	42.3%	42.3%	9.9%	36.3%	36.3%
Maximum Green (s)	14.3	39.0	39.0	5.0	29.7	29.7	12.4	44.2	44.2	5.2	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	C-Max	C-Max	Min	C-Max	C-Max	Min	Min	Min	Min	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	21.1	58.0	58.0	8.7	45.6	45.6	12.4	21.6	21.6	5.2	14.4	14.4
Actuated g/C Ratio	0.18	0.48	0.48	0.07	0.38	0.38	0.10	0.18	0.18	0.04	0.12	0.12

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Existing (2017) - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.67	0.71	0.17	0.37	0.63	0.18	1.02	0.71	0.19	0.37	0.21	0.53
Control Delay	52.1	28.7	0.6	55.3	36.9	1.5	108.4	52.6	1.0	65.7	47.4	6.8
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	52.1	28.7	0.6	55.3	36.9	1.5	108.4	52.6	1.0	65.7	47.4	6.8
LOS	D	C	A	E	D	A	F	D	A	E	D	A
Approach Delay	31.7			34.0			69.6			23.3		
Approach LOS	C			C			E			C		
Queue Length 50th (m)	40.4	101.0	0.0	8.7	66.0	0.0	~39.4	47.0	0.0	4.5	8.4	0.0
Queue Length 95th (m)	53.9	144.6	0.5	15.9	110.1	3.3	#65.9	58.5	0.0	10.0	14.5	8.5
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	577	1637	798	220	1250	707	326	1248	642	110	1005	639
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	0.67	0.71	0.17	0.37	0.63	0.18	1.02	0.34	0.13	0.37	0.08	0.35

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 80 (67%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 125

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 39.8

Intersection LOS: D

Intersection Capacity Utilization 69.1%

ICU Level of Service C

Analysis Period (min) 15

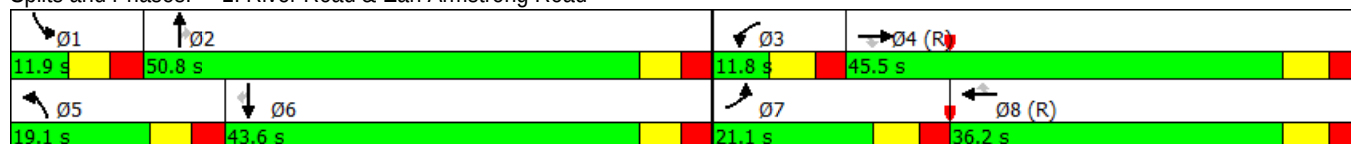
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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



Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Existing (2017) - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	858	325	111	801	33	197	140	75	28	272	660
Future Volume (vph)	291	858	325	111	801	33	197	140	75	28	272	660
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.98			0.98	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)	3321	3325	1488	3288	3390	1279	3257	3357	1502	2683	3424	1532
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3315	3325	1456	3288	3390	1258	3246	3357	1502	2683	3424	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			323			155			154			225
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3					3	3					3
Confl. Bikes (#/hr)			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%	4%	4%	2%	2%	21%	3%	3%	3%	25%	1%	1%
Adj. Flow (vph)	323	953	361	123	890	37	219	156	83	31	302	733
Shared Lane Traffic (%)												
Lane Group Flow (vph)	323	953	361	123	890	37	219	156	83	31	302	733
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	17.0	39.0	39.0	17.0	39.0	39.0	21.0	43.6	43.6	21.0	43.6	43.6
Total Split (%)	14.1%	32.3%	32.3%	14.1%	32.3%	32.3%	17.4%	36.2%	36.2%	17.4%	36.2%	36.2%
Maximum Green (s)	10.2	32.5	32.5	10.2	32.5	32.5	14.3	37.0	37.0	14.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	C-Max	C-Max	Min	C-Max	C-Max	Min	Min	Min	Min	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	10.2	33.5	33.5	9.2	32.5	32.5	12.7	44.4	44.4	6.9	38.6	38.6
Actuated g/C Ratio	0.08	0.28	0.28	0.08	0.27	0.27	0.11	0.37	0.37	0.06	0.32	0.32

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Existing (2017) - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	1.15	1.03	0.57	0.49	0.97	0.08	0.64	0.13	0.13	0.20	0.28	1.15
Control Delay	150.3	81.3	9.7	60.0	68.2	0.4	60.4	25.9	0.4	56.9	31.8	113.3
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	150.3	81.3	9.7	60.0	68.2	0.4	60.4	25.9	0.4	56.9	31.8	113.3
LOS	F	F	A	E	E	A	E	C	A	E	C	F
Approach Delay	79.1			64.8			37.8			88.6		
Approach LOS	E			E			D			F		
Queue Length 50th (m)	~42.6	~119.5	6.2	13.4	101.4	0.0	23.8	11.7	0.0	3.4	26.0	~154.6
Queue Length 95th (m)	#69.3	#157.3	31.5	22.4	#139.7	0.0	35.3	19.1	0.0	7.9	37.2	#223.3
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	280	923	637	278	913	452	386	1236	650	318	1095	635
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	1.15	1.03	0.57	0.44	0.97	0.08	0.57	0.13	0.13	0.10	0.28	1.15

Intersection Summary

Area Type: Other

Cycle Length: 120.6

Actuated Cycle Length: 120.6

Offset: 108 (90%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Natural Cycle: 125

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.15

Intersection Signal Delay: 73.5

Intersection LOS: E

Intersection Capacity Utilization 89.3%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

 Ø1	 Ø2	 Ø3	 Ø4 (R)
21 s	43.6 s	17 s	39 s
 Ø5	 Ø6	 Ø7	 Ø8 (R)
21 s	43.6 s	17 s	39 s

Intersection						
Int Delay, s/veh	1.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	
Traffic Vol, veh/h	646	14	16	683	40	68
Future Vol, veh/h	646	14	16	683	40	68
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	1000	1150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	0	0	2	5	1
Mvmt Flow	718	16	18	759	44	76
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	719	0	1134	360
Stage 1	-	-	-	-	719	-
Stage 2	-	-	-	-	415	-
Critical Hdwy	-	-	4.1	-	6.9	6.92
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.2	-	3.55	3.31
Pot Cap-1 Maneuver	-	-	892	-	192	639
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	626	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	892	-	188	638
Mov Cap-2 Maneuver	-	-	-	-	188	-
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	613	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.2		21.4	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	338	-	-	892	-	
HCM Lane V/C Ratio	0.355	-	-	0.02	-	
HCM Control Delay (s)	21.4	-	-	9.1	-	
HCM Lane LOS	C	-	-	A	-	
HCM 95th %tile Q(veh)	1.6	-	-	0.1	-	

Intersection						
Int Delay, s/veh	1.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Vol, veh/h	838	73	70	897	29	39
Future Vol, veh/h	838	73	70	897	29	39
Conflicting Peds, #/hr	0	4	4	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	1000	1150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	0	0	2	3	0
Mvmt Flow	931	81	78	997	32	43
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	935	0	1589	470
Stage 1	-	-	-	-	935	-
Stage 2	-	-	-	-	654	-
Critical Hdwy	-	-	4.1	-	6.86	6.9
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	-	-	2.2	-	3.53	3.3
Pot Cap-1 Maneuver	-	-	741	-	97	545
Stage 1	-	-	-	-	340	-
Stage 2	-	-	-	-	476	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	741	-	86	543
Mov Cap-2 Maneuver	-	-	-	-	86	-
Stage 1	-	-	-	-	339	-
Stage 2	-	-	-	-	426	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.8		43.6	
HCM LOS					E	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	166	-	-	741	-	
HCM Lane V/C Ratio	0.455	-	-	0.105	-	
HCM Control Delay (s)	43.6	-	-	10.4	-	
HCM Lane LOS	E	-	-	B	-	
HCM 95th %tile Q(veh)	2.1	-	-	0.3	-	

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	646	14	16	683	40	68
Future Volume (vph)	646	14	16	683	40	68
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.914	
Flt Protected			0.950		0.982	
Satd. Flow (prot)	3390	1547	1729	3390	1594	0
Flt Permitted			0.363		0.982	
Satd. Flow (perm)	3390	1514	660	3390	1594	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		16			76	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	718	16	18	759	44	76
Shared Lane Traffic (%)						
Lane Group Flow (vph)	718	16	18	759	120	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effect Green (s)	13.5	13.5	13.5	13.5	10.1	
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.31	
v/c Ratio	0.51	0.03	0.07	0.54	0.22	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	8.4	3.1	6.0	8.7	6.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.4	3.1	6.0	8.7	6.2	
LOS	A	A	A	A	A	
Approach Delay	8.3			8.6	6.2	
Approach LOS	A			A	A	
Queue Length 50th (m)	12.1	0.0	0.5	13.0	1.5	
Queue Length 95th (m)	19.5	1.4	2.2	20.8	8.6	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	1883	847	366	1883	919	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.38	0.02	0.05	0.40	0.13	

Intersection Summary

Area Type: Other
 Cycle Length: 45
 Actuated Cycle Length: 32.6
 Natural Cycle: 45
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 8.3
 Intersection Capacity Utilization 35.8%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↙ Ø2	→ Ø4
22.5 s	22.5 s
	↖ Ø8
	22.5 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	838	73	70	897	29	39
Future Volume (vph)	838	73	70	897	29	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.97	1.00			
Frt		0.850			0.923	
Flt Protected			0.950		0.979	
Satd. Flow (prot)	3390	1547	1729	3390	1624	0
Flt Permitted			0.260		0.979	
Satd. Flow (perm)	3390	1508	473	3390	1624	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		81			43	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		4	4			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	0%	0%	2%	3%	0%
Adj. Flow (vph)	931	81	78	997	32	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	931	81	78	997	75	0
Turn Type	NA	Perm	Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases		4	8			
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	27.0	27.0	27.0	27.0	23.0	
Total Split (%)	54.0%	54.0%	54.0%	54.0%	46.0%	
Maximum Green (s)	22.5	22.5	22.5	22.5	18.5	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effect Green (s)	17.3	17.3	17.3	17.3	10.1	
Actuated g/C Ratio	0.47	0.47	0.47	0.47	0.28	
v/c Ratio	0.58	0.11	0.35	0.62	0.16	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	8.4	1.9	10.7	8.9	8.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.4	1.9	10.7	8.9	8.1	
LOS	A	A	B	A	A	
Approach Delay	7.9			9.0	8.1	
Approach LOS	A			A	A	
Queue Length 50th (m)	17.1	0.0	2.4	18.8	1.3	
Queue Length 95th (m)	26.7	3.2	8.2	29.4	7.8	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	2116	971	295	2116	854	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.44	0.08	0.26	0.47	0.09	

Intersection Summary

Area Type: Other
 Cycle Length: 50
 Actuated Cycle Length: 36.5
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.62
 Intersection Signal Delay: 8.5
 Intersection Capacity Utilization 52.4%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↙ Ø2	→ Ø4
23 s	27 s
	↖ Ø8
	27 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Existing (2017) - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	614	8	15	435	6	5	2	20	36	9	260
Future Volume (vph)	92	614	8	15	435	6	5	2	20	36	9	260
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.468			0.386			0.751			0.756		
Satd. Flow (perm)	795	3424	1210	656	3293	1519	1365	3458	1439	1376	3458	1496
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			145			146			289
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	102	682	9	17	483	7	6	2	22	40	10	289
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	682	9	17	483	7	6	2	22	40	10	289
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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	58.0	58.0	15.0	51.0	51.0	47.0	47.0	47.0	47.0	47.0	47.0
Total Split (%)	18.3%	48.3%	48.3%	12.5%	42.5%	42.5%	39.2%	39.2%	39.2%	39.2%	39.2%	39.2%
Maximum Green (s)	15.6	51.7	51.7	8.6	44.7	44.7	40.8	40.8	40.8	40.8	40.8	40.8
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	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	Min	C-Max	C-Max	Min	C-Max	C-Max	Min	Min	Min	Min	Min	Min
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		0	0	0	0	0	0	0	0
Act Effct Green (s)	90.9	83.8	83.8	88.1	82.4	82.4	11.5	11.5	11.5	11.5	11.5	11.5
Actuated g/C Ratio	0.76	0.70	0.70	0.73	0.69	0.69	0.10	0.10	0.10	0.10	0.10	0.10

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Existing (2017) - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.16	0.29	0.01	0.03	0.21	0.01	0.05	0.01	0.08	0.30	0.03	0.71
Control Delay	3.8	5.8	0.0	3.4	7.6	0.0	48.0	46.5	0.6	55.6	47.4	16.1
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	3.8	5.8	0.0	3.4	7.6	0.0	48.0	46.5	0.6	55.6	47.4	16.1
LOS	A	A	A	A	A	A	D	D	A	E	D	B
Approach Delay	5.5			7.3			13.1			21.7		
Approach LOS	A			A			B			C		
Queue Length 50th (m)	2.6	13.0	0.0	0.6	17.3	0.0	1.2	0.2	0.0	8.3	1.0	0.0
Queue Length 95th (m)	m9.4	29.5	m0.0	2.4	30.2	0.0	4.8	1.3	0.0	17.5	3.4	23.4
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	742	2390	871	565	2260	1088	464	1175	585	467	1175	699
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	0.14	0.29	0.01	0.03	0.21	0.01	0.01	0.00	0.04	0.09	0.01	0.41

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 94 (78%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 9.5

Intersection LOS: A

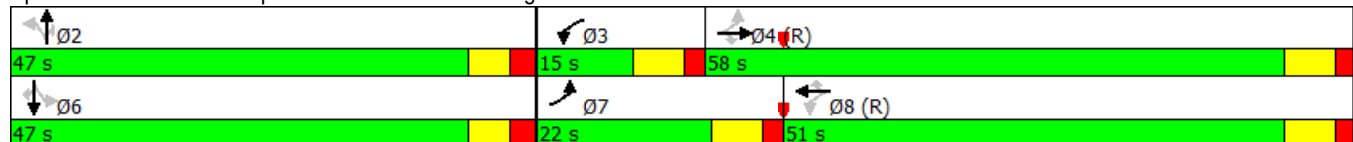
Intersection Capacity Utilization 61.1%

ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 3: Spratt Road & Earl Armstrong Road



Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Existing (2017) - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	579	6	9	963	47	10	6	10	13	16	264
Future Volume (vph)	291	579	6	9	963	47	10	6	10	13	16	264
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor			0.98	1.00		0.98						0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3390	1547	1729	3424	1547	1729	3458	1547	1729	3458	1517
Flt Permitted	0.191			0.408			0.745			0.753		
Satd. Flow (perm)	344	3390	1508	741	3424	1523	1356	3458	1547	1370	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			87			145			146			293
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)			2	2								
Confl. Bikes (#/hr)						6						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%	2%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%
Adj. Flow (vph)	323	643	7	10	1070	52	11	7	11	14	18	293
Shared Lane Traffic (%)												
Lane Group Flow (vph)	323	643	7	10	1070	52	11	7	11	14	18	293
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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	77.3	77.3	11.4	55.7	55.7	31.3	31.3	31.3	31.3	31.3	31.3
Total Split (%)	27.5%	64.4%	64.4%	9.5%	46.4%	46.4%	26.1%	26.1%	26.1%	26.1%	26.1%	26.1%
Maximum Green (s)	26.6	71.0	71.0	5.0	49.4	49.4	25.1	25.1	25.1	25.1	25.1	25.1
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	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-Min	C-Min	None	C-Min	C-Min	Min	Min	Min	Min	Min	Min
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		0	0	0	0	0	0	0	0
Act Effct Green (s)	95.9	93.5	93.5	77.1	71.6	71.6	11.5	11.5	11.5	11.5	11.5	11.5
Actuated g/C Ratio	0.80	0.78	0.78	0.64	0.60	0.60	0.10	0.10	0.10	0.10	0.10	0.10

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Existing (2017) - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.67	0.24	0.01	0.02	0.52	0.05	0.08	0.02	0.04	0.11	0.05	0.72
Control Delay	13.9	4.6	0.0	5.9	17.1	0.1	49.3	47.3	0.3	49.9	48.1	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	4.6	0.0	5.9	17.1	0.1	49.3	47.3	0.3	49.9	48.1	16.2
LOS	B	A	A	A	B	A	D	D	A	D	D	B
Approach Delay	7.7			16.2			30.2			19.4		
Approach LOS	A			B			C			B		
Queue Length 50th (m)	12.8	13.4	0.0	0.3	64.8	0.0	2.3	0.7	0.0	2.9	1.9	0.0
Queue Length 95th (m)	42.2	37.6	0.0	1.6	115.0	0.0	7.2	2.7	0.0	8.4	5.0	23.4
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	582	2642	1194	522	2042	966	283	723	439	286	723	544
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	0.55	0.24	0.01	0.02	0.52	0.05	0.04	0.01	0.03	0.05	0.02	0.54

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 64.3 (54%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 13.4

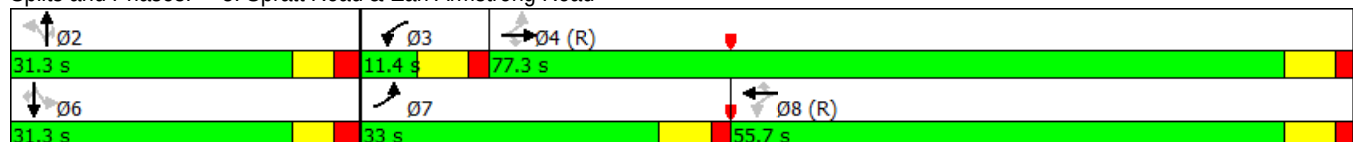
Intersection LOS: B

Intersection Capacity Utilization 69.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road



Intersection						
Int Delay, s/veh	5.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	23	196	602	14	31	184
Future Vol, veh/h	23	196	602	14	31	184
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	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	3	4	2	2	9
Mvmt Flow	26	218	669	16	34	204
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	950	677	0	0	684	0
Stage 1	677	-	-	-	-	-
Stage 2	273	-	-	-	-	-
Critical Hdwy	7.12	6.23	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.327	-	-	2.218	-
Pot Cap-1 Maneuver	240	451	-	-	909	-
Stage 1	443	-	-	-	-	-
Stage 2	733	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	233	451	-	-	909	-
Mov Cap-2 Maneuver	233	-	-	-	-	-
Stage 1	443	-	-	-	-	-
Stage 2	706	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	25.7		0		1.3	
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 411	909	-		
HCM Lane V/C Ratio	-	- 0.592	0.038	-		
HCM Control Delay (s)	-	- 25.7	9.1	-		
HCM Lane LOS	-	- D	A	-		
HCM 95th %tile Q(veh)	-	- 3.7	0.1	-		

Intersection						
Int Delay, s/veh	2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	85	289	13	138	578
Future Vol, veh/h	4	85	289	13	138	578
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	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	94	321	14	153	642
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1277	328	0	0	336	0
Stage 1	328	-	-	-	-	-
Stage 2	949	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	143	713	-	-	1223	-
Stage 1	685	-	-	-	-	-
Stage 2	313	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	129	713	-	-	1223	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	685	-	-	-	-	-
Stage 2	274	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	12.3		0		1.6	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 592	1223	-		
HCM Lane V/C Ratio	-	- 0.167	0.125	-		
HCM Control Delay (s)	-	- 12.3	8.4	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.6	0.4	-		

Intersection						
Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	4	23	1	10	23
Future Vol, veh/h	0	4	23	1	10	23
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	4	26	1	11	26
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	74	26	0	0	27	0
Stage 1	26	-	-	-	-	-
Stage 2	48	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	930	1050	-	-	1587	-
Stage 1	997	-	-	-	-	-
Stage 2	974	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	923	1050	-	-	1587	-
Mov Cap-2 Maneuver	923	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	967	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	8.4		0		2.2	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 1050	1587	-		
HCM Lane V/C Ratio	-	- 0.004	0.007	-		
HCM Control Delay (s)	-	- 8.4	7.3	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0	0	-		

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	1	21	0	5	27
Future Vol, veh/h	6	1	21	0	5	27
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	90	90	90	90	90	90
Heavy Vehicles, %	0	10	2	33	0	2
Mvmt Flow	7	1	23	0	6	30
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	64	23	0	0	23	0
Stage 1	23	-	-	-	-	-
Stage 2	41	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.2	-
Pot Cap-1 Maneuver	947	1031	-	-	1605	-
Stage 1	1005	-	-	-	-	-
Stage 2	987	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	943	1031	-	-	1605	-
Mov Cap-2 Maneuver	943	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	8.8		0		1.1	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 955	1605	-		
HCM Lane V/C Ratio	-	- 0.008	0.003	-		
HCM Control Delay (s)	-	- 8.8	7.3	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0	0	-		

Future (2021) Background

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	263	1218	147	105	901	176	377	483	115	57	91	204
Future Volume (vph)	263	1218	147	105	901	176	377	483	115	57	91	204
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	1.00		0.98	1.00		0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3282	3390	1421	3048	3293	1408	3155	3390	1374	2537	3262	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			208			208			148			147
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	263	1218	147	105	901	176	377	483	115	57	91	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	263	1218	147	105	901	176	377	483	115	57	91	204
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pt+ov
Protected Phases	7	4		3	8		5	2		1	6	6 7
Permitted Phases			4			8			2			
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6 7
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	
Total Split (s)	17.8	48.9	48.9	11.8	42.9	42.9	20.7	50.6	50.6	13.7	43.6	
Total Split (%)	14.2%	39.1%	39.1%	9.4%	34.3%	34.3%	16.6%	40.5%	40.5%	11.0%	34.9%	
Maximum Green (s)	11.0	42.4	42.4	5.0	36.4	36.4	14.0	44.0	44.0	7.0	37.0	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	
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	
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	11.0	42.5	42.5	5.0	36.4	36.4	14.0	23.5	23.5	6.7	13.6	31.4
Actuated g/C Ratio	0.11	0.42	0.42	0.05	0.36	0.36	0.14	0.23	0.23	0.07	0.13	0.31

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.74	0.86	0.21	0.70	0.76	0.28	0.86	0.62	0.27	0.34	0.21	0.37
Control Delay	58.1	35.1	1.5	73.4	34.5	3.2	64.1	39.8	4.1	52.4	39.9	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	58.1	35.1	1.5	73.4	34.5	3.2	64.1	39.8	4.1	52.4	39.9	10.3
LOS	E	D	A	E	C	A	E	D	A	D	D	B
Approach Delay	35.8			33.3			45.0			24.8		
Approach LOS	D			C			D			C		
Queue Length 50th (m)	24.1	103.0	0.0	9.8	74.8	0.0	34.8	43.2	0.0	5.1	7.8	7.4
Queue Length 95th (m)	#43.0	#154.5	3.3	#23.1	105.4	8.5	#62.4	58.6	7.1	11.5	14.4	22.9
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	356	1415	714	150	1180	638	436	1468	678	175	1188	631
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	0.86	0.21	0.70	0.76	0.28	0.86	0.33	0.17	0.33	0.08	0.32

Intersection Summary

Area Type: Other

Cycle Length: 125

Actuated Cycle Length: 101.7

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 36.3

Intersection LOS: D

Intersection Capacity Utilization 82.4%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
13.7 s	50.6 s	11.8 s	48.9 s
 Ø5	 Ø6	 Ø7	 Ø8
20.7 s	43.6 s	17.8 s	42.9 s

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	296	1115	406	184	1017	82	247	182	118	105	359	503
Future Volume (vph)	296	1115	406	184	1017	82	247	182	118	105	359	503
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3390	1421	3048	3293	1408	3158	3390	1374	2534	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310			143			143			197
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	296	1115	406	184	1017	82	247	182	118	105	359	503
Shared Lane Traffic (%)												
Lane Group Flow (vph)	296	1115	406	184	1017	82	247	182	118	105	359	503
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	19.7	51.8	51.8	17.2	49.3	49.3	17.0	46.0	46.0	15.0	44.0	44.0
Total Split (%)	15.2%	39.8%	39.8%	13.2%	37.9%	37.9%	13.1%	35.4%	35.4%	11.5%	33.8%	33.8%
Maximum Green (s)	12.9	45.3	45.3	10.4	42.8	42.8	10.3	39.4	39.4	8.3	37.4	37.4
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	13.0	44.0	44.0	10.1	41.2	41.2	10.3	36.1	36.1	8.1	33.9	33.9
Actuated g/C Ratio	0.10	0.35	0.35	0.08	0.33	0.33	0.08	0.29	0.29	0.06	0.27	0.27

1: River Road & Earl Armstrong Road

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.87	0.94	0.58	0.74	0.94	0.15	0.95	0.19	0.24	0.64	0.41	0.94
Control Delay	81.2	54.5	11.9	76.1	57.4	0.5	101.4	34.0	4.1	76.8	38.9	53.3
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	81.2	54.5	11.9	76.1	57.4	0.5	101.4	34.0	4.1	76.8	38.9	53.3
LOS	F	D	B	E	E	A	F	C	A	E	D	D
Approach Delay	49.3			56.4			58.0			50.5		
Approach LOS	D			E			E			D		
Queue Length 50th (m)	36.2	133.8	15.8	22.3	122.3	0.0	30.5	16.6	0.0	12.6	35.7	75.3
Queue Length 95th (m)	#60.1	#173.7	45.6	#37.6	#160.4	0.2	#55.5	25.3	8.2	#23.7	48.7	#135.6
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	340	1233	714	254	1132	577	261	1072	532	169	979	574
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	0.87	0.90	0.57	0.72	0.90	0.14	0.95	0.17	0.22	0.62	0.37	0.88

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 125.1

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 52.6

Intersection LOS: D

Intersection Capacity Utilization 86.7%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
15 s	46 s	17.2 s	51.8 s
 Ø5	 Ø6	 Ø7	 Ø8
17 s	44 s	19.7 s	49.3 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	827	23	21	956	72	87
Future Volume (vph)	827	23	21	956	72	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.926	
Flt Protected			0.950		0.978	
Satd. Flow (prot)	3390	1547	1729	3390	1603	0
Flt Permitted			0.305		0.978	
Satd. Flow (perm)	3390	1514	555	3390	1603	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		23			69	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	827	23	21	956	72	87
Shared Lane Traffic (%)						
Lane Group Flow (vph)	827	23	21	956	159	0
Turn Type	NA	Perm	Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases		4	8			
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effct Green (s)	15.5	15.5	15.5	15.5	10.2	
Actuated g/C Ratio	0.45	0.45	0.45	0.45	0.29	
v/c Ratio	0.55	0.03	0.09	0.63	0.31	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	8.5	3.0	6.3	9.6	8.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.5	3.0	6.3	9.6	8.5	
LOS	A	A	A	A	A	
Approach Delay	8.4			9.5	8.5	
Approach LOS	A			A	A	
Queue Length 50th (m)	14.5	0.0	0.6	17.7	3.7	
Queue Length 95th (m)	24.6	1.8	2.7	29.6	12.1	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	1765	799	289	1765	868	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.47	0.03	0.07	0.54	0.18	

Intersection Summary

Area Type: Other
 Cycle Length: 45
 Actuated Cycle Length: 34.8
 Natural Cycle: 45
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.63
 Intersection Signal Delay: 8.9
 Intersection Capacity Utilization 45.2%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↙ Ø2	→ Ø4
22.5 s	22.5 s
	↖ Ø8
	22.5 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	1190	131	91	1209	67	50
Future Volume (vph)	1190	131	91	1209	67	50
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.942	
Flt Protected			0.950		0.972	
Satd. Flow (prot)	3390	1547	1729	3390	1613	0
Flt Permitted			0.229		0.972	
Satd. Flow (perm)	3390	1514	417	3390	1613	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		131			19	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	1190	131	91	1209	67	50
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1190	131	91	1209	117	0
Turn Type	NA	Perm	Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases		4	8			
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effct Green (s)	17.5	17.5	17.5	17.5	10.0	
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.27	
v/c Ratio	0.73	0.17	0.46	0.74	0.26	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	10.9	2.0	15.9	11.2	10.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.9	2.0	15.9	11.2	10.9	
LOS	B	A	B	B	B	
Approach Delay	10.0			11.5	10.9	
Approach LOS	B			B	B	
Queue Length 50th (m)	24.4	0.0	3.0	25.0	4.3	
Queue Length 95th (m)	38.8	4.2	#14.9	40.1	11.4	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	1668	811	204	1668	803	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.71	0.16	0.45	0.72	0.15	

Intersection Summary

Area Type: Other
 Cycle Length: 45
 Actuated Cycle Length: 36.6
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 10.8
 Intersection Capacity Utilization 62.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
22.5 s	22.5 s
	↖ Ø8
	22.5 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	734	87	45	586	7	116	8	76	38	21	278
Future Volume (vph)	98	734	87	45	586	7	116	8	76	38	21	278
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.371			0.324			0.743			0.752		
Satd. Flow (perm)	630	3424	1211	551	3293	1521	1351	3458	1439	1369	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140			140			141			267
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	98	734	87	45	586	7	116	8	76	38	21	278
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	734	87	45	586	7	116	8	76	38	21	278
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	12.8	32.4	32.4	11.4	31.0	31.0	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	17.1%	43.2%	43.2%	15.2%	41.3%	41.3%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Maximum Green (s)	6.4	26.1	26.1	5.0	24.7	24.7	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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	24.0	17.8	17.8	21.6	16.6	16.6	11.4	11.4	11.4	11.4	11.4	11.4
Actuated g/C Ratio	0.45	0.33	0.33	0.40	0.31	0.31	0.21	0.21	0.21	0.21	0.21	0.21

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.25	0.64	0.18	0.14	0.57	0.01	0.40	0.01	0.18	0.13	0.03	0.53
Control Delay	7.8	17.9	1.8	7.3	17.8	0.0	24.4	18.5	1.9	20.0	18.6	7.8
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	7.8	17.9	1.8	7.3	17.8	0.0	24.4	18.5	1.9	20.0	18.6	7.8
LOS	A	B	A	A	B	A	C	B	A	B	B	A
Approach Delay	15.3			16.9			15.6			9.8		
Approach LOS	B			B			B			A		
Queue Length 50th (m)	3.4	26.6	0.0	1.5	21.3	0.0	8.8	0.3	0.0	2.7	0.7	0.8
Queue Length 95th (m)	9.5	45.2	2.7	5.2	36.9	0.0	22.8	1.7	2.1	9.4	3.1	16.1
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	405	1696	670	322	1544	787	641	1641	757	649	1641	850
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	0.24	0.43	0.13	0.14	0.38	0.01	0.18	0.00	0.10	0.06	0.01	0.33

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 53.5

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 14.9

Intersection LOS: B

Intersection Capacity Utilization 59.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
31.2 s	11.4 s	32.4 s
 Ø6	 Ø7	 Ø8
31.2 s	12.8 s	31 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	300	727	220	105	828	50	205	46	96	14	62	270
Future Volume (vph)	300	727	220	105	828	50	205	46	96	14	62	270
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.152			0.375			0.714			0.725		
Satd. Flow (perm)	258	3424	1211	637	3293	1520	1298	3458	1439	1320	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			220			205			207			270
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	300	727	220	105	828	50	205	46	96	14	62	270
Shared Lane Traffic (%)												
Lane Group Flow (vph)	300	727	220	105	828	50	205	46	96	14	62	270
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	21.9	40.6	40.6	13.2	31.9	31.9	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	25.8%	47.8%	47.8%	15.5%	37.5%	37.5%	36.7%	36.7%	36.7%	36.7%	36.7%	36.7%
Maximum Green (s)	15.5	34.3	34.3	6.8	25.6	25.6	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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	42.6	30.1	30.1	29.1	22.6	22.6	16.9	16.9	16.9	16.9	16.9	16.9
Actuated g/C Ratio	0.58	0.41	0.41	0.40	0.31	0.31	0.23	0.23	0.23	0.23	0.23	0.23

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.73	0.52	0.35	0.31	0.81	0.08	0.68	0.06	0.20	0.05	0.08	0.49
Control Delay	25.5	18.0	4.2	11.8	31.8	0.3	38.8	22.6	0.9	22.7	22.8	6.6
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	25.5	18.0	4.2	11.8	31.8	0.3	38.8	22.6	0.9	22.7	22.8	6.6
LOS	C	B	A	B	C	A	D	C	A	C	C	A
Approach Delay	17.4			28.1			26.2			10.1		
Approach LOS	B			C			C			B		
Queue Length 50th (m)	20.3	34.8	0.0	5.2	51.6	0.0	25.6	2.5	0.0	1.5	3.4	0.0
Queue Length 95th (m)	#60.4	57.0	11.7	13.6	#87.2	0.0	44.9	6.1	0.0	5.4	7.5	15.1
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	448	1649	697	350	1183	678	455	1214	639	463	1214	700
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	0.67	0.44	0.32	0.30	0.70	0.07	0.45	0.04	0.15	0.03	0.05	0.39

Intersection Summary

Area Type: Other

Cycle Length: 85

Actuated Cycle Length: 73

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 21.2

Intersection LOS: C

Intersection Capacity Utilization 76.1%

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.

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
31.2 s	13.2 s	40.6 s
 Ø6	 Ø7	 Ø8
31.2 s	21.9 s	31.9 s

Intersection						
Int Delay, s/veh	6.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	203	830	15	32	264
Future Vol, veh/h	24	203	830	15	32	264
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	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	3	4	2	2	9
Mvmt Flow	24	203	830	15	32	264
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1166	838	0	0	845	0
Stage 1	838	-	-	-	-	-
Stage 2	328	-	-	-	-	-
Critical Hdwy	6.42	6.23	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.327	-	-	2.218	-
Pot Cap-1 Maneuver	214	365	-	-	792	-
Stage 1	424	-	-	-	-	-
Stage 2	730	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	205	365	-	-	792	-
Mov Cap-2 Maneuver	205	-	-	-	-	-
Stage 1	424	-	-	-	-	-
Stage 2	701	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	35.1		0		1.1	
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 337	792	-		
HCM Lane V/C Ratio	-	- 0.674	0.04	-		
HCM Control Delay (s)	-	- 35.1	9.7	-		
HCM Lane LOS	-	- E	A	-		
HCM 95th %tile Q(veh)	-	- 4.6	0.1	-		

Intersection						
Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	88	422	14	143	839
Future Vol, veh/h	5	88	422	14	143	839
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	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	3	4	2	2	9
Mvmt Flow	5	88	422	14	143	839
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1554	429	0	0	436	0
Stage 1	429	-	-	-	-	-
Stage 2	1125	-	-	-	-	-
Critical Hdwy	6.42	6.23	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.327	-	-	2.218	-
Pot Cap-1 Maneuver	125	624	-	-	1124	-
Stage 1	657	-	-	-	-	-
Stage 2	310	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	109	624	-	-	1124	-
Mov Cap-2 Maneuver	109	-	-	-	-	-
Stage 1	657	-	-	-	-	-
Stage 2	271	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	13.9		0		1.3	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 498	1124	-		
HCM Lane V/C Ratio	-	- 0.187	0.127	-		
HCM Control Delay (s)	-	- 13.9	8.7	-		
HCM Lane LOS	-	- B	A	-		
HCM 95th %tile Q(veh)	-	- 0.7	0.4	-		

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	830	15	32	264
Future Volume (vph)	24	203	830	15	32	264
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1547	0	1747	0	1695	1670
Flt Permitted	0.995				0.188	
Satd. Flow (perm)	1547	0	1747	0	335	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	68		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	24	203	830	15	32	264
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	845	0	32	264
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	22.5		22.5		22.5	22.5
Total Split (s)	22.5		22.5		22.5	22.5
Total Split (%)	50.0%		50.0%		50.0%	50.0%
Maximum Green (s)	18.0		18.0		18.0	18.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	4.5		4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	10.9		22.2		22.2	22.2
Actuated g/C Ratio	0.28		0.58		0.58	0.58
v/c Ratio	0.46		0.83		0.16	0.27
Control Delay	11.3		23.6		9.4	7.4
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	11.3		23.6		9.4	7.4
LOS	B		C		A	A
Approach Delay	11.3		23.6			7.6
Approach LOS	B		C			A
Queue Length 50th (m)	7.3		41.4		0.9	7.9
Queue Length 95th (m)	18.2		#115.3		5.2	21.2
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	764		1014		194	969
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.30		0.83		0.16	0.27

Intersection Summary

Area Type: Other
 Cycle Length: 45
 Actuated Cycle Length: 38.3
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.83
 Intersection Signal Delay: 18.1
 Intersection Capacity Utilization 69.2%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
22.5 s	
 Ø6	 Ø8
22.5 s	22.5 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	88	422	14	143	839
Future Volume (vph)	5	88	422	14	143	839
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872		0.996			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1537	0	1744	0	1695	1670
Flt Permitted	0.997				0.505	
Satd. Flow (perm)	1537	0	1744	0	901	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	88		4			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	5	88	422	14	143	839
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	436	0	143	839
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	22.5		22.5		22.5	22.5
Total Split (s)	22.5		22.5		22.5	22.5
Total Split (%)	50.0%		50.0%		50.0%	50.0%
Maximum Green (s)	18.0		18.0		18.0	18.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	4.5		4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	10.1		29.1		29.1	29.1
Actuated g/C Ratio	0.25		0.72		0.72	0.72
v/c Ratio	0.21		0.34		0.22	0.69
Control Delay	5.1		5.8		6.2	15.5
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	5.1		5.8		6.2	15.5
LOS	A		A		A	B
Approach Delay	5.1		5.8			14.1
Approach LOS	A		A			B
Queue Length 50th (m)	0.3		14.5		4.3	42.7
Queue Length 95th (m)	5.9		28.5		11.2	#97.1
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	744		1265		653	1210
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.13		0.34		0.22	0.69

Intersection Summary

Area Type: Other
 Cycle Length: 45
 Actuated Cycle Length: 40.2
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 11.2
 Intersection Capacity Utilization 62.4%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
22.5 s	
 Ø6	 Ø8
22.5 s	22.5 s

Intersection						
Int Delay, s/veh	4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	69	68	6	30	41
Future Vol, veh/h	5	69	68	6	30	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	69	68	6	30	41
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	172	71	0	0	74	0
Stage 1	71	-	-	-	-	-
Stage 2	101	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	791	991	-	-	1526	-
Stage 1	939	-	-	-	-	-
Stage 2	905	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	779	991	-	-	1526	-
Mov Cap-2 Maneuver	779	-	-	-	-	-
Stage 1	939	-	-	-	-	-
Stage 2	887	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9		0		3.1	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 973	1526	-		
HCM Lane V/C Ratio	-	- 0.076	0.02	-		
HCM Control Delay (s)	-	- 9	7.4	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	3.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	46	53	15	70	75
Future Vol, veh/h	6	46	53	15	70	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	46	53	15	70	75
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	276	61	0	0	68	0
Stage 1	61	-	-	-	-	-
Stage 2	215	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	714	1004	-	-	1533	-
Stage 1	962	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	680	1004	-	-	1533	-
Mov Cap-2 Maneuver	680	-	-	-	-	-
Stage 1	962	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9		0		3.6	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 952	1533	-		
HCM Lane V/C Ratio	-	- 0.055	0.046	-		
HCM Control Delay (s)	-	- 9	7.5	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	62	673	3	19	246
Future Vol, veh/h	11	62	673	3	19	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	62	673	3	19	246
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	959	675	0	0	676	0
Stage 1	675	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	285	454	-	-	915	-
Stage 1	506	-	-	-	-	-
Stage 2	764	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	278	454	-	-	915	-
Mov Cap-2 Maneuver	278	-	-	-	-	-
Stage 1	506	-	-	-	-	-
Stage 2	746	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	15.5		0		0.6	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 414	915	-		
HCM Lane V/C Ratio	-	- 0.176	0.021	-		
HCM Control Delay (s)	-	- 15.5	9	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 0.6	0.1	-		

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	40	343	12	70	658
Future Vol, veh/h	7	40	343	12	70	658
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	40	343	12	70	658
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1147	349	0	0	355	0
Stage 1	349	-	-	-	-	-
Stage 2	798	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	220	694	-	-	1204	-
Stage 1	714	-	-	-	-	-
Stage 2	443	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	200	694	-	-	1204	-
Mov Cap-2 Maneuver	200	-	-	-	-	-
Stage 1	714	-	-	-	-	-
Stage 2	402	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	12.8		0		0.8	
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 507	1204	-		
HCM Lane V/C Ratio	-	- 0.093	0.058	-		
HCM Control Delay (s)	-	- 12.8	8.2	0		
HCM Lane LOS	-	- B	A	A		
HCM 95th %tile Q(veh)	-	- 0.3	0.2	-		

Future (2026) Background

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	1332	131	104	974	205	418	550	116	69	112	209
Future Volume (vph)	180	1332	131	104	974	205	418	550	116	69	112	209
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	1.00		0.98	1.00		0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3390	1421	3048	3293	1408	3155	3390	1374	2537	3262	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			200			205			143			142
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	180	1332	131	104	974	205	418	550	116	69	112	209
Shared Lane Traffic (%)												
Lane Group Flow (vph)	180	1332	131	104	974	205	418	550	116	69	112	209
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pt+ov
Protected Phases	7	4		3	8		5	2		1	6	6 7
Permitted Phases			4			8			2			
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6 7
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	
Total Split (s)	14.9	52.6	52.6	11.8	49.5	49.5	22.0	51.2	51.2	14.4	43.6	
Total Split (%)	11.5%	40.5%	40.5%	9.1%	38.1%	38.1%	16.9%	39.4%	39.4%	11.1%	33.5%	
Maximum Green (s)	8.1	46.1	46.1	5.0	43.0	43.0	15.3	44.6	44.6	7.7	37.0	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	
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	
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	8.1	46.2	46.2	5.0	43.1	43.1	15.3	27.1	27.1	7.3	16.3	31.2
Actuated g/C Ratio	0.07	0.42	0.42	0.05	0.39	0.39	0.14	0.25	0.25	0.07	0.15	0.28

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.74	0.93	0.18	0.75	0.75	0.30	0.94	0.66	0.26	0.41	0.23	0.40
Control Delay	69.3	43.6	1.0	83.7	33.8	4.6	78.7	42.0	4.5	58.0	41.5	12.9
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	69.3	43.6	1.0	83.7	33.8	4.6	78.7	42.0	4.5	58.0	41.5	12.9
LOS	E	D	A	F	C	A	E	D	A	E	D	B
Approach Delay	43.0			33.2			52.2			29.1		
Approach LOS	D			C			D			C		
Queue Length 50th (m)	18.0	127.6	0.0	10.5	84.7	0.0	42.3	53.4	0.0	6.7	10.3	9.9
Queue Length 95th (m)	#35.8	#192.6	1.5	#25.3	120.4	13.8	#76.4	70.1	8.0	14.3	17.7	27.1
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	243	1430	715	139	1295	678	443	1383	645	179	1104	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	0.74	0.93	0.18	0.75	0.75	0.30	0.94	0.40	0.18	0.39	0.10	0.35

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 109.5

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 41.2

Intersection LOS: D

Intersection Capacity Utilization 87.6%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
14.4 s	51.2 s	11.8 s	52.6 s
 Ø5	 Ø6	 Ø7	 Ø8
22 s	43.6 s	14.9 s	49.5 s

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	303	1250	462	184	1191	118	279	225	127	161	421	343
Future Volume (vph)	303	1250	462	184	1191	118	279	225	127	161	421	343
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3284	3390	1421	3048	3293	1408	3158	3390	1374	2535	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			287			143			143			184
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	303	1250	462	184	1191	118	279	225	127	161	421	343
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	1250	462	184	1191	118	279	225	127	161	421	343
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	18.6	51.7	51.7	17.0	50.1	50.1	17.7	45.4	45.4	15.9	43.6	43.6
Total Split (%)	14.3%	39.8%	39.8%	13.1%	38.5%	38.5%	13.6%	34.9%	34.9%	12.2%	33.5%	33.5%
Maximum Green (s)	11.8	45.2	45.2	10.2	43.6	43.6	11.0	38.8	38.8	9.2	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	11.9	45.7	45.7	10.0	43.8	43.8	11.1	25.2	25.2	9.2	23.4	23.4
Actuated g/C Ratio	0.10	0.39	0.39	0.09	0.38	0.38	0.10	0.22	0.22	0.08	0.20	0.20

1: River Road & Earl Armstrong Road

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.91	0.94	0.63	0.71	0.97	0.19	0.93	0.31	0.31	0.81	0.65	0.78
Control Delay	83.9	49.9	15.7	68.5	55.2	3.4	91.1	38.8	6.1	82.4	47.2	32.8
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	83.9	49.9	15.7	68.5	55.2	3.4	91.1	38.8	6.1	82.4	47.2	32.8
LOS	F	D	B	E	E	A	F	D	A	F	D	C
Approach Delay	47.2			52.8			55.4			48.0		
Approach LOS	D			D			E			D		
Queue Length 50th (m)	32.3	128.5	27.1	19.3	124.1	0.0	29.9	21.0	0.0	17.1	43.0	32.5
Queue Length 95th (m)	#65.6	#209.1	71.3	#38.2	#203.5	7.8	#62.6	30.8	10.4	#38.9	57.5	63.1
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	333	1325	730	267	1234	617	299	1131	553	200	1038	587
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	0.91	0.94	0.63	0.69	0.97	0.19	0.93	0.20	0.23	0.81	0.41	0.58

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 116.8

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 50.0

Intersection LOS: D

Intersection Capacity Utilization 87.9%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
15.9 s	45.4 s	17 s	51.7 s
 Ø5	 Ø6	 Ø7	 Ø8
17.7 s	43.6 s	18.6 s	50.1 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	871	80	29	1045	114	114
Future Volume (vph)	871	80	29	1045	114	114
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		50.0	0.0
Storage Lanes		1	1		0	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.932	
Flt Protected			0.950		0.976	
Satd. Flow (prot)	3390	1547	1729	3390	1607	0
Flt Permitted			0.294		0.976	
Satd. Flow (perm)	3390	1514	535	3390	1607	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		80			45	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	871	80	29	1045	114	114
Shared Lane Traffic (%)						
Lane Group Flow (vph)	871	80	29	1045	228	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	28.2	28.2	16.2	16.2	37.8	
Total Split (s)	32.0	32.0	32.0	32.0	38.0	
Total Split (%)	45.7%	45.7%	45.7%	45.7%	54.3%	
Maximum Green (s)	25.8	25.8	25.8	25.8	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	1.2	1.2	1.2	1.2	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	20.2	20.2	20.2	20.2	11.9	
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.27	
v/c Ratio	0.56	0.11	0.12	0.68	0.49	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	10.5	2.7	8.7	12.1	16.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.5	2.7	8.7	12.1	16.0	
LOS	B	A	A	B	B	
Approach Delay	9.9			12.0	16.0	
Approach LOS	A			B	B	
Queue Length 50th (m)	20.2	0.0	1.0	26.0	10.6	
Queue Length 95th (m)	38.6	4.6	4.7	49.2	27.3	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0		50.0	
Base Capacity (vph)	2016	932	318	2016	1204	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.43	0.09	0.09	0.52	0.19	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 44.3
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 11.5
 Intersection Capacity Utilization 54.5%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
38 s	32 s
	↖ Ø8
	32 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	1273	288	120	1344	151	67
Future Volume (vph)	1273	288	120	1344	151	67
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		50.0	0.0
Storage Lanes		1	1		0	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.959	
Flt Protected			0.950		0.967	
Satd. Flow (prot)	3390	1547	1729	3390	1626	0
Flt Permitted			0.164		0.967	
Satd. Flow (perm)	3390	1513	298	3390	1626	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		288			21	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	1273	288	120	1344	151	67
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1273	288	120	1344	218	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	41.0	41.0	41.0	41.0	39.0	
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	
Maximum Green (s)	35.1	35.1	35.1	35.1	33.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	35.2	35.2	35.2	35.2	12.9	
Actuated g/C Ratio	0.59	0.59	0.59	0.59	0.22	
v/c Ratio	0.64	0.29	0.69	0.67	0.59	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	10.5	1.9	36.1	11.1	26.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.5	1.9	36.1	11.1	26.0	
LOS	B	A	D	B	C	
Approach Delay	8.9			13.2	26.0	
Approach LOS	A			B	C	
Queue Length 50th (m)	37.7	0.0	7.0	41.0	17.8	
Queue Length 95th (m)	68.1	8.1	#35.0	74.6	34.1	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0		50.0	
Base Capacity (vph)	1994	1008	175	1994	914	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.64	0.29	0.69	0.67	0.24	

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 59.8
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 12.0
 Intersection Capacity Utilization 73.3%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
39 s	41 s
	↖ Ø8
	41 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	769	112	72	619	7	161	31	137	41	37	297
Future Volume (vph)	113	769	112	72	619	7	161	31	137	41	37	297
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.353			0.276			0.732			0.736		
Satd. Flow (perm)	600	3424	1211	469	3293	1521	1331	3458	1439	1340	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140			140			141			289
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	113	769	112	72	619	7	161	31	137	41	37	297
Shared Lane Traffic (%)												
Lane Group Flow (vph)	113	769	112	72	619	7	161	31	137	41	37	297
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	13.2	31.2	31.2	12.6	30.6	30.6	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	17.6%	41.6%	41.6%	16.8%	40.8%	40.8%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Maximum Green (s)	6.8	24.9	24.9	6.2	24.3	24.3	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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	25.2	18.7	18.7	24.1	18.1	18.1	13.3	13.3	13.3	13.3	13.3	13.3
Actuated g/C Ratio	0.44	0.33	0.33	0.42	0.32	0.32	0.23	0.23	0.23	0.23	0.23	0.23

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.30	0.69	0.23	0.23	0.60	0.01	0.52	0.04	0.31	0.13	0.05	0.52
Control Delay	9.5	20.7	3.4	9.2	19.5	0.0	27.1	18.2	6.1	19.7	18.2	6.9
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	9.5	20.7	3.4	9.2	19.5	0.0	27.1	18.2	6.1	19.7	18.2	6.9
LOS	A	C	A	A	B	A	C	B	A	B	B	A
Approach Delay	17.5			18.2			17.5			9.4		
Approach LOS	B			B			B			A		
Queue Length 50th (m)	4.5	32.0	0.0	2.8	25.0	0.0	13.6	1.2	0.0	3.1	1.4	0.6
Queue Length 95th (m)	12.8	55.5	5.9	8.9	44.5	0.0	30.4	4.0	9.9	9.7	4.5	15.5
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	389	1518	615	325	1425	737	592	1539	718	596	1539	826
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	0.29	0.51	0.18	0.22	0.43	0.01	0.27	0.02	0.19	0.07	0.02	0.36

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 57.4

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 16.4

Intersection LOS: B

Intersection Capacity Utilization 62.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
31.2 s	12.6 s	31.2 s
 Ø6	 Ø7	 Ø8
31.2 s	13.2 s	30.6 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	306	729	305	212	841	54	362	97	199	15	135	271
Future Volume (vph)	306	729	305	212	841	54	362	97	199	15	135	271
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.135			0.321			0.666			0.691		
Satd. Flow (perm)	229	3424	1210	546	3293	1520	1211	3458	1439	1258	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			305			105			199			271
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	306	729	305	212	841	54	362	97	199	15	135	271
Shared Lane Traffic (%)												
Lane Group Flow (vph)	306	729	305	212	841	54	362	97	199	15	135	271
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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	43.1	43.1	15.9	38.0	38.0	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	21.0%	43.1%	43.1%	15.9%	38.0%	38.0%	41.0%	41.0%	41.0%	41.0%	41.0%	41.0%
Maximum Green (s)	14.6	36.8	36.8	9.5	31.7	31.7	34.8	34.8	34.8	34.8	34.8	34.8
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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	48.6	34.0	34.0	37.5	28.4	28.4	30.9	30.9	30.9	30.9	30.9	30.9
Actuated g/C Ratio	0.52	0.36	0.36	0.40	0.30	0.30	0.33	0.33	0.33	0.33	0.33	0.33

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.90	0.58	0.48	0.65	0.84	0.10	0.90	0.08	0.33	0.04	0.12	0.40
Control Delay	53.9	26.7	5.5	24.8	39.3	0.9	57.7	22.1	5.0	22.0	22.3	4.9
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	53.9	26.7	5.5	24.8	39.3	0.9	57.7	22.1	5.0	22.0	22.3	4.9
LOS	D	C	A	C	D	A	E	C	A	C	C	A
Approach Delay	28.1			34.7			36.5			11.1		
Approach LOS	C			C			D			B		
Queue Length 50th (m)	38.1	54.2	0.0	19.6	72.1	0.0	59.5	6.0	0.0	1.7	8.5	0.0
Queue Length 95th (m)	#85.7	71.0	15.9	32.1	93.4	1.1	#106.2	11.1	13.0	5.8	14.5	14.9
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	339	1369	667	332	1134	592	458	1307	667	475	1307	734
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	0.90	0.53	0.46	0.64	0.74	0.09	0.79	0.07	0.30	0.03	0.10	0.37

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 93.2

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 29.7

Intersection LOS: C

Intersection Capacity Utilization 93.3%

ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
41 s	15.9 s	43.1 s
 Ø6	 Ø7	 Ø8
41 s	21 s	38 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	965	15	32	304
Future Volume (vph)	24	203	965	15	32	304
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0		0.0	100.0	
Storage Lanes	0	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1547	0	1747	0	1695	1670
Flt Permitted	0.995				0.160	
Satd. Flow (perm)	1547	0	1747	0	285	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	124		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	24	203	965	15	32	304
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	980	0	32	304
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.2		52.8		52.8	52.8
Total Split (%)	34.0%		66.0%		66.0%	66.0%
Maximum Green (s)	22.1		46.9		46.9	46.9
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	12.0		45.0		45.0	45.0
Actuated g/C Ratio	0.18		0.66		0.66	0.66
v/c Ratio	0.61		0.85		0.17	0.28
Control Delay	19.9		19.0		7.8	5.9
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	19.9		19.0		7.8	5.9
LOS	B		B		A	A
Approach Delay	19.9		19.0			6.1
Approach LOS	B		B			A
Queue Length 50th (m)	11.1		66.0		1.1	11.0
Queue Length 95th (m)	28.8		#182.8		5.4	26.9
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)	50.0				100.0	
Base Capacity (vph)	588		1211		197	1157
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.39		0.81		0.16	0.26

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 68
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 16.3
 Intersection Capacity Utilization 78.4%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
52.8 s	
 Ø6	
52.8 s	 Ø8
	27.2 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	88	514	14	143	983
Future Volume (vph)	5	88	514	14	143	983
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0		0.0	100.0	
Storage Lanes	0	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872		0.996			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1537	0	1744	0	1695	1670
Flt Permitted	0.997				0.452	
Satd. Flow (perm)	1537	0	1744	0	807	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	88		3			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	5	88	514	14	143	983
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	528	0	143	983
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.1		52.9		52.9	52.9
Total Split (%)	33.9%		66.1%		66.1%	66.1%
Maximum Green (s)	22.0		47.0		47.0	47.0
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	10.2		55.9		55.9	55.9
Actuated g/C Ratio	0.14		0.78		0.78	0.78
v/c Ratio	0.32		0.39		0.23	0.76
Control Delay	11.0		4.9		4.7	12.5
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	11.0		4.9		4.7	12.5
LOS	B		A		A	B
Approach Delay	11.0		4.9			11.5
Approach LOS	B		A			B
Queue Length 50th (m)	0.6		21.9		5.1	69.9
Queue Length 95th (m)	10.7		36.0		11.0	#160.6
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)	50.0				100.0	
Base Capacity (vph)	538		1354		626	1296
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.17		0.39		0.23	0.76

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 72
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 9.5
 Intersection Capacity Utilization 72.1%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
52.9 s	
 Ø6	
52.9 s	 Ø8
	27.1 s

Intersection						
Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	69	138	6	30	60
Future Vol, veh/h	5	69	138	6	30	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	69	138	6	30	60
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	261	141	0	0	144	0
Stage 1	141	-	-	-	-	-
Stage 2	120	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	728	907	-	-	1438	-
Stage 1	886	-	-	-	-	-
Stage 2	905	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	712	907	-	-	1438	-
Mov Cap-2 Maneuver	712	-	-	-	-	-
Stage 1	886	-	-	-	-	-
Stage 2	885	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.4		0		2.5	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 891	1438	-		
HCM Lane V/C Ratio	-	- 0.083	0.021	-		
HCM Control Delay (s)	-	- 9.4	7.6	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.3	0.1	-		

Intersection						
Int Delay, s/veh	2.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	46	91	15	70	153
Future Vol, veh/h	6	46	91	15	70	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	46	91	15	70	153
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	392	99	0	0	106	0
Stage 1	99	-	-	-	-	-
Stage 2	293	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	567	957	-	-	1485	-
Stage 1	907	-	-	-	-	-
Stage 2	715	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	544	957	-	-	1485	-
Mov Cap-2 Maneuver	544	-	-	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.3		0		2.4	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 880	1485	-		
HCM Lane V/C Ratio	-	- 0.059	0.047	-		
HCM Control Delay (s)	-	- 9.3	7.5	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	82	738	6	28	265
Future Vol, veh/h	21	82	738	6	28	265
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	82	738	6	28	265
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1062	741	0	0	744	0
Stage 1	741	-	-	-	-	-
Stage 2	321	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	201	416	-	-	864	-
Stage 1	408	-	-	-	-	-
Stage 2	691	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	195	416	-	-	864	-
Mov Cap-2 Maneuver	195	-	-	-	-	-
Stage 1	408	-	-	-	-	-
Stage 2	665	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	20.3		0		0.9	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 338	864	-		
HCM Lane V/C Ratio	-	- 0.305	0.032	-		
HCM Control Delay (s)	-	- 20.3	9.3	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 1.3	0.1	-		

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	55	387	23	86	734
Future Vol, veh/h	13	55	387	23	86	734
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	55	387	23	86	734
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1305	399	0	0	410	0
Stage 1	399	-	-	-	-	-
Stage 2	906	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	177	651	-	-	1149	-
Stage 1	678	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	155	651	-	-	1149	-
Mov Cap-2 Maneuver	155	-	-	-	-	-
Stage 1	678	-	-	-	-	-
Stage 2	344	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	15.7		0		0.9	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 404	1149	-		
HCM Lane V/C Ratio	-	- 0.168	0.075	-		
HCM Control Delay (s)	-	- 15.7	8.4	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 0.6	0.2	-		

Intersection						
Int Delay, s/veh	3.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	5	5	37	31	9
Future Vol, veh/h	35	5	5	37	31	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	5	5	37	31	9
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	83	36	40	0	-	0
Stage 1	36	-	-	-	-	-
Stage 2	47	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	919	1037	1570	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	916	1037	1570	-	-	-
Mov Cap-2 Maneuver	916	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	972	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9	0.9		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1570	-	930	-	-	
HCM Lane V/C Ratio	0.003	-	0.043	-	-	
HCM Control Delay (s)	7.3	0	9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	5	5	24	45	23
Future Vol, veh/h	19	5	5	24	45	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	5	5	24	45	23
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	91	57	68	0	-	0
Stage 1	57	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	909	1009	1533	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	988	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	906	1009	1533	-	-	-
Mov Cap-2 Maneuver	906	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	985	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9	1.3		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1533	-	926	-	-	
HCM Lane V/C Ratio	0.003	-	0.026	-	-	
HCM Control Delay (s)	7.4	0	9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Future (2031) Background

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	1406	162	105	984	205	417	548	116	69	110	214
Future Volume (vph)	184	1406	162	105	984	205	417	548	116	69	110	214
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3390	1421	3048	3293	1408	3155	3390	1374	2537	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			205			143			143
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	184	1406	162	105	984	205	417	548	116	69	110	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	184	1406	162	105	984	205	417	548	116	69	110	214
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	16.0	52.6	52.6	12.0	48.6	48.6	21.0	51.0	51.0	14.4	44.4	44.4
Total Split (%)	12.3%	40.5%	40.5%	9.2%	37.4%	37.4%	16.2%	39.2%	39.2%	11.1%	34.2%	34.2%
Maximum Green (s)	9.2	46.1	46.1	5.2	42.1	42.1	14.3	44.4	44.4	7.7	37.8	37.8
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	9.1	46.2	46.2	5.2	42.3	42.3	14.3	26.8	26.8	7.3	17.0	17.0
Actuated g/C Ratio	0.08	0.42	0.42	0.05	0.39	0.39	0.13	0.24	0.24	0.07	0.16	0.16

1: River Road & Earl Armstrong Road

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.67	0.98	0.24	0.72	0.77	0.31	1.01	0.66	0.26	0.41	0.22	0.62
Control Delay	62.8	52.3	5.9	80.2	35.2	4.8	94.5	42.3	4.6	58.1	40.6	23.1
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	62.8	52.3	5.9	80.2	35.2	4.8	94.5	42.3	4.6	58.1	40.6	23.1
LOS	E	D	A	F	D	A	F	D	A	E	D	C
Approach Delay	49.1			34.1			58.4			34.2		
Approach LOS	D			C			E			C		
Queue Length 50th (m)	18.3	139.9	2.1	10.6	87.4	0.0	~42.9	53.2	0.0	6.7	10.0	12.5
Queue Length 95th (m)	#33.6	#210.1	14.6	#25.0	123.8	14.0	#79.4	69.9	8.0	14.3	17.3	34.0
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	276	1431	682	145	1273	670	414	1378	643	179	1129	596
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	0.67	0.98	0.24	0.72	0.77	0.31	1.01	0.40	0.18	0.39	0.10	0.36

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 109.4

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 45.7

Intersection LOS: D

Intersection Capacity Utilization 89.7%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

 Ø1	 Ø2	 Ø3	 Ø4
14.4 s	51 s	12 s	52.6 s
 Ø5	 Ø6	 Ø7	 Ø8
21 s	44.4 s	16 s	48.6 s

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	1260	461	184	1240	116	278	222	127	156	417	351
Future Volume (vph)	310	1260	461	184	1240	116	278	222	127	156	417	351
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.98			0.98	1.00					0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3325	1488	3288	3390	1279	3257	3357	1502	2683	3424	1532
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3317	3325	1456	3288	3390	1258	3247	3357	1502	2683	3424	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			306			143			143			177
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3					3	3					3
Confl. Bikes (#/hr)			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%	4%	4%	2%	2%	21%	3%	3%	3%	25%	1%	1%
Adj. Flow (vph)	310	1260	461	184	1240	116	278	222	127	156	417	351
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	1260	461	184	1240	116	278	222	127	156	417	351
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	18.0	52.0	52.0	17.0	51.0	51.0	17.4	43.8	43.8	17.2	43.6	43.6
Total Split (%)	13.8%	40.0%	40.0%	13.1%	39.2%	39.2%	13.4%	33.7%	33.7%	13.2%	33.5%	33.5%
Maximum Green (s)	11.2	45.5	45.5	10.2	44.5	44.5	10.7	37.2	37.2	10.5	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	11.3	46.1	46.1	9.9	44.7	44.7	10.8	23.9	23.9	10.1	23.2	23.2
Actuated g/C Ratio	0.10	0.40	0.40	0.08	0.38	0.38	0.09	0.20	0.20	0.09	0.20	0.20

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.97	0.96	0.61	0.66	0.95	0.20	0.93	0.32	0.30	0.67	0.61	0.79
Control Delay	96.5	52.5	13.7	65.3	52.4	3.3	90.0	40.1	6.1	68.0	46.0	34.8
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	96.5	52.5	13.7	65.3	52.4	3.3	90.0	40.1	6.1	68.0	46.0	34.8
LOS	F	D	B	E	D	A	F	D	A	E	D	C
Approach Delay	50.4			50.2			55.3			45.5		
Approach LOS	D			D			E			D		
Queue Length 50th (m)	33.4	131.4	22.7	19.2	128.7	0.0	29.8	21.1	0.0	16.3	42.2	35.7
Queue Length 95th (m)	#68.9	#213.6	64.3	#35.8	#209.2	7.2	#62.1	31.0	10.6	#32.7	56.4	66.6
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	320	1313	760	288	1299	570	300	1075	578	242	1091	601
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	0.97	0.96	0.61	0.64	0.95	0.20	0.93	0.21	0.22	0.64	0.38	0.58

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 116.7

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 50.1

Intersection LOS: D

Intersection Capacity Utilization 89.9%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
17.2 s	43.8 s	17 s	52 s
 Ø5	 Ø6	 Ø7	 Ø8
17.4 s	43.6 s	18 s	51 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	917	75	28	1091	108	111
Future Volume (vph)	917	75	28	1091	108	111
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		50.0	0.0
Storage Lanes		1	1		0	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.932	
Flt Protected			0.950		0.976	
Satd. Flow (prot)	3390	1547	1729	3390	1608	0
Flt Permitted			0.277		0.976	
Satd. Flow (perm)	3390	1514	504	3390	1608	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		75			39	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	917	75	28	1091	108	111
Shared Lane Traffic (%)						
Lane Group Flow (vph)	917	75	28	1091	219	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	32.0	32.0	32.0	32.0	38.0	
Total Split (%)	45.7%	45.7%	45.7%	45.7%	54.3%	
Maximum Green (s)	26.1	26.1	26.1	26.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	None	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effct Green (s)	24.5	24.5	24.5	24.5	11.8	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.25	
v/c Ratio	0.53	0.09	0.11	0.63	0.52	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	9.6	2.6	8.2	10.9	17.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	9.6	2.6	8.2	10.9	17.6	
LOS	A	A	A	B	B	
Approach Delay	9.1			10.8	17.6	
Approach LOS	A			B	B	
Queue Length 50th (m)	21.1	0.0	1.0	27.1	11.1	
Queue Length 95th (m)	40.2	4.3	4.5	51.0	26.7	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0		50.0	
Base Capacity (vph)	1902	882	282	1902	1100	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.48	0.09	0.10	0.57	0.20	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 48.1
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.63
 Intersection Signal Delay: 10.7
 Intersection Capacity Utilization 55.1%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
38 s	32 s
	↖ Ø8
	32 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	1330	274	116	1406	145	65
Future Volume (vph)	1330	274	116	1406	145	65
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		60.0	0.0
Storage Lanes		1	1		0	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.97				
Frt		0.850			0.958	
Flt Protected			0.950		0.967	
Satd. Flow (prot)	3390	1547	1729	3390	1652	0
Flt Permitted			0.153		0.967	
Satd. Flow (perm)	3390	1505	278	3390	1652	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		274			17	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		4	4			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	3%	0%
Adj. Flow (vph)	1330	274	116	1406	145	65
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1330	274	116	1406	210	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	41.0	41.0	41.0	41.0	39.0	
Total Split (%)	51.3%	51.3%	51.3%	51.3%	48.8%	
Maximum Green (s)	35.1	35.1	35.1	35.1	33.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	None	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	37.6	37.6	37.6	37.6	12.8	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.21	
v/c Ratio	0.65	0.27	0.69	0.69	0.59	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	10.5	1.8	37.6	11.1	27.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.5	1.8	37.6	11.1	27.0	
LOS	B	A	D	B	C	
Approach Delay	9.0			13.1	27.0	
Approach LOS	A			B	C	
Queue Length 50th (m)	39.8	0.0	6.9	43.5	17.4	
Queue Length 95th (m)	71.8	7.8	#34.7	79.0	33.3	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0		60.0	
Base Capacity (vph)	2051	1019	168	2051	895	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.65	0.27	0.69	0.69	0.23	

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 62.1
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 12.0
 Intersection Capacity Utilization 74.5%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
39 s	41 s
	↖ Ø8
	41 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	812	111	70	651	7	156	29	131	44	36	316
Future Volume (vph)	119	812	111	70	651	7	156	29	131	44	36	316
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.307			0.275			0.732			0.737		
Satd. Flow (perm)	522	3424	1210	467	3293	1519	1330	3458	1439	1341	3458	1496
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			111			81			131			292
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	119	812	111	70	651	7	156	29	131	44	36	316
Shared Lane Traffic (%)												
Lane Group Flow (vph)	119	812	111	70	651	7	156	29	131	44	36	316
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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	65.0	65.0	17.0	60.0	60.0	48.0	48.0	48.0	48.0	48.0	48.0
Total Split (%)	16.9%	50.0%	50.0%	13.1%	46.2%	46.2%	36.9%	36.9%	36.9%	36.9%	36.9%	36.9%
Maximum Green (s)	15.6	58.7	58.7	10.6	53.7	53.7	41.8	41.8	41.8	41.8	41.8	41.8
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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	31.0	22.4	22.4	27.2	20.5	20.5	14.0	14.0	14.0	14.0	14.0	14.0
Actuated g/C Ratio	0.49	0.36	0.36	0.43	0.33	0.33	0.22	0.22	0.22	0.22	0.22	0.22

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BG - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.29	0.66	0.22	0.21	0.60	0.01	0.53	0.04	0.31	0.15	0.05	0.56
Control Delay	8.8	20.2	4.7	8.9	20.8	0.0	30.1	21.0	7.1	22.7	21.0	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	8.8	20.2	4.7	8.9	20.8	0.0	30.1	21.0	7.1	22.7	21.0	8.6
LOS	A	C	A	A	C	A	C	C	A	C	C	A
Approach Delay	17.2			19.5			19.7			11.3		
Approach LOS	B			B			B			B		
Queue Length 50th (m)	5.0	35.6	0.0	2.8	28.8	0.0	14.2	1.2	0.0	3.6	1.5	2.0
Queue Length 95th (m)	13.3	62.0	8.3	8.6	52.5	0.0	34.4	4.4	11.2	11.9	5.2	20.4
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	577	3124	1114	433	2845	1323	912	2373	1029	920	2373	1118
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	0.21	0.26	0.10	0.16	0.23	0.01	0.17	0.01	0.13	0.05	0.02	0.28

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 62.7

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 17.3

Intersection LOS: B

Intersection Capacity Utilization 64.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
48 s	17 s	65 s
 Ø6	 Ø7	 Ø8
48 s	22 s	60 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	328	771	300	206	889	57	353	95	194	16	131	290
Future Volume (vph)	328	771	300	206	889	57	353	95	194	16	131	290
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor			0.98	1.00		0.98						0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3390	1547	1729	3424	1547	1729	3458	1547	1729	3458	1517
Flt Permitted	0.128			0.312			0.669			0.692		
Satd. Flow (perm)	231	3390	1510	567	3424	1521	1218	3458	1547	1259	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			300			116			194			285
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)			2	2								
Confl. Bikes (#/hr)						6						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%	2%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%
Adj. Flow (vph)	328	771	300	206	889	57	353	95	194	16	131	290
Shared Lane Traffic (%)												
Lane Group Flow (vph)	328	771	300	206	889	57	353	95	194	16	131	290
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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	38.0	38.0	15.0	32.0	32.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	23.3%	42.2%	42.2%	16.7%	35.6%	35.6%	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%
Maximum Green (s)	14.6	31.7	31.7	8.6	25.7	25.7	30.8	30.8	30.8	30.8	30.8	30.8
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	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	Min	Min	None	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	45.5	31.1	31.1	33.0	24.8	24.8	27.8	27.8	27.8	27.8	27.8	27.8
Actuated g/C Ratio	0.53	0.36	0.36	0.38	0.29	0.29	0.32	0.32	0.32	0.32	0.32	0.32

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BG - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.88	0.63	0.41	0.63	0.90	0.11	0.90	0.09	0.31	0.04	0.12	0.43
Control Delay	47.0	26.2	4.5	22.6	44.1	0.6	55.9	20.5	4.7	20.2	20.8	5.1
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	47.0	26.2	4.5	22.6	44.1	0.6	55.9	20.5	4.7	20.2	20.8	5.1
LOS	D	C	A	C	D	A	E	C	A	C	C	A
Approach Delay	26.4			38.1			35.2			10.4		
Approach LOS	C			D			D			B		
Queue Length 50th (m)	37.2	53.4	0.0	17.0	71.6	0.0	51.5	5.3	0.0	1.7	7.4	0.5
Queue Length 95th (m)	#81.8	71.1	14.7	28.6	#103.9	0.7	#95.2	10.1	12.4	5.6	13.1	15.4
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	373	1254	747	335	1026	537	437	1242	680	452	1242	720
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	0.88	0.61	0.40	0.61	0.87	0.11	0.81	0.08	0.29	0.04	0.11	0.40

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 86.2

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 29.8

Intersection LOS: C

Intersection Capacity Utilization 95.0%

ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
37 s	15 s	38 s
 Ø6	 Ø7	 Ø8
37 s	21 s	32 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	988	15	32	312
Future Volume (vph)	24	203	988	15	32	312
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1547	0	1747	0	1695	1670
Flt Permitted	0.995				0.152	
Satd. Flow (perm)	1547	0	1747	0	271	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	117		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	24	203	988	15	32	312
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	1003	0	32	312
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.2		52.8		52.8	52.8
Total Split (%)	34.0%		66.0%		66.0%	66.0%
Maximum Green (s)	22.1		46.9		46.9	46.9
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effect Green (s)	12.2		47.1		47.1	47.1
Actuated g/C Ratio	0.17		0.67		0.67	0.67
v/c Ratio	0.62		0.86		0.18	0.28
Control Delay	21.3		19.7		8.1	6.0
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	21.3		19.7		8.1	6.0
LOS	C		B		A	A
Approach Delay	21.3		19.7			6.2
Approach LOS	C		B			A
Queue Length 50th (m)	12.0		71.0		1.1	11.6
Queue Length 95th (m)	29.9		#191.3		5.5	28.1
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	567		1172		181	1120
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.40		0.86		0.18	0.28

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 70.3

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 17.0

Intersection LOS: B

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.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
52.8 s	
 Ø6	
52.8 s	 Ø8
	27.2 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	88	522	14	143	1003
Future Volume (vph)	5	88	522	14	143	1003
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0		0.0	100.0	
Storage Lanes	0	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872		0.996			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1551	0	1777	0	1695	1784
Flt Permitted	0.997				0.447	
Satd. Flow (perm)	1551	0	1777	0	798	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	88		3			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		279.5			234.8
Travel Time (s)	27.9		12.6			10.6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	88	522	14	143	1003
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	536	0	143	1003
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.1		52.9		52.9	52.9
Total Split (%)	33.9%		66.1%		66.1%	66.1%
Maximum Green (s)	22.0		47.0		47.0	47.0
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	10.5		53.0		53.0	53.0
Actuated g/C Ratio	0.15		0.77		0.77	0.77
v/c Ratio	0.30		0.39		0.23	0.73
Control Delay	10.6		5.0		4.9	10.9
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	10.6		5.0		4.9	10.9

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	B		A		A	B
Approach Delay	10.6		5.0			10.2
Approach LOS	B		A			B
Queue Length 50th (m)	0.6		22.2		5.1	67.0
Queue Length 95th (m)	10.7		36.1		11.1	#123.9
Internal Link Dist (m)	363.6		255.5			210.8
Turn Bay Length (m)	50.0				100.0	
Base Capacity (vph)	580		1375		617	1380
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.16		0.39		0.23	0.73

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 68.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 8.6

Intersection LOS: A

Intersection Capacity Utilization 73.2%

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.

Splits and Phases: 4: River Road & Summerhill St

 Ø2		
52.9 s		
 Ø6		
52.9 s		
	 Ø8	
	27.1 s	

Intersection						
Int Delay, s/veh	3.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	69	131	6	30	59
Future Vol, veh/h	5	69	131	6	30	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	69	131	6	30	59
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	253	134	0	0	137	0
Stage 1	134	-	-	-	-	-
Stage 2	119	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	736	915	-	-	1447	-
Stage 1	892	-	-	-	-	-
Stage 2	906	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	721	915	-	-	1447	-
Mov Cap-2 Maneuver	721	-	-	-	-	-
Stage 1	892	-	-	-	-	-
Stage 2	887	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.4		0		2.5	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 899	1447	-		
HCM Lane V/C Ratio	-	- 0.082	0.021	-		
HCM Control Delay (s)	-	- 9.4	7.5	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.3	0.1	-		

Intersection						
Int Delay, s/veh	2.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	46	87	15	70	146
Future Vol, veh/h	6	46	87	15	70	146
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	10	2	33	0	2
Mvmt Flow	6	46	87	15	70	146
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	381	95	0	0	102	0
Stage 1	95	-	-	-	-	-
Stage 2	286	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.2	-
Pot Cap-1 Maneuver	625	940	-	-	1503	-
Stage 1	934	-	-	-	-	-
Stage 2	767	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	593	940	-	-	1503	-
Mov Cap-2 Maneuver	593	-	-	-	-	-
Stage 1	934	-	-	-	-	-
Stage 2	728	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.3		0		2.4	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	881	1503	-	
HCM Lane V/C Ratio	-	-	0.059	0.047	-	
HCM Control Delay (s)	-	-	9.3	7.5	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-	

Intersection						
Int Delay, s/veh	1.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	75	783	6	26	280
Future Vol, veh/h	20	75	783	6	26	280
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	75	783	6	26	280
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1118	786	0	0	789	0
Stage 1	786	-	-	-	-	-
Stage 2	332	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	184	392	-	-	831	-
Stage 1	385	-	-	-	-	-
Stage 2	681	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	179	392	-	-	831	-
Mov Cap-2 Maneuver	179	-	-	-	-	-
Stage 1	385	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	21.4		0		0.8	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 313	831	-		
HCM Lane V/C Ratio	-	- 0.304	0.031	-		
HCM Control Delay (s)	-	- 21.4	9.5	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 1.2	0.1	-		

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	51	408	22	79	775
Future Vol, veh/h	12	51	408	22	79	775
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	51	408	22	79	775
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1352	419	0	0	430	0
Stage 1	419	-	-	-	-	-
Stage 2	933	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	165	634	-	-	1129	-
Stage 1	664	-	-	-	-	-
Stage 2	383	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	145	634	-	-	1129	-
Mov Cap-2 Maneuver	145	-	-	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	16.1		0		0.8	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 386	1129	-		
HCM Lane V/C Ratio	-	- 0.163	0.07	-		
HCM Control Delay (s)	-	- 16.1	8.4	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 0.6	0.2	-		

Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	5	5	39	33	8
Future Vol, veh/h	33	5	5	39	33	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	5	5	39	33	8
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	86	37	41	0	-	0
Stage 1	37	-	-	-	-	-
Stage 2	49	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	915	1035	1568	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	973	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	912	1035	1568	-	-	-
Mov Cap-2 Maneuver	912	-	-	-	-	-
Stage 1	985	-	-	-	-	-
Stage 2	970	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.1	0.8		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1568	-	926	-	-	
HCM Lane V/C Ratio	0.003	-	0.041	-	-	
HCM Control Delay (s)	7.3	0	9.1	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	17	5	5	26	46	21
Future Vol, veh/h	17	5	5	26	46	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	5	5	26	46	21
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	93	57	67	0	-	0
Stage 1	57	-	-	-	-	-
Stage 2	36	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	907	1009	1535	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	986	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	904	1009	1535	-	-	-
Mov Cap-2 Maneuver	904	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9	1.2		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1535	-	926	-	-	
HCM Lane V/C Ratio	0.003	-	0.024	-	-	
HCM Control Delay (s)	7.4	0	9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Future (2021) Background Plus
Site Generated

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	263	1218	164	117	901	176	434	549	148	57	108	204
Future Volume (vph)	263	1218	164	117	901	176	434	549	148	57	108	204
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3282	3390	1421	3048	3293	1408	3155	3390	1374	2537	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			200			200			143			199
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	263	1218	164	117	901	176	434	549	148	57	108	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	263	1218	164	117	901	176	434	549	148	57	108	204
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	18.2	50.4	50.4	12.3	44.5	44.5	23.7	53.5	53.5	13.8	43.6	43.6
Total Split (%)	14.0%	38.8%	38.8%	9.5%	34.2%	34.2%	18.2%	41.2%	41.2%	10.6%	33.5%	33.5%
Maximum Green (s)	11.4	43.9	43.9	5.5	38.0	38.0	17.0	46.9	46.9	7.1	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	11.4	44.0	44.0	5.5	38.1	38.1	17.0	27.0	27.0	6.8	14.1	14.1
Actuated g/C Ratio	0.11	0.41	0.41	0.05	0.36	0.36	0.16	0.25	0.25	0.06	0.13	0.13

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.75	0.88	0.23	0.75	0.77	0.28	0.86	0.64	0.33	0.36	0.25	0.56
Control Delay	61.7	38.3	2.4	79.6	36.7	3.8	62.9	40.6	8.2	55.8	42.7	12.7
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	61.7	38.3	2.4	79.6	36.7	3.8	62.9	40.6	8.2	55.8	42.7	12.7
LOS	E	D	A	E	D	A	E	D	A	E	D	B
Approach Delay	38.5			36.1			44.9			28.1		
Approach LOS	D			D			D			C		
Queue Length 50th (m)	25.4	109.3	0.0	11.5	78.8	0.0	41.9	51.7	0.8	5.4	9.9	0.9
Queue Length 95th (m)	#45.8	#165.4	7.0	#26.8	112.2	9.9	#72.2	68.2	14.6	12.0	17.3	19.1
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	349	1389	700	156	1168	628	502	1484	682	168	1126	632
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	0.75	0.88	0.23	0.75	0.77	0.28	0.86	0.37	0.22	0.34	0.10	0.32

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 107.3

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 38.6

Intersection LOS: D

Intersection Capacity Utilization 82.4%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
13.8 s	53.5 s	12.3 s	50.4 s
 Ø5	 Ø6	 Ø7	 Ø8
23.7 s	43.6 s	18.2 s	44.5 s

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	296	1115	478	220	1017	82	282	217	144	105	422	503
Future Volume (vph)	296	1115	478	220	1017	82	282	217	144	105	422	503
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3390	1421	3048	3293	1408	3158	3390	1374	2535	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			306			143			144			187
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	296	1115	478	220	1017	82	282	217	144	105	422	503
Shared Lane Traffic (%)												
Lane Group Flow (vph)	296	1115	478	220	1017	82	282	217	144	105	422	503
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	19.5	50.6	50.6	16.8	47.9	47.9	19.0	45.0	45.0	17.6	43.6	43.6
Total Split (%)	15.0%	38.9%	38.9%	12.9%	36.8%	36.8%	14.6%	34.6%	34.6%	13.5%	33.5%	33.5%
Maximum Green (s)	12.7	44.1	44.1	10.0	41.4	41.4	12.3	38.4	38.4	10.9	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	12.7	44.0	44.0	10.0	41.3	41.3	12.3	37.2	37.2	9.7	34.6	34.6
Actuated g/C Ratio	0.10	0.34	0.34	0.08	0.32	0.32	0.10	0.29	0.29	0.08	0.27	0.27

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2021) BGSB - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.91	0.95	0.69	0.92	0.95	0.15	0.92	0.22	0.29	0.54	0.48	0.95
Control Delay	87.7	58.7	18.5	99.7	61.2	0.6	93.0	35.0	6.9	68.0	40.8	57.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.7	58.7	18.5	99.7	61.2	0.6	93.0	35.0	6.9	68.0	40.8	57.2
LOS	F	E	B	F	E	A	F	D	A	E	D	E
Approach Delay	53.1			63.9			54.1			51.6		
Approach LOS	D			E			D			D		
Queue Length 50th (m)	36.2	135.9	34.9	27.1	124.4	0.0	34.6	20.2	0.0	12.4	43.1	78.4
Queue Length 95th (m)	#60.7	#177.7	72.8	#49.4	#165.0	0.2	#59.2	30.0	14.0	21.3	57.6	#140.0
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	327	1173	692	239	1070	553	305	1030	517	217	947	554
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	0.91	0.95	0.69	0.92	0.95	0.15	0.92	0.21	0.28	0.48	0.45	0.91

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 127.6

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 55.8

Intersection LOS: E

Intersection Capacity Utilization 87.8%

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.

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

 Ø1	 Ø2	 Ø3	 Ø4
17.6 s	45 s	16.8 s	50.6 s
 Ø5	 Ø6	 Ø7	 Ø8
19 s	43.6 s	19.5 s	47.9 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	860	23	21	968	72	87
Future Volume (vph)	860	23	21	968	72	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.926	
Flt Protected			0.950		0.978	
Satd. Flow (prot)	3390	1547	1729	3390	1603	0
Flt Permitted			0.319		0.978	
Satd. Flow (perm)	3390	1514	580	3390	1603	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		23			49	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	860	23	21	968	72	87
Shared Lane Traffic (%)						
Lane Group Flow (vph)	860	23	21	968	159	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	32.0	32.0	32.0	32.0	38.0	
Total Split (%)	45.7%	45.7%	45.7%	45.7%	54.3%	
Maximum Green (s)	26.1	26.1	26.1	26.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	None	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effct Green (s)	24.5	24.5	24.5	24.5	10.6	
Actuated g/C Ratio	0.59	0.59	0.59	0.59	0.26	
v/c Ratio	0.43	0.03	0.06	0.48	0.35	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	7.7	3.1	6.7	8.2	13.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	7.7	3.1	6.7	8.2	13.1	
LOS	A	A	A	A	B	
Approach Delay	7.6			8.2	13.1	
Approach LOS	A			A	B	
Queue Length 50th (m)	18.5	0.0	0.7	21.8	5.5	
Queue Length 95th (m)	31.7	2.1	3.1	37.1	18.5	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	2197	989	375	2197	1278	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.39	0.02	0.06	0.44	0.12	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 41.3
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.48
 Intersection Signal Delay: 8.3
 Intersection Capacity Utilization 47.8%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↙ Ø2	→ Ø4
38 s	32 s
	↖ Ø8
	32 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	1215	131	91	1245	67	50
Future Volume (vph)	1215	131	91	1245	67	50
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.942	
Flt Protected			0.950		0.972	
Satd. Flow (prot)	3390	1547	1729	3390	1613	0
Flt Permitted			0.191		0.972	
Satd. Flow (perm)	3390	1513	348	3390	1613	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		131			28	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	1215	131	91	1245	67	50
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1215	131	91	1245	117	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	42.0	42.0	42.0	42.0	38.0	
Total Split (%)	52.5%	52.5%	52.5%	52.5%	47.5%	
Maximum Green (s)	36.1	36.1	36.1	36.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	Min	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	36.1	36.1	36.1	36.1	10.4	
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.18	
v/c Ratio	0.58	0.13	0.42	0.59	0.38	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	8.0	1.5	13.5	8.2	20.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.0	1.5	13.5	8.2	20.5	
LOS	A	A	B	A	C	
Approach Delay	7.4			8.6	20.5	
Approach LOS	A			A	C	
Queue Length 50th (m)	30.5	0.0	3.8	31.6	7.7	
Queue Length 95th (m)	48.3	4.4	14.8	50.3	18.8	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	2103	988	216	2103	904	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.58	0.13	0.42	0.59	0.13	

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 58.2
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.59
 Intersection Signal Delay: 8.5
 Intersection Capacity Utilization 66.8%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↙ Ø2	→ Ø4
38 s	42 s
	↖ Ø8
	42 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	767	87	45	595	7	116	8	76	38	21	280
Future Volume (vph)	98	767	87	45	595	7	116	8	76	38	21	280
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.363			0.305			0.743			0.752		
Satd. Flow (perm)	617	3424	1211	519	3293	1521	1351	3458	1439	1369	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140			140			141			264
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	98	767	87	45	595	7	116	8	76	38	21	280
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	767	87	45	595	7	116	8	76	38	21	280
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	13.0	32.4	32.4	11.4	30.8	30.8	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	17.3%	43.2%	43.2%	15.2%	41.1%	41.1%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Maximum Green (s)	6.6	26.1	26.1	5.0	24.5	24.5	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	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	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
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		0	0	0	0	0	0	0	0
Act Effct Green (s)	24.6	18.3	18.3	21.9	16.9	16.9	11.4	11.4	11.4	11.4	11.4	11.4
Actuated g/C Ratio	0.46	0.34	0.34	0.41	0.31	0.31	0.21	0.21	0.21	0.21	0.21	0.21

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.24	0.66	0.17	0.14	0.58	0.01	0.41	0.01	0.18	0.13	0.03	0.53
Control Delay	7.7	18.2	1.8	7.4	17.9	0.0	24.7	18.6	1.9	20.2	18.8	8.1
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	7.7	18.2	1.8	7.4	17.9	0.0	24.7	18.6	1.9	20.2	18.8	8.1
LOS	A	B	A	A	B	A	C	B	A	C	B	A
Approach Delay	15.6			17.0			15.8			10.1		
Approach LOS	B			B			B			B		
Queue Length 50th (m)	3.4	28.2	0.0	1.5	21.9	0.0	8.9	0.3	0.0	2.7	0.7	1.2
Queue Length 95th (m)	9.5	47.5	2.7	5.2	37.7	0.0	22.8	1.7	2.1	9.4	3.1	16.7
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	408	1680	665	313	1517	776	635	1626	751	643	1626	843
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	0.24	0.46	0.13	0.14	0.39	0.01	0.18	0.00	0.10	0.06	0.01	0.33

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 54

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 15.2

Intersection LOS: B

Intersection Capacity Utilization 60.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
31.2 s	11.4 s	32.4 s
 Ø6	 Ø7	 Ø8
31.2 s	13 s	30.8 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	303	747	220	105	855	50	205	46	96	14	62	279
Future Volume (vph)	303	747	220	105	855	50	205	46	96	14	62	279
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	55.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.155			0.368			0.714			0.725		
Satd. Flow (perm)	263	3424	1210	625	3293	1520	1298	3458	1438	1320	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			220			175			176			279
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	303	747	220	105	855	50	205	46	96	14	62	279
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	747	220	105	855	50	205	46	96	14	62	279
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	26.0	54.8	54.8	13.2	42.0	42.0	32.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	26.0%	54.8%	54.8%	13.2%	42.0%	42.0%	32.0%	32.0%	32.0%	32.0%	32.0%	32.0%
Maximum Green (s)	19.6	48.5	48.5	6.8	35.7	35.7	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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	48.5	35.7	35.7	33.4	26.6	26.6	17.8	17.8	17.8	17.8	17.8	17.8
Actuated g/C Ratio	0.60	0.45	0.45	0.42	0.33	0.33	0.22	0.22	0.22	0.22	0.22	0.22

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2021) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.71	0.49	0.33	0.31	0.78	0.08	0.71	0.06	0.21	0.05	0.08	0.51
Control Delay	24.1	16.9	3.6	11.8	30.7	0.3	45.6	27.2	1.1	28.0	27.3	7.4
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	24.1	16.9	3.6	11.8	30.7	0.3	45.6	27.2	1.1	28.0	27.3	7.4
LOS	C	B	A	B	C	A	D	C	A	C	C	A
Approach Delay	16.3			27.2			30.8			11.7		
Approach LOS	B			C			C			B		
Queue Length 50th (m)	21.0	36.8	0.0	5.4	57.3	0.0	27.3	2.7	0.0	1.6	3.7	0.0
Queue Length 95th (m)	#55.3	58.1	10.6	13.2	89.4	0.0	54.2	7.3	0.0	6.3	9.1	17.5
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	55.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	508	2254	871	351	1540	804	438	1168	602	446	1168	690
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	0.60	0.33	0.25	0.30	0.56	0.06	0.47	0.04	0.16	0.03	0.05	0.40

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 80.2

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.2

Intersection LOS: C

Intersection Capacity Utilization 77.1%

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.

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
32 s	13.2 s	54.8 s
 Ø6	 Ø7	 Ø8
32 s	26 s	42 s

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	986	15	32	310
Future Volume (vph)	24	203	986	15	32	310
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0		0.0	100.0	
Storage Lanes	0	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1547	0	1747	0	1695	1670
Flt Permitted	0.995				0.153	
Satd. Flow (perm)	1547	0	1747	0	273	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	118		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	24	203	986	15	32	310
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	1001	0	32	310
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.2		52.8		52.8	52.8
Total Split (%)	34.0%		66.0%		66.0%	66.0%
Maximum Green (s)	22.1		46.9		46.9	46.9
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effect Green (s)	12.1		46.9		46.9	46.9
Actuated g/C Ratio	0.17		0.67		0.67	0.67
v/c Ratio	0.62		0.86		0.18	0.28
Control Delay	21.1		19.6		8.1	5.9
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	21.1		19.6		8.1	5.9
LOS	C		B		A	A
Approach Delay	21.1		19.6			6.1
Approach LOS	C		B			A
Queue Length 50th (m)	11.9		70.3		1.1	11.4
Queue Length 95th (m)	29.7		#190.4		5.5	27.9
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)	50.0				100.0	
Base Capacity (vph)	569		1173		183	1120
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.40		0.85		0.17	0.28

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 70.1

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 16.9

Intersection LOS: B

Intersection Capacity Utilization 79.5%

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.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
52.8 s	
 Ø6	
52.8 s	 Ø8
	27.2 s

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	88	518	14	143	1010
Future Volume (vph)	5	88	518	14	143	1010
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872		0.996			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1537	0	1744	0	1695	1670
Flt Permitted	0.997				0.449	
Satd. Flow (perm)	1537	0	1744	0	801	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	88		3			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	5	88	518	14	143	1010
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	532	0	143	1010
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.1		52.9		52.9	52.9
Total Split (%)	33.9%		66.1%		66.1%	66.1%
Maximum Green (s)	22.0		47.0		47.0	47.0
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	10.1		57.4		57.4	57.4
Actuated g/C Ratio	0.14		0.78		0.78	0.78
v/c Ratio	0.33		0.39		0.23	0.78
Control Delay	11.1		4.9		4.7	13.4
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	11.1		4.9		4.7	13.4
LOS	B		A		A	B
Approach Delay	11.1		4.9			12.3
Approach LOS	B		A			B
Queue Length 50th (m)	0.6		22.2		5.1	74.7
Queue Length 95th (m)	10.7		36.3		11.1	#167.9
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	521		1354		621	1296
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.18		0.39		0.23	0.78

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 74

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 10.1

Intersection LOS: B

Intersection Capacity Utilization 73.6%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2		
52.9 s		
 Ø6		
52.9 s		
	 Ø8	
	27.1 s	

Intersection						
Int Delay, s/veh	4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	69	68	6	30	41
Future Vol, veh/h	5	69	68	6	30	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	69	68	6	30	41
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	172	71	0	0	74	0
Stage 1	71	-	-	-	-	-
Stage 2	101	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	818	991	-	-	1526	-
Stage 1	952	-	-	-	-	-
Stage 2	923	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	802	991	-	-	1526	-
Mov Cap-2 Maneuver	802	-	-	-	-	-
Stage 1	952	-	-	-	-	-
Stage 2	905	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9		0		3.1	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 975	1526	-		
HCM Lane V/C Ratio	-	- 0.076	0.02	-		
HCM Control Delay (s)	-	- 9	7.4	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	3.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	46	53	15	70	75
Future Vol, veh/h	6	46	53	15	70	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	46	53	15	70	75
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	276	61	0	0	68	0
Stage 1	61	-	-	-	-	-
Stage 2	215	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	714	1004	-	-	1533	-
Stage 1	962	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	680	1004	-	-	1533	-
Mov Cap-2 Maneuver	680	-	-	-	-	-
Stage 1	962	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9		0		3.6	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 952	1533	-		
HCM Lane V/C Ratio	-	- 0.055	0.046	-		
HCM Control Delay (s)	-	- 9	7.5	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.1	-		

Intersection						
Int Delay, s/veh	5.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	218	673	6	65	246
Future Vol, veh/h	20	218	673	6	65	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	218	673	6	65	246
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1052	676	0	0	679	0
Stage 1	676	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	251	453	-	-	913	-
Stage 1	505	-	-	-	-	-
Stage 2	694	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	230	453	-	-	913	-
Mov Cap-2 Maneuver	230	-	-	-	-	-
Stage 1	505	-	-	-	-	-
Stage 2	637	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	24.3		0		1.9	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 419	913	-		
HCM Lane V/C Ratio	-	- 0.568	0.071	-		
HCM Control Delay (s)	-	- 24.3	9.2	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 3.4	0.2	-		

Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	136	343	21	241	658
Future Vol, veh/h	12	136	343	21	241	658
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	136	343	21	241	658
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1494	354	0	0	364	0
Stage 1	354	-	-	-	-	-
Stage 2	1140	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	136	690	-	-	1195	-
Stage 1	710	-	-	-	-	-
Stage 2	305	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	93	690	-	-	1195	-
Mov Cap-2 Maneuver	93	-	-	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	208	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	16.7		0		2.4	
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 454	1195	-		
HCM Lane V/C Ratio	-	- 0.326	0.202	-		
HCM Control Delay (s)	-	- 16.7	8.8	0		
HCM Lane LOS	-	- C	A	A		
HCM 95th %tile Q(veh)	-	- 1.4	0.8	-		

Future (2026) Background Plus
Site Generated

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	1340	180	104	1001	205	476	630	124	69	134	209
Future Volume (vph)	180	1340	180	104	1001	205	476	630	124	69	134	209
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3390	1420	3048	3293	1408	3155	3390	1374	2537	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			200			205			143			199
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	180	1340	180	104	1001	205	476	630	124	69	134	209
Shared Lane Traffic (%)												
Lane Group Flow (vph)	180	1340	180	104	1001	205	476	630	124	69	134	209
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	13.2	48.4	48.4	12.2	47.4	47.4	23.0	55.0	55.0	14.4	46.4	46.4
Total Split (%)	10.2%	37.2%	37.2%	9.4%	36.5%	36.5%	17.7%	42.3%	42.3%	11.1%	35.7%	35.7%
Maximum Green (s)	6.4	41.9	41.9	5.4	40.9	40.9	16.3	48.4	48.4	7.7	39.8	39.8
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	6.4	42.0	42.0	5.4	41.0	41.0	16.3	29.5	29.5	7.2	17.7	17.7
Actuated g/C Ratio	0.06	0.39	0.39	0.05	0.38	0.38	0.15	0.27	0.27	0.07	0.16	0.16

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.92	1.02	0.27	0.68	0.80	0.31	1.00	0.68	0.26	0.41	0.25	0.52
Control Delay	99.7	63.2	3.6	74.6	36.8	4.9	87.4	40.1	4.9	57.4	39.8	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	99.7	63.2	3.6	74.6	36.8	4.9	87.4	40.1	4.9	57.4	39.8	11.2
LOS	F	E	A	E	D	A	F	D	A	E	D	B
Approach Delay	60.7			34.8			54.8			28.2		
Approach LOS	E			C			D			C		
Queue Length 50th (m)	18.2	~145.8	0.0	10.4	90.2	0.0	48.1	59.8	0.0	6.7	12.0	1.7
Queue Length 95th (m)	#41.2	#208.2	10.2	#24.1	#130.4	14.2	#87.8	77.4	9.2	14.3	19.9	19.5
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	195	1317	674	152	1249	661	478	1521	695	181	1203	662
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	1.02	0.27	0.68	0.80	0.31	1.00	0.41	0.18	0.38	0.11	0.32

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 108.1

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 49.0

Intersection LOS: D

Intersection Capacity Utilization 89.6%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

 Ø1	 Ø2	 Ø3	 Ø4
14.4 s	55 s	12.2 s	48.4 s
 Ø5	 Ø6	 Ø7	 Ø8
23 s	46.4 s	13.2 s	47.4 s

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	303	1279	534	184	1207	118	318	273	127	161	508	343
Future Volume (vph)	303	1279	534	184	1207	118	318	273	127	161	508	343
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3284	3390	1420	3048	3293	1408	3159	3390	1374	2535	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			283			143			143			180
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	303	1279	534	184	1207	118	318	273	127	161	508	343
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	1279	534	184	1207	118	318	273	127	161	508	343
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	18.0	50.0	50.0	17.0	49.0	49.0	19.0	45.0	45.0	18.0	44.0	44.0
Total Split (%)	13.8%	38.5%	38.5%	13.1%	37.7%	37.7%	14.6%	34.6%	34.6%	13.8%	33.8%	33.8%
Maximum Green (s)	11.2	43.5	43.5	10.2	42.5	42.5	12.3	38.4	38.4	11.3	37.4	37.4
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	11.2	43.9	43.9	10.0	42.6	42.6	12.3	27.5	27.5	10.8	26.0	26.0
Actuated g/C Ratio	0.09	0.37	0.37	0.08	0.36	0.36	0.10	0.23	0.23	0.09	0.22	0.22

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2026) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.98	1.02	0.76	0.72	1.02	0.20	0.97	0.35	0.30	0.70	0.71	0.75
Control Delay	100.1	69.2	23.8	70.4	70.4	3.5	96.5	39.1	5.9	69.9	48.6	30.5
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	100.1	69.2	23.8	70.4	70.4	3.5	96.5	39.1	5.9	69.9	48.6	30.5
LOS	F	E	C	E	E	A	F	D	A	E	D	C
Approach Delay	62.2			65.2			58.7			45.8		
Approach LOS	E			E			E			D		
Queue Length 50th (m)	33.6	~151.6	48.1	19.8	~137.8	0.0	35.1	26.0	0.0	17.2	53.3	33.2
Queue Length 95th (m)	#67.5	#222.6	104.5	#38.2	#211.2	7.9	#69.5	36.8	10.4	#33.7	69.6	63.7
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	310	1250	702	262	1180	596	328	1097	541	242	1028	581
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	0.98	1.02	0.76	0.70	1.02	0.20	0.97	0.25	0.23	0.67	0.49	0.59

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 118.9

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 59.5

Intersection LOS: E

Intersection Capacity Utilization 91.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

 Ø1	 Ø2	 Ø3	 Ø4
18 s	45 s	17 s	50 s
 Ø5	 Ø6	 Ø7	 Ø8
19 s	44 s	18 s	49 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	879	88	37	1045	140	141
Future Volume (vph)	879	88	37	1045	140	141
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.932	
Flt Protected			0.950		0.976	
Satd. Flow (prot)	3390	1547	1729	3390	1607	0
Flt Permitted			0.282		0.976	
Satd. Flow (perm)	3390	1514	513	3390	1607	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		88			45	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	879	88	37	1045	140	141
Shared Lane Traffic (%)						
Lane Group Flow (vph)	879	88	37	1045	281	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	32.0	32.0	32.0	32.0	38.0	
Total Split (%)	45.7%	45.7%	45.7%	45.7%	54.3%	
Maximum Green (s)	26.1	26.1	26.1	26.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	None	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effct Green (s)	21.4	21.4	21.4	21.4	13.2	
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.28	
v/c Ratio	0.56	0.12	0.16	0.67	0.58	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	11.2	2.9	10.2	12.7	17.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.2	2.9	10.2	12.7	17.8	
LOS	B	A	B	B	B	
Approach Delay	10.4			12.6	17.8	
Approach LOS	B			B	B	
Queue Length 50th (m)	22.2	0.0	1.4	28.3	14.4	
Queue Length 95th (m)	43.3	5.2	6.3	54.5	34.2	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	1943	905	294	1943	1149	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.45	0.10	0.13	0.54	0.24	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 46.6
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.67
 Intersection Signal Delay: 12.3
 Intersection Capacity Utilization 59.5%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
38 s	32 s
	↖ Ø8
	32 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	1273	316	149	1344	167	83
Future Volume (vph)	1273	316	149	1344	167	83
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.955	
Flt Protected			0.950		0.968	
Satd. Flow (prot)	3390	1547	1729	3390	1623	0
Flt Permitted			0.163		0.968	
Satd. Flow (perm)	3390	1513	297	3390	1623	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		316			24	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	1273	316	149	1344	167	83
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1273	316	149	1344	250	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	42.0	42.0	42.0	42.0	38.0	
Total Split (%)	52.5%	52.5%	52.5%	52.5%	47.5%	
Maximum Green (s)	36.1	36.1	36.1	36.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	None	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	37.3	37.3	37.3	37.3	14.2	
Actuated g/C Ratio	0.59	0.59	0.59	0.59	0.22	
v/c Ratio	0.64	0.31	0.85	0.67	0.65	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	11.1	2.0	58.6	11.7	28.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.1	2.0	58.6	11.7	28.1	
LOS	B	A	E	B	C	
Approach Delay	9.3			16.4	28.1	
Approach LOS	A			B	C	
Queue Length 50th (m)	40.5	0.0	11.3	44.2	21.4	
Queue Length 95th (m)	74.0	9.1	#46.6	80.7	39.5	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	1999	1021	175	1999	840	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.64	0.31	0.85	0.67	0.30	

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 63.2
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.85
 Intersection Signal Delay: 13.9
 Intersection Capacity Utilization 75.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
38 s	42 s
	↖ Ø8
	42 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BGSB - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	804	112	82	626	7	161	49	172	41	42	297
Future Volume (vph)	113	804	112	82	626	7	161	49	172	41	42	297
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	55.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.368			0.254			0.728			0.723		
Satd. Flow (perm)	625	3424	1211	432	3293	1521	1324	3458	1439	1316	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140			140			172			272
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	113	804	112	82	626	7	161	49	172	41	42	297
Shared Lane Traffic (%)												
Lane Group Flow (vph)	113	804	112	82	626	7	161	49	172	41	42	297
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	12.0	31.8	31.8	12.0	31.8	31.8	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	16.0%	42.4%	42.4%	16.0%	42.4%	42.4%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Maximum Green (s)	5.6	25.5	25.5	5.6	25.5	25.5	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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	25.3	19.7	19.7	25.2	19.6	19.6	13.3	13.3	13.3	13.3	13.3	13.3
Actuated g/C Ratio	0.44	0.34	0.34	0.44	0.34	0.34	0.23	0.23	0.23	0.23	0.23	0.23

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.31	0.69	0.22	0.27	0.56	0.01	0.53	0.06	0.37	0.14	0.05	0.54
Control Delay	9.7	20.3	3.3	9.7	18.1	0.0	27.4	18.3	6.3	19.8	18.3	7.9
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	9.7	20.3	3.3	9.7	18.1	0.0	27.4	18.3	6.3	19.8	18.3	7.9
LOS	A	C	A	A	B	A	C	B	A	B	B	A
Approach Delay	17.3			16.9			16.8			10.4		
Approach LOS	B			B			B			B		
Queue Length 50th (m)	4.5	33.2	0.0	3.2	24.4	0.0	13.6	1.9	0.0	3.1	1.6	1.9
Queue Length 95th (m)	12.9	57.8	5.8	9.9	43.8	0.0	30.3	5.5	11.3	9.7	4.9	17.4
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	55.0		80.0	60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	370	1536	620	304	1477	759	582	1521	729	578	1521	811
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	0.31	0.52	0.18	0.27	0.42	0.01	0.28	0.03	0.24	0.07	0.03	0.37

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 57.9

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 16.1

Intersection LOS: B

Intersection Capacity Utilization 63.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
31.2 s	12 s	31.8 s
 Ø6	 Ø7	 Ø8
31.2 s	12 s	31.8 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	306	745	305	241	869	54	362	108	220	15	164	271
Future Volume (vph)	306	745	305	241	869	54	362	108	220	15	164	271
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor			0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.108			0.287			0.648			0.684		
Satd. Flow (perm)	184	3424	1210	488	3293	1518	1178	3458	1439	1245	3458	1496
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			305			91			220			271
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	306	745	305	241	869	54	362	108	220	15	164	271
Shared Lane Traffic (%)												
Lane Group Flow (vph)	306	745	305	241	869	54	362	108	220	15	164	271
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	26.0	44.0	44.0	22.0	40.0	40.0	49.0	49.0	49.0	49.0	49.0	49.0
Total Split (%)	22.6%	38.3%	38.3%	19.1%	34.8%	34.8%	42.6%	42.6%	42.6%	42.6%	42.6%	42.6%
Maximum Green (s)	19.6	37.7	37.7	15.6	33.7	33.7	42.8	42.8	42.8	42.8	42.8	42.8
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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	55.7	37.2	37.2	44.6	31.4	31.4	36.4	36.4	36.4	36.4	36.4	36.4
Actuated g/C Ratio	0.52	0.35	0.35	0.42	0.30	0.30	0.34	0.34	0.34	0.34	0.34	0.34

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2026) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.86	0.62	0.49	0.70	0.89	0.11	0.90	0.09	0.35	0.04	0.14	0.39
Control Delay	52.8	32.7	6.2	27.2	49.2	2.1	59.4	23.9	4.9	23.5	24.4	4.7
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	52.8	32.7	6.2	27.2	49.2	2.1	59.4	23.9	4.9	23.5	24.4	4.7
LOS	D	C	A	C	D	A	E	C	A	C	C	A
Approach Delay	31.3			42.5			36.5			12.5		
Approach LOS	C			D			D			B		
Queue Length 50th (m)	48.0	68.0	0.0	26.6	89.6	0.0	67.3	7.5	0.0	2.0	11.6	0.0
Queue Length 95th (m)	#96.1	88.5	18.8	42.3	#123.5	2.8	#113.9	13.1	14.0	6.2	18.5	15.3
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	365	1253	636	385	1062	551	482	1417	719	510	1417	773
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	0.84	0.59	0.48	0.63	0.82	0.10	0.75	0.08	0.31	0.03	0.12	0.35

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 106.1

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 33.5

Intersection LOS: C

Intersection Capacity Utilization 94.1%

ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
49 s	22 s	44 s
 Ø6	 Ø7	 Ø8
49 s	26 s	40 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	1112	15	32	345
Future Volume (vph)	24	203	1112	15	32	345
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1547	0	1747	0	1695	1670
Flt Permitted	0.995				0.117	
Satd. Flow (perm)	1547	0	1747	0	209	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	113		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	24	203	1112	15	32	345
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	1127	0	32	345
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.4		67.6		67.6	67.6
Total Split (%)	28.8%		71.2%		71.2%	71.2%
Maximum Green (s)	22.3		61.7		61.7	61.7
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	13.3		62.1		62.1	62.1
Actuated g/C Ratio	0.15		0.72		0.72	0.72
v/c Ratio	0.68		0.90		0.21	0.29
Control Delay	28.1		22.6		9.3	5.6
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	28.1		22.6		9.3	5.6
LOS	C		C		A	A
Approach Delay	28.1		22.6			5.9
Approach LOS	C		C			A
Queue Length 50th (m)	16.0		104.4		1.3	14.3
Queue Length 95th (m)	36.6		#257.4		6.5	33.0
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	483		1256		150	1200
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.47		0.90		0.21	0.29

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 86.4

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 19.7

Intersection LOS: B

Intersection Capacity Utilization 86.5%

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.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2		
67.6 s		
 Ø6		
67.6 s		
	 Ø8	
	27.4 s	

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	88	601	14	143	1141
Future Volume (vph)	5	88	601	14	143	1141
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872		0.997			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1537	0	1746	0	1695	1670
Flt Permitted	0.997				0.402	
Satd. Flow (perm)	1537	0	1746	0	717	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	88		3			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	5	88	601	14	143	1141
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	615	0	143	1141
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.1		52.9		52.9	52.9
Total Split (%)	33.9%		66.1%		66.1%	66.1%
Maximum Green (s)	22.0		47.0		47.0	47.0
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	10.1		57.4		57.4	57.4
Actuated g/C Ratio	0.14		0.78		0.78	0.78
v/c Ratio	0.33		0.45		0.26	0.88
Control Delay	11.1		5.5		5.1	20.1
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	11.1		5.5		5.1	20.1
LOS	B		A		A	C
Approach Delay	11.1		5.5			18.4
Approach LOS	B		A			B
Queue Length 50th (m)	0.6		27.6		5.2	105.5
Queue Length 95th (m)	10.7		45.0		11.7	#202.7
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	521		1356		556	1296
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.18		0.45		0.26	0.88

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 74

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 14.1

Intersection LOS: B

Intersection Capacity Utilization 80.9%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2	
52.9 s	
 Ø6	
52.9 s	 Ø8
	27.1 s

Intersection						
Int Delay, s/veh	2.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	69	192	6	30	74
Future Vol, veh/h	5	69	192	6	30	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	69	192	6	30	74
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	329	195	0	0	198	0
Stage 1	195	-	-	-	-	-
Stage 2	134	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	665	846	-	-	1375	-
Stage 1	838	-	-	-	-	-
Stage 2	892	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	650	846	-	-	1375	-
Mov Cap-2 Maneuver	650	-	-	-	-	-
Stage 1	838	-	-	-	-	-
Stage 2	871	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.8		0		2.2	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 829	1375	-		
HCM Lane V/C Ratio	-	- 0.089	0.022	-		
HCM Control Delay (s)	-	- 9.8	7.7	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.3	0.1	-		

Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	46	122	15	70	211
Future Vol, veh/h	4	46	122	15	70	211
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	46	122	15	70	211
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	481	130	0	0	137	0
Stage 1	130	-	-	-	-	-
Stage 2	351	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	544	920	-	-	1447	-
Stage 1	896	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	514	920	-	-	1447	-
Mov Cap-2 Maneuver	514	-	-	-	-	-
Stage 1	896	-	-	-	-	-
Stage 2	674	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.4		0		1.9	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 865	1447	-		
HCM Lane V/C Ratio	-	- 0.058	0.048	-		
HCM Control Delay (s)	-	- 9.4	7.6	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.2	-		

Intersection						
Int Delay, s/veh	7.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	229	738	10	69	265
Future Vol, veh/h	35	229	738	10	69	265
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	229	738	10	69	265
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1146	743	0	0	748	0
Stage 1	743	-	-	-	-	-
Stage 2	403	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	220	415	-	-	861	-
Stage 1	470	-	-	-	-	-
Stage 2	675	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	199	415	-	-	861	-
Mov Cap-2 Maneuver	199	-	-	-	-	-
Stage 1	470	-	-	-	-	-
Stage 2	612	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	37.3		0		2	
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 363	861	-		
HCM Lane V/C Ratio	-	- 0.727	0.08	-		
HCM Control Delay (s)	-	- 37.3	9.5	0		
HCM Lane LOS	-	- E	A	A		
HCM 95th %tile Q(veh)	-	- 5.5	0.3	-		

Intersection						
Int Delay, s/veh	4.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	143	387	38	244	734
Future Vol, veh/h	21	143	387	38	244	734
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	143	387	38	244	734
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1628	406	0	0	425	0
Stage 1	406	-	-	-	-	-
Stage 2	1222	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	112	645	-	-	1134	-
Stage 1	673	-	-	-	-	-
Stage 2	278	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	71	645	-	-	1134	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	673	-	-	-	-	-
Stage 2	177	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	27.9		0		2.3	
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 317	1134	-		
HCM Lane V/C Ratio	-	- 0.517	0.215	-		
HCM Control Delay (s)	-	- 27.9	9	0		
HCM Lane LOS	-	- D	A	A		
HCM 95th %tile Q(veh)	-	- 2.8	0.8	-		

Intersection						
Int Delay, s/veh	4.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	89	5	5	37	31	24
Future Vol, veh/h	89	5	5	37	31	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	89	5	5	37	31	24
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	90	43	55	0	-	0
Stage 1	43	-	-	-	-	-
Stage 2	47	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	910	1027	1550	-	-	-
Stage 1	979	-	-	-	-	-
Stage 2	975	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	907	1027	1550	-	-	-
Mov Cap-2 Maneuver	907	-	-	-	-	-
Stage 1	979	-	-	-	-	-
Stage 2	972	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.4	0.9		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1550	-	913	-	-	
HCM Lane V/C Ratio	0.003	-	0.103	-	-	
HCM Control Delay (s)	7.3	0	9.4	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.3	-	-	

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	50	5	5	24	45	80
Future Vol, veh/h	50	5	5	24	45	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	5	5	24	45	80
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	119	85	125	0	-	0
Stage 1	85	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	877	974	1462	-	-	-
Stage 1	938	-	-	-	-	-
Stage 2	988	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	874	974	1462	-	-	-
Mov Cap-2 Maneuver	874	-	-	-	-	-
Stage 1	938	-	-	-	-	-
Stage 2	985	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.4	1.3		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1462	-	882	-	-	
HCM Lane V/C Ratio	0.003	-	0.062	-	-	
HCM Control Delay (s)	7.5	0	9.4	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	

Future (2031) Background Plus
Site Generated

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	1413	179	105	1009	205	471	621	123	69	131	214
Future Volume (vph)	184	1413	179	105	1009	205	471	621	123	69	131	214
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.97	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)	3288	3390	1459	3049	3293	1432	3164	3390	1394	2541	3262	1473
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3283	3390	1420	3048	3293	1408	3155	3390	1374	2537	3262	1453
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			200			205			143			199
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3		1	1		3	2		2	2		2
Confl. Bikes (#/hr)			4			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 (%)	2%	2%	6%	10%	5%	8%	6%	2%	11%	32%	6%	5%
Adj. Flow (vph)	184	1413	179	105	1009	205	471	621	123	69	131	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	184	1413	179	105	1009	205	471	621	123	69	131	214
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	14.0	49.6	49.6	13.0	48.6	48.6	22.0	53.0	53.0	14.4	45.4	45.4
Total Split (%)	10.8%	38.2%	38.2%	10.0%	37.4%	37.4%	16.9%	40.8%	40.8%	11.1%	34.9%	34.9%
Maximum Green (s)	7.2	43.1	43.1	6.2	42.1	42.1	15.3	46.4	46.4	7.7	38.8	38.8
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	7.2	43.2	43.2	6.2	42.2	42.2	15.3	29.2	29.2	7.3	18.4	18.4
Actuated g/C Ratio	0.07	0.39	0.39	0.06	0.38	0.38	0.14	0.27	0.27	0.07	0.17	0.17

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.85	1.06	0.26	0.61	0.80	0.31	1.07	0.69	0.26	0.41	0.24	0.52
Control Delay	85.0	75.7	3.5	67.7	36.7	4.8	107.7	41.4	5.0	58.6	39.9	11.7
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	85.0	75.7	3.5	67.7	36.7	4.8	107.7	41.4	5.0	58.6	39.9	11.7
LOS	F	E	A	E	D	A	F	D	A	E	D	B
Approach Delay	69.3			34.2			63.4			28.4		
Approach LOS	E			C			E			C		
Queue Length 50th (m)	19.0	~163.6	0.0	10.7	92.7	0.0	~53.7	60.4	0.0	6.8	11.8	2.5
Queue Length 95th (m)	#40.3	#224.7	9.9	#22.4	129.7	14.2	#90.7	78.1	9.3	14.3	19.7	20.9
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	216	1333	679	172	1265	667	441	1435	664	178	1155	643
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	0.85	1.06	0.26	0.61	0.80	0.31	1.07	0.43	0.19	0.39	0.11	0.33

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 109.9

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 54.4

Intersection LOS: D

Intersection Capacity Utilization 91.5%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

 Ø1	 Ø2	 Ø3	 Ø4
14.4 s	53 s	13 s	49.6 s
 Ø5	 Ø6	 Ø7	 Ø8
22 s	45.4 s	14 s	48.6 s

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BGSF - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	1286	527	184	1255	116	314	266	127	156	497	351
Future Volume (vph)	310	1286	527	184	1255	116	314	266	127	156	497	351
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00		0.98			0.98	1.00					0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3325	1488	3288	3390	1279	3257	3357	1502	2683	3424	1532
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3317	3325	1456	3288	3390	1258	3248	3357	1502	2683	3424	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			282			143			143			143
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			587.6			202.2			214.7	
Travel Time (s)		22.5			30.2			12.1			12.9	
Confl. Peds. (#/hr)	3					3	3					3
Confl. Bikes (#/hr)			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%	4%	4%	2%	2%	21%	3%	3%	3%	25%	1%	1%
Adj. Flow (vph)	310	1286	527	184	1255	116	314	266	127	156	497	351
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	1286	527	184	1255	116	314	266	127	156	497	351
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	18.0	54.4	54.4	14.0	50.4	50.4	18.0	44.4	44.4	17.2	43.6	43.6
Total Split (%)	13.8%	41.8%	41.8%	10.8%	38.8%	38.8%	13.8%	34.2%	34.2%	13.2%	33.5%	33.5%
Maximum Green (s)	11.2	47.9	47.9	7.2	43.9	43.9	11.3	37.8	37.8	10.5	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
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)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	11.2	48.1	48.1	7.2	44.1	44.1	11.3	27.1	27.1	10.1	25.9	25.9
Actuated g/C Ratio	0.09	0.40	0.40	0.06	0.37	0.37	0.09	0.23	0.23	0.08	0.22	0.22

Lanes, Volumes, Timings
1: River Road & Earl Armstrong Road

Future (2031) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.99	0.96	0.70	0.92	1.00	0.21	1.02	0.35	0.28	0.69	0.67	0.80
Control Delay	103.3	52.2	19.6	103.4	64.1	3.4	109.0	39.5	5.7	70.1	47.0	39.6
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	103.3	52.2	19.6	103.4	64.1	3.4	109.0	39.5	5.7	70.1	47.0	39.6
LOS	F	D	B	F	E	A	F	D	A	E	D	D
Approach Delay	51.6			64.2			64.3			48.0		
Approach LOS	D			E			E			D		
Queue Length 50th (m)	34.4	136.8	42.4	20.4	138.1	0.0	~35.0	25.4	0.0	16.8	51.7	43.7
Queue Length 95th (m)	#68.9	#212.4	93.7	#45.4	#215.0	7.3	#70.3	36.2	10.5	#32.7	67.5	75.4
Internal Link Dist (m)	413.3			563.6			178.2			190.7		
Turn Bay Length (m)	300.0	70.0		160.0	150.0		150.0	25.0		80.0	100.0	
Base Capacity (vph)	313	1340	755	199	1252	555	309	1068	575	237	1066	568
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	0.96	0.70	0.92	1.00	0.21	1.02	0.25	0.22	0.66	0.47	0.62

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 119.2

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 56.2

Intersection LOS: E

Intersection Capacity Utilization 93.5%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

 Ø1	 Ø2	 Ø3	 Ø4
17.2 s	44.4 s	14 s	54.4 s
 Ø5	 Ø6	 Ø7	 Ø8
18 s	43.6 s	18 s	50.4 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	925	82	35	1091	132	135
Future Volume (vph)	925	82	35	1091	132	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.98	1.00			
Frt		0.850			0.932	
Flt Protected			0.950		0.976	
Satd. Flow (prot)	3390	1547	1729	3390	1608	0
Flt Permitted			0.263		0.976	
Satd. Flow (perm)	3390	1514	478	3390	1608	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		82			38	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		1	1			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	5%	1%
Adj. Flow (vph)	925	82	35	1091	132	135
Shared Lane Traffic (%)						
Lane Group Flow (vph)	925	82	35	1091	267	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	32.0	32.0	32.0	32.0	38.0	
Total Split (%)	45.7%	45.7%	45.7%	45.7%	54.3%	
Maximum Green (s)	26.1	26.1	26.1	26.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	21.9	21.9	21.9	21.9	12.9	
Actuated g/C Ratio	0.47	0.47	0.47	0.47	0.28	
v/c Ratio	0.58	0.11	0.16	0.69	0.57	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	11.2	2.8	10.0	12.8	18.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.2	2.8	10.0	12.8	18.3	
LOS	B	A	B	B	B	
Approach Delay	10.5			12.7	18.3	
Approach LOS	B			B	B	
Queue Length 50th (m)	23.5	0.0	1.3	29.6	15.0	
Queue Length 95th (m)	45.2	5.0	6.1	56.8	33.0	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	1934	899	272	1934	1143	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.48	0.09	0.13	0.56	0.23	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 46.8
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 12.4
 Intersection Capacity Utilization 58.0%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↙ Ø2	→ Ø4
38 s	32 s
	↖ Ø8
	32 s

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Volume (vph)	1330	301	143	1401	160	79
Future Volume (vph)	1330	301	143	1401	160	79
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)		100.0	115.0		0.0	0.0
Storage Lanes		1	1		1	0
Taper Length (m)			20.0		20.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor		0.97				
Frt		0.850			0.955	
Flt Protected			0.950		0.968	
Satd. Flow (prot)	3390	1547	1729	3390	1649	0
Flt Permitted			0.149		0.968	
Satd. Flow (perm)	3390	1505	271	3390	1649	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		301			19	
Link Speed (k/h)	80			80	50	
Link Distance (m)	587.6			336.4	716.5	
Travel Time (s)	26.4			15.1	51.6	
Confl. Peds. (#/hr)		4	4			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	0%	2%	3%	0%
Adj. Flow (vph)	1330	301	143	1401	160	79
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1330	301	143	1401	239	0
Turn Type	NA	Perm	Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases		4	8		2	
Detector Phase	4	4	8	8	2	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.9	27.9	15.9	15.9	37.8	
Total Split (s)	42.0	42.0	42.0	42.0	38.0	
Total Split (%)	52.5%	52.5%	52.5%	52.5%	47.5%	
Maximum Green (s)	36.1	36.1	36.1	36.1	32.2	
Yellow Time (s)	5.0	5.0	5.0	5.0	3.6	
All-Red Time (s)	0.9	0.9	0.9	0.9	2.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Min	Min	Min	Min	None	
Walk Time (s)	7.0	7.0			7.0	
Flash Dont Walk (s)	15.0	15.0			25.0	
Pedestrian Calls (#/hr)	0	0			0	
Act Effect Green (s)	37.6	37.6	37.6	37.6	13.8	
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.22	
v/c Ratio	0.66	0.30	0.89	0.69	0.64	

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	11.2	1.9	68.2	11.9	28.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.2	1.9	68.2	11.9	28.1	
LOS	B	A	E	B	C	
Approach Delay	9.5			17.1	28.1	
Approach LOS	A			B	C	
Queue Length 50th (m)	42.6	0.0	11.2	46.5	20.7	
Queue Length 95th (m)	77.3	8.6	#45.6	84.3	38.3	
Internal Link Dist (m)	563.6			312.4	692.5	
Turn Bay Length (m)		100.0	115.0			
Base Capacity (vph)	2017	1017	161	2017	852	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.66	0.30	0.89	0.69	0.28	

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 63.1
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 14.3
 Intersection Capacity Utilization 76.3%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Brian Good Avenue & Earl Armstrong Road

↖ Ø2	→ Ø4
38 s	42 s
	↖ Ø8
	42 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	844	111	79	657	7	156	32	163	44	41	316
Future Volume (vph)	119	844	111	79	657	7	156	32	163	44	41	316
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor	1.00		0.98	1.00		0.98	1.00		0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1616	3424	1238	1616	3293	1547	1729	3458	1459	1729	3458	1517
Flt Permitted	0.350			0.236			0.729			0.735		
Satd. Flow (perm)	595	3424	1211	401	3293	1521	1326	3458	1439	1338	3458	1497
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140			140			163			263
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Confl. Bikes (#/hr)						3			3			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	1%	25%	7%	5%	0%	0%	0%	6%	0%	0%	2%
Adj. Flow (vph)	119	844	111	79	657	7	156	32	163	44	41	316
Shared Lane Traffic (%)												
Lane Group Flow (vph)	119	844	111	79	657	7	156	32	163	44	41	316
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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)	12.0	31.8	31.8	12.0	31.8	31.8	31.2	31.2	31.2	31.2	31.2	31.2
Total Split (%)	16.0%	42.4%	42.4%	16.0%	42.4%	42.4%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Maximum Green (s)	5.6	25.5	25.5	5.6	25.5	25.5	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	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	Min	Min	Min	Min	Min	Min	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		0	0	0	0	0	0	0	0
Act Effct Green (s)	26.2	20.6	20.6	26.2	20.6	20.6	13.2	13.2	13.2	13.2	13.2	13.2
Actuated g/C Ratio	0.45	0.35	0.35	0.45	0.35	0.35	0.22	0.22	0.22	0.22	0.22	0.22

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BGS - Base
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.33	0.70	0.22	0.27	0.57	0.01	0.53	0.04	0.36	0.15	0.05	0.59
Control Delay	9.8	20.3	3.1	9.5	17.9	0.0	27.9	18.8	6.5	20.4	18.8	10.0
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	9.8	20.3	3.1	9.5	17.9	0.0	27.9	18.8	6.5	20.4	18.8	10.0
LOS	A	C	A	A	B	A	C	B	A	C	B	B
Approach Delay	17.3			16.8			17.1			12.1		
Approach LOS	B			B			B			B		
Queue Length 50th (m)	4.8	35.6	0.0	3.1	26.0	0.0	13.7	1.3	0.0	3.5	1.6	4.3
Queue Length 95th (m)	13.3	60.7	5.7	9.4	45.8	0.0	29.6	4.1	11.2	10.3	4.8	21.8
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	364	1513	613	296	1455	750	574	1498	716	579	1498	797
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	0.33	0.56	0.18	0.27	0.45	0.01	0.27	0.02	0.23	0.08	0.03	0.40

Intersection Summary

Area Type: Other

Cycle Length: 75

Actuated Cycle Length: 58.7

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 16.3

Intersection LOS: B

Intersection Capacity Utilization 64.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
31.2 s	12 s	31.8 s
 Ø6	 Ø7	 Ø8
31.2 s	12 s	31.8 s

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BGS - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	328	786	300	233	915	57	353	104	213	16	157	290
Future Volume (vph)	328	786	300	233	915	57	353	104	213	16	157	290
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		80.0	60.0		80.0	75.0		25.0	100.0		25.0
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	0.95	1.00
Ped Bike Factor			0.98	1.00		0.98						0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1712	3390	1547	1729	3424	1547	1729	3458	1547	1729	3458	1517
Flt Permitted	0.102			0.278			0.652			0.686		
Satd. Flow (perm)	184	3390	1509	505	3424	1522	1187	3458	1547	1249	3458	1498
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			300			91			213			290
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		336.4			270.5			111.1			232.4	
Travel Time (s)		15.1			12.2			5.0			10.5	
Confl. Peds. (#/hr)			2	2								
Confl. Bikes (#/hr)						6						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%	2%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%
Adj. Flow (vph)	328	786	300	233	915	57	353	104	213	16	157	290
Shared Lane Traffic (%)												
Lane Group Flow (vph)	328	786	300	233	915	57	353	104	213	16	157	290
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	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	47.0	47.0	21.0	43.0	43.0	47.0	47.0	47.0	47.0	47.0	47.0
Total Split (%)	21.7%	40.9%	40.9%	18.3%	37.4%	37.4%	40.9%	40.9%	40.9%	40.9%	40.9%	40.9%
Maximum Green (s)	18.6	40.7	40.7	14.6	36.7	36.7	40.8	40.8	40.8	40.8	40.8	40.8
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	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	Min	Min	None	Min	Min	Min	Min	Min	Min	Min	Min
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		0	0	0	0	0	0	0	0
Act Effct Green (s)	56.7	39.2	39.2	45.0	32.8	32.8	35.1	35.1	35.1	35.1	35.1	35.1
Actuated g/C Ratio	0.54	0.37	0.37	0.43	0.31	0.31	0.33	0.33	0.33	0.33	0.33	0.33

Lanes, Volumes, Timings
3: Spratt Road & Earl Armstrong Road

Future (2031) BGSB - Base
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.89	0.63	0.40	0.65	0.86	0.11	0.90	0.09	0.33	0.04	0.14	0.42
Control Delay	56.2	31.2	4.7	24.0	44.6	2.3	60.6	24.9	4.9	24.8	25.3	5.0
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	56.2	31.2	4.7	24.0	44.6	2.3	60.6	24.9	4.9	24.8	25.3	5.0
LOS	E	C	A	C	D	A	E	C	A	C	C	A
Approach Delay	31.4			38.6			37.3			12.6		
Approach LOS	C			D			D			B		
Queue Length 50th (m)	53.0	70.6	0.0	24.9	92.3	0.0	66.7	7.4	0.0	2.2	11.4	0.0
Queue Length 95th (m)	#105.1	90.9	16.2	38.5	115.7	3.1	#113.3	13.1	14.0	6.6	18.4	16.1
Internal Link Dist (m)	312.4			246.5			87.1			208.4		
Turn Bay Length (m)	60.0	80.0		60.0	80.0		75.0	25.0		100.0	25.0	
Base Capacity (vph)	371	1330	774	398	1207	595	465	1356	736	490	1356	763
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	0.88	0.59	0.39	0.59	0.76	0.10	0.76	0.08	0.29	0.03	0.12	0.38

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 105.8

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 32.4

Intersection LOS: C

Intersection Capacity Utilization 95.8%

ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Spratt Road & Earl Armstrong Road

 Ø2	 Ø3	 Ø4
47 s	21 s	47 s
 Ø6	 Ø7	 Ø8
47 s	25 s	43 s

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	1123	15	32	349
Future Volume (vph)	24	203	1123	15	32	349
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1547	0	1747	0	1695	1670
Flt Permitted	0.995				0.114	
Satd. Flow (perm)	1547	0	1747	0	203	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	111		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	374.3		282.5			231.8
Travel Time (s)	26.9		12.7			10.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	3%	4%	2%	2%	9%
Adj. Flow (vph)	24	203	1123	15	32	349
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	1138	0	32	349
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.4		67.6		67.6	67.6
Total Split (%)	28.8%		71.2%		71.2%	71.2%
Maximum Green (s)	22.3		61.7		61.7	61.7
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effect Green (s)	13.4		63.3		63.3	63.3
Actuated g/C Ratio	0.15		0.72		0.72	0.72
v/c Ratio	0.69		0.90		0.22	0.29
Control Delay	28.6		23.3		9.7	5.6
Queue Delay	0.0		0.0		0.0	0.0

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	28.6		23.3		9.7	5.6
LOS	C		C		A	A
Approach Delay	28.6		23.3			5.9
Approach LOS	C		C			A
Queue Length 50th (m)	16.3		108.7		1.3	14.7
Queue Length 95th (m)	37.0		#262.3		6.6	33.6
Internal Link Dist (m)	350.3		258.5			207.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	476		1260		146	1204
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.48		0.90		0.22	0.29

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 87.7

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 20.2

Intersection LOS: C

Intersection Capacity Utilization 87.2%

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.

Splits and Phases: 4: River Road & Summerhill Street

 Ø2		
67.6 s		
 Ø6		
67.6 s		
	 Ø8	
	27.4 s	

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	88	602	14	143	1149
Future Volume (vph)	5	88	602	14	143	1149
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	50.0	0.0		0.0	100.0	
Storage Lanes	0	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.872		0.997			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1551	0	1779	0	1695	1784
Flt Permitted	0.997				0.401	
Satd. Flow (perm)	1551	0	1779	0	716	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	88		3			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		279.5			234.8
Travel Time (s)	27.9		12.6			10.6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	88	602	14	143	1149
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	616	0	143	1149
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.1		27.9		15.9	15.9
Total Split (s)	27.1		52.9		52.9	52.9
Total Split (%)	33.9%		66.1%		66.1%	66.1%
Maximum Green (s)	22.0		47.0		47.0	47.0
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.5		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.1		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0			
Flash Dont Walk (s)	15.0		15.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	10.1		57.4		57.4	57.4
Actuated g/C Ratio	0.14		0.78		0.78	0.78
v/c Ratio	0.32		0.45		0.26	0.83
Control Delay	11.1		5.4		5.1	15.7
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	11.1		5.4		5.1	15.7

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	B		A		A	B
Approach Delay	11.1		5.4			14.5
Approach LOS	B		A			B
Queue Length 50th (m)	0.6		27.4		5.2	94.2
Queue Length 95th (m)	10.7		44.4		11.7	#195.2
Internal Link Dist (m)	363.6		255.5			210.8
Turn Bay Length (m)	50.0				100.0	
Base Capacity (vph)	525		1381		555	1384
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.18		0.45		0.26	0.83

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 74

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 11.5

Intersection LOS: B

Intersection Capacity Utilization 81.3%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: River Road & Summerhill St

 Ø2	
52.9 s	
 Ø6	
52.9 s	 Ø8
	27.1 s

Intersection						
Int Delay, s/veh	2.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	69	180	6	30	72
Future Vol, veh/h	5	69	180	6	30	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	69	180	6	30	72
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	315	183	0	0	186	0
Stage 1	183	-	-	-	-	-
Stage 2	132	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	678	859	-	-	1388	-
Stage 1	848	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	662	859	-	-	1388	-
Mov Cap-2 Maneuver	662	-	-	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	873	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.7		0		2.3	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	842	1388	-	
HCM Lane V/C Ratio	-	-	0.088	0.022	-	
HCM Control Delay (s)	-	-	9.7	7.7	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-	

Intersection						
Int Delay, s/veh	2.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	46	117	15	90	199
Future Vol, veh/h	6	46	117	15	90	199
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	10	2	33	0	2
Mvmt Flow	6	46	117	15	90	199
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	504	125	0	0	132	0
Stage 1	125	-	-	-	-	-
Stage 2	379	-	-	-	-	-
Critical Hdwy	6.4	6.3	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.39	-	-	2.2	-
Pot Cap-1 Maneuver	531	905	-	-	1466	-
Stage 1	906	-	-	-	-	-
Stage 2	696	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	494	905	-	-	1466	-
Mov Cap-2 Maneuver	494	-	-	-	-	-
Stage 1	906	-	-	-	-	-
Stage 2	648	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	9.7		0		2.4	
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 826	1466	-		
HCM Lane V/C Ratio	-	- 0.063	0.061	-		
HCM Control Delay (s)	-	- 9.7	7.6	0		
HCM Lane LOS	-	- A	A	A		
HCM 95th %tile Q(veh)	-	- 0.2	0.2	-		

Intersection

Int Delay, s/veh 7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	210	783	9	63	280
Future Vol, veh/h	32	210	783	9	63	280
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	210	783	9	63	280

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1194	788	0	0	792	0
Stage 1	788	-	-	-	-	-
Stage 2	406	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	206	391	-	-	829	-
Stage 1	448	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	187	391	-	-	829	-
Mov Cap-2 Maneuver	187	-	-	-	-	-
Stage 1	448	-	-	-	-	-
Stage 2	612	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37.4	0	1.8
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 342	829	-
HCM Lane V/C Ratio	-	- 0.708	0.076	-
HCM Control Delay (s)	-	- 37.4	9.7	0
HCM Lane LOS	-	- E	A	A
HCM 95th %tile Q(veh)	-	- 5.1	0.2	-

Intersection						
Int Delay, s/veh	3.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	131	408	35	225	775
Future Vol, veh/h	19	131	408	35	225	775
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	131	408	35	225	775
Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1651	426	0	0	443	0
Stage 1	426	-	-	-	-	-
Stage 2	1225	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	109	628	-	-	1117	-
Stage 1	659	-	-	-	-	-
Stage 2	278	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	70	628	-	-	1117	-
Mov Cap-2 Maneuver	70	-	-	-	-	-
Stage 1	659	-	-	-	-	-
Stage 2	180	-	-	-	-	-
Approach	WB		NB		SB	
HCM Control Delay, s	26.8		0		2	
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	- 312	1117	-		
HCM Lane V/C Ratio	-	- 0.481	0.201	-		
HCM Control Delay (s)	-	- 26.8	9	0		
HCM Lane LOS	-	- D	A	A		
HCM 95th %tile Q(veh)	-	- 2.5	0.8	-		

Intersection						
Int Delay, s/veh	4.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	81	5	5	39	33	22
Future Vol, veh/h	81	5	5	39	33	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	81	5	5	39	33	22
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	93	44	55	0	-	0
Stage 1	44	-	-	-	-	-
Stage 2	49	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	907	1026	1550	-	-	-
Stage 1	978	-	-	-	-	-
Stage 2	973	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	904	1026	1550	-	-	-
Mov Cap-2 Maneuver	904	-	-	-	-	-
Stage 1	978	-	-	-	-	-
Stage 2	970	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.4	0.8		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1550	-	910	-	-	
HCM Lane V/C Ratio	0.003	-	0.095	-	-	
HCM Control Delay (s)	7.3	0	9.4	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.3	-	-	

Intersection						
Int Delay, s/veh	2.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	46	5	5	26	46	74
Future Vol, veh/h	46	5	5	26	46	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	5	5	26	46	74
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	119	83	120	0	-	0
Stage 1	83	-	-	-	-	-
Stage 2	36	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	877	976	1468	-	-	-
Stage 1	940	-	-	-	-	-
Stage 2	986	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	874	976	1468	-	-	-
Mov Cap-2 Maneuver	874	-	-	-	-	-
Stage 1	940	-	-	-	-	-
Stage 2	983	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.3	1.2		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1468	-	883	-	-	
HCM Lane V/C Ratio	0.003	-	0.058	-	-	
HCM Control Delay (s)	7.5	0	9.3	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.2	-	-	



Riverside South Phase 2

Transportation Impact Assessment Strategy Report

Appendix C: Existing Signal Timing Plans

November 2017

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Operations Unit

Intersection:	<i>Main:</i> Earl Armstrong	<i>Side:</i> River
Controller:	MS-3200	TSD: 6416
Author:	Matthew Anderson	Date: 10-Aug-2017

Timing Plans[†]

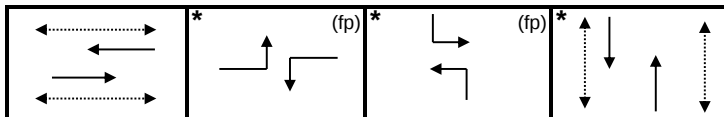
	Plan				Ped Minimum Time		
	AM Peak 1	Off Peak 2	PM Peak 3	Night 4	Walk	DW	A+R
Cycle	120	110	120	110			
Offset	80	X	108	X			
EB Thru	39	35	39	35	7	21	4.2+2.3
WB Thru	39	35	39	35	7	21	4.2+2.3
EBLT (fp)	17	16	17	16	-	-	4.2+2.6
WBLT (fp)	17	16	17	16	-	-	4.2+2.6
NBLT (fp)	21	16	21	16	-	-	3.7+3.0
SBLT (fp)	21	16	21	16	-	-	3.7+3.0
NB Thru	43	43	43	43	7	30	3.7+2.9
SB Thru	43	43	43	43	7	30	3.7+2.9

Notes:

- 1) All plans have a minimum recall on the north-south vehicle movements of 10 seconds of green.
- 2) If there are no ped actuations, the north-south movements will be forced off after a maximum of 30 seconds of green.

Phasing Sequence[‡]

Plan: All



Schedule

Weekday

Time	Plan
6:30	1
9:30	2
15:00	3
18:30	2
23:30	4

Weekend

Time	Plan
0:15	4
8:00	2
23:30	4

Notes

†: Time for each direction includes amber and all red intervals
 ‡: Start of first phase should be used as reference point for offset
 Asterisk (*) Indicates actuated phase
 (fp): Fully Protected Left Turn

◄-----► Pedestrian signal

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

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Operations Unit

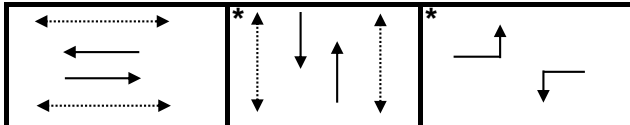
Intersection:	Main: Earl Armstrong	Side: Spratt
Controller:	MS 3200	TSD: 6718
Author:	Matthew Anderson	Date: 10-Aug-2017

Existing Timing Plans[†]

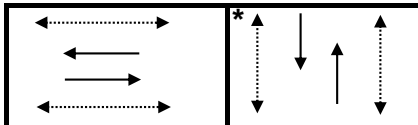
	Plan				Ped Minimum Time		
	AM Peak 1	Off Peak 2	PM Peak 3	Night 4	Walk	DW	A+R
Cycle	120	80	120	70			
Offset	93	8	15	X			
EB Thru	70	35	63	39	10	14	4.6+1.7
WB Thru	70	35	63	39	10	14	4.6+1.7
NB Thru	35	32	32	31	7	18	3.7+2.5
SB Thru	35	32	32	31	7	18	3.7+2.5
EB Left	15	13	25	-	-	-	4.6+1.8
WB Left	15	13	25	-	-	-	4.6+1.8

Phasing Sequence[‡]

Plans: 1, 2, 3



Plans: 4



Schedule

Weekday

Time	Plan
0:15	4
6:30	1
9:30	2
15:00	3
18:30	2
23:30	4

Weekend

Time	Plan
0:15	4
8:00	2
23:30	4

Notes

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

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

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◀.....▶ Pedestrian signal

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



Riverside South Phase 2

Transportation Impact Assessment Strategy Report

Appendix D: MMLOS Results

November 2017

Intersection Multi-Modal Level of Service
Riverside South Phase 2 Transportation Impact Assessment
Existing Conditions

November 2, 2017



INTERSECTIONS		Summerhill Street & River ¹				Earl Armstrong & River				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	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)					8	8	10	10					7	7	7	7
	Median					No Median	No Median	No Median	No Median					No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)					Protected	Protected	Protected	Protected					Permissive	Permissive	Protected/permis sive	Protected/permis sive
	Conflicting Right Turns (from street to left)					Protected/permis sive	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					> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m					> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	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 (PETSİ)					3 F	3 F	-30 F	-30 F		71 C	46 D	47 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)					120	120	120	120					120	120	120	120
	Pedestrian Walk Time (solid white symbol) (sec)					8.7	11.5	7	7					49.7	49.7	7.8	7.8
	LOS (Delay,seconds)					51.6 E	49.1 E	53.2 E	53.2 E		22.5 C	32.4 D	32.4 D	20.6 C	20.6	52.5	52.5 E
	Overall Level of Service					F				D				F			
Cyclist	Type of Bikeway					Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track					Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	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?					No	No	No	No					No	No	No	No
	Number of Lanes Crossed for Left Turns					2+ Lanes 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 (Posted Speed + 10km/h)					≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h					≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?					Yes	Yes	Yes	Yes					No	No	No	No
	Level of Service					F	F	F	F					F	F	F	F
Transit	Average Signal Delay					>40 sec	>40 sec	≤10 sec	≤10 sec					≤30 sec	≤10 sec	>40 sec	>40 sec
	Level of Service					F	F	B	B					D	B	F	F
Truck	Turning Radius (Right Turn)					< 10m	< 10m	< 10m	< 10m					10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes					2+	2+	2+	2+					2+	2+	2+	2+
						D	D	D	D					B	B	B	B
Auto						D								B			
	Level of Service	C (AM) / B (PM)				C (AM) / F (PM)				C (AM) / C (PM)				C (AM) / C (PM)			

¹ Multi-Modal Level of Service does not apply to unsignalized intersections.



INTERSECTIONS		Summerhill Street & River Road				Earl Armstrong & River Road				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	3		8	8	10	10		3	5	5	7	7	7	7
	Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive	Permissive		Protected	Protected	Protected	Protected		Permissive	No left turn/prohibited	Permissive	Permissive	Permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn	Permissive or yield control		Protected/permissive	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	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	No	No	No	No	No	No
	Corner Radius	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 10m to 15m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel		Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'		No right turn channel	No right turn channel	Conventional right turn channel without receiving lane	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	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETS I)	79 B	79 B	71 C		3 F	3 F	-30 F	-30 F		71 C	45 D	47 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)	80	80	80		130	130	130	130		80	80	80	85	85	85	85
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	32		19	25	8	8		20	8	8	22	24	9	7.5
	LOS (Delay,seconds)	33.3 D	33.3 D	14.4 B		47.4 E	42.4 E	57.2 E	57.2 E		22.5 C	32.4 D	32.4 D	23.3 C	21.9 C	34.0 D	35.3 D
	Overall Level of Service	D				F				D				F			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow		Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	≤ 50m		> 50m	≤ 50m	> 50m	> 50m		≤ 50m	> 50m	≤ 50m	≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Shared Through-Right?	No	Yes	No		No	No	No	No		Yes	No	No	No	No	No	No
	Bike Box?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed		No Lanes Crossed	2+ Lanes Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed
	Operating Speed on Approach (Posted Speed + 10km/h)	≥ 60km/h	≥ 60km/h	50km/h		≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h		50km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No		Yes	Yes	Yes	Yes		No	No	No	No	No	No	No
	Level of Service	F	F	D		F	F	F	F		D	F	C	F	F	F	F
Transit	Average Signal Delay	≤20 sec	≤30 sec	≤10 sec		>40 sec	>40 sec	≤10 sec	≤10 sec		≤10 sec	≤10 sec		≤30 sec	≤20 sec	≤30 sec	≤10 sec
	Level of Service	C	D	B	A	F	F	B	B		B	B		D	C	D	B
		D				F				B				D			
Truck	Turning Radius (Right Turn)	< 10m	< 10m	< 10m		< 10m	< 10m	< 10m	< 10m		< 10m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1		2+	2+	2+	2+		1	2+		2+	2+	2+	2+
		F	F	F		D	D	D	D		F	B		B	B	B	B
Auto		F				D				F				B			
	Level of Service	D (AM) / B (PM)				D (AM) / E (PM)				B (AM) / C (PM)				B (AM) / D (PM)			

Intersection Multi-Modal Level of Service
Riverside South Phase 2 Transportation Impact Assessment
2026 Total Background Traffic

November 2, 2017



INTERSECTIONS		Summerhill Street & River				Earl Armstrong & River				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	3		8	8	10	10		3	5	5	7	7	7	7
	Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive	Permissive		Protected	Protected	Protected	Protected		Permissive	No left turn/prohibited	Permissive	Permissive	Permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn	Permissive or yield control		Protected/permissive	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	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	No	No	No	No	No	No
	Corner Radius	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 10m to 15m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel		Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'		No right turn channel	No right turn 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	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSJ)	79 B	79 B	71 C		3 F	3 F	-30 F	-30 F		71 C	45 D	49 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)	80	80	80		130	130	130	130		80	80	80	100	100	100	100
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	32		19	25	15	8		20	8	8	15	20	17	17
	LOS (Delay,seconds)	33.3 D	33.3 D	14.4 B		47.4 E	42.4 E	50.9 E	57.2 E		22.5 C	32.4 D	32.4 D	36.1 D	32.0 D	34.4 D	34.4 D
	Overall Level of Service	D				F				D				F			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow		Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	≤ 50m		> 50m	≤ 50m	> 50m	> 50m		≤ 50m	> 50m	≤ 50m	≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Shared Through-Right?	No	Yes	No		No	No	No	No		No	No	No	No	No	No	No
	Bike Box?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed		1 Lane Crossed	2+ Lanes Crossed	No Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	50km/h		≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h		50km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No		Yes	Yes	Yes	Yes		No	No	No	No	No	No	No
	Level of Service	F	F	D		F	F	F	F		D	F	C	F	F	F	F
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤20 sec		>40 sec	>40 sec	≤10 sec	≤10 sec		≤20 sec	≤10 sec	≤10 sec	≤20 sec	≤40 sec	≤40 sec	≤30 sec
	Level of Service	B	B	C		F	F	B	B		C	B		C	E	E	D
Truck	Turning Radius (Right Turn)	< 10m	< 10m	< 10m		< 10m	< 10m	< 10m	< 10m		< 10m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1		2+	2+	2+	2+		1	2+		2+	2+	2+	2+
		F	F	F		D	D	D	D		F	B		B	B	B	B
Auto	Level of Service	D (AM) / C (PM)				E (AM) / E (PM)				B (AM) / B (PM)				B (AM) / D (PM)			

Intersection Multi-Modal Level of Service
Riverside South Phase 2 Transportation Impact Assessment
2031 Total Background Traffic

November 2, 2017



INTERSECTIONS		Summerhill Street & River				Earl Armstrong & River				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	3		8	8	10	10		3	5	5	7	7	7	7
	Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive	Permissive		Protected	Protected	Protected	Protected		Permissive	No left turn/prohibited	Permissive	Permissive	Permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn	Permissive or yield control		Protected/permissive	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	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	No	No	No	No	No	No
	Corner Radius	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 10m to 15m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel		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 '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	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSJ)	79 B	79 B	71 C		3 F	3 F	-30 F	-30 F		77 B	51 D	49 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)	80	80	80		130	130	130	130		80	80	80	100	100	100	100
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	44		23	27	7	7		20	8	8	15	21	16	16
	LOS (Delay,seconds)	33.3 D	33.3 D	8.1 A		44.0 E	40.8 E	58.2 E	58.2 E		22.5 C	32.4 D	32.4 D	36.1 D	31.2 D	35.3 D	35.3 D
	Overall Level of Service	D				F				D				F			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow		Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	≤ 50m		> 50m	≤ 50m	> 50m	> 50m		≤ 50m	> 50m	≤ 50m	≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Shared Through-Right?	No	Yes	No		No	No	No	No		No	No	No	No	No	No	No
	Bike Box?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed		1 Lane 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	50km/h		≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h		50km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No		Yes	Yes	Yes	Yes		No	No	No	No	No	No	No
	Level of Service	F	F	D		F	F	F	F		D	C	F	F	F	F	F
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤20 sec		>40 sec	>40 sec	≤10 sec	≤10 sec		≤30 sec	≤10 sec	≤10 sec	≤20 sec	≤40 sec	≤40 sec	≤30 sec
	Level of Service	B	B	C		F	F	B	B		D	B		C	E	E	D
Truck	Turning Radius (Right Turn)	< 10m	< 10m	< 10m		< 10m	< 10m	< 10m	< 10m		< 10m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1		2+	2+	2+	2+		1	2+		2+	2+	2+	2+
		F	F	F		D	D	D	D		F	B		B	B	B	B
Auto	Level of Service	D (AM) / C (PM)				E (AM) / E (PM)				B (AM) / B (PM)				B (AM) / D (PM)			



INTERSECTIONS		Summerhill Street & River				Earl Armstrong & River				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	3		8	8	10	10		3	5	5	7	7	7	7
	Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive	Permissive		Protected	Protected	Protected	Protected		Permissive	No left turn/prohibited	Permissive	Permissive	Permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn	Permissive or yield control		Protected/permissive	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	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	No	No	No	No	No	No
	Corner Radius	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 10m to 15m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel		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 '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	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSJ)	79 B	79 B	71 C		3 F	3 F	-30 F	-30 F		77 B	51 D	49 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)	80	80	80		130	130	130	130		80	80	80	100	100	100	100
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	32		20	23	8	7		20	8	8	19	31	8	8
	LOS (Delay,seconds)	33.3 D	33.3 D	14.4 B		46.5 E	44.0 E	57.2 E	58.2 E		22.5 C	32.4 D	32.4 D	32.8 D	23.8 C	42.3 E	42.3 E
	Overall Level of Service	D				F				D				F			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow		Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	≤ 50m		> 50m	≤ 50m	> 50m	> 50m		≤ 50m	> 50m	≤ 50m	≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Shared Through-Right?	No	Yes	No		No	No	No	No		No	No	No	No	No	No	No
	Bike Box?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed		1 Lane 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	50km/h		≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h		50km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No		Yes	Yes	Yes	Yes		No	No	No	No	No	No	No
	Level of Service	F	F	D		F	F	F	F		D	C	F	F	F	F	F
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤20 sec		>40 sec	>40 sec	≤10 sec	≤10 sec		≤20 sec	≤10 sec	≤10 sec	≤30 sec	≤30 sec	≤30 sec	≤20 sec
	Level of Service	B	B	C		F	F	B	B		C	B		D	D	D	C
Truck	Turning Radius (Right Turn)	< 10m	< 10m	< 10m		< 10m	< 10m	< 10m	< 10m		< 10m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1		2+	2+	2+	2+		1	2+		2+	2+	2+	2+
		F	F	F		D	D	D	D		F	B		B	B	B	B
Auto		F				D				F				B			
	Level of Service	D (AM) / C (PM)				D (AM) / E (PM)				A (AM) / A (PM)				B (AM) / C (PM)			

INTERSECTIONS		Summerhill Street & River				Earl Armstrong & River				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	3		8	8	10	10		3	5	5	7	7	7	7
	Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive	Permissive		Protected	Protected	Protected	Protected		Permissive	No left turn/prohibited	Permissive	Permissive	Permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn	Permissive or yield control		Protected/permissive	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	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	No	No	No	No	No	No
	Corner Radius	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 10m to 15m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel		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 '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	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSJ)	79 B	79 B	71 C		3 F	3 F	-30 F	-30 F		77 B	51 D	49 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)	80	80	80		130	130	130	130		80	80	80	110	110	110	110
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	32		23	26	7	7		19	9	9	18	23	22	22
	LOS (Delay,seconds)	33.3 D	33.3 D	14.4 B		44.0 E	41.6 E	58.2 E	58.2 E		23.3 C	31.5 D	31.5 D	38.5 D	34.4 D	35.2 D	35.2 D
	Overall Level of Service	D				F				D				F			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow		Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	≤ 50m		> 50m	≤ 50m	> 50m	> 50m		≤ 50m	> 50m	≤ 50m	≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Shared Through-Right?	No	Yes	No		No	No	No	No		No	No	No	No	No	No	No
	Bike Box?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed		1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	50km/h		≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h		50km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No		Yes	Yes	Yes	Yes		No	No	No	No	No	No	No
	Level of Service	F	F	D		F	F	F	F		D	C	F	F	F	F	F
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤20 sec		>40 sec	>40 sec	≤10 sec	≤10 sec		≤30 sec	≤20 sec	≤10 sec	≤20 sec	≤40 sec	≤30 sec	≤20 sec
	Level of Service	B	B	C		F	F	B	B		D	C	B	C	E	D	C
Truck	Turning Radius (Right Turn)	< 10m	< 10m	< 10m		< 10m	< 10m	< 10m	< 10m		< 10m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1		2+	2+	2+	2+		1	2+		2+	2+	2+	2+
		F	F	F		D	D	D	D		F	B		B	B	B	B
Auto	Level of Service	D (AM) / D (PM)				F (AM) / F (PM)				B (AM) / D (PM)				B (AM) / D (PM)			

INTERSECTIONS		Summerhill Street & River				Earl Armstrong & River				Earl Armstrong Road & Brian Good Avenue				Earl Armstrong Road & Spratt Road			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	3	3	3		8	8	10	10		3	5	5	7	7	7	7
	Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median	No Median	No Median	No Median
	Island Refuge																
	Conflicting Left Turns (from street to right)	No left turn/prohibited	Permissive	Permissive		Protected	Protected	Protected	Protected		Permissive	No left turn/prohibited	Permissive	Permissive	Permissive	Protected/permisive	Protected/permisive
	Conflicting Right Turns (from street to left)	Permissive or yield control	No right turn	Permissive or yield control		Protected/permisive	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR prohibited	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	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	No	No	No	No	No	No
	Corner Radius	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m		> 5m to 10m	> 10m to 15m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m	> 5m to 10m
	Right Turn Channel	No right turn channel	No right turn channel	No right turn channel		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 '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	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSJ)	79 B	79 B	71 C		3 F	3 F	-30 F	-30 F		77 B	51 D	49 D	11 F	11 F	11 F	11 F
	Cycle Length (sec)	80	80	80		130	130	130	130		80	80	80	115	115	115	115
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	32		23	26	7	7		20	8	8	20	23	23	23
	LOS (Delay,seconds)	33.3 D	33.3 D	14.4 B		44.0 E	41.6 E	58.2 E	58.2 E		22.5 C	32.4 D	32.4 D	39.2 D	36.8 D	36.8 D	36.8 D
	Overall Level of Service	D				F				D				F			
Cyclist	Type of Bikeway	Mixed Traffic	Mixed Traffic	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track		Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow		Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	≤ 50m		> 50m	≤ 50m	> 50m	> 50m		≤ 50m	> 50m	≤ 50m	≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Shared Through-Right?	No	Yes	No		No	No	No	No		No	No	No	No	No	No	No
	Bike Box?	No	No	No		No	No	No	No		No	No	No	No	No	No	No
	Number of Lanes Crossed for Left Turns	1 Lane Crossed	1 Lane Crossed	1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed		1 Lane Crossed		2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	50km/h		≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h		50km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h
	Dual Left Turn Lanes?	No	No	No		Yes	Yes	Yes	Yes		No	No	No	No	No	No	No
	Level of Service	F	F	D		F	F	F	F		D	C	F	F	F	F	F
Transit	Average Signal Delay	≤10 sec	≤10 sec	≤20 sec		>40 sec	>40 sec	≤10 sec	≤10 sec		≤30 sec	≤10 sec	≤10 sec	≤20 sec	≤40 sec	>40 sec	≤30 sec
	Level of Service	B	B	C		F	F	B	B		D	B	B	C	E	F	D
Truck	Turning Radius (Right Turn)	< 10m	< 10m	< 10m		< 10m	< 10m	< 10m	< 10m		< 10m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	1	1	1		2+	2+	2+	2+		1	2+		2+	2+	2+	2+
		F	F	F		D	D	D	D		F	B		B	B	B	B
Auto	Level of Service	D (AM) / D (PM)				F (AM) / F (PM)				B (AM) / D (PM)				B (AM) / D (PM)			

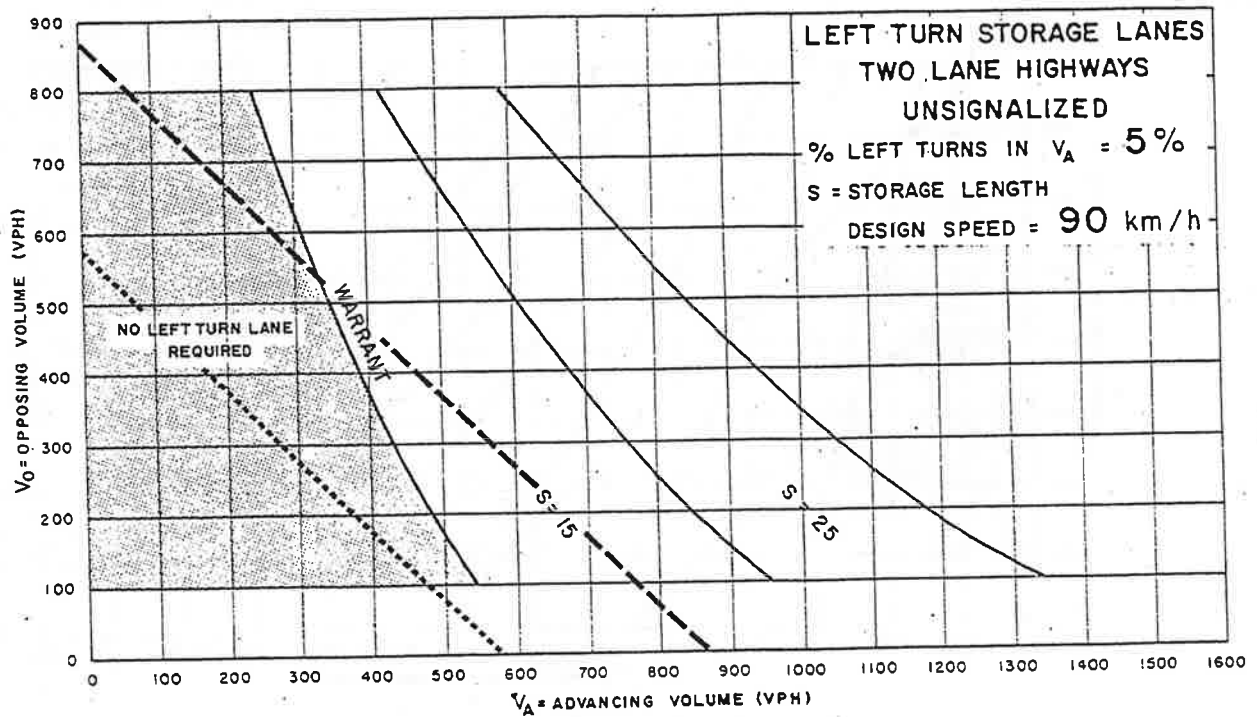


Riverside South Phase 2

Transportation Impact Assessment Strategy Report

Appendix E: Technical Standards

November 2017



--- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL
AREAS OR URBAN AREAS WITH RESTRICTED FLOW

..... TRAFFIC SIGNALS MAY BE WARRANTED IN
"FREE FLOW" URBAN AREAS

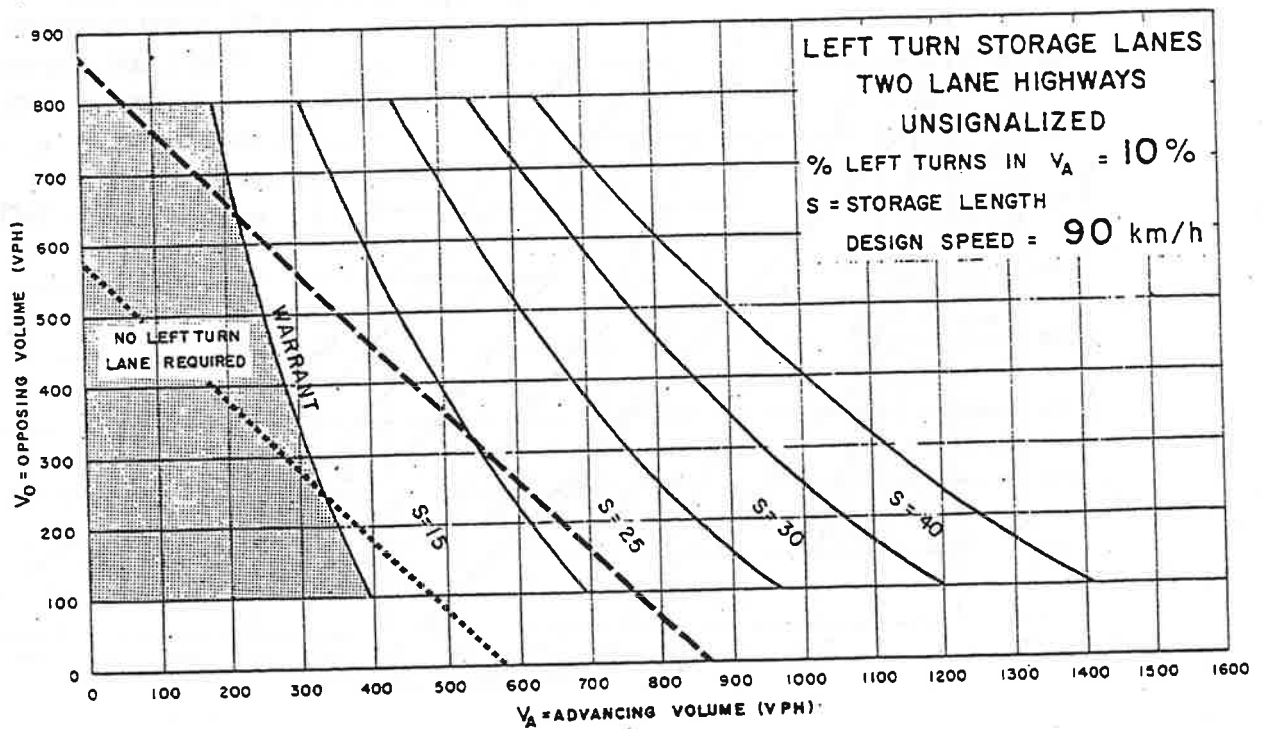


Figure EA-18

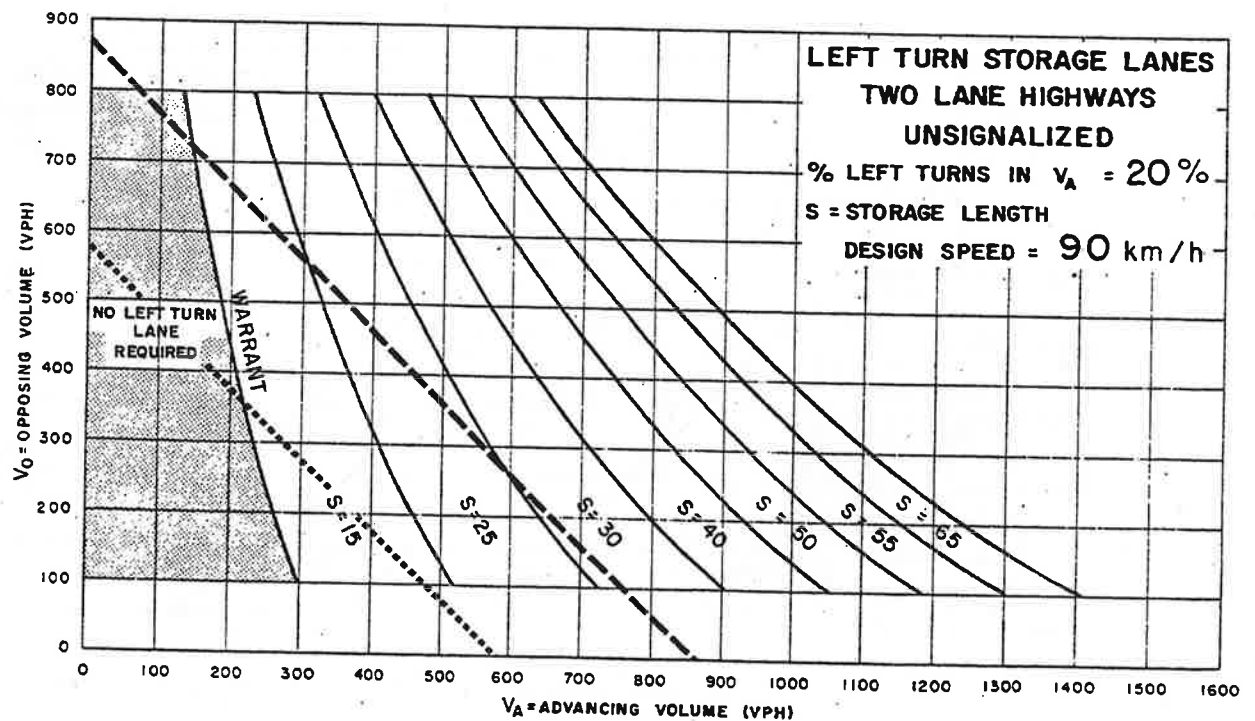
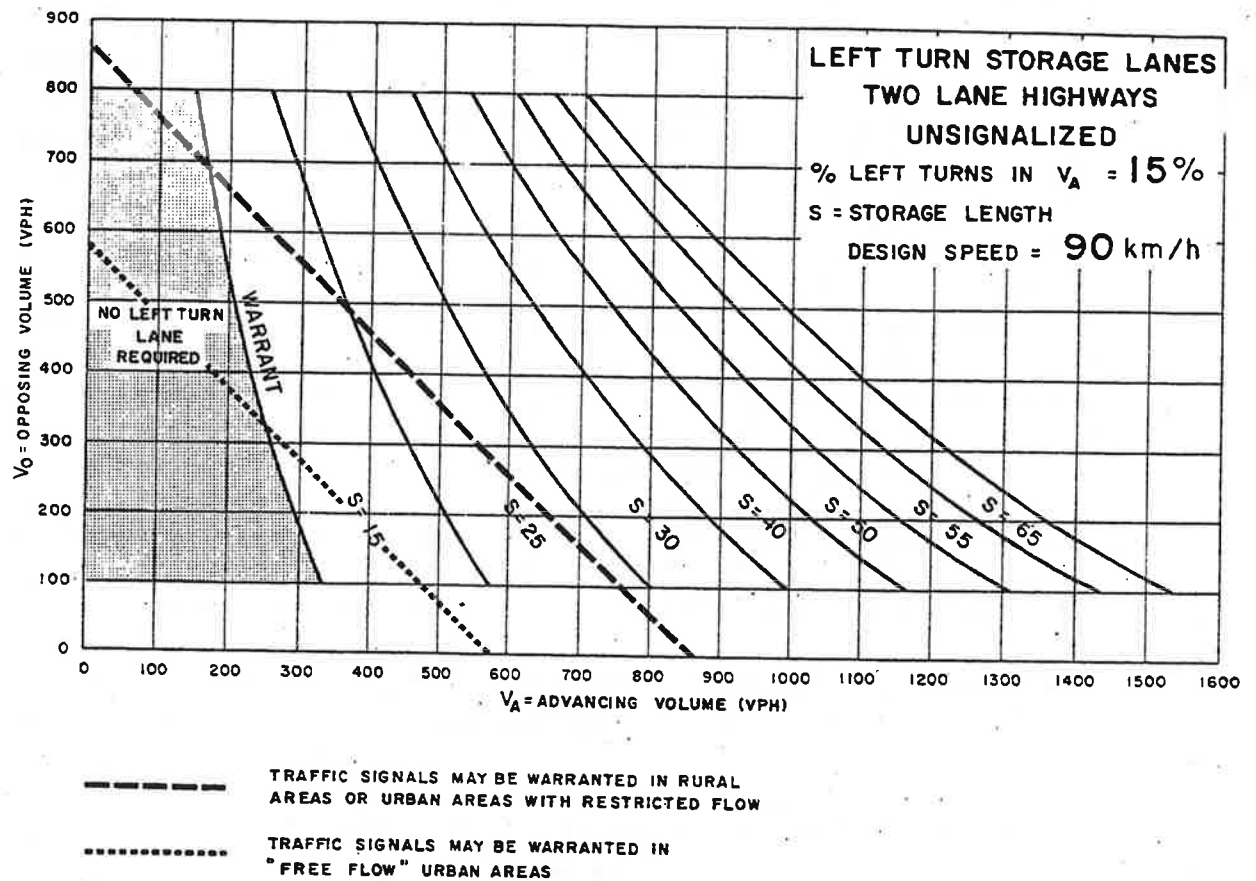


Figure EA-19

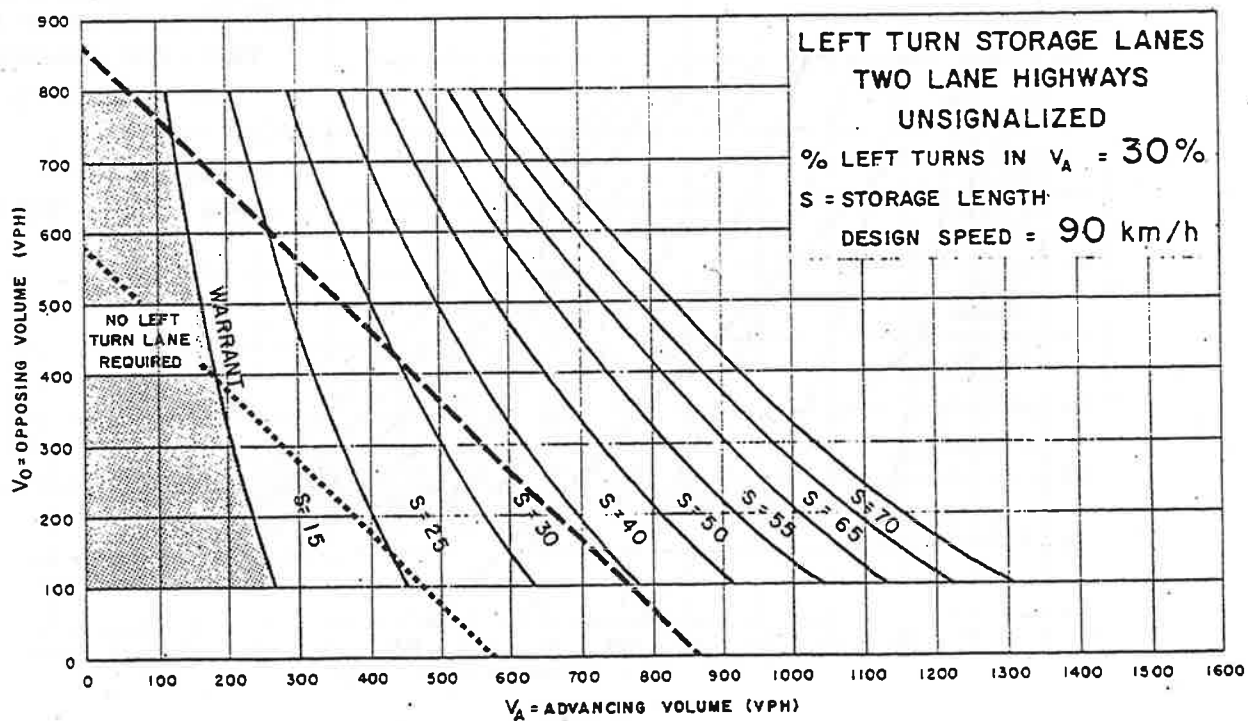
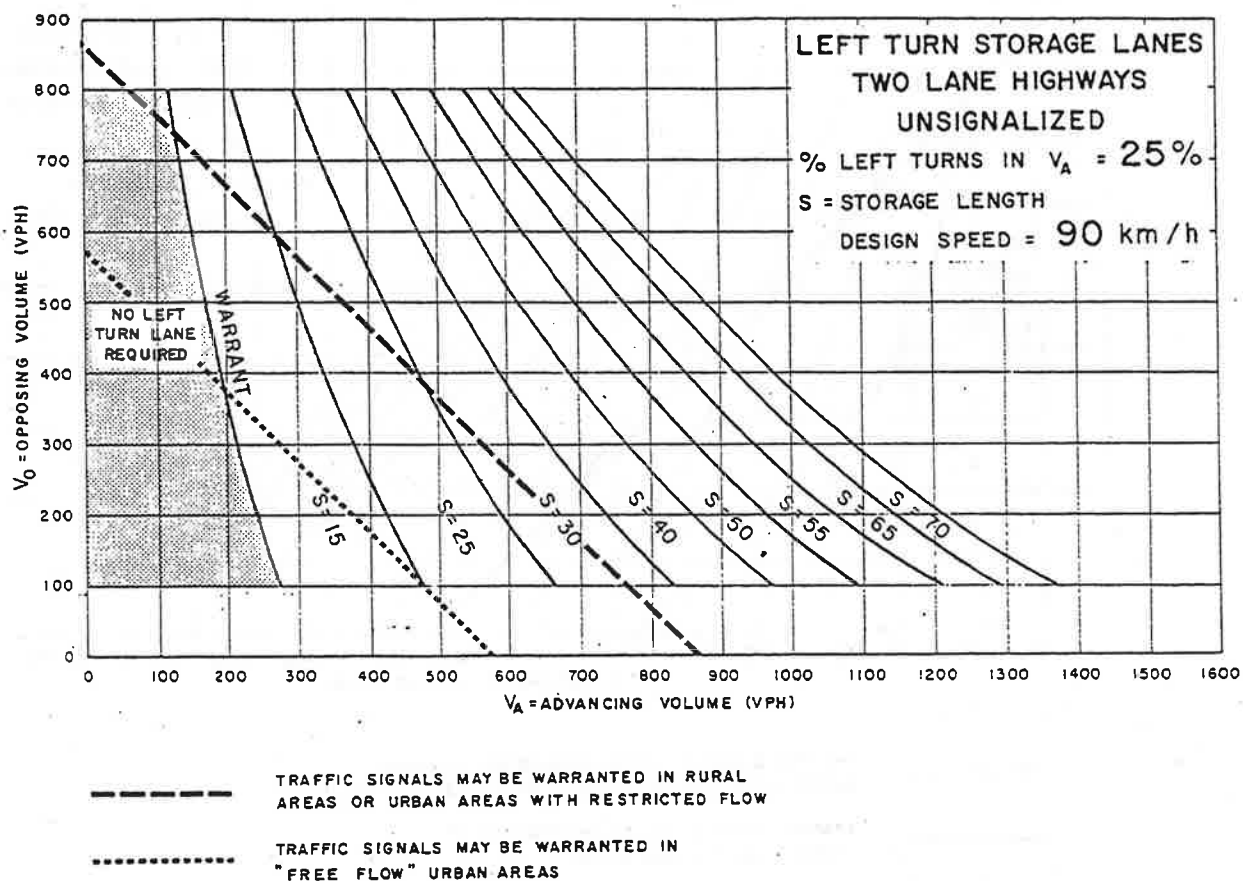


Figure EA-20

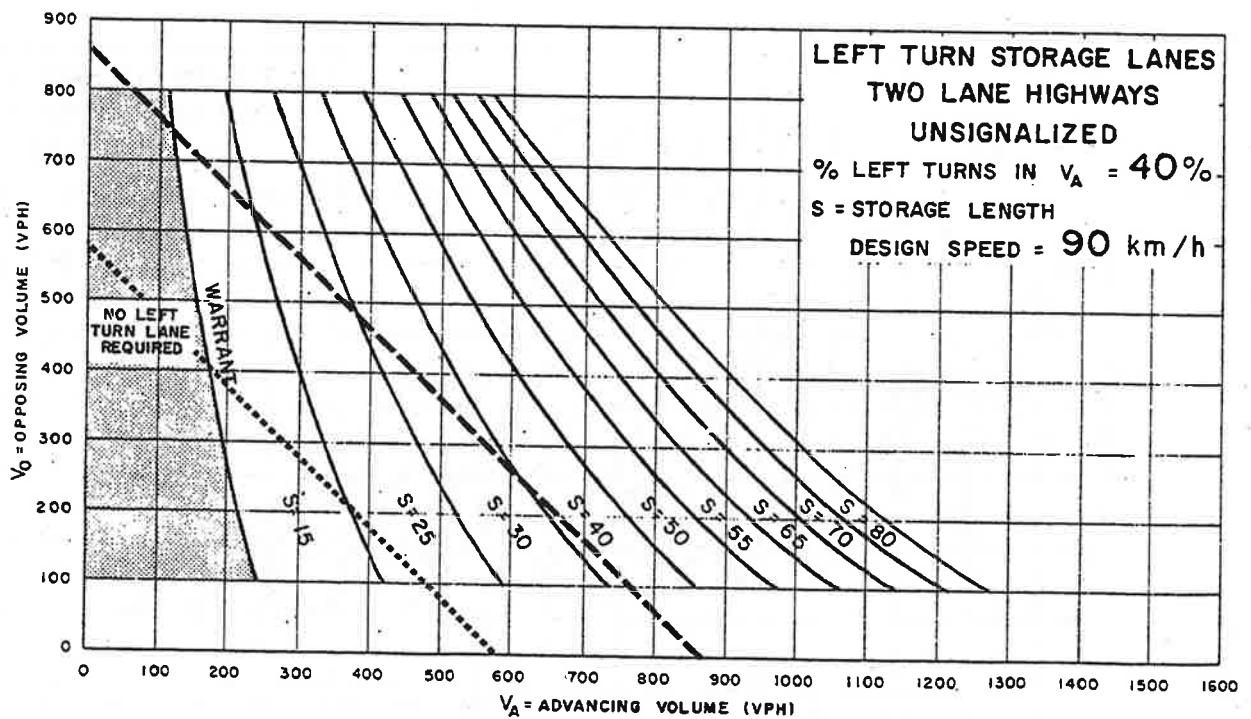
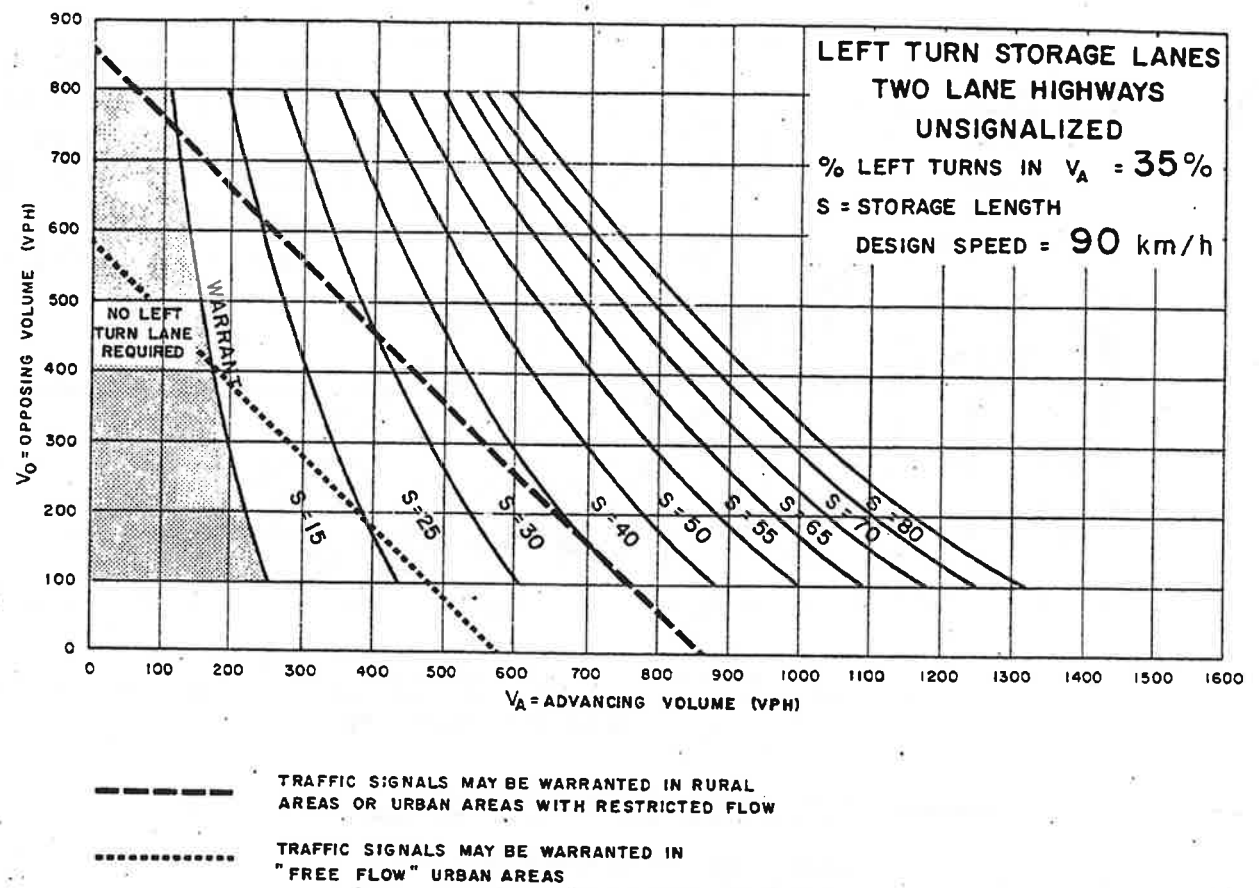
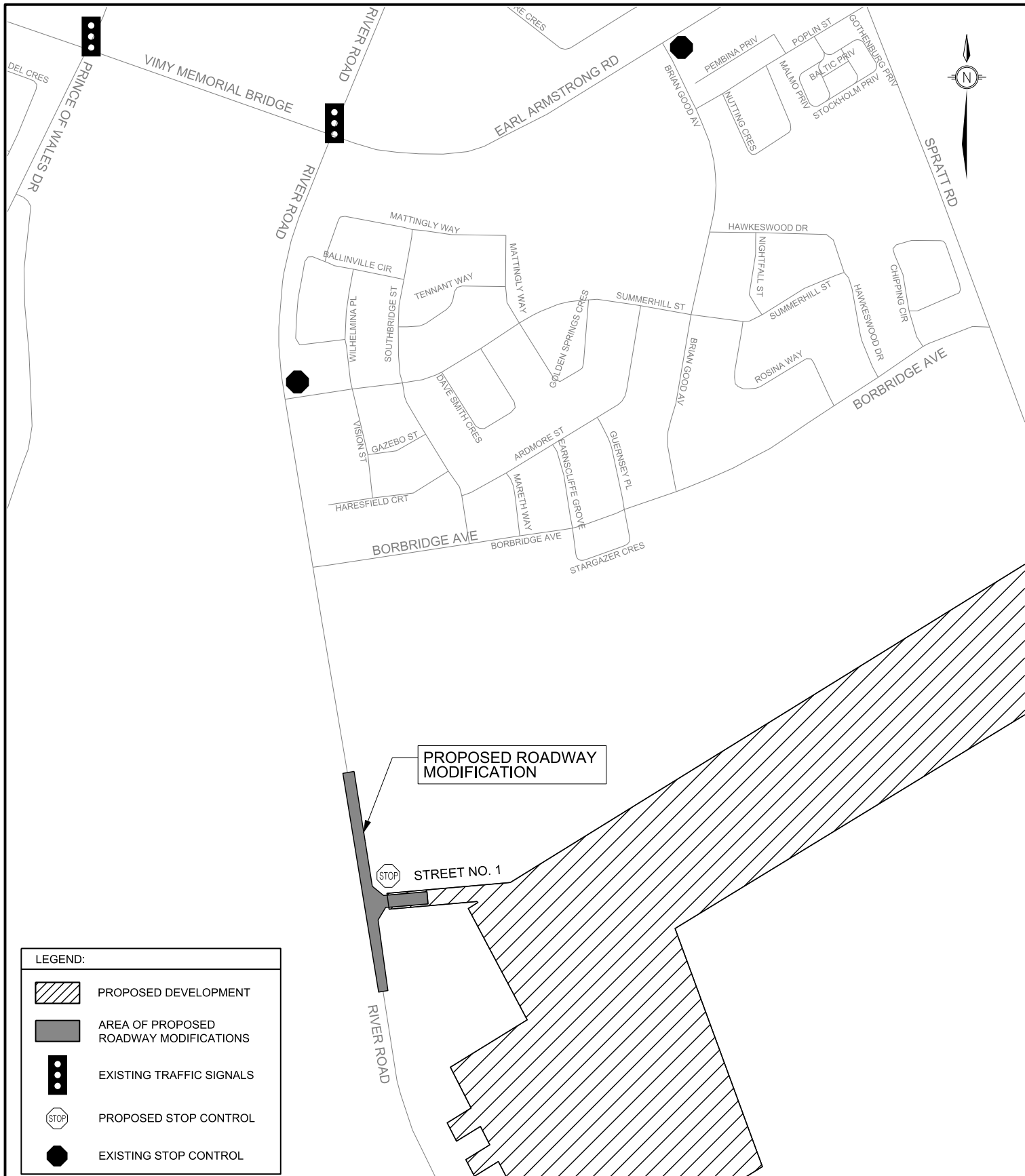


Figure EA-21



PLANNING AND GROWTH
MANAGEMENT

KEY PLAN

RIVER ROAD AT STREET NO. 1

Design Review and Implementation

Approved By:
X. Xxxxx

Completed By:
IBI GROUP

Scale:
N.T.S.

Date:
OCT.
2017

Drawing No.:

DRI-xx-xxxxA

