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Sequoia Church 35 Highbury Park Drive Transportation Impact Assessment

Engineering excellence. Planning precision. Inspired landscapes.

Sequoia Church
35 Highbury Park Drive
Transportation Impact Assessment

Prepared By:

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May 27, 2019

Novatech File: 118187
Ref: R-2018-166

May 27, 2019

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

Attention: Ms. Rosanna Baggs
Project Manager, Infrastructure Approvals

Dear Ms. Baggs:

Reference: Sequoia Church, 35 Highbury Park Drive
Transportation Impact Assessment Report
Novatech File No. 118187

We are pleased to submit the following Transportation Impact Assessment report in support of Site Plan Control and Zoning By-Law Amendment applications for the above address. The structure and format of this report is in accordance with the City of Ottawa Transportation Impact Assessment Guidelines (June 2017).

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

Yours truly,

NOVATECH



Rochelle Fortier, B.Eng.
E.I.T. | Transportation/Traffic



TIA Plan Reports

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

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

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

CERTIFICATION

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

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

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Dated at Ottawa this 27 day of May, 2019.
(City)

Name: Brad Byvelds, P.Eng.
(Please Print)

Professional Title: Project Coordinator, Transportation/Traffic

B. Byvelds

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

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EXECUTIVE SUMMARY

This Transportation Impact Assessment (TIA) report has been prepared in support of Site Plan Control and Zoning By-Law Amendment applications for 35 Highbury Park Drive. The subject site is currently vacant.

The subject site is designated as 'General Urban Area' on Schedule 'B' of The City of Ottawa's Official Plan. It is currently zoned I1B – Minor Institutional Zone.

The proposed development consists of a new church with a café to be leased out to a local coffee shop. The Sequoia Church currently holds Sunday service at the Ottawa Christian School (255 Tartan Drive). Based on current attendance records, on average approximately 300 people (adults and children) attend Sunday service. The proposed coffee shop will provide approximately 1,700 square feet of Gross Floor Area (GFA).

Activities at the church will consist of a Sunday morning service (and Sunday School) from 10:10-11:30am, Sunday afternoon meetings (Church Plant), Tuesday night youth groups from 7-9pm and occasional weekday evening meetings from 7-9pm. Ministry offices will be open Monday to Saturday from 9am to 7pm. The café is anticipated to be open all week, from 8am to 8pm.

A parking lot containing 125 parking spaces (and an additional 17 tandem parking spaces) will be provided with a full movement access on Highbury Park Drive. The proposed development is anticipated to be completed in one phase, with full occupancy by the year 2020.

The majority of trips generated by the church will either occur on a Sunday, or outside the weekday AM and PM peak hours. The café is anticipated to generate the most trips during the weekday AM and Saturday peak hours. As Sunday service is anticipated to be the overall peak hour for the site, it has been analyzed. The background traffic along Greenbank Road and site traffic generation is higher during the Saturday peak hour compared to the weekday peak hours, therefore the Saturday peak hour has also been analyzed.

For the purpose of this analysis, a projected attendance of 400 people for Sunday Service and Sunday School has been assumed in order to account for the worst-case scenario. However, it is anticipated that the attendance will be significantly lower when the site first develops (approximately 300 people) and may grow over time. Should the attendance reach 400 people, church staff have confirmed that two separate Sunday services will be offered.

The development is anticipated to generate a total of 71 trips (39 in, 32 out) during the Saturday peak, 246 trips (190 in, 56 out) during the Sunday arrival peak, and 246 trips (54 in, 192 out) during the Sunday departure period.

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

Development Design and Parking

- Pedestrian facilities will be provided between the main building entrance and the parking lot. A connection to the sidewalk along Highbury Park Drive will be provided, as shown on the site plan. Sidewalks will be continuous and depressed across all accesses.
- OC Transpo stops #7218, #7217, #4634, #4635, #2835, and #2834 are all located within a 400m walking distance (measured using legal crosswalks) of the proposed development.

- A MUP is provided along the east side of the Transitway. The MUP crosses under the Highbury Park/Transitway overpass as well as connects to the sidewalks on either side of Highbury Park Drive. As pedestrians have the opportunity to cross under the Highbury Park Drive/Transitway overpass, and the MUP connections to the sidewalk on Highway Park Drive are located 200m from the signalized intersection with Greenbank Road, a pedestrian crossover (PXO) is not recommended at this location.
- All required TDM-supportive design and infrastructure measures in the TDM checklist are met.
- A lay-by is proposed along the south edge of the development. It is 2.6m wide, and approximately 22m in length. This would provide enough storage for approximately three vehicles.
- The 125 proposed vehicular parking spaces will not meet the requirements of the ZBL. As it is anticipated that the church, community centre, and café uses will generally be used by the same individuals, relief from the minimum parking requirements of the ZBL is being sought. It is noteworthy that an additional 17 tandem parking spaces will be provided near the northern limits of the parking lot, however these spaces do not count towards the parking count.

Boundary Street MMLOS

- Highbury Park Drive meets the target segment PLOS, BLOS, and Auto LOS. No improvements are recommended along Highbury Park Drive based on the segment MMLOS analysis.

Access Design

- The proposed development will be served by one all-movement access along Highbury Park Drive. This access will be approximately 8.5m in width and will meet all requirements of the City's *Private Approach By-Law*.
- Available sightlines are within recommended guidelines to allow safe all directional access to the development.

Transit

- It is anticipated that the proposed development will generate an additional 6 transit trips (3 in, 3 out) during the Saturday peak hour, 25 transit trips (22 in, 3 out) during the Sunday arrival peak, and 25 transit trips (2 in, 23 out) during the Sunday departure peak.

Intersection MMLOS

- The Greenbank Road/Highbury Park Drive intersection currently achieves the target BLOS and Auto LOS, however does not meet the target PLOS or TkLOS for the policy area. As this intersection was recently constructed, no changes are recommended.
- The Greenbank Road/Berrigan Drive/Wessex Road intersection currently achieves the target Auto LOS, however does not meet the target PLOS, BLOS, or TkLOS. However, as this intersection was recently reconstructed, and the current configuration was deemed appropriate by the City, no changes are recommended.

Background Traffic

- Under 2020 and 2025 background traffic conditions, all intersections are anticipated to operate with a LOS B or better.

Total Traffic

- Under 2020 total traffic conditions, all intersections are anticipated to operate with a LOS B or better. The site access is anticipated to operate with a LOS A, and a maximum delay of approximately 10 seconds.
- Under 2025 total traffic conditions, all intersections are anticipated to operate with a LOS C or better. The site access is anticipated to operate with a LOS A, and a maximum delay of approximately 10 seconds.
- The westbound left turn movement at the Greenbank Road/Highbury Park Drive intersection is anticipated to have a 95th percentile queue length of approximately 55m during the Sunday departure peak. The queuing during the departure period is not anticipated to extend past the nearest access to 30 Highbury Park Drive.
- The addition of site traffic is not anticipated to have any major impacts on operating conditions of the study area intersections.

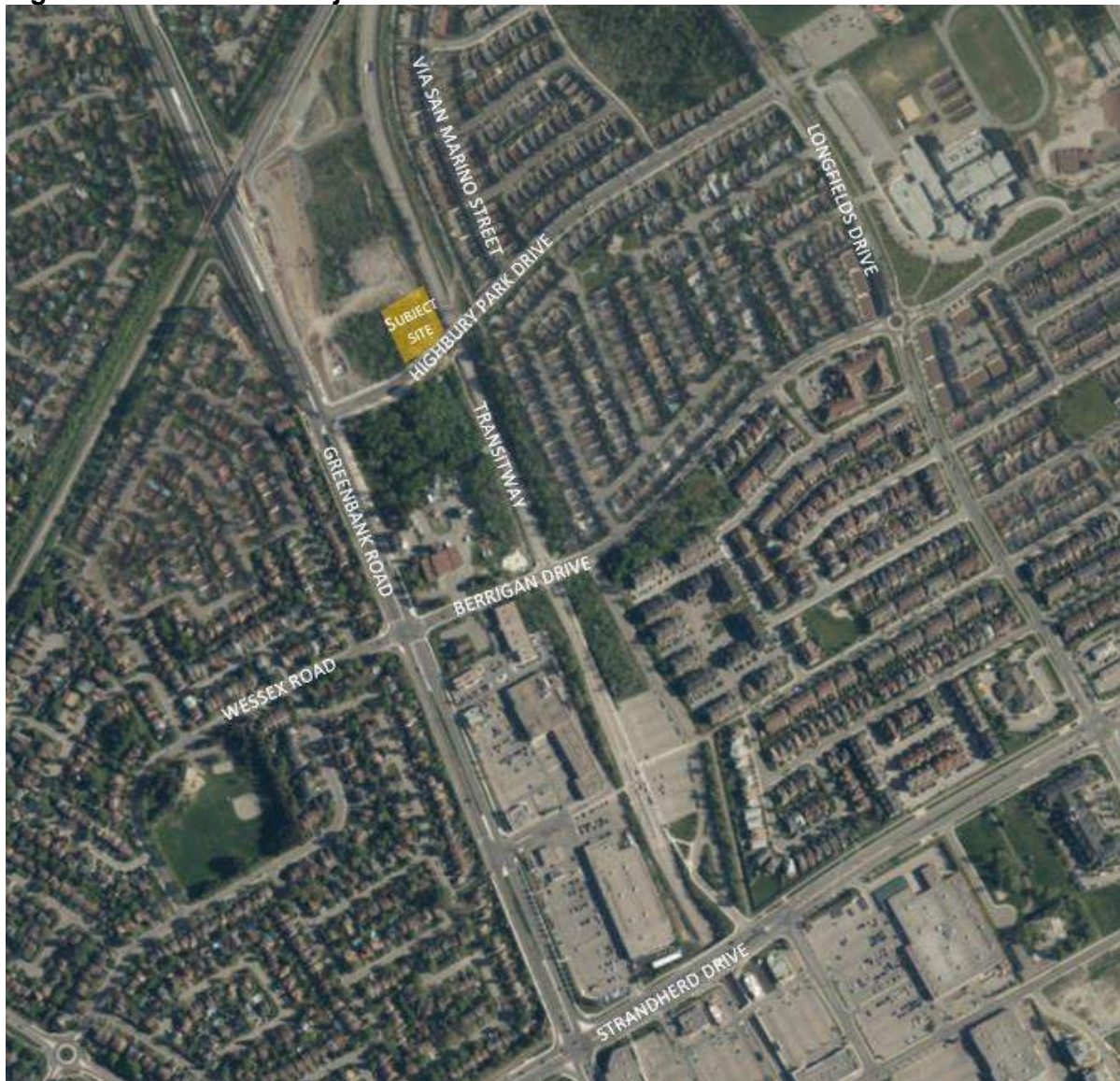
1.0 INTRODUCTION

This Transportation Impact Assessment (TIA) report has been prepared in support of Site Plan Control and Zoning By-Law Amendment applications for 35 Highbury Park Drive. The subject site is currently vacant. The subject site is surrounded by the following:

- Vacant land to the north;
- The Transitway and residential properties to the east;
- Highbury Park Drive and commercial properties to the south; and
- Greenbank Road and residential properties to the west.

A view of the subject site is provided in **Figure 1**.

Figure 1: View of the Subject Site



2.0 PROPOSED DEVELOPMENT

The subject site is designated as 'General Urban Area' on Schedule 'B' of The City of Ottawa's Official Plan. It is currently zoned I1B – Minor Institutional Zone.

The proposed development consists of a new church with a café to be leased out to a local coffee shop. The Sequoia Church currently holds Sunday service at the Ottawa Christian School (255 Tartan Drive). Based on current attendance records, on average approximately 325 people (adults and children) attend Sunday service. The proposed coffee shop will provide approximately 1,700 square feet of Gross Floor Area (GFA).

Activities at the church will consist of a Sunday morning service (and Sunday School) from 10:10-11:30am, Sunday afternoon meetings (Church Plant), Tuesday night youth groups from 7-9pm and occasional weekday evening meetings from 7-9pm. Ministry offices will be open Monday to Saturday from 9am to 7pm. The café is anticipated to be open all week, from 8am to 8pm.

A parking lot containing 125 parking spaces (and an additional 17 tandem parking spaces) will be provided with a full movement access on Highbury Park Drive. The proposed development is anticipated to be completed in one phase, with full occupancy by the year 2020.

A copy of the proposed site plan is included in **Appendix A**.

3.0 SCREENING

3.1 Screening Form

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

The trigger results are as follows:

- Trip Generation Triggers – The proposed church is anticipated to generate over 60 person trips/peak hour; further assessment is required based on this trigger. The proposed café is also anticipated to generate more than 60 person trips/peak hour.
- Location Triggers – The proposed development is not located along a boundary street that is designated as part of the City's Transit Priority, Rapid Transit, or Spine Bicycle Networks; further assessment is not required based on this trigger.
- Safety Triggers – The proposed development is located within the area of influence of an adjacent traffic signal; further assessment is required based on this trigger.

The proposed development satisfies the trip generation and the safety triggers for completing a TIA. A copy of the TIA screening form is included in **Appendix B**.

4.0 SCOPING

4.1 Existing Conditions

4.1.1 Roadways

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

Highbury Park Drive is an east-west collector roadway with a two-lane undivided urban cross section. It extends from Longfields Drive in the east, to Greenbank Road in the west. Highbury Park Drive has a posted speed limit of 40km/h, and street parking is permitted along both sides of the roadway. Annex 1 of the City of Ottawa's Official Plan identifies a right-of-way (ROW) protection of 24m for Highbury Park Drive between Greenbank Road and Longfields Drive.

Greenbank Road is a north-south arterial roadway, which extends from Prince of Wales in the south, to Highway 417 in the north, where it continues as Pinecrest Road. Within the study area, Greenbank Road has a four-lane divided urban cross section with a posted speed limit of 60km/h. Parking is not permitted along Greenbank Road. It is classified as a truck route, allowing full loads. Annex 1 of the City of Ottawa's Official Plan identifies a right-of-way (ROW) protection of 44.5m for Greenbank Road between Fallowfield Road to Strandherd Drive.

Berrigan Drive is an east-west collector roadway which extends from Beatrice Drive in the east to Greenbank Road in the west, where it continues as Wessex Road. Berrigan Drive has a two-lane urban undivided cross section with a posted speed limit of 40km/h.

Wessex Road is an east-west collector roadway which extends from Exeter Drive in the west, to Greenbank Road in the east, where it continues as Berrigan Drive. It has a two-lane urban undivided cross section with a posted speed limit of 40km/h.

Via San Marino Street is a north-south local roadway which extends from Highbury Park Drive in the south to Via Verona Avenue in the north. It has a two-lane undivided cross section with a regulatory speed limit of 50km/h.

4.1.2 Intersections

Greenbank Road/Highbury Park Drive

- Signalized intersection
- Southbound: one left turn lane, two through lanes
- Northbound: one through lane, one shared through/right lane
- Westbound: one left turn lane, one right turn lane
- Standard crosswalks are provided on all legs
- A pedestrian refuge area is provided within the median on the north and south legs
- A two-stage left turn bike box is provided on the east leg
- Bicycle signals are provided to facilitate southbound left turn movements for cyclists



Greenbank Road/Berrigan Drive/Wessex Road

- Signalized intersection
- Northbound/Southbound: one left turn lane, two through lanes, one right turn lane
- Westbound: one left turn lane, one through lane, one right turn lane
- Eastbound: one left turn lane, one shared through/right turn lane
- Standard crosswalks are provided on all legs
- Bike lanes are provided on the north and south legs



Highbury Park Drive/Via San Marino Street

- Stop controlled T intersection, with free flow on Highbury Park Drive
- One travel lane on all approaches



4.1.3 Driveways

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

Along the south side of Highbury Park Drive, approximately 80m east of the Greenbank Road/Highbury Park Drive intersection: one driveway to the plaza at 30 Highbury Park Drive. Land uses include retail, fast-food restaurant, medical office and pharmacy.

4.1.4 Pedestrian and Cycling Facilities

Greenbank Road is classified as a Spine Route in the City's Ultimate Cycling Network. Bike lanes are currently provided along Greenbank Road within the vicinity of the subject site, and a Multi-Use Pathway (MUP) is located along the west side of Greenbank Road. A sidewalk is provided along the east side of Greenbank Road.

Highbury Park Drive, between Greenbank Road and the Transitway is classified as a Pathway Link in the City's Ultimate Cycling Network. Bike lanes are provided along this stretch of Highbury Park Drive. Sidewalks are provided along both sides of Highbury Park Drive.

There is a MUP that runs along the east side of the transitway which ties into the sidewalks on either side of Highbury Park Drive. Pedestrians may cross underneath the Highbury Park Drive/Transitway overpass.

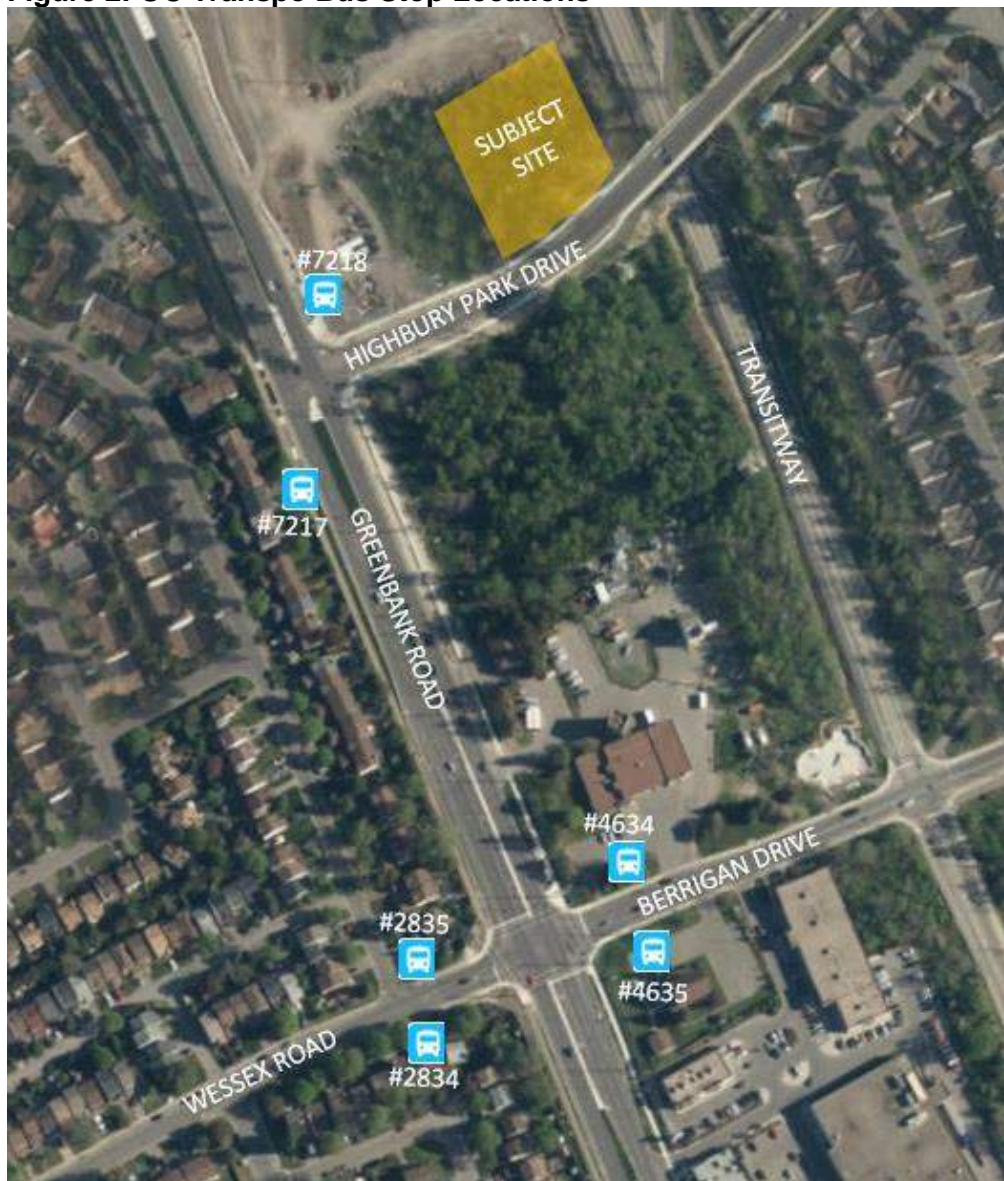
Berrigan Drive and Wessex Road are classified as local routes in the City's Ultimate Cycling Network. There are no dedicated cycling facilities along Berrigan Drive, Wessex Road or Via San Marino Street. Sidewalks are provided along both sides of Berrigan Drive, along the north side of Wessex Road, and along the west side of Via San Marino Street.

4.1.5 Transit

The nearest bus stops to the subject site are stop #7218 (serving OC Transpo Route 170, located on the east side of Greenbank Road, north of Highbury Park Drive), stop #7217 (serving OC Transpo Route 170, located on the west side of Greenbank Road, south of Highbury Park Drive), stop #4634 (serving OC Transpo Route 170 and 273, located on the north side of Berrigan Drive, east of Greenbank Road), stop #4635 (serving OC Transpo Route 170 and 273, located on the south side of Berrigan Drive, east of Greenbank Road), stop #2835 (serving OC Transpo Route 273, located on the north side of Wessex Road, west of Greenbank Road), and stop #2834 (serving OC Transpo Route 273, located on the south side of Wessex Road, west of Greenbank Road).

These bus stop locations are shown in **Figure 2**.

Figure 2: OC Transpo Bus Stop Locations



Rapid transit service is also provided via the Strandherd Transit Station, located at a walking distance of approximately 750m from the proposed development. This station provides convenient access to multiple routes along the north/south Transitway.

OC Transpo Route 170 travels from Fallowfield Transit Station to Barrhaven Centre Transit Station. It's offered all week, with all day service.

OC Transpo Route 273 travels from Mackenzie King Transit Station to Strandherd Drive/Jockvale Road. It's offered Monday to Friday, with peak period service only.

OC Transpo Route information is included in **Appendix C**.

4.1.6 Existing Area Traffic Management Measures

A red light camera exists at the Greenbank Road/Berrigan Drive/Wessex Road intersection.

Currently, there are no other existing Area Traffic Management (ATM) measures within the study area.

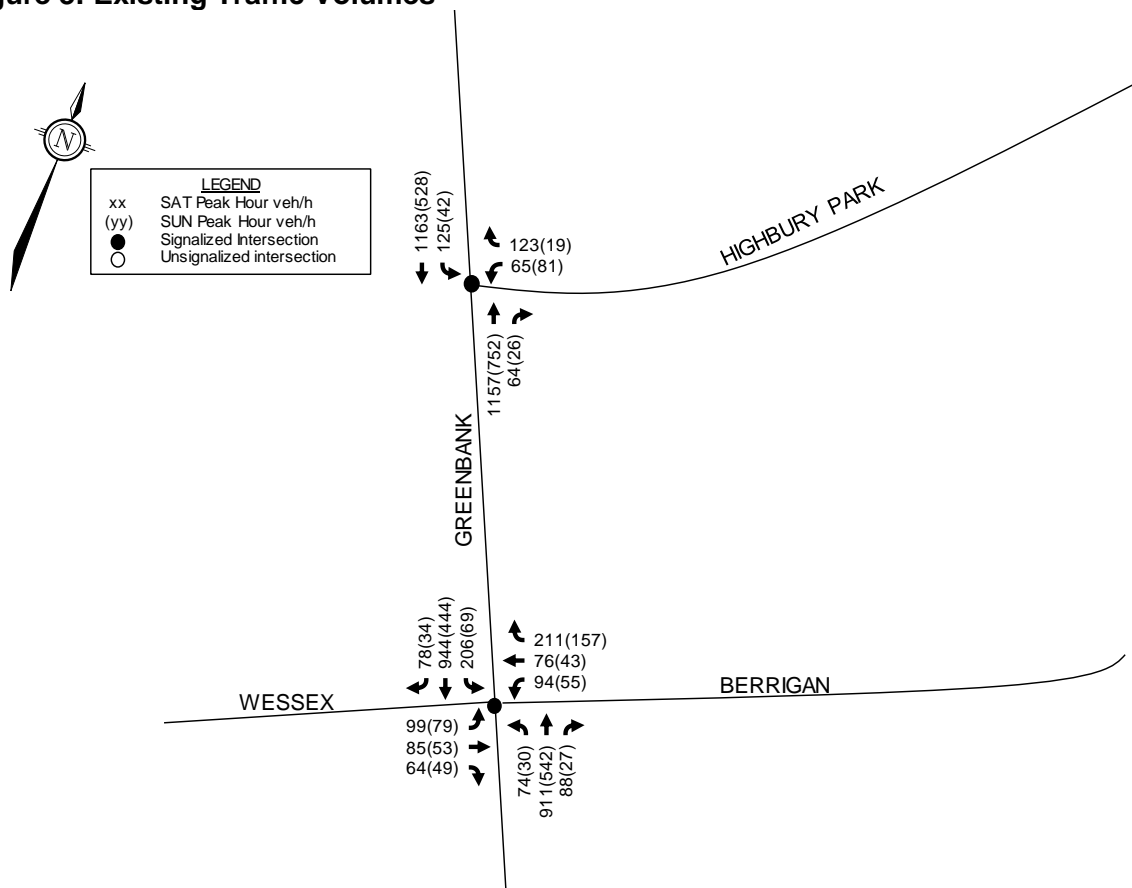
4.1.7 Existing Traffic Volumes

Traffic counts were coordinated by Novatech at the study area intersections in order to determine the existing pedestrian, cyclist and vehicular traffic volumes. Sunday counts were performed between the hours of 8:00-14:00, which would capture the peak hours of the church. Saturday counts were performed between the hours of 10:00-14:00, which would capture the peak hours of the café.

The traffic counts were completed on the following dates:

- | | |
|---|-----------------------------|
| • Greenbank Road/Highbury Park Drive | November 4, 2018 (Sunday) |
| • Greenbank Road/Highbury Park Drive | December 1, 2018 (Saturday) |
| • Greenbank Road/Berrigan Drive/Wessex Road | November 4, 2018 (Sunday) |
| • Greenbank Road/Berrigan Drive/Wessex Road | December 1, 2018 (Saturday) |

Existing traffic volumes along the study area roadways are shown in **Figure 3**. Peak hour summary sheets of the above traffic counts are included in **Appendix D**.

Figure 3: Existing Traffic Volumes

4.1.8 Collision Records

Historical collision data from the last five years was obtained from the City's Public Works and Service Department for the study area intersections. Copies of the collision summary report are included in **Appendix E**.

The collision data has been evaluated to determine if there are any identifiable collision patterns. The following summarizes the number of collisions at each intersection from January 1, 2013 to December 31, 2017.

Table 1: Reported Collisions

Intersection/Segment	Number of Reported Collisions
Greenbank Road/Highbury Park Drive	2
Greenbank Road between Highbury Park Drive & Wessex Road	7
Greenbank Road/Berrigan Drive/Wessex Road	65

It is important to note that Greenbank Road was under construction from 2015 to 2016, while it was widened to its current divided four-lane cross section. Prior to this, Greenbank Road had a two-lane, undivided cross section along the study area intersections. Construction along Greenbank Road was completed in November 2016.

Greenbank Road/Highbury Park Drive

A total of two collisions were reported at this intersection over the last five years. This intersection was recently constructed and both collisions occurred in 2017. Both collisions were rear end collisions that occurred on the northbound approach. One occurred in icy conditions, and one occurred in clear conditions. No injuries were reported.

Greenbank Road between Highbury Park Drive & Wessex Road

A total of seven collisions were reported at this location over the last five years. Of these, there were five rear end collisions, and two approaching collisions. Three of the collisions caused injuries, but none caused fatalities. No collisions were reported in 2016 or 2017, following the Greenbank Road construction.

Greenbank Road/Berrigan Drive/Wessex Road

A total of 65 collisions were reported at this intersection over the last five years. Of these, there were 38 rear end impacts, nine turning movement impacts, seven angle impacts, five sideswipe impacts, four single vehicle/other impacts, and one approaching impact.

It is important to note that this intersection was under construction from 2015 to 2016, while Greenbank Road was widened to a four-lane cross section. Prior to this, the northbound and southbound approaches comprised of one left turn lane, one through lane and one right turn lane. Construction along Greenbank Road was completed in November 2016. Of the total 65 collisions reported at this intersection over the last 5 years, 27 occurred pre-construction (2013-2014), 29 occurred during construction (2015-2016), and 8 collisions were reported after construction (2017). Of the 8 collisions that occurred after construction on Greenbank Road was complete there were three turning movement impacts, two rear end collisions, two angle impacts, and one single vehicle impact.

Of the total 38 rear end impacts, 15 occurred on the northbound approach, 21 on the southbound approach, and two on the westbound approach. Of the total 38 rear end impacts, 28 were classified as having property damage only, 9 caused injuries, but none were fatal, and one rear end impact was classified as non-reportable. Four of the collisions occurred under snowy/icy conditions, 8 under wet conditions, and 26 under clear conditions.

The high volume of rear end collisions could be attributed to the construction in the area, and to the previous two-lane cross section of Greenbank Road. Twenty of the rear end collisions occurred pre-construction (2013-2014), sixteen during construction (2015-2016), and two after construction (2017).

Of the nine turning movement impacts, six involved southbound left turning vehicles colliding with northbound through vehicles, two involved northbound left turning vehicles colliding with southbound through vehicles, and one involved a northbound right turning vehicle colliding with a northbound through vehicle. Of the total nine turning movement impacts, two occurred in snowy conditions, two in rainy conditions, and five in clear conditions. One of the turning movement impacts caused injuries, but none were fatal. Three of the turning movement impacts occurred pre-construction (2013-2014), three during construction (2016), and three after construction (2017).

Of the seven angle impacts, three occurred between westbound vehicles and northbound vehicles, two occurred between westbound vehicles and southbound vehicles, and two occurred between southbound vehicles and eastbound vehicles. Of the total seven angle impacts, two

occurred in snowy conditions, one in rainy conditions, and four in clear conditions. One of the angle impacts caused an injury, but none caused fatalities. Two of the angle impacts occurred pre-construction (2014), three during construction (2015-2016), and two after construction (2017).

Based on the collision history post-construction on Greenbank Road, no relevant collision patterns are identified. It is recommended that the City monitor the collision history in the future to determine any collision patterns post Greenbank construction.

4.2 Planned Conditions

Currently, there are no planned improvements to the study area road network.

The City of Ottawa's Development Application Tool identifies a new development located at 30 Highbury Park Drive. Currently, some of this development has been built out and is occupied. The remainder of this development is currently under construction and will provide 1,200 square metres of ground floor retail/pharmacy use and 740 square metres of second floor office/medical uses.

4.3 Study Area and Time Periods

A boundary street review was conducted for Highbury Park Drive. The study area intersections include the proposed access and the signalized intersections at Greenbank Road/Highbury Park Drive and Greenbank Road/Berrigan Drive/Wessex Road.

As per discussions with the church, the majority of trips generated by the church will either occur on a Sunday, or outside the weekday AM and PM peak hours. As such, the peak period for analysis for the church will be the Sunday peak hour.

The café (which will be leased out to a local coffee shop) is anticipated to generate trips during the weekday and Saturday peak hours. The café will have approximately 160 square metres of GFA. As the ITE Land Use Code 936 for a Coffee/Donut Shop without Drive Through Window relies on data from larger chain coffee shops (i.e. Tim Hortons, Starbucks, etc.), this is considered unrepresentative of the anticipated trips generated by the café. As such, local surveys were conducted at the Bridgehead coffee shop at 2140 Carling Avenue. This location was chosen as it has a similar size, clientele and walkability as the proposed café. The findings of the weekday and Saturday person trip generation surveys are summarized as follows:

- Weekday AM peak: 96 person trips (63 in, 33 out)
- Weekday PM peak: 52 person trips (26 in, 26 out)
- Saturday peak: 112 person trips (54 in, 58 out)

A review of the adjacent street traffic along Greenbank Road was conducted. Based on a weekday count and a Saturday count at the Greenbank Road/Wessex Road/Berrigan Drive intersection, it was found that traffic along Greenbank Road is highest during the Saturday peak hour. The two-way totals on Greenbank Road based on the traffic counts are as follows:

- Weekday AM peak: 1553 vehicles per hour
- Weekday PM peak: 1910 vehicles per hour
- Saturday peak: 2449 vehicles per hour

The results of the Bridgehead trip generation surveys and the peak hour summary sheets of the above traffic counts can be found in **Appendix D**.

The selected period for analysis for the café is the Saturday peak hour, as this represents the 'worst case' combination of site generated traffic and adjacent street traffic. Based on the foregoing, the analysis in this report will be completed for the Saturday peak and Sunday peak hours, for the 2020 build-out year and 2025 horizon year.

4.4 Exemptions Review

This module reviews possible exemptions from the final TIA, as outlined in the TIA Guidelines. The applicable exemptions for this site are shown in **Table 2**.

Table 2: TIA Exemptions

Module	Element	Exemption Criteria	Exemption Applies
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	<ul style="list-style-type: none"> Only required for site plans 	Not Exempt
	4.1.3 New Street Networks	<ul style="list-style-type: none"> Only required for plans of subdivision 	Exempt
4.2 Parking	4.2.1 Parking Supply	<ul style="list-style-type: none"> Only required for site plans 	Not Exempt
	4.2.2 Spillover Parking	<ul style="list-style-type: none"> Only required for site plans where parking supply is 15% below unconstrained demand 	Exempt
Network Impact Component			
4.5 Transportation Demand Management	<i>All elements</i>	<ul style="list-style-type: none"> Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time 	Exempt
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	<ul style="list-style-type: none"> Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds 	Exempt
4.8 Network Concept	<i>All elements</i>	<ul style="list-style-type: none"> Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by the established zoning 	Exempt

The traffic volumes at the Greenbank Road/Highbury Park Drive intersection indicate a two-way total of approximately 375 vehicles use Highbury Park Drive during the Saturday peak hour and 170 during the Sunday peak hour. The TIA guidelines identify an Area Traffic Management (ATM) threshold of 300 vehicles during the peak hour for a collector roadway.

The Saturday peak directional traffic volume along Highbury Park Drive is approximately 190 vehicles (westbound) and the Sunday peak directional traffic volume is approximately 100 vehicles (westbound). The lane capacity along Highbury Park Drive is estimated at 600 vehicles per hour per lane based on the City's TRANS Long Range Transportation Model. Based on the foregoing, the v/c ratio is 0.32 during the Saturday peak and 0.17 during the Sunday peak hour.

The majority of the traffic being generated by the proposed development is expected to arrive/depart to the west along Highbury Park Drive, using the Greenbank Road/Highbury Park Drive intersection. Based on the foregoing, the added traffic generated by the proposed development is not anticipated to have a significant impact on the existing vehicular operations along Highbury Park Drive east of the site and will not change the classification of Highbury Park Drive from a collector to a major collector. Despite existing traffic volumes of 375 vehicles per hour during the Saturday peak hour on Highbury Park Drive exceeding ATM thresholds of 300 vehicles per hour for a collector roadway, the Neighbourhood Traffic Management module should be exempt from the required analysis in the TIA.

5.0 FORECASTING

5.1 Development-Generated Traffic

5.1.1 Trip Generation

The proposed development will have several uses which have been reviewed independently. The approximate time periods associated with each program or facility are identified in **Table 3**.

Activities at the church will consist of a Sunday morning service (and Sunday School) between 10:10-11:30am, Sunday afternoon meetings (Church Plant), Tuesday night youth groups from 7-9pm, and occasional weekday evening meetings from 7-9pm. Ministry offices are anticipated to be open Monday to Saturday from 9am to 7pm. The café is anticipated to be open 8am to 8pm, Monday to Sunday.

Table 3: Typical Facility Uses by Day and Time Period

Use/Program	Weekday			Saturday			Sunday		
	AM	PM	Evening	AM	Mid-Day	Evening	AM	Mid-Day	Evening
Church Service							✓		
Sunday School							✓		
Church Plant								✓	
Youth Group			✓						
Ministry Offices	✓		✓	✓		✓			
Café	✓	✓	✓	✓	✓	✓	✓	✓	✓

The vehicle trips for the proposed church have been estimated based on discussions with church staff. High proportions of carpooling are anticipated, and estimated vehicle occupancies are identified for each trip generator. Person trips have been estimated for the coffee shop based on data that was collected by Novatech at a local coffee shop on the 17th and 20th of November 2018, as discussed in Section 4.3.

Church & Sunday School

The Church Service and Sunday School run from 10:10-11:30am on Sundays. Based on the existing Sequoia Church operations, approximately 300 people attend on average. This number is anticipated to grow up to 450-500 people over time following the development of the new facility at 35 Highbury Park Drive. Once the congregation reaches 400 attendees, the intent is to offer two separate Sunday services.

It is anticipated that 20% of attendees will take transit or walk/bike to the site, based on data collected from the 2011 *TRANS O-D Survey Report* for trips within the South Nepean district.

Existing attendance statistics, including adults and children, have been obtained from the Church. Currently an average of 200 adults and 90 children are attending Sunday service. A vehicle occupancy survey was conducted on May 5, 2019 (Sunday) at the existing church located at 255 Tartan Drive. The results suggest an average of 2.0 parishioners per vehicle. Vehicle occupancy data collected by Novatech is included in **Appendix D**. Approximately 15% of vehicle trips were observed to be drop-off trips.

Parishioners typically arrive/depart Sunday service gradually over multiple hours. However, for the purpose of this analysis, it has been conservatively assumed that all persons will arrive during a one-hour period before service and depart during a one-hour period after the service.

A breakdown of trips generated by the Church and Sunday School can be found in **Table 4**.

Table 4: Church/Sunday School Trips

	Current Attendance	Maximum Attendance (per service)
Persons	300	400
Transit (5%)	15	20
Non-Auto (15%)	45	60
Vehicle Occupancy	2.0	2.0
Vehicles	120	160
Sunday Peak Hour Vehicle Trips (in/out)		
- Arrival (100% in, 15% out)	120/18	160/24
- Departure (15% in, 100% out)	18/120	24/160

Church Plant

The Sunday afternoon Church Plant, from 1-4pm, is anticipated to host approximately 100 people. Consistent with the Church and Sunday School trips, it is anticipated that 20% of attendees will take transit or walk/bike to the Church Plant. A vehicle occupancy factor of 1.4 was assumed, based on the 2011 *TRANS O-D Survey Report* for trips within the South Nepean district. It is

anticipated that most vehicles will arrive between 12:30-1pm and depart from 4-4:30pm. It has also been assumed that 15% of the trips will be drop-off trips.

A breakdown of trips generated by the Church Plant can be found in **Table 5**.

Table 5: Church Plant Trips

	Projected Attendance
Persons	100
Transit (5%)	5
Non-Auto (15%)	15
Vehicle Occupancy	1.4
Vehicles	57
Sunday PM Vehicle Trips	
- In (100%)	57
- Out (15%)	9

Youth Group

A youth group will be hosted on Tuesday nights beginning at approximately 7:00pm and ending at 9:00pm. The youth groups are anticipated to host approximately 50 youths. Consistent with the above, it has been assumed that 20% of attendees will take transit or bike/walk. A vehicle occupancy factor of 1.4 was assumed, based on the 2011 *TRANS O-D Survey Report* for trips within the South Nepean district. One third of the vehicles are expected to remain on-site while drivers attend the youth group, while the other two thirds return at the end of each session to pick-up the youth.

A breakdown of trips generated by the youth group can be found in **Table 6**.

Table 6: Youth Group Trips

	Projected Attendance
Persons	50
Transit (5%)	2
Non-Auto (15%)	8
Vehicle Occupancy	1.4
Vehicles	36
Weekday Evening Vehicle Trips	
- In (100%)	36
- Out (67%)	24

Ministry Offices

Ministry offices are anticipated to be open Monday to Saturday from 9am to 7pm. Ministry office space will be used by Church staff, as well as staff from other ministries and not-for-profit/charity organizations. As the congregation grows, a maximum of approximately 35 people are anticipated to use this office space. Users of this space generally work flex hours and as such are not anticipated to arrive/depart the site during peak hours. However, for the purpose of this analysis,

it has been conservatively assumed that 15 people arrive during the AM peak hour and depart during the PM peak hour. A non-auto mode of 20% and a vehicle occupancy factor of 1.4 was assumed, based on the 2011 *TRANS O-D Survey Report* for trips within the South Nepean district.

A breakdown of trips generated by the ministry offices can be found in **Table 7**.

Table 7: Ministry Office Trips

	Projected Attendance
Persons	15
Transit (5%)	1
Non-Auto (15%)	2
Vehicle Occupancy	1.4
Vehicles	9
Weekday and Saturday Vehicle Trips (jn/out)	
- Arrival (AM Peak)	9/0
- Departure (PM Peak)	0/9

Café

The café is intended to be leased out to a local coffee shop. It is anticipated to be open 8am-8pm Monday-Sunday. The café will have approximately 160 square metres of GFA.

As the ITE Land Use Code 936 for a Coffee/Donut Shop without Drive Through Window relies on data from larger chain coffee shops (i.e. Tim Hortons, Starbucks, etc.), this is considered unrepresentative of the anticipated trips generated by the café. As such, local surveys were conducted at the Bridgehead coffee shop at 2140 Carling Avenue. This location was chosen as it has a similar size, clientele and walkability as the proposed café. The findings of the weekday and Saturday person trip generation surveys are summarized as follows:

- Weekday AM peak: 96 person trips (63 in, 33 out)
- Weekday PM peak: 52 person trips (26 in, 26 out)
- Saturday peak: 112 person trips (54 in, 58 out)

As Sunday surveys were not collected, it has been assumed that the Saturday and Sunday café trip generation will be equivalent for the purpose of this analysis.

Modal shares for the café have been assumed to be consistent with the modal shares as outlined in the 2011 *TRANS O-D Survey Report* for trips within the South Nepean district.

A full breakdown of trips generated by the café by modal share can be found in **Table 8**.

Table 8: Café Trips

Travel Mode	AM Peak (pph)			PM Peak (pph)			SAT/SUN Peak (pph)		
	IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
<i>Total Person Trips</i>	63	33	96	26	26	52	54	58	112
Auto Driver (55%)	35	18	53	14	14	28	30	32	62
Auto Passenger (25%)	16	8	24	7	7	14	13	15	28
Transit (5%)	3	2	5	1	1	2	2	3	5
Non-Auto (15%)	8	5	13	4	4	8	8	8	16

The café is also anticipated to generate trips during the evening as it will be open until 8pm. For the purpose of this analysis, it was assumed that the weekday evening trips generated by the café are approximately equal to the trips generated by the café during the weekday PM peak. The peak hours on a Saturday/Sunday are during the AM. Based on a ratio of AM to PM trips during the weekday, it was assumed that the café trip generation for the off-peak hours on Saturday and Sunday is approximately half of the peak hour trips.

The café is expected to generate two types of external peak hour trips: primary and pass-by trips. Primary trips are made for the specific purpose of visiting the site, and pass-by trips are made as intermediate stops on the way to another destination. Peak hour pass-by trips have been estimated based on a pass-by rate of 43%. The *ITE Trip Generation Handbook* identifies this percentage as an average rate for the High Turnover Restaurant (land use 932). The pass-by trips were estimated using this land use code as there was no data available for the Coffee/Donut Shop without Drive Through Window, and this data set was chosen as the most representative of the café (i.e. no drive-through and has indoor seating). The pass-by trips generated by the café are part of the observed background traffic and do not constitute new trips on the adjacent road network. The primary and pass-by trip generation for the development is summarized in **Table 9**.

Table 9: Primary and Pass-By Café Trips

Travel Mode	AM Peak (pph)			PM Peak (pph)			SAT/SUN Peak (pph)		
	IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
<i>Total Auto Driver Trips</i>	35	18	53	14	14	28	30	32	62
Pass-By (43%)	11	11	22	6	6	12	13	13	26
Primary (57%)	24	7	31	8	8	16	17	19	36

As the café and the Church are both anticipated to generate trips during the Sunday peak hour, it is anticipated that there would be some internally captured trips (i.e., parishioners frequenting the café). With respect to the adjacent road network, this would result in only a single vehicle entering and leaving the site. However, in the interests of making a conservative estimate of the likely traffic impact associated with this development, the possibility of traffic being internally captured within the site has been ignored.

Summary

The overall trip generation for the site, as identified in **Tables 2 to 8** above, is summarized in **Table 10**.

Table 10: Summary of Peak Hour Vehicle Trips

WEEKDAYS			
Use or Program	AM Peak (in/out)	PM Peak (in/out)	Evening Peak (in/out)
Youth Group	-	-	36/24
Ministry Offices	9/0	0/9	-
Café	35/18	14/14	14/14
Sub-Total	44/18	14/23	50/38
SATURDAY			
Use/Program	AM Peak (in/out)	Mid-Day Peak (in/out)	Evening Peak (in/out)
Ministry Offices	9/0	-	0/9
Café	30/32	15/16	15/16
Sub-Total	39/32	15/16	15/25
SUNDAY			
Use/Program	AM Peak (in/out)	Mid-Day Peak (in/out)	Evening Peak (in/out)
Church Service & Sunday School	160/24 ¹	-	-
Church Plant	-	57/9	9/57
Café	30/32	15/16	15/16
Sub-Total	190/56	72/25	24/73

1 – Departure period occurs during separate peak hour, and will be opposite arrival period

Based on the foregoing, the proposed development is anticipated to generate:

- 62 vehicle trips (44 in, 18 out) during the AM peak hour;
- 37 vehicle trips (14 in, 23 out) during the PM peak hour;
- 71 vehicle trips (39 in, 32 out) during the Saturday peak hour;
- 246 vehicle trips (190 in, 56 out) during the Sunday arrival peak; and
- 246 vehicle trips (54 in, 192 out) during the Sunday departure period.

As Sunday service is anticipated to be the overall peak hour for the site, it has been analyzed. The background traffic along Greenbank Road and site traffic generation is higher during the Saturday peak hour compared to the weekday peak hours, therefore the Saturday peak hour has also been analyzed.

For the purpose of this analysis, a projected attendance of 400 people for Sunday Service and Sunday School has been assumed in order to account for the worst-case scenario. However, it is anticipated that the attendance will be significantly lower when the site first develops (approximately 300 people) and may grow over time. Should the attendance reach 400 people, church staff have confirmed that two separate Sunday services will be offered.

Based on the foregoing, the development is anticipated to generate a total of 71 trips (39 in, 32 out) during the Saturday peak, 246 trips (190 in, 56 out) during the Sunday arrival peak, and 246 trips (54 in, 192 out) during the Sunday departure period.

5.1.2 Trip Distribution

The assumed distribution of trips generated by the proposed development has been derived from existing traffic patterns on the roadways within the study area. The distribution can be described as follows:

- 40% to/from the north via Greenbank Road
- 35% to/from the south via Greenbank Road
- 10% to/from the west via Wessex Road
- 15% to/from the east via Highbury Park Drive

Pass-by trips for the café have been distributed based on existing traffic patterns along the area roadways. As Sunday will have separate arrival and departure peak hours, they have been reviewed separately.

Primary trips generated by the proposed development can be found in **Figure 4**. Pass-by trips can be found in **Figure 5**. Total site generated traffic figures can be found in **Figure 6**.

Figure 4: Primary Site Generated Trips

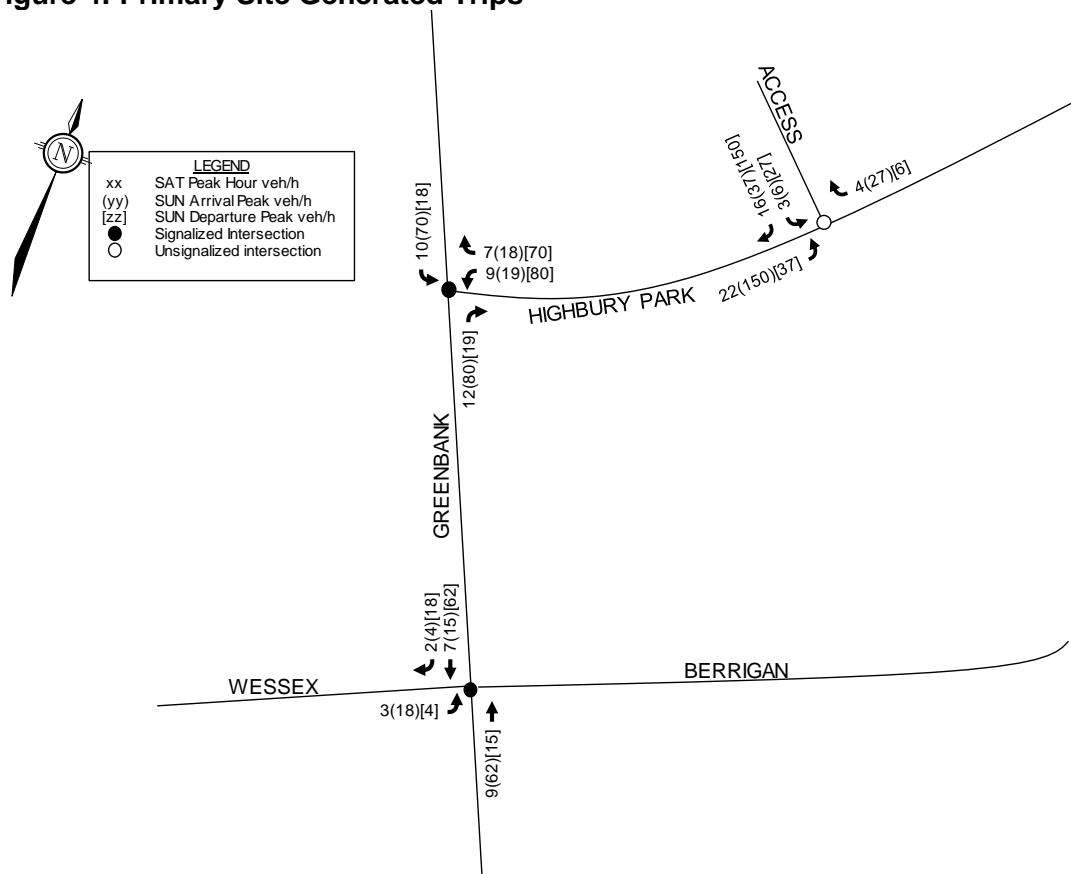


Figure 5: Pass-By Trips

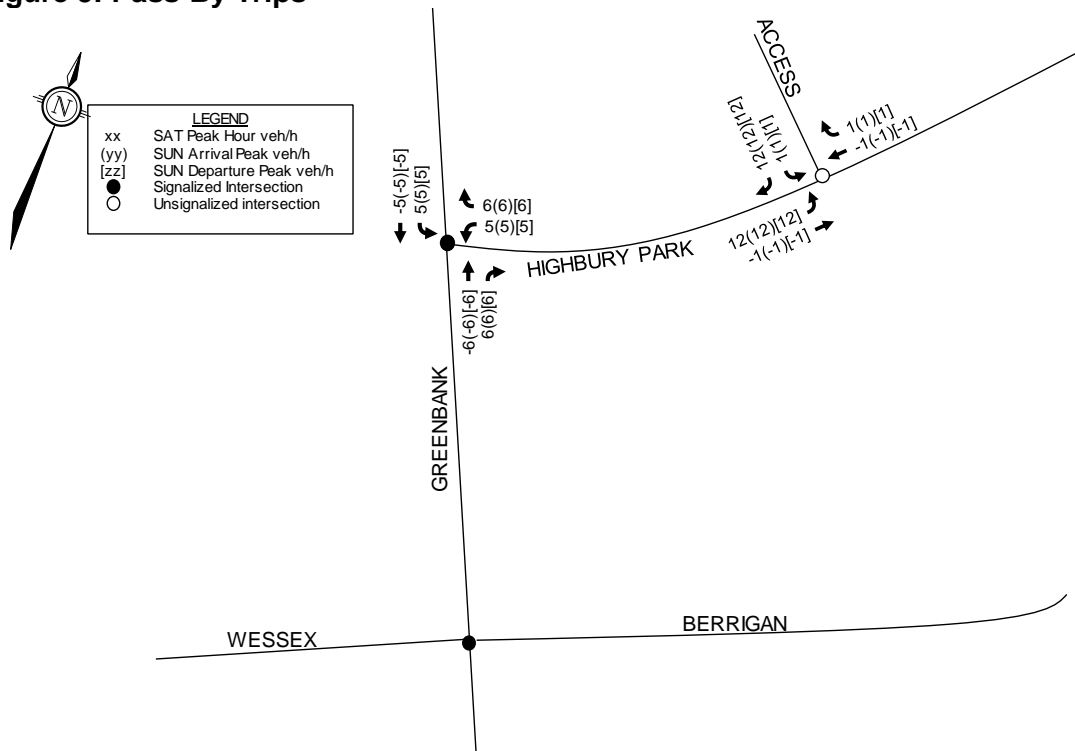
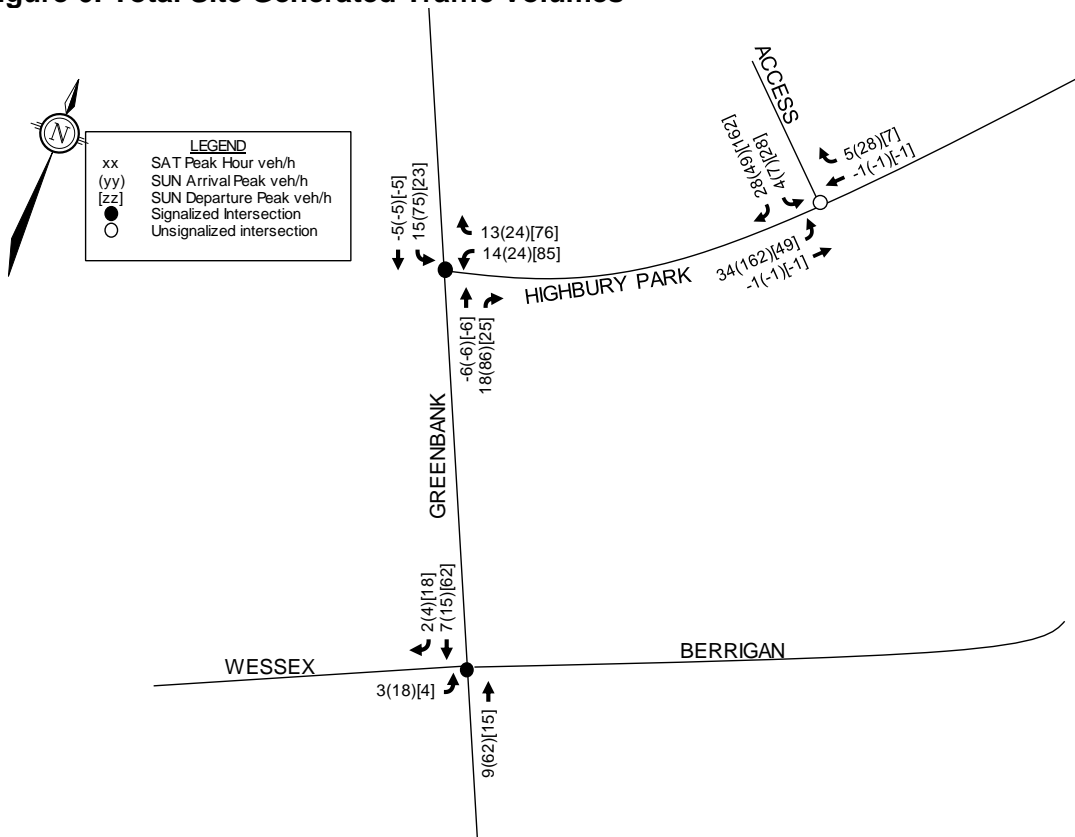


Figure 6: Total Site Generated Traffic Volumes



5.2 Background Traffic

5.2.1 General Background Growth Rate

A review of the City of Ottawa's Long-Range TRANS model was conducted in order to determine a general background growth rate in the area. It was found that in general traffic along Greenbank Road (between Highbury Park Drive and Berrigan Drive/Wessex Road) increases at a rate of approximately 2.5% per year, traffic along Berrigan Drive and along Highbury Park Drive in the vicinity of Greenbank Road increases at a rate of approximately 1.5% per year, and traffic along Wessex Road does not increase significantly. The 2031 TRANS model accounts for the widening of Greenbank Road from two to four lanes between Cambrian Road and Foxfield Drive, in addition to a relatively high projected population growth (2.5% annual growth) and employment growth (3.5% annual growth) in the adjacent area.

The March 2016 TIS prepared by Parsons in support of the development at 30 Highbury Park identified an annual background growth rate of 2% along Greenbank Road, based on historical traffic count data (years 2005, 2007, 2008, 2010, and 2015).

For the purpose of this analysis, a 2% annual growth rate was assumed along Greenbank Road, in order to remain consistent with the Parsons 2016 TIS. An annual growth rate of 1.5% was applied to Berrigan Drive and to Highbury Park Drive. No background growth rate was applied to Wessex Road.

Long Range Model Snapshots and Background Traffic Growth analysis from the 2016 TIS are provided in **Appendix F**.

5.2.2 Other Area Development

The development at 30 Highbury Park Drive is currently under construction. At the time of writing this TIA, two of the three buildings have been constructed and are occupied. As the traffic counts at the study area intersections are recent, they will have captured the traffic generated by these two buildings. The third building is currently under construction and is anticipated to have 1,200 square metres of ground floor retail and 740 square metres of medical office uses. The trips generated by this building for the Saturday and Sunday peak hours have been estimated using recommended rates from the Institute of Transportation Engineers (ITE) *Trip Generation Manual*. Person Trips were calculated using an ITE Trip to Person Trip factor of 1.28, consistent with the TIA Guidelines. The Person Trips generated by the development of the third building at 30 Highbury Park Drive are summarized in **Table 11**.

Table 11: 30 Highbury Park Third Building – Person Trips

Land Use	ITE Code	GFA	SAT Peak (PPH)			SUN Peak (PPH)		
			IN	OUT	TOT	IN	OUT	TOT
Medical-Dental Office Building	720	8,000 ft ²	18	14	32	1	3	4
Shopping Centre	820	12,900 ft ²	38	36	74	23	23	46

The modal shares for the development at 30 Highbury Park Drive were assumed to be consistent with the modal shares as outlined in the Parsons 2016 TIS for this development. A breakdown of the projected trips by modal share for the third building at 30 Highbury Park Drive are shown in **Table 12**. Consistent with the Parsons TIS for 30 Highbury Park Drive, a 30% retail pass-by was assumed, and a 10% reduction was applied to the total vehicle trip generation to account for multi-purpose trips within the development.

Table 12: 30 Highbury Park Third Building – Person Trips by Modal Share

Travel Mode	SAT Peak (pph)			SUN Peak (pph)		
	IN	OUT	TOT	IN	OUT	TOT
<i>Medical-Dental Office Building Trips</i>						
Total Person Trips	18	14	32	1	3	4
Auto Driver (60%)	11	8	19	1	1	2
Auto Passenger (10%)	2	1	3	0	0	0
Transit (15%)	2	3	5	0	1	1
Non-Auto (15%)	3	2	5	0	1	1
<i>Shopping Centre Trips</i>						
Total Person Trips	38	36	74	23	23	46
Auto Driver (60%)	23	22	45	14	14	28
Auto Passenger (10%)	4	4	8	2	2	4
Transit (15%)	5	5	10	4	3	7
Non-Auto (15%)	6	5	11	3	4	7
30 Highbury Park Drive Sub-Total						
Auto Driver Trips	23	22	45	15	15	30
Less 30% Retail Pass-By Trips	-7	-7	-14	-7	-7	-14
Less 10% Multi-Purpose Trips	-2	-2	-4	-1	-1	-2
Total 'New' Auto Trips	14	13	27	7	7	14

As shown in **Table 12**, the resulting number of new trips generated by the third building at 30 Highbury Park Drive is 27 trips (14 in, 13 out) during the Saturday peak and 14 trips (7 in, 7 out) during the Sunday peak hour.

Traffic distribution for the third building at 30 Highbury Park Drive was assumed to be consistent with the assumptions as outlined in the Parsons 2016 TIS. Relevant excerpts from the Parsons 2016 TIS for 30 Highbury Park Drive can be found in **Appendix G**. Traffic generated by the third building at 30 Highbury Park Drive has been added to the 2020 and 2025 background traffic.

For the purposes of this analysis, background traffic for both the arrival and departure periods on Sunday have been assumed to be the same. Background traffic figures for the 2020 build out and 2025 horizon year can be found in **Figures 7 and 8**. Total traffic volumes for the 2020 build out and 2025 horizon year can be found in **Figures 9 and 10**.

Figure 7: 2020 Background Traffic Volumes

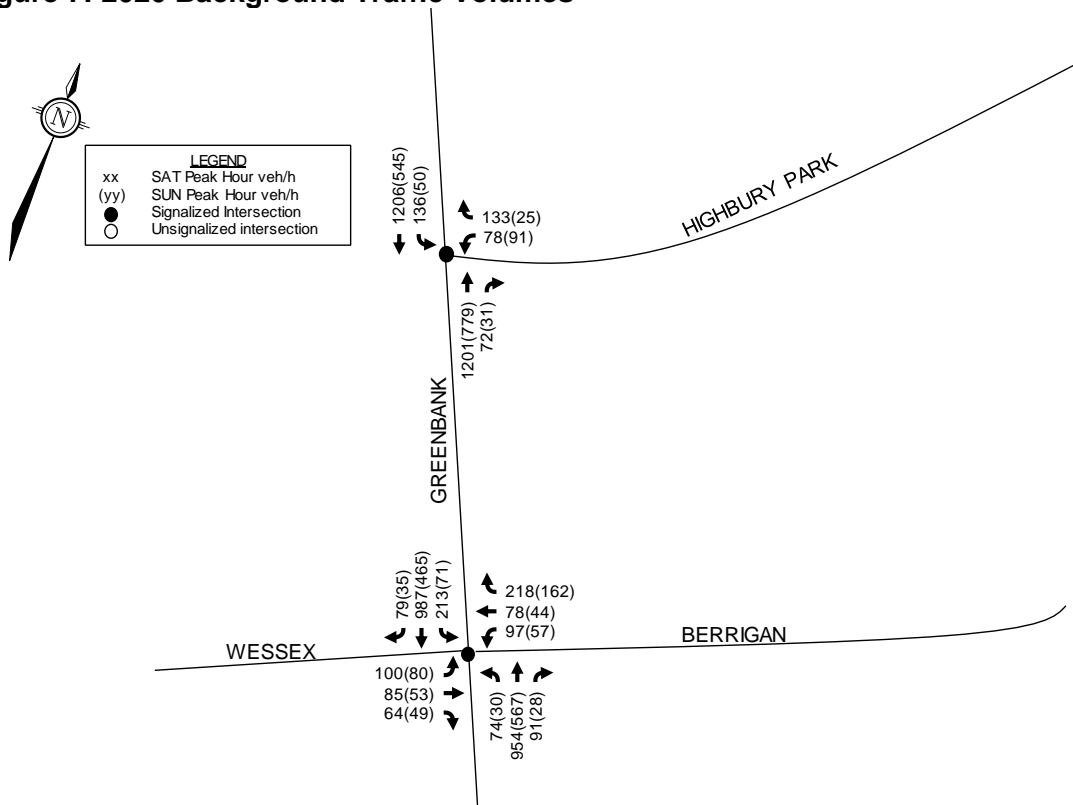


Figure 8: 2025 Background Traffic Volumes

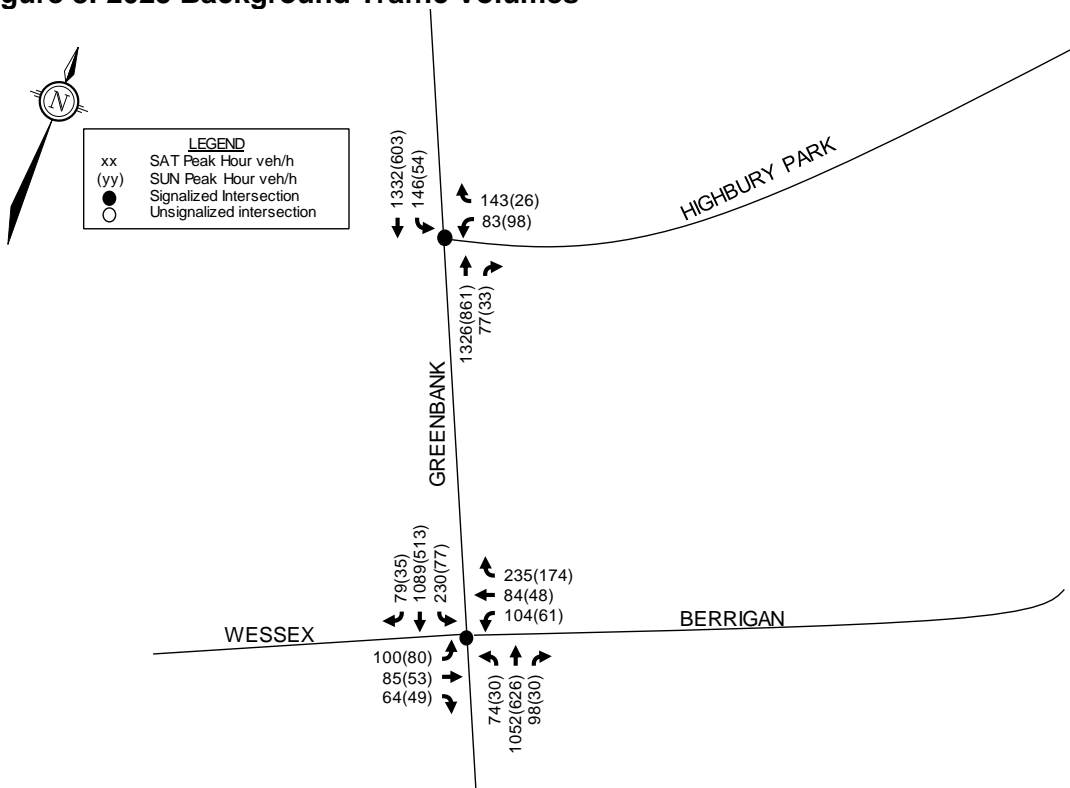


Figure 9: 2020 Total Traffic Volumes

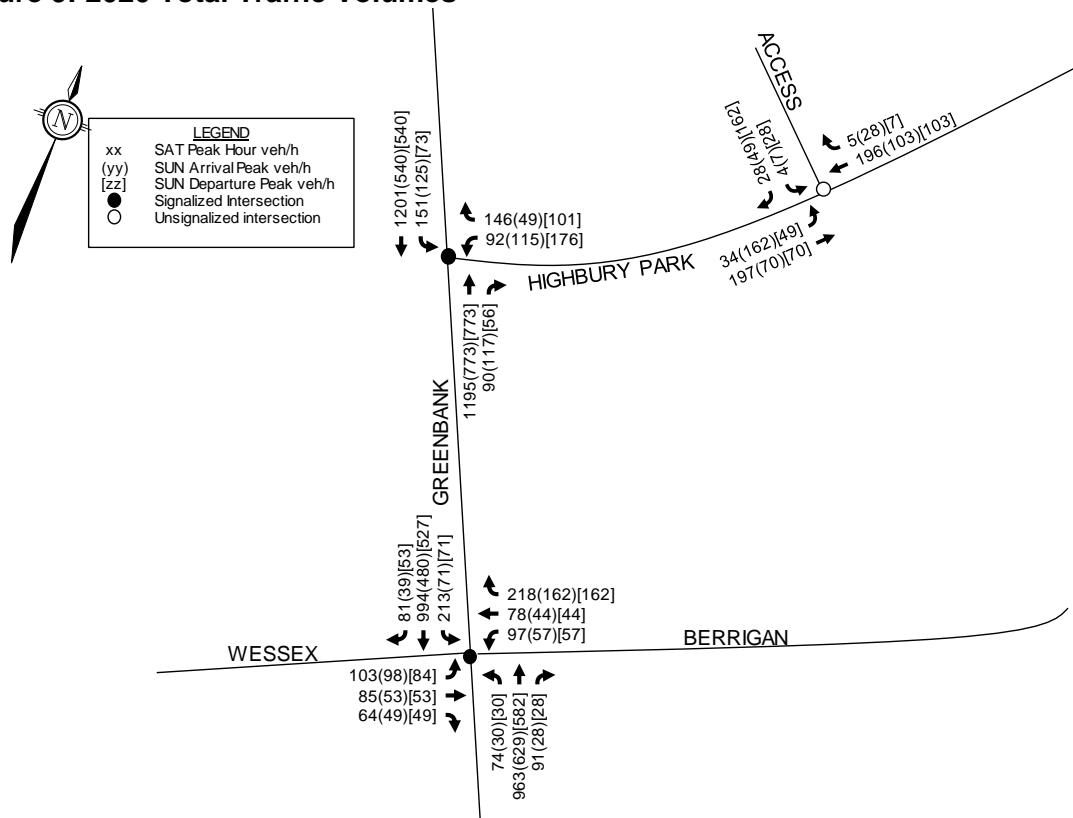
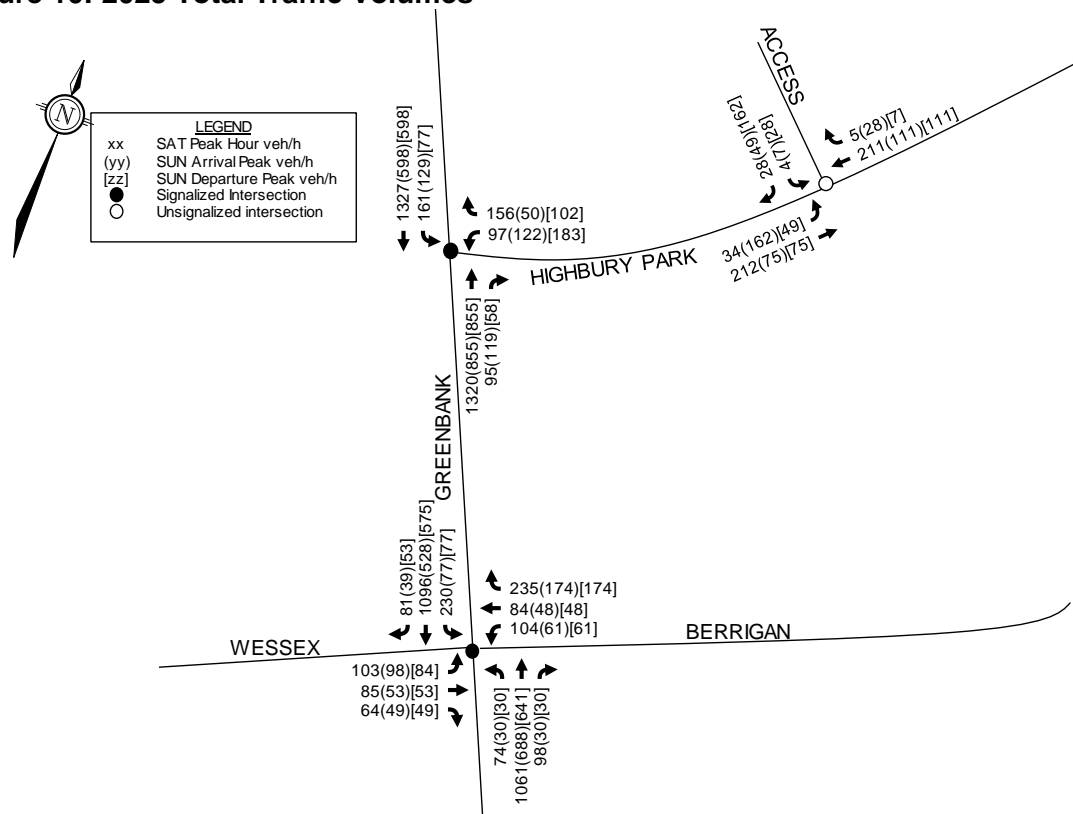


Figure 10: 2025 Total Traffic Volumes



6.0 ANALYSIS

6.1 Development Design

6.1.1 Design for Sustainable Modes

Pedestrian facilities will be provided between the main building entrance and the parking lot. A connection to the sidewalk along Highbury Park Drive will be provided, as shown on the site plan. Sidewalks will be continuous and depressed across all accesses.

A MUP is provided along the east side of the Transitway. The MUP crosses under the Highbury Park/Transitway overpass as well as connects to the sidewalks on either side of Highbury Park Drive. As pedestrians have the opportunity to cross under the overpass, and the MUP connections to the sidewalk on Highbury Park Drive are located 200m from the signalized intersection with Greenbank Road, a pedestrian crossover (PXO) is not recommended at this location.

The nearest bus stops to the subject site are described in Section 4.1.5.

OC Transpo's service design guideline for peak period service is to provide service within a five minute (400m) walk of the home, school and work location of 95% of urban residents. Stops #7218, #7217, #4634, #4635, #2835, and #2834 are all located within 400m actual walking distance (measured using legal crosswalks) of the proposed development.

Bicycle parking for the proposed development will be located at the southwest corner of the proposed building and will be in accordance with the minimum requirement of the City's Zoning By-law (ZBL), as described in Section 6.2.

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

6.1.2 Circulation and Access

The proposed fire route is shown on the site plan.

Snow storage will be located at the north end of the parking lot. A garbage/recycling enclosure will be located at the southeast corner of the parking lot, as shown on the site plan.

A lay-by is proposed along the south edge of the development. It is 2.6m wide, and approximately 22m in length. This would provide enough storage for approximately three vehicles.

As per the City of Ottawa's Zoning By-Law (ZBL), one loading space is required for the proposed church, but none are required for the café. One loading space is proposed, as shown on the site plan.

6.2 Parking

The subject site is located in Area C on Schedule 1 and 1A of the City of Ottawa's ZBL. Minimum vehicular and bicycle parking rates for the proposed uses are identified in the ZBL and are summarized in the following table.

Table 13: Parking Requirements

Land Use	Rate	GFA	Requirement
<i>Vehicle Parking</i>			
Café (Calculated as Restaurant in the ZBL)	10 per 100m ² of gross floor area	170m ²	17
Place of Worship	10 per 100m ² of gross floor area of assembly area ¹	732m ²	73; 7 of which can be in tandem
Community Center	4 per 100m ² of gross floor area	1,195m ²	48
Total Required Vehicle Parking			139
<i>Bicycle Parking</i>			
Café (Calculated as Restaurant in the ZBL)	1 per 250m ² of gross floor area	170m ²	1
All other non-residential uses	1 per 1500m ² of gross floor area	1,927m ²	1
Total Required Bicycle Parking			2

1 – Per ZBL Section 105(1)(a), where a place of worship is required to provide 50 or more motor vehicle parking spaces, 10% of those required motor vehicle parking spaces need not have direct, unobstructed access to a public street

Based on the foregoing, the 10 proposed bicycle parking spaces meet the requirements of the ZBL. A total of 125 vehicular parking spaces are proposed, seven of which are located in tandem. It is noteworthy that an additional 17 parking spaces will be provided in tandem (for a total of 24 tandem spaces) near the northern limits of the parking lot, however these spaces do not count towards the parking count. As it is anticipated that the church, community centre, and café uses will generally be used by the same individuals, relief from the minimum parking requirements of the ZBL is being sought.

The TIA guidelines identify the need to review spillover parking when the parking supply is 15% below demand. As the 125 proposed parking spaces are only 10% below the demand of 138 spaces, a review of spillover parking is not required for the TIA.

Minimum barrier-free parking was also reviewed for the subject site. A total of five accessible spaces are required for the site (two type A spaces and three type B spaces). Six barrier-free spaces are provided (three type A and three type B), as shown on the site plan.

6.3 Boundary Streets

This section provides a review of Highbury Park Drive using complete streets principles. The Multi-Modal Level of Service (MMLOS) guidelines produced by IBI Group in 2015 were used to

evaluate the LOS of Highbury Park Drive for each mode of transportation. Schedule 'B' of the City of Ottawa's Official Plan indicates Highbury Park Drive is located within the General Urban Area. This segment of Highbury Park Drive is also located within 600m of the Standherd Rapid Transit Station.

Targets for the Pedestrian Level of Service (PLOS), Bicycle Level of Service (BLOS), and Vehicular Level of Service (Auto LOS) for Highbury Park Drive are based on the targets for the collector roadways located within 600m of a rapid transit station, as identified in Exhibit 22 of the MMLOS guidelines. Since Highbury Park Drive is not a truck route and does not serve transit, the Truck Level of Service (TkLOS) and Transit Level of Service (TLOS) have not been evaluated.

Table 14 summarizes the findings of the MMLOS segment analysis. Detailed segment MMLOS calculations can be found in **Appendix I**.

Table 14: Segment MMLOS Summary

Segment	PLOS	BLOS	TLOS	TkLOS	Auto LOS
Highbury Park Drive	A	A	-	-	A
Target	A	D	-	-	E

Highbury Park Drive meets the target segment PLOS, BLOS, and Auto LOS. No improvements are recommended along Highbury Park Drive based on the segment MMLOS analysis.

6.4 Access Intersections Design

The proposed development will be served by one all-movement access along Highbury Park Drive.

Section 25 (c) of the City of Ottawa's *Private Approach By-Law* identifies a requirement for two-way accesses to have a width no greater than 9m, as measured at the street line. Section 107 (1)(a) of the *Zoning By-Law* identifies a minimum width requirement of 6.7m for a two-way driveway to a parking lot. The proposed access on Highbury Park Drive is approximately 8.5m in width, measured at the property line, thereby meeting the requirements.

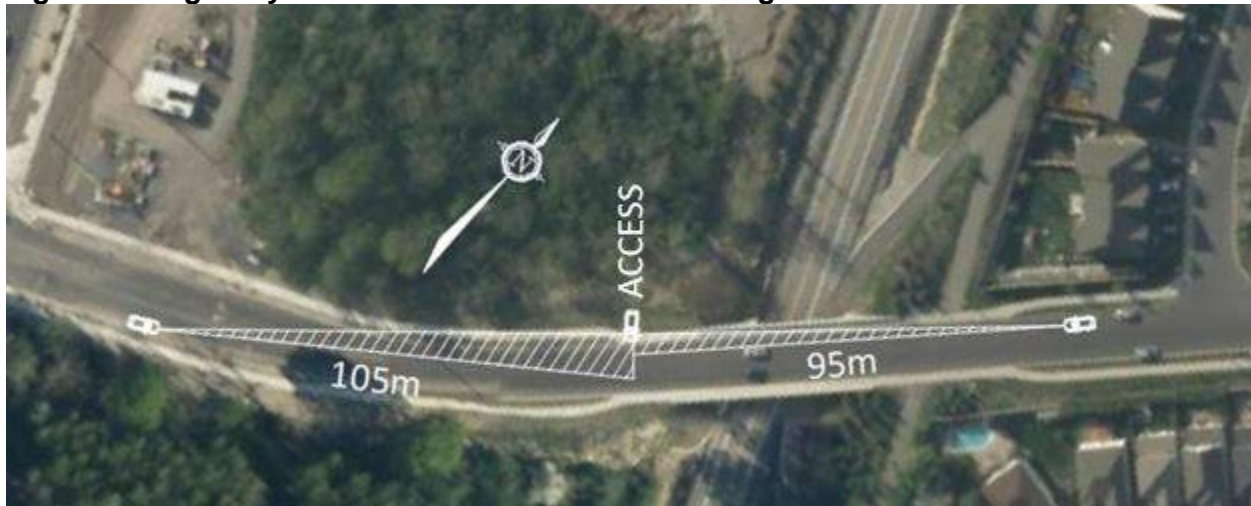
Section 25 (o) of the *Private Approach By-Law* identifies a requirement to provide a minimum spacing of 3m between the nearest edge of the private approach and the property line, as measured at the street line. The access along Highbury Park Drive is located approximately 5m from the eastern property line. Due to the proximity of the site to the intersection of Greenbank Road and Highbury Park Drive, as well as access constraints to the neighbouring property, it was suggested that the access to the subject property be as far east of the Greenbank Road/Highbury Park Drive intersection as possible.

Intersection sight distance (ISD) at the proposed access has been determined using the TAC *Geometric Design Guide for Canadian Roads*. The ISD for the access, for a design speed of 50km/h (10km/h above the posted speed limit), is as follows:

- Left Turn from Minor Road 105 metres
- Right Turn from Minor Road 95 metres

The required ISD for a passenger vehicle to turn left of right from the proposed access is shown in **Figure 11**.

Figure 11: Highbury Park Drive Access Intersection Sight Distance



Additionally, the stopping sight distance (SSD) requirement for a design speed of 50km/h is 65m for vehicles turning left or right at the access.

There is slight horizontal curvature along Highbury Park Drive west of the proposed site access, however, as demonstrated in **Figure 11**, the ISD is not impacted. A site visit was performed on March 26, 2019 in order to determine if the ISD looking east over the vertical curvature of the overpass, and SSD between a westbound vehicle and a vehicle entering the access would be achieved. It was found that the required ISD and SSD at the access are adequate.

Based on the foregoing, available sightlines are within recommended guidelines to allow safe all directional access to the development.

6.5 Transit

Based on the trip generation presented in Section 5.1, it is anticipated that the proposed development will generate an additional 6 transit trips (3 in, 3 out) during the Saturday peak hour, 25 transit trips (22 in, 3 out) during the Sunday arrival peak, and 25 transit trips (2 in, 23 out) during the Sunday departure peak.

It is anticipated that most transit trips will arrive/depart the subject site via OC Transpo route 170 or walk to/from Strandherd Transit Station.

6.6 Intersection Design

6.6.1 Existing Intersection MMLOS Analysis

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

of Ottawa's Official Plan indicates the Greenbank Road/Highbury Park Drive and the Greenbank Road/Berrigan Drive/Wessex Road intersections are located within the General Urban Area. All study area intersections are located within 600m of the Standherd Rapid Transit Station. Aerial photos of the study area intersections are provided in Section 4.1.2.

Target PLOS, BLOS, TLOS, TkLOS, and Auto LOS for the study area intersections are based on the General Urban Area designation, as identified in Exhibit 22 of the MMLOS guidelines. **Table 15** summarizes the findings of the intersection MMLOS analysis. Detailed intersection MMLOS calculations can be found in **Appendix K**.

Table 15: Intersection MMLOS Summary

Intersection	PLOS	BLOS	TLOS	TkLOS	Auto LOS
Greenbank Road/Highbury Park Drive	F	A	B	E	A
Target	A	C	-	D	E
Greenbank Road/Berrigan Drive/Wessex Road	F	F	F	E	B
Target	A	B	-	D	E

Greenbank Road/Highbury Park Drive

The Greenbank Road/Highbury Park Drive intersection currently achieves the target BLOS and Auto LOS, however does not meet the target PLOS or TkLOS for the policy area.

Based on the Pedestrian Exposure to Traffic (PETSI), the Greenbank Road/Highbury Park Drive intersection is currently operating with a PLOS F. A reduction in the crossing distance on all legs of the intersection would have the greatest improvement on the PETSI score and the Pedestrian Delay. However, based on the existing traffic volumes, the existing four lane cross section along Greenbank Road is appropriate. Pedestrian refuge is currently provided on the north and south legs at this intersection. As this intersection was recently constructed, no changes are recommended.

The Greenbank Road/Highbury Park Drive intersection is currently operating with a TkLOS E. The northbound right turn movement has only one receiving lane on Highbury Park Drive, which earns an E. Highbury Park Drive is not a truck route and is a collector road which means that there is no MMLOS target for this roadway. As this intersection was recently constructed, no changes are recommended. All other approaches earn a TkLOS B, exceeding the target TkLOS D for truck routes on an arterial roadway.

As this intersection was recently constructed, no changes are recommended.

Greenbank Road/Berrigan Drive/Wessex Road

The Greenbank Road/Berrigan Drive/Wessex Road intersection currently achieves the target Auto LOS, however does not meet the target PLOS, BLOS, or TkLOS.

Based on the Pedestrian Exposure to Traffic (PETSI), the Greenbank Road/Berrigan Drive/Wessex Road intersection is currently operating with a PLOS F. A reduction in the crossing distance on all legs of the intersection would have the greatest improvement on the PETSI score and the Pedestrian Delay. However, based on the existing traffic volumes, the existing four lane

cross section along Greenbank Road is appropriate. As this intersection was recently reconstructed, no changes are recommended.

In order to achieve the target BLOS, two-stage left turn bike boxes and cross-rides or a reduction in the operating speed along Greenbank Road along with a reduction in the length of the southbound right turn lane would be required. However, as this intersection was recently reconstructed, and the current configuration was deemed appropriate by the City, no changes are recommended.

The Greenbank Road/Berrigan Drive/Wessex Road intersection is currently operating with a TkLOS E. The northbound and southbound right turn movements have only one receiving lane on Berrigan Drive and Wessex Road, which earn a TkLOS E. Berrigan Drive and Wessex Road are not truck routes and are collector roads which means that there is no MMLOS target for these roadways. As this intersection was recently reconstructed, no changes are recommended. All other approaches earn a TkLOS B, exceeding the target TkLOS D for truck routes on an arterial roadway.

As this intersection was recently reconstructed, no changes are recommended.

6.6.2 Background Intersection Operations

Intersection capacity analysis has been completed for the 2020 and 2025 background traffic conditions. The intersection parameters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800 vphpl, PHF: 1.0). The results of the synchro analysis are summarized in the following table for the Saturday and Sunday peak hours. Signal timing plans obtained from the City of Ottawa are included in **Appendix K**. Detailed Synchro reports are included in **Appendix L**.

Table 16: Background Intersection Operations

Intersection	SAT Peak			SUN Peak		
	Max. v/c	LOS	Mvmt	Max. v/c	LOS	Mvmt
<i>2020 Background Traffic</i>						
Greenbank Road/Highbury Park Drive	0.51	A	WBR/SBL	0.42	A	WBL
Greenbank Road/Berrigan Drive/Wessex Road	0.63	B	WBL	0.47	A	WBR
<i>2025 Background Traffic</i>						
Greenbank Road/Highbury Park Drive	0.65	B	SBL	0.44	A	WBL
Greenbank Road/Berrigan Drive/Wessex Road	0.65	B	WBL	0.48	A	WBR

Under 2020 and 2025 background traffic conditions, all intersections are anticipated to operate with a LOS B or better.

Note that some critical movements appear to operate slightly better under projected conditions than under existing conditions; this is a result of the PHF of 1.0 for future conditions as per the TIA guidelines.

6.6.3 Total Intersection Operations

Intersection capacity analysis has been completed for the 2020 and 2025 total traffic conditions. The intersection parameters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800 vphpl, PHF: 1.0). The results of the synchro analysis are summarized in the following table for the Saturday and Sunday peak hours. Detailed Synchro reports are included in **Appendix L**.

Table 17: Total Intersection Operations

Intersection	SAT Peak			SUN Arrival Peak			SUN Departure Peak		
	Max. v/c or delay	LOS	Mvmt	Max. v/c or delay	LOS	Mvmt	Max. v/c or delay	LOS	Mvmt
2020 Total Traffic									
Greenbank Road/Highbury Park Drive	0.58	A	SBL	0.50	A	WBL	0.65	B	WBL
Greenbank Road/Berrigan Drive/Wessex Road	0.63	B	WBL	0.51	A	EBL	0.46	A	EBL/WBR
Highbury Park Drive Access	10 sec.	A	SB	10 sec.	A	SB	10 sec.	B	SB
2025 Total Traffic									
Greenbank Road/Highbury Park Drive	0.74	C	SBL	0.52	A	WBL	0.67	B	WBL
Greenbank Road/Berrigan Drive/Wessex Road	0.65	B	WBL	0.51	A	EBL	0.48	A	WBR
Highbury Park Drive Access	10 sec.	A	SB	10 sec.	A	SB	10 sec.	B	SB

Under 2020 and 2025 total traffic conditions, all intersections are anticipated to operate with a LOS C or better. The site access is anticipated to operate with a LOS B, and a maximum delay of approximately 10 seconds.

The westbound left turn movement at the Greenbank Road/Highbury Park Drive intersection is anticipated to have a 95th percentile queue length of approximately 55m during the Sunday departure peak. The queuing during the departure period is not anticipated to extend past the nearest access to 30 Highbury Park Drive.

The addition of site traffic is not anticipated to have any major impacts on operating conditions of the study area intersections.

7.0 CONCLUSIONS AND RECOMMENDATIONS

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

Development Design and Parking

- Pedestrian facilities will be provided between the main building entrance and the parking lot. A connection to the sidewalk along Highbury Park Drive will be provided, as shown on the site plan. Sidewalks will be continuous and depressed across all accesses.
- OC Transpo stops #7218, #7217, #4634, #4635, #2835, and #2834 are all located within a 400m walking distance (measured using legal crosswalks) of the proposed development.
- A MUP is provided along the east side of the Transitway. The MUP crosses under the Highbury Park/Transitway overpass as well as connects to the sidewalks on either side of Highbury Park Drive. As pedestrians have the opportunity to cross under the Highbury Park Drive/Transitway overpass, and the MUP connections to the sidewalk on Highway Park Drive are located 200m from the signalized intersection with Greenbank Road, a pedestrian crossover (PXO) is not recommended at this location.
- All required TDM-supportive design and infrastructure measures in the TDM checklist are met.
- A lay-by is proposed along the south edge of the development. It is 2.6m wide, and approximately 22m in length. This would provide enough storage for approximately three vehicles.
- The 125 proposed vehicular parking spaces will not meet the requirements of the ZBL. As it is anticipated that the church, community centre, and café uses will generally be used by the same individuals, relief from the minimum parking requirements of the ZBL is being sought. It is noteworthy that an additional 17 tandem parking spaces will be provided near the northern limits of the parking lot, however these spaces do not count towards the parking count.

Boundary Street MMLOS

- Highbury Park Drive meets the target segment PLOS, BLOS, and Auto LOS. No improvements are recommended along Highbury Park Drive based on the segment MMLOS analysis.

Access Design

- The proposed development will be served by one all-movement access along Highbury Park Drive. This access will be approximately 8.5m in width and will meet all requirements of the City's *Private Approach By-Law*.
- Available sightlines are within recommended guidelines to allow safe all directional access to the development.

Transit

- It is anticipated that the proposed development will generate an additional 6 transit trips (3 in, 3 out) during the Saturday peak hour, 25 transit trips (22 in, 3 out) during the Sunday arrival peak, and 25 transit trips (2 in, 23 out) during the Sunday departure peak.

Intersection MMLOS

- The Greenbank Road/Highbury Park Drive intersection currently achieves the target BLOS and Auto LOS, however does not meet the target PLOS or TkLOS for the policy area. As this intersection was recently constructed, no changes are recommended.
- The Greenbank Road/Berrigan Drive/Wessex Road intersection currently achieves the target Auto LOS, however does not meet the target PLOS, BLOS, or TkLOS. However, as this intersection was recently reconstructed, and the current configuration was deemed appropriate by the City, no changes are recommended.

Background Traffic

- Under 2020 and 2025 background traffic conditions, all intersections are anticipated to operate with a LOS B or better.

Total Traffic

- Under 2020 total traffic conditions, all intersections are anticipated to operate with a LOS B or better. The site access is anticipated to operate with a LOS A, and a maximum delay of approximately 10 seconds.
- Under 2025 total traffic conditions, all intersections are anticipated to operate with a LOS C or better. The site access is anticipated to operate with a LOS A, and a maximum delay of approximately 10 seconds.
- The westbound left turn movement at the Greenbank Road/Highbury Park Drive intersection is anticipated to have a 95th percentile queue length of approximately 55m during the Sunday departure peak. The queuing during the departure period is not anticipated to extend past the nearest access to 30 Highbury Park Drive.
- The addition of site traffic is not anticipated to have any major impacts on operating conditions of the study area intersections.

NOVATECH

Prepared by:



Rochelle Fortier, B.Eng.,
Engineering Intern | Transportation/Traffic

Reviewed by:



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

APPENDIX A

Proposed Site Plan

SEQUOIA CHURCH

ZONING INFORMATION

NOTE: ALL ZONING DEFINITIONS AND REQUIREMENTS AS PER CITY OF OTTAWA ZONING BY-LAW 2008-250

ZONING MECHANISM	REQUIRED	PROVIDED
DEFINITION	I1B MINOR INSTITUTIONAL ZONE	PLACE OF WORSHIP / COMMUNITY CENTER
MIN. LOT WIDTH	30.0 m	93.2 m
MIN. LOT AREA	1000 m ²	11751 m ² (± 2.9 Acres)
MIN. FRONT YARD SETBACK	6 m	± 14.4 m
MIN. REAR YARD SETBACK	7.5 m	± 61.4 m
MIN. INTERIOR SIDE YARD SETBACK	7.5 m	± 13 m
MIN. CORNER SIDE YARD SETBACK	7.5 m	-
MAX. BUILDING HEIGHT	18.0 m	12 m
MAX. FLOOR SPACE INDEX	-	
MIN. WIDTH OF LANDSCAPED AREA	ABUTTING A STREET = 3m	3 m
PARKING LANDSCAPE BUFFER	FOR A PARKING LOT CONTAINING 100 OR MORE SPACES: ABUTTING A STREET = 3 m NOT ABUTTING A STREET = 3 m	ABUTTING A STREET > 3 m NOT ABUTTING A STREET 3 m
PRIVATE APPROACH PROVISIONS: DISTANCE BETWEEN A TWO WAY PRIVATE APPROACH AND ANY OTHER PRIVATE APPROACH	30.0 m, AS PER OTTAWA BY-LAW 2003-447, ITEM (I)(II). FOR A PARKING LOT CONTAINING 100-199 SPACES	>30 m
STANDARD PARKING SPACE	2.6m WIDTH x 5.2m LENGTH	2.6 m WIDTH x 5.2 m LENGTH
PARALLEL PARKING SPACE	2.6m WIDTH x 6.7m LENGTH	-
ACCESSIBLE PARKING SPACE	3.4m WIDTH x 5.2m LENGTH	3.4m WIDTH x 5.2m LENGTH
PARKING REQUIREMENTS	WITHIN AREA C OF SCHEDULE 1A TO ZONING BY-LAW NO. 2008-250: PLACE OF WORSHIP GROSS FLOOR AREA (GFA): 732 m ² - 73 SPACES RESTAURANT GFA: 170 m ² - 17 SPACES (COMMUNITY CENTER GFA: 1195 m ² - 48 SPACES***) TOTAL REQ'D = 73 + 17 = 90 PARKING SPACES	118 SPACES + 7 TANDEM SPACES (SEE ZONING BY-LAW 2008-250 105(1)(A); 10% OF 73 SPACES) TOTAL PROVIDED: 125 PARKING SPACES
***PLACE OF WORSHIP AND COMMUNITY CENTER OCCUPANCIES NOT OPERATING CONCURRENTLY. PARKING REQUIREMENT IS BASED ON THE REQUIREMENT FOR THE LARGER OF THE TWO (THE PLACE OF WORSHIP)		
HANDICAP ACCESSIBLE	AS PER OTTAWA TRAFFIC AND PARKING BY-LAW 2017-301, PART C, SECTION 111(2), FOR A PARKING AREA WITH A CAPACITY OF 100-199 SPACES, MIN. REQ'D SPACES FOR PERSON WITH DISABILITIES: 2 SPACES	6 PARKING SPACES
LOADING SPACES	1 per 2,000 m ² - 4,999 m ² of G.F.A. 2,097 m ² G.F.A. = 1 SPACE	1 SPACE
BICYCLE PARKING RATE	RESTAURANT: 1 per 250m ² of GFA - 1 REQUIRED ALL OTHER NON-RESIDENTIAL USES: 1 per 1500m ² of GFA - 1 REQUIRED TOTAL REQUIRED: 2 SPACES	10 SPACE

PROJECT INFORMATION:

BUILDING CLASSIFICATION:
THE BUILDING IS CLASIFIED AND DESIGN TO CONFORM TO THE ONTARIO BUILDING CODE 2012 (CURRENT EDITION) PART 3

OCCUPANCY:
MAJOR: GROUP A, DIVISION 2, SPRINKLERED, THREE STOREYS (3.2.2.24)
MINOR: GROUP E

BUILDING STATISTICS:

BUILDING AREA (FOOTPRINT): 1923 sq.m.
ZONING GROSS FLOOR AREA: 2097 sq.m.
NUMBER OF STOREYS: 3
BUILDING SPRINKLERED: YES
OF STREET ACCESS ROUTES: 1
CONSTRUCTION TYPE: NON-COMBUSTIBLE
FLOOR ASSEMBLY & F.R.R.: 1 HOUR (2 HOURS BETWEEN A2 AND E OCCUPANCY)

TOPOGRAPHICAL PLAN INFORMATION:

TOPOGRAPHIC PLAN SURVEY, PART OF LOT 18, CONCESSION 2 (RIDEAU FRONT), GEOGRAPHIC TOWNSHIP OF NEPEAN, AND BLOCK 122, REGISTERED PLAN 4M-1046, CITY OF OTTAWA

PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK, LTD.
OCTOBER 1, 2014

GENERAL NOTES

ALL ASPHALT/CONCRETE WALKS NOT DIMENSIONED SHALL BE A MINIMUM 2M WIDE.

EXTENT OF CONTRACT IS LIMITED TO WITHIN PROPERTY EXCEPT WHERE NOTED OTHERWISE.

PARKING STALL SIZE: 2600 mm x 5200 mm
B.F., PARKING STALL TYPE A: 3400 mm x 5200 mm, 1500 mm AISLE
B.F., PARKING STALL TYPE B: 2400 mm x 5200 mm, 1500 mm AISLE

FOR SITE SERVICING PLAN SEE DRAWING C-1, AS PREPARED BY DB GRAY

FOR SITE GRADING PLAN SEE DRAWING C-2, AS PREPARED BY DB GRAY

FOR EROSION AND SEDIMENT CONTROL PLAN SEE DRAWING C-3, AS PREPARED BY DB GRAY

FOR DRAINAGE PLAN SEE DRAWING C-5, AS PREPARED BY DB GRAY

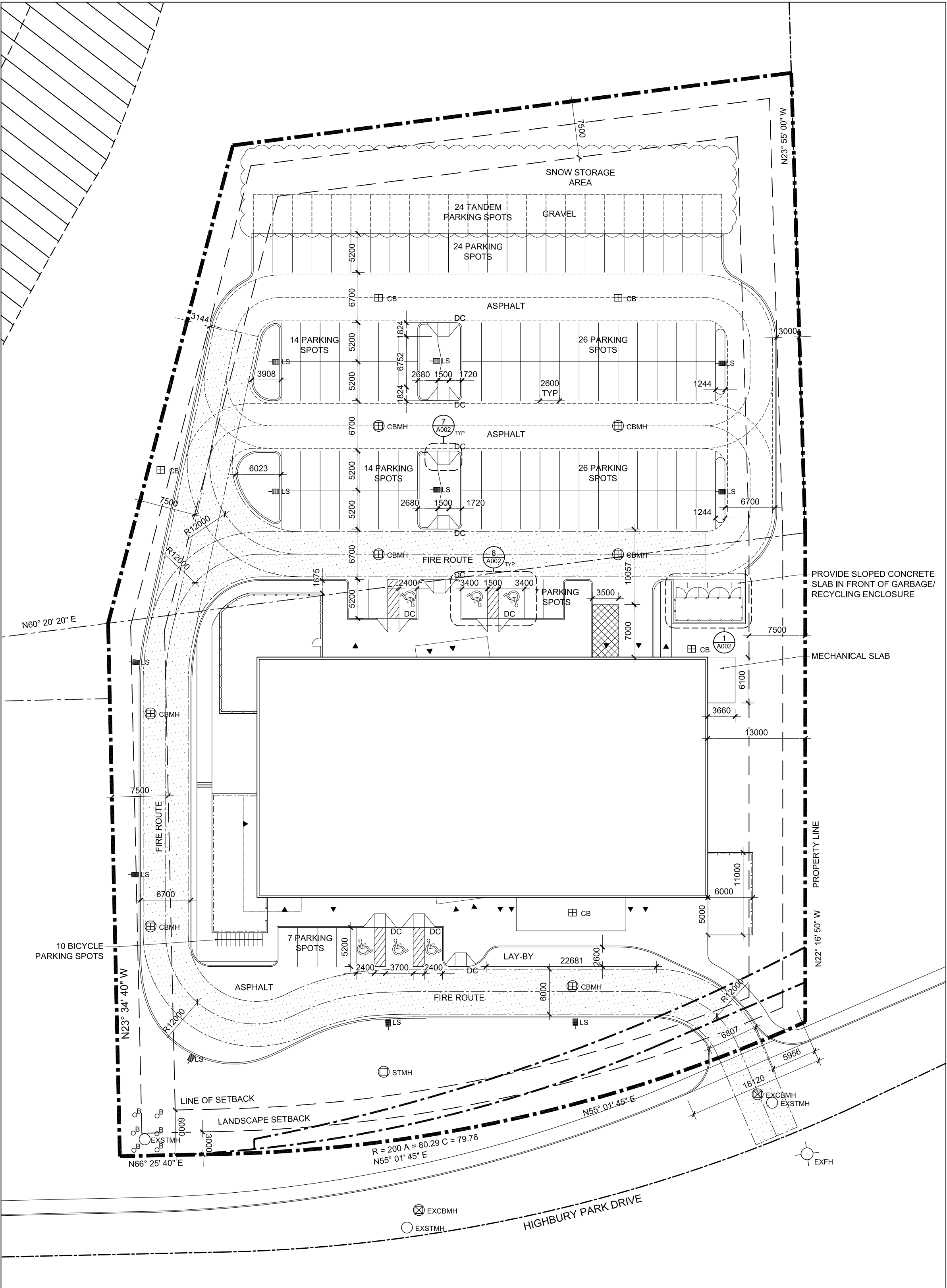
FOR GEOTECHNICAL INVESTIGATION REPORT REFER TO REPORT 16114424 PREPARED BY GOLDER ASSOCIATES LTD., DATED JANUARY 2019

ALL WORK OUTSIDE PROPERTY LINE TO BE CONSTRUCTED TO CITY OF OTTAWA CONSTRUCTION STANDARDS.

SLOPES OF PAVING AT DEPRESSED CURB SHALL NOT EXCEED 6%

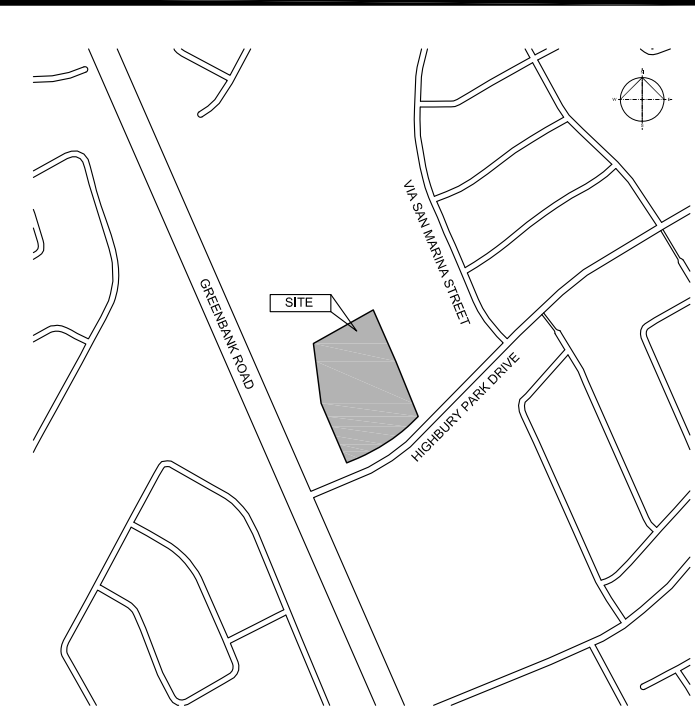
SYMBOL LEGEND:

	EXISTING FIRE HYDRANT
	EXISTING BOLLARD
	EXISTING LIGHT STANDARD
	RELOCATED EXISTING LIGHT STANDARD
	LIGHT STANDARD - SEE ELECTRICAL
	EXISTING CATCH BASIN
	EXISTING CATCH BASIN/MANHOLE
	EXISTING STORM MANHOLE
	CATCH BASIN - SEE CIVIL
	CATCH BASIN/MANHOLE - SEE CIVIL
	STORM MANHOLE - SEE CIVIL
	BUILDING ENTRANCE/EXIT
	DEPRESSED CURB
	NEW CURB
	PROPERTY LINE
	SETBACK LINE
	FENCE
	RAILING/GUARD
	FIRE ROUTE
	LOADING BAY



1 SITE PLAN
A001 1:300

sequoiachurch



APPROVED ☐ REFUSED ☐

DATE _____

XX, Manager Development Review, Suburban Services

no.	revision	date
-----	----------	------

N45 ARCHITECTURE INC.

71 Bank Street, 7th Floor - Ottawa, Ontario, K1P 5N2
tel. 613.224.0095 fax 613.224.9811

SEQUOIA CHURCH

35 Highbury Park Drive
Ottawa, Ontario
K2J 6K8

seal

drawing title

SITE PLAN

scale AS NOTED	drawn by TL
date MARCH 2019	checked by VP
project number 14-030	drawing number A-001
CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE WORK COMMENCES.	
DO NOT SCALE DRAWINGS	
revision	

APPENDIX B

TIA Screening Form

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	35 Highbury Park Drive
Description of Location	100m east of Greenbank Road/Highbury Park Drive
Land Use Classification	Church/Cafe
Development Size (units)	
Development Size (m ²)	1830 m² total
Number of Accesses and Locations	1 full movement to Highbury Park Drive
Phase of Development	1
Buildout Year	2019

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

2. Trip Generation Trigger

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

Land Use Type	Minimum Development Size
Single-family homes	40 units
Townhomes or apartments	90 units
Office	3,500 m ²
Industrial	5,000 m ²
Fast-food restaurant or coffee shop	100 m²
Destination retail	1,000 m ²
Gas station or convenience market	75 m ²

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

If the proposed development size is greater than the sizes identified above, the Trip Generation Trigger is satisfied.

3. Location Triggers

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

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

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

4. Safety Triggers

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

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

5. Summary

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

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

APPENDIX C

OC Transpo System Information

273

MACKENZIE KING TARTAN

Connexion

Monday to Friday / Lundi au vendredi

Peak periods only
Périodes de pointe seulement



- Transitway & Station
- Limited stops: Off only in AM / No stop in PM
Arrêts limités : Débarquement en AM seulement / Aucun arrêt en PM
- Limited stops: Off only in AM / Full service in PM
Arrêts limités : Débarquement en AM seulement / Service complet en PM
- Park & Ride / Parc-o-bus

170

FALLOWFIELD BARRHAVEN CENTRE

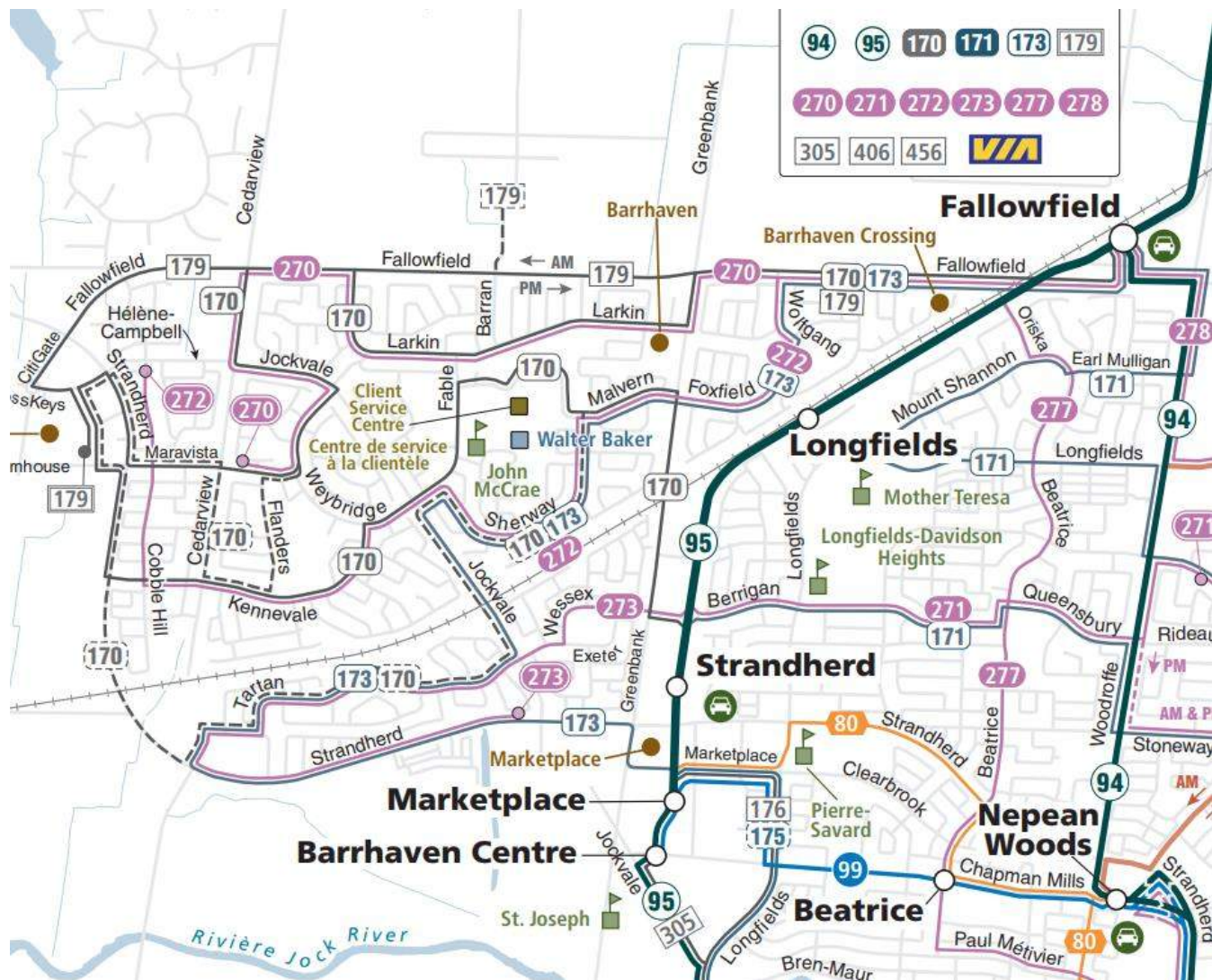
Local

7 days a week / 7 jours par semaine

All day service
Service toute la journée



- Legend / Légende
- Transitway & Station / Station du Transitway
 - Park & Ride / Parc-o-Bus
 - Evenings and weekends only / Soirs et fins de semaine seulement
 - No service evenings and weekends / Pas de service le soir et les fins de semaine
 - Timepoint / Heures de passage



APPENDIX D

Traffic Count Data

Turning Movement Count - Peak Hour Diagram

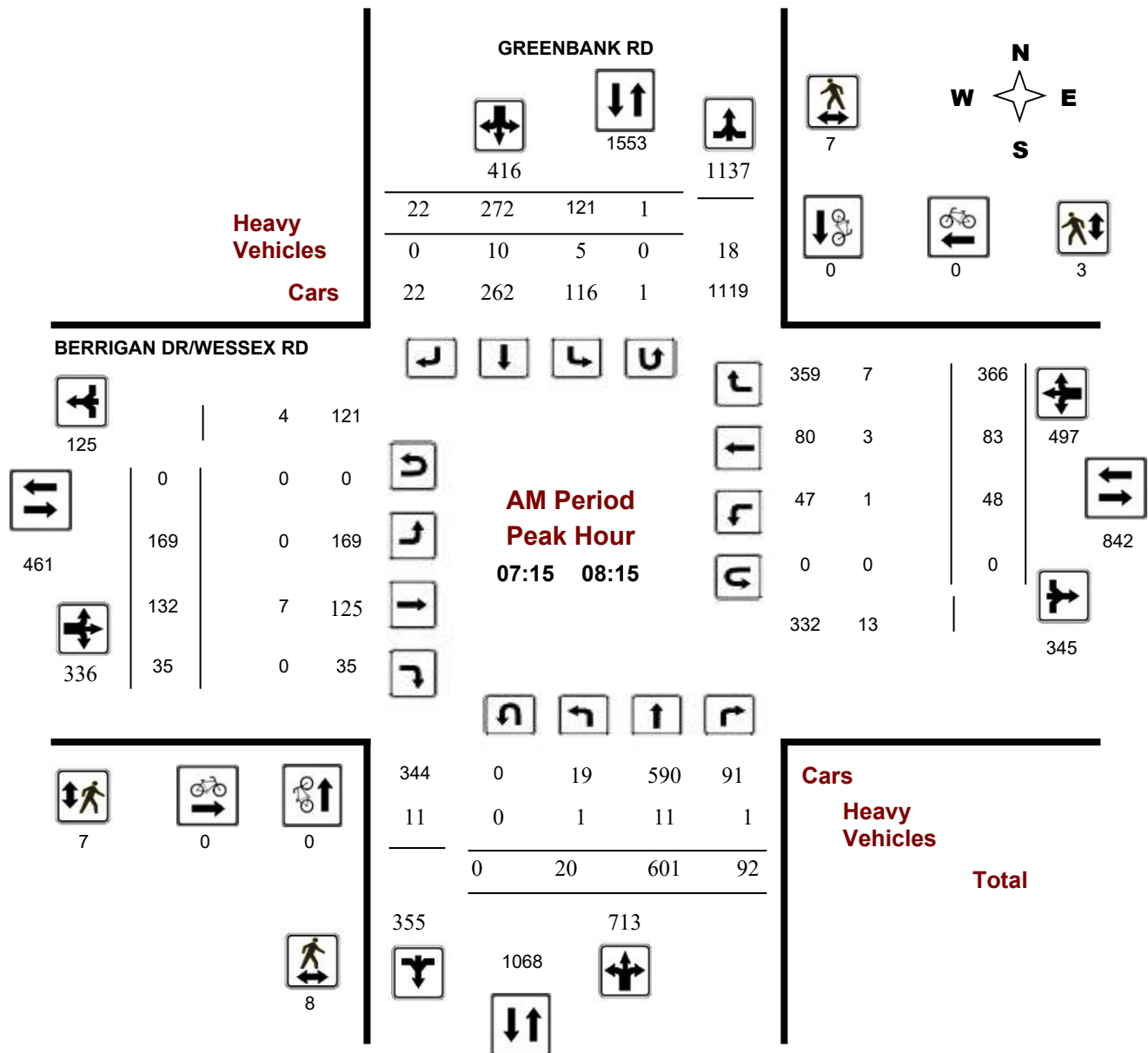
GREENBANK RD @ BERRIGAN DR/WESSEX RD

Survey Date: Wednesday, February 10, 2016

Start Time: 07:00

WO No: 35723

Device: Miovision



Turning Movement Count - Peak Hour Diagram

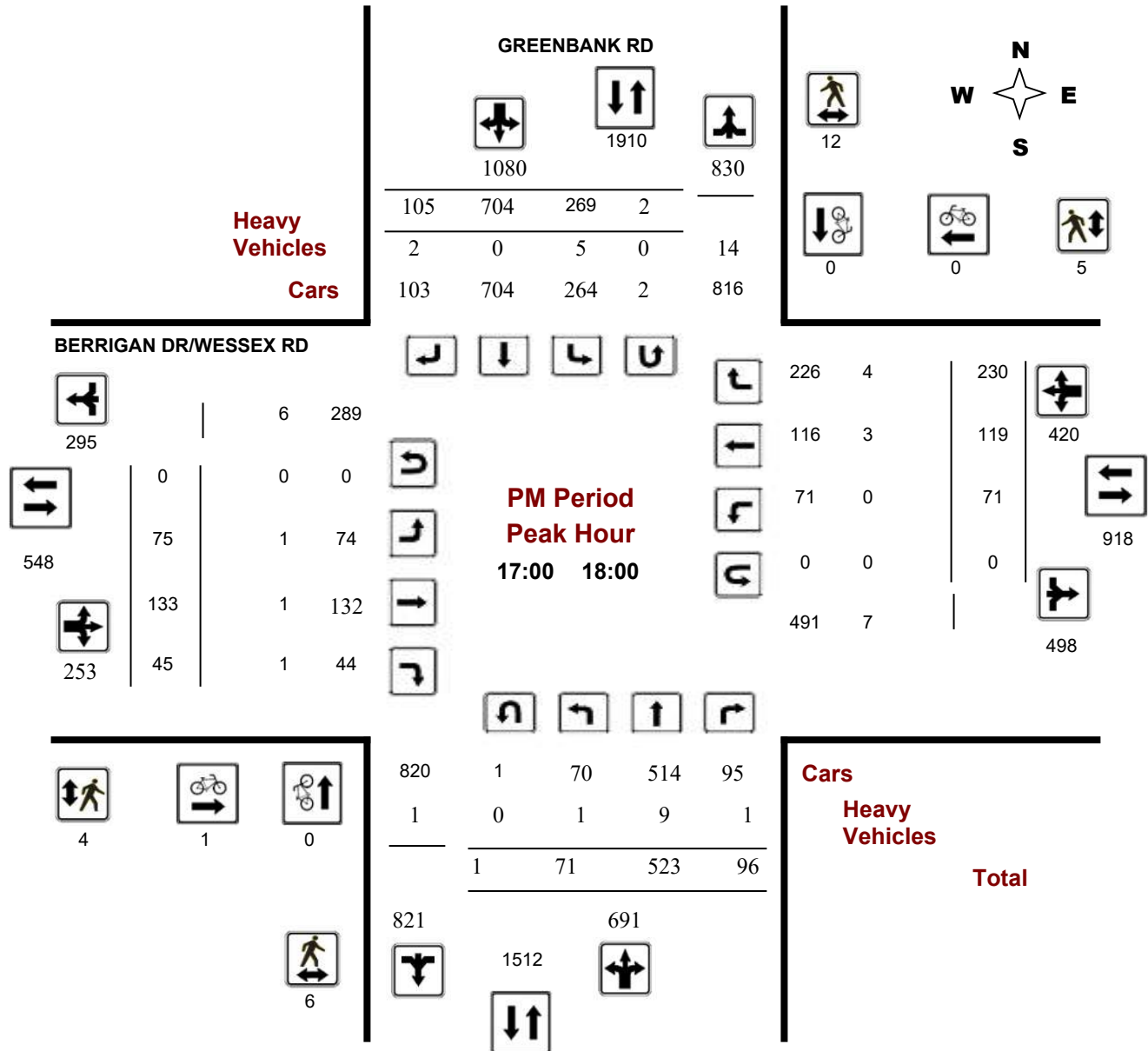
GREENBANK RD @ BERRIGAN DR/WESSEX RD

Survey Date: Wednesday, February 10, 2016

Start Time: 07:00

WO No: 35723

Device: Miovision



Turning Movement Count - Peak Hour Diagram

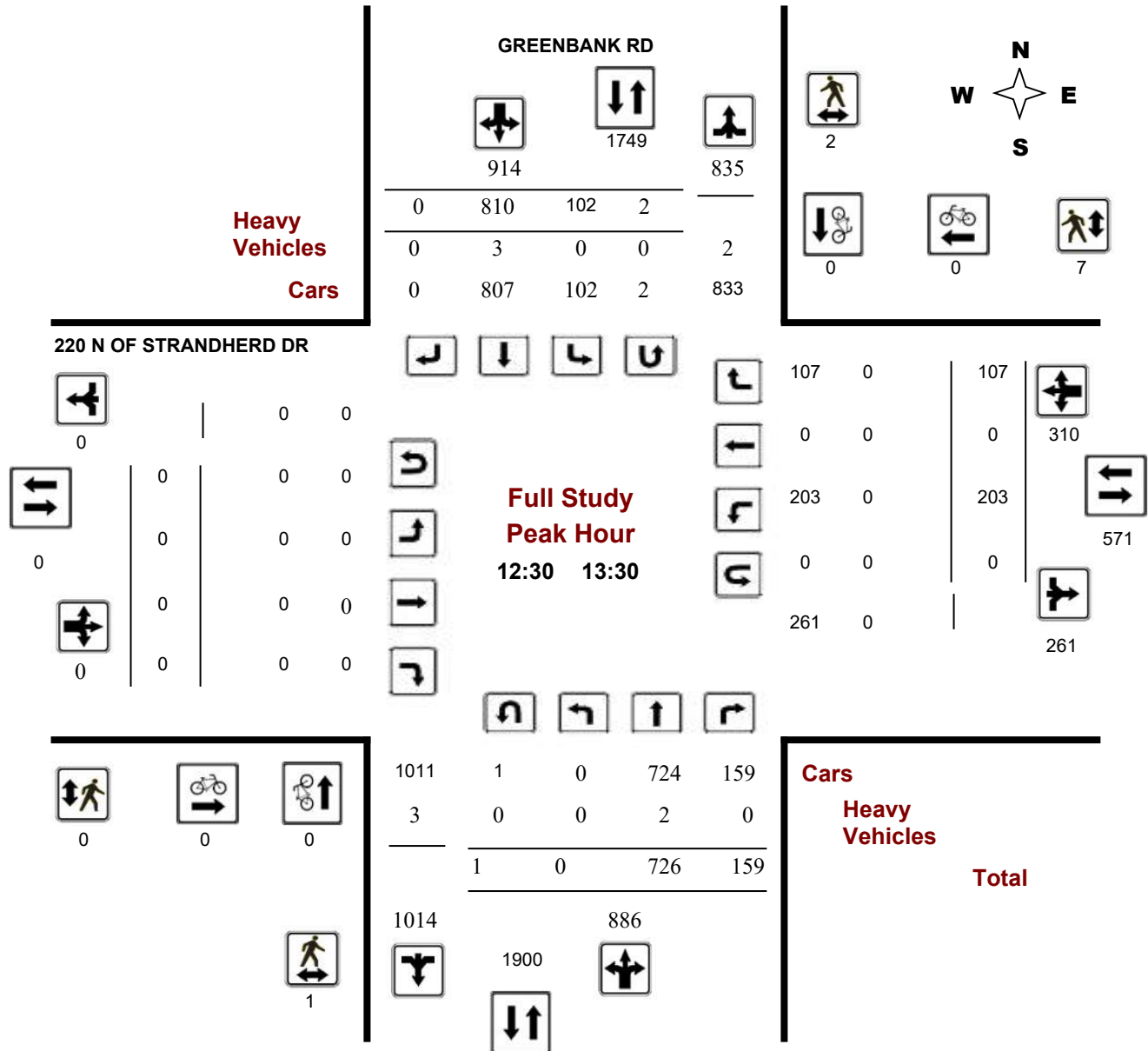
GREENBANK RD @ 220 N OF STRANDHERD DR

Survey Date: Saturday, April 01, 2017

Start Time: 11:00

WO No: 36883

Device: Miovision





Turning Movement Count Summary, OFF and EVENING Peak Hour Flow Diagrams

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

Berrigan Drive/Wessex Road & Greenbank Road

Nepean, ON

All Vehicles

(Except Bicycles & Electric Scooters)

Saturday, 1 December 2018

1000-1400

4 Hour Survey

City of Ottawa Ward 3

Wessex Rd.

Greenbank Rd.

Berrigan Dr.

Total Volume

10940

Approaching Intersection
(A+B+C+D)

(D) 1422

2807

1385

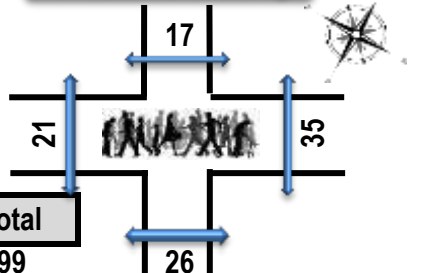
4072

8169

4097

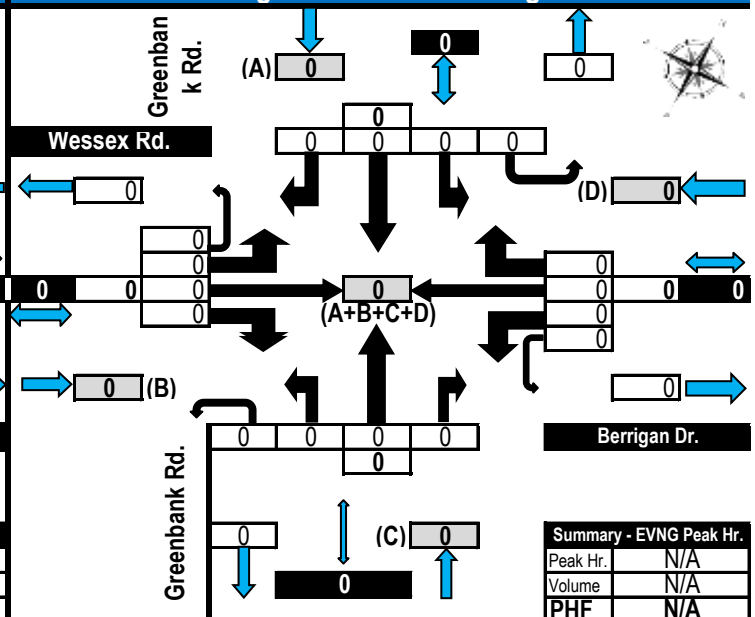
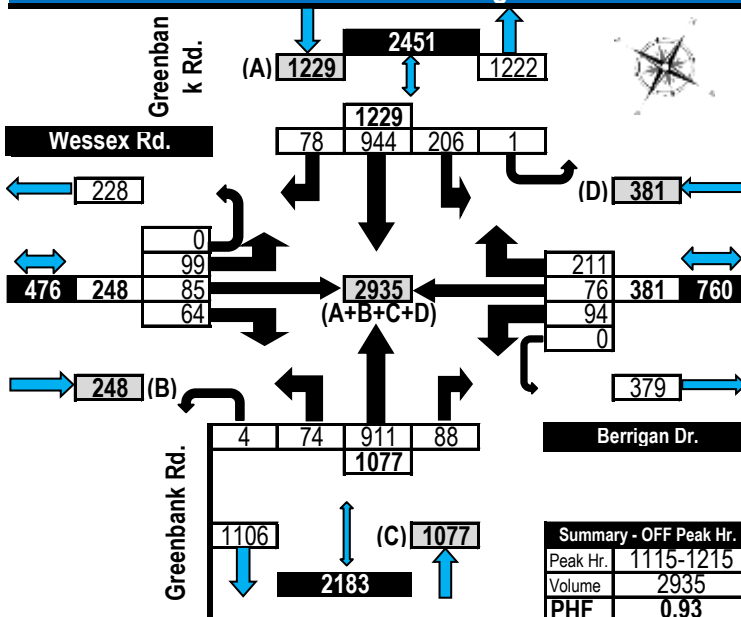
(C)

All Pedestrian Crossings



Off Peak Hour Flow Diagram

Evening Peak Hour Flow Diagram





Turning Movement Count

Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

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

Berrigan Drive/Wessex Road & Greenbank Road

Nepean, ON

Survey Date: Saturday, 1 December 2018

Start Time: 1000

AADT Factor: 1.1

Weather: P. Cloudy -2°C/P. Cloudy +2°C

Survey Duration: 4 Hrs.

Survey Hours: 1000-1400

(AM/PM)

Surveyor(s): Carmody

Wessex Rd.					Berrigan Dr.					Greenbank Rd.					Greenbank Rd.								
Eastbound					Westbound					Northbound					Southbound								
Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
1000-1100	103	82	49	0	234	70	76	176	0	322	556	59	823	73	2	957	156	781	63	0	1000	1957	2513
1100-1200	101	76	65	0	242	92	73	213	0	378	620	76	878	82	2	1038	197	898	77	1	1173	2211	2831
1200-1300	66	84	48	0	198	98	88	225	0	411	609	61	936	89	4	1090	200	933	72	0	1205	2295	2904
1300-1400	80	84	40	0	204	77	64	170	0	311	515	68	855	84	5	1012	178	908	79	0	1165	2177	2692
Totals	350	326	202	0	878	337	301	784	0	1422	2300	264	3492	328	13	4097	731	3520	291	1	4543	8640	10940

Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h

AM Peak Hour Factor ➡ N/A												Highest Hourly Vehicle Volume Between 0700h & 1000h											
AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OFF Peak Hour Factor ➡ 0.93												Highest Hourly Vehicle Volume Between 1000h & 1500h											
OFF Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1115-1215	99	85	64	0	248	94	76	211	0	381	629	74	911	88	4	1077	206	944	78	1	1229	2306	2935
PM Peak Hour Factor ➡ N/A												Highest Hourly Vehicle Volume Between 1500h & 1900h											
PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

Notes:

1. Includes all vehicle types except bicycles and electric scooters.
2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.



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

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

Berrigan Drive/Wessex Road & Greenbank Road

Nepean, ON

All Vehicles

(Except Bicycles & Electric Scooters)

Sunday, 4 November 2018

0800-1400

6 Hour Survey

City of Ottawa Ward 3

Wessex Rd.

Greenbank Rd.

Berrigan Dr.

Total Volume

12157

Approaching Intersection
(A+B+C+D)

(D) 1532

3033

1501

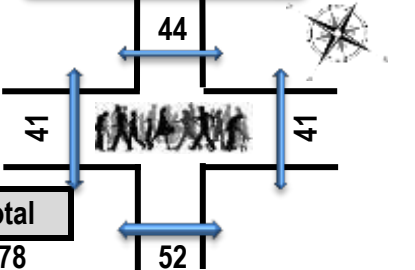
11 324 3916 371
4622

4435

9057

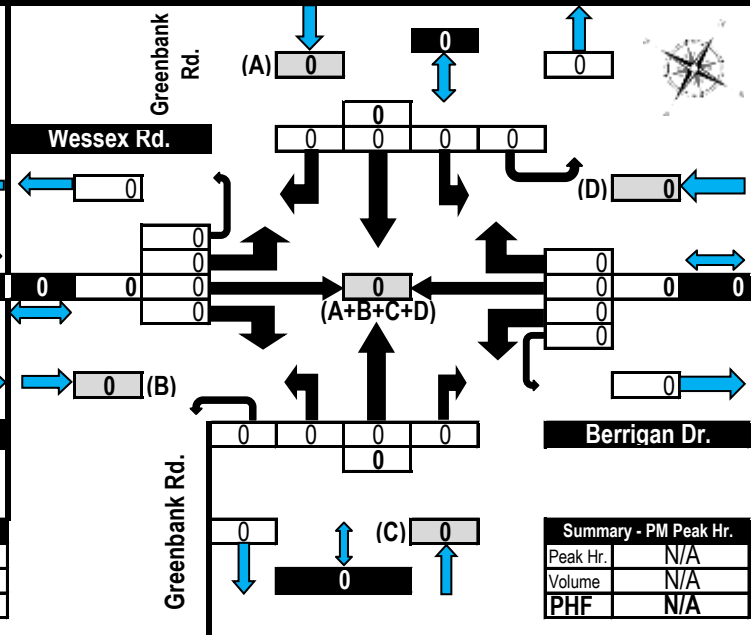
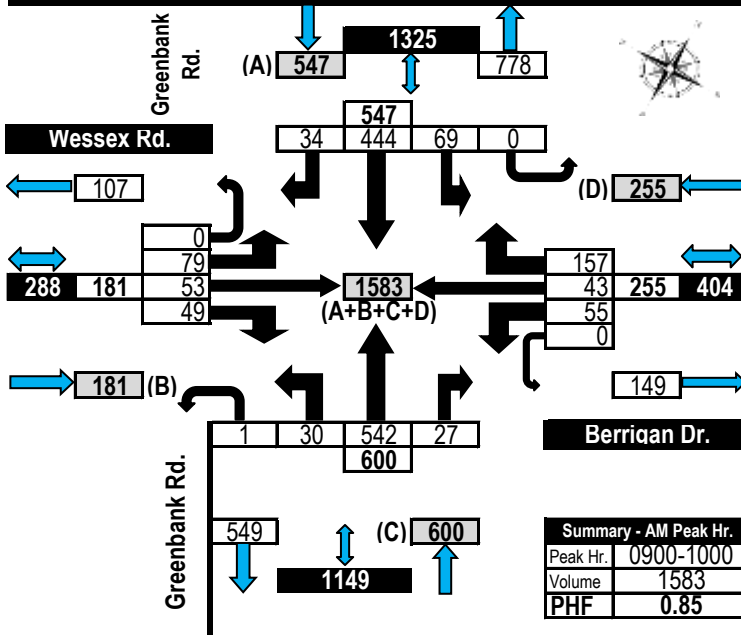
4622 (C)

All Pedestrian Crossings



AM Peak Hour Flow Diagram

PM Peak Hour Flow Diagram





Turning Movement Count

Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

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

Berrigan Drive/Wessex Road & Greenbank Road

Nepean, ON

Survey Date: Sunday, 4 November 2018

Start Time: 0800

AADT Factor: 1.5

Weather: Sunny +1°C/Sunny +5°C

Survey Duration: 12 Hrs.

Survey Hours: 0800-1400

Surveyor(s): Carmody

(AM/PM)

Wessex Rd.

Berrigan Dr.

Greenbank Rd.

Greenbank Rd.

Eastbound

Westbound

Northbound

Southbound

Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
0800-0900	58	36	34	0	128	36	20	87	0	143	271	18	387	17	0	422	61	264	26	0	351	773	1044
0900-1000	79	53	49	0	181	55	43	157	0	255	436	30	542	27	1	600	69	444	34	0	547	1147	1583
1000-1100	101	65	65	0	231	81	62	151	0	294	525	63	695	68	4	830	114	633	57	0	804	1634	2159
1100-1200	81	78	68	0	227	79	53	155	0	287	514	59	747	80	4	890	130	714	63	2	909	1799	2313
1200-1300	88	75	57	0	220	80	58	140	0	278	498	73	729	77	2	881	172	756	80	1	1009	1890	2388
1300-1400	83	80	57	0	220	68	65	142	0	275	495	81	816	102	0	999	197	884	94	1	1176	2175	2670
Totals	490	387	330	0	1207	399	301	832	0	1532	2739	324	3916	371	11	4622	743	3695	354	4	4796	9418	12157

Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h

AM Peak Hour Factor → 0.85												Highest Hourly Vehicle Volume Between 0700h & 1000h											
AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
0900-1000	79	53	49	0	181	55	43	157	0	255	436	30	542	27	1	600	69	444	34	0	547	1147	1583
OFF Peak Hour Factor → 0.94												Highest Hourly Vehicle Volume Between 1000h & 1500h											
OFF Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1300-1400	83	80	57	0	220	68	65	142	0	275	495	81	816	102	0	999	197	884	94	1	1176	2175	2670
PM Peak Hour Factor → N/A												Highest Hourly Vehicle Volume Between 1500h & 1900h											
PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

Almost all cyclists do not use the bicycle lanes on Greenbank Road.

Notes:

1. Includes all vehicle types except bicycles and electric scooters.
2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.



Turning Movement Count Summary, OFF and EVENING Peak Hour Flow Diagrams

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

Greenbank Road & Highbury Park Drive

Nepean, ON

All Vehicles

(Except Bicycles & Electric Scooters)

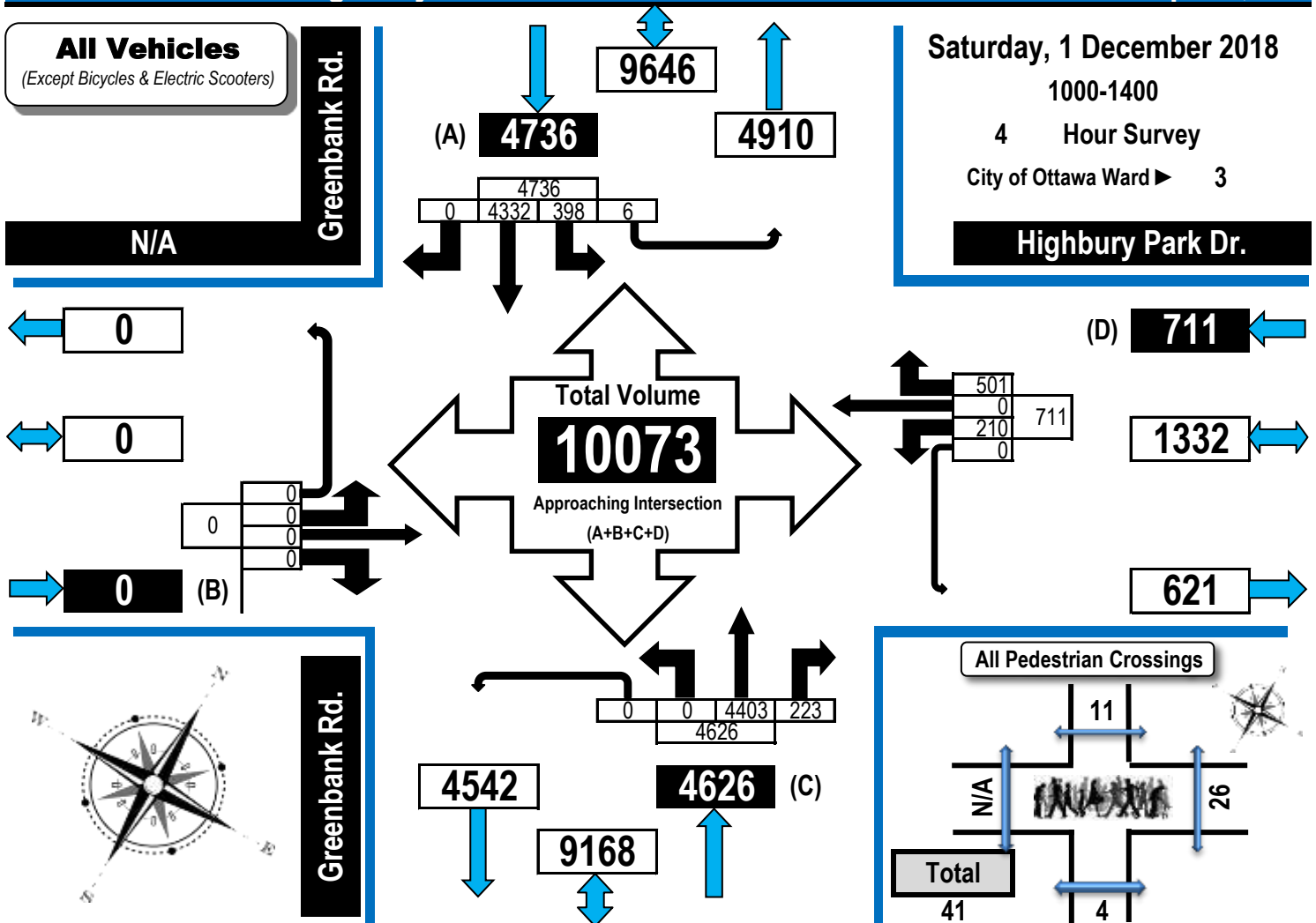
Saturday, 1 December 2018

1000-1400

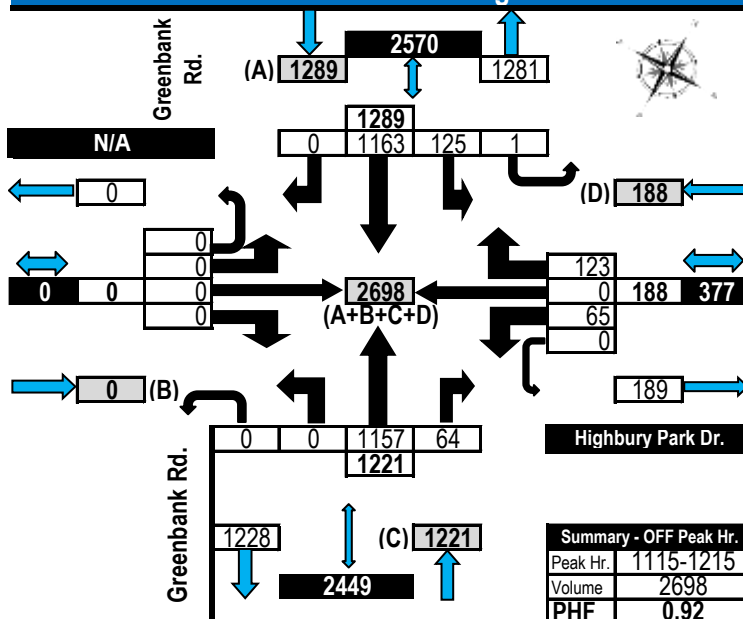
4 Hour Survey

City of Ottawa Ward 3

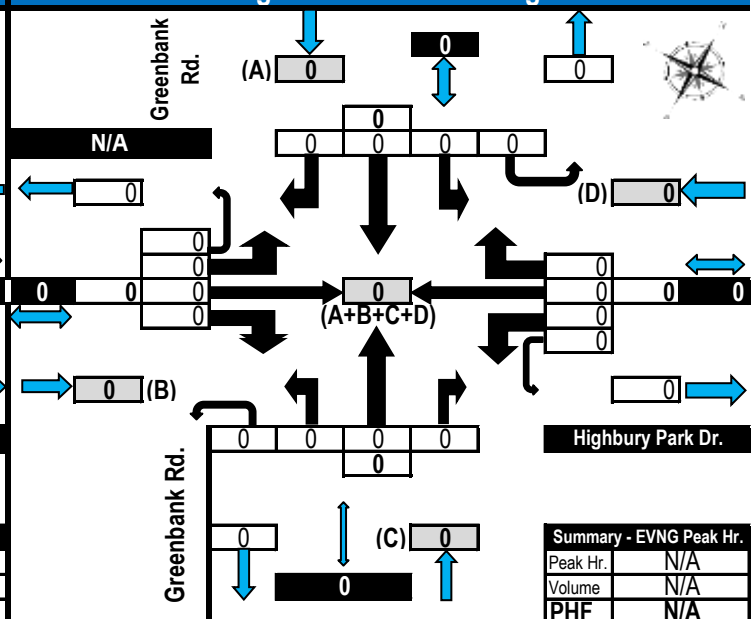
Highbury Park Dr.



Off Peak Hour Flow Diagram



Evening Peak Hour Flow Diagram





Turning Movement Count

Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

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

Greenbank Road & Highbury Park Drive

Nepean, ON

Survey Date: Saturday, 1 December 2018

Start Time: 1000

AADT Factor: 1.1

Weather: P. Cloudy -2°C/P. Cloudy +2°C

Survey Duration: 4 Hrs.

Survey Hours: 1000-1400

(AM/PM)

Surveyor(s) Carmody

N/A

Highbury Park Dr.

Greenbank Rd.

Greenbank Rd.

Eastbound

Westbound

Northbound

Southbound

Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
1000-1100	0	0	0	0	0	45	0	113	0	158	158	0	1060	42	0	1102	64	955	0	1	1020	2122	2280
1100-1200	0	0	0	0	0	54	0	122	0	176	176	0	1131	61	0	1192	111	1118	0	1	1230	2422	2598
1200-1300	0	0	0	0	0	56	0	142	0	198	198	0	1151	76	0	1227	109	1149	0	1	1259	2486	2684
1300-1400	0	0	0	0	0	55	0	124	0	179	179	0	1061	44	0	1105	114	1110	0	3	1227	2332	2511
Totals	0	0	0	0	0	210	0	501	0	711	711	0	4403	223	0	4626	398	4332	0	6	4736	9362	10073

Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h

AM Peak Hour Factor → N/A												Highest Hourly Vehicle Volume Between 0700h & 1000h											
AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OFF Peak Hour Factor → 0.92												Highest Hourly Vehicle Volume Between 1000h & 1500h											
OFF Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1115-1215	0	0	0	0	0	65	0	123	0	188	188	0	1157	64	0	1221	125	1163	0	1	1289	2510	2698
PM Peak Hour Factor → N/A												Highest Hourly Vehicle Volume Between 1500h & 1900h											
PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

No bicycles observed during this survey on either the roadways or the sidewalks..

Notes:

1. Includes all vehicle types except bicycles and electric scooters.
2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.



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

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

Greenbank Road & Highbury Park Drive

Nepean, ON

All Vehicles

(Except Bicycles & Electric Scooters)

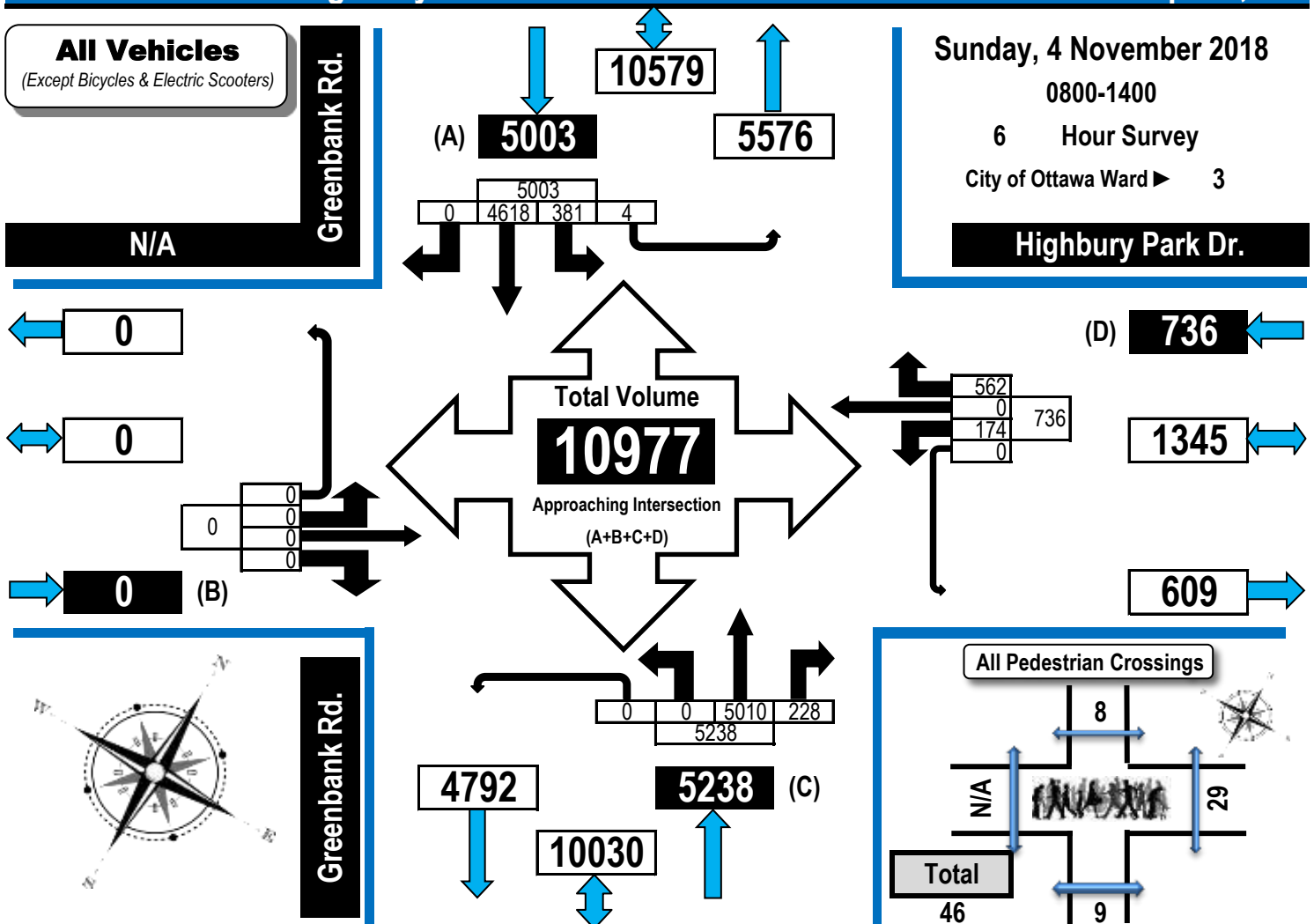
Sunday, 4 November 2018

0800-1400

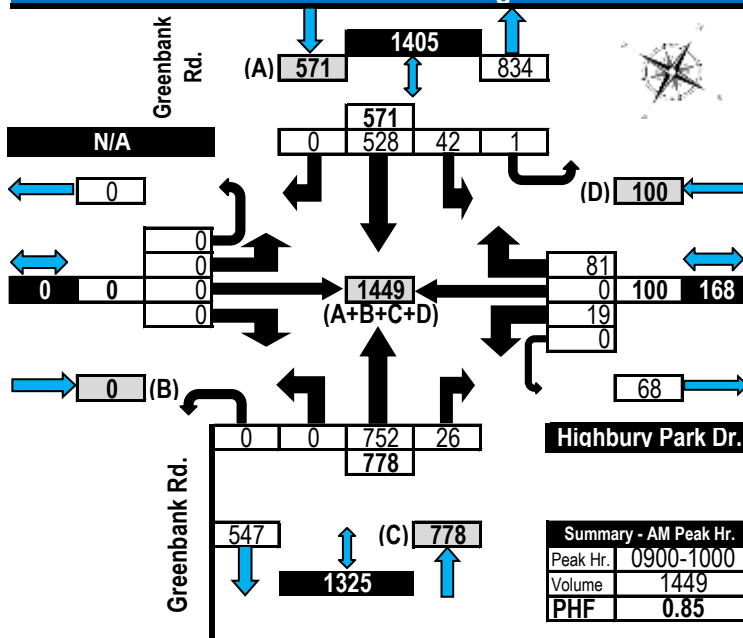
6 Hour Survey

City of Ottawa Ward 3

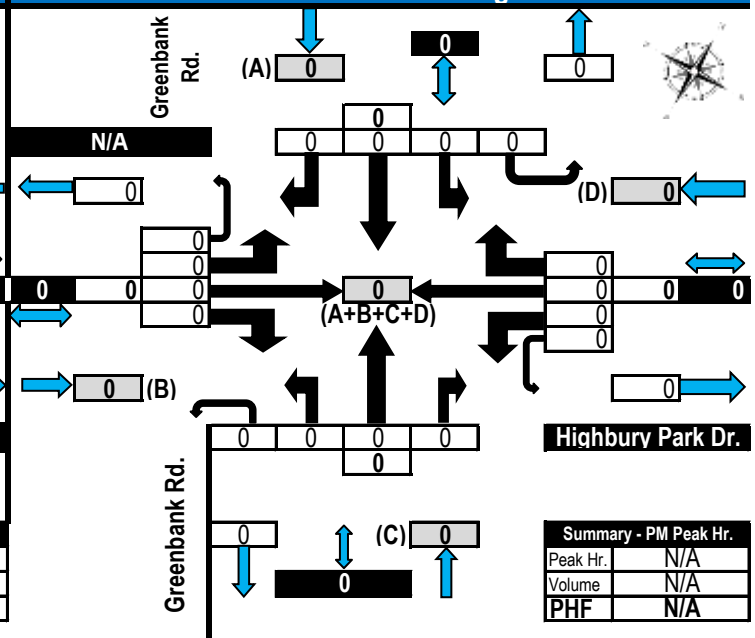
Highbury Park Dr.



AM Peak Hour Flow Diagram



PM Peak Hour Flow Diagram





Turning Movement Count

Summary Report Including AM, OFF Peak, PM, Evening Peak Hours, and PHF

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

Greenbank Road & Highbury Park Drive

Nepean, ON

Survey Date: Sunday, 4 November 2018

Start Time: 0800

AADT Factor: 1.5

Weather: Sunny +1°C/Sunny +5°C

Survey Duration: 12 Hrs.

Survey Hours: 0800-1400

Surveyor(s): Carmody

(AM/PM)

N/A

Highbury Park Dr.

Greenbank Rd.

Greenbank Rd.

Eastbound

Westbound

Northbound

Southbound

Time Period	LT	ST	RT	UT	E/B Tot	LT	ST	RT	UT	W/B Tot	Street Total	LT	ST	RT	UT	N/B Tot	LT	ST	RT	UT	S/B Tot	Street Total	Grand Total
0800-0900	0	0	0	0	0	17	0	62	0	79	79	0	515	17	0	532	15	334	0	1	350	882	961
0900-1000	0	0	0	0	0	19	0	81	0	100	100	0	752	26	0	778	42	528	0	1	571	1349	1449
1000-1100	0	0	0	0	0	23	0	107	0	130	130	0	915	32	0	947	43	781	0	0	824	1771	1901
1100-1200	0	0	0	0	0	24	0	91	0	115	115	0	930	53	0	983	67	883	0	1	951	1934	2049
1200-1300	0	0	0	0	0	42	0	111	0	153	153	0	905	52	0	957	108	966	0	0	1074	2031	2184
1300-1400	0	0	0	0	0	49	0	110	0	159	159	0	993	48	0	1041	106	1126	0	1	1233	2274	2433
Totals	0	0	0	0	0	174	0	562	0	736	736	0	5010	228	0	5238	381	4618	0	4	5003	####	10977

Expansion factors are applied exclusively to standard weekday 8-hour turning movement counts conducted during the hours of 0700h - 1000h, 1130h - 1330h and 1500h - 1800h

AM Peak Hour Factor → 0.85												Highest Hourly Vehicle Volume Between 0700h & 1000h											
AM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
0900-1000	0	0	0	0	0	19	0	81	0	100	100	0	752	26	0	778	42	528	0	1	571	1349	1449
OFF Peak Hour Factor → 0.92												Highest Hourly Vehicle Volume Between 1000h & 1500h											
OFF Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
1300-1400	0	0	0	0	0	49	0	110	0	159	159	0	993	48	0	1041	106	1126	0	1	1233	2274	2433
PM Peak Hour Factor → N/A												Highest Hourly Vehicle Volume Between 1500h & 1900h											
PM Peak Hr	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	LT	ST	RT	UT	TOT	LT	ST	RT	UT	TOT	S.TOT	G.TOT
N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

Almost all cyclists do not use the bicycle lanes on Greenbank Road.

Notes:

1. Includes all vehicle types except bicycles and electric scooters.
2. When expansion and AADT factors are applied, the results will differ slightly due to rounding.

Date: May 5, 2019
 Job No. 118187

Occupancy Count

Sequoia Church - 255 Tartan Dr

Interval	Time period			Location	in/out	Number of Vehicles	Number of Adults	Number of Children
1	8:30	-	8:45	Driveway 1	in			
				Driveway 1	out			
2	8:45	-	9:00	Driveway 1	in	1	1	
				Driveway 1	out			
3	9:00	-	9:15	Driveway 1	in	4	7	6
				Driveway 1	out			
4	9:15	-	9:30	Driveway 1	in	2	2	1
				Driveway 1	out	2	2	2
5	9:30	-	9:45	Driveway 1	in	7	10	7
				Driveway 1	out			
6	9:45	-	10:00	Driveway 1	in	1	1	
				Driveway 1	out	2	2	
7	10:00	-	10:15	Driveway 1	in	12	15	8
				Driveway 1	out			
8	10:15	-	10:30	Driveway 1	in	1	2	1
				Driveway 1	out	2	3	1
9	11:15	-	11:30	Driveway 1	in	29	39	25
				Driveway 1	out	1	1	
10	11:30	-	11:45	Driveway 1	in	5	7	5
				Driveway 1	out	4	4	1
11	10:00	-	10:15	Driveway 1	in	45	70	27
				Driveway 1	out			
12	10:15	-	10:30	Driveway 1	in	7	11	4
				Driveway 1	out	8	8	1
13	10:30	-	10:45	Driveway 1	in	7	13	5
				Driveway 1	out			
14	11:15	-	11:30	Driveway 1	in	1	1	
				Driveway 1	out	25	36	17
15	11:30	-	11:45	Driveway 1	in	3	4	
				Driveway 1	out	25	36	17
16	11:45	-	12:00	Driveway 1	in	4	4	
				Driveway 1	out	16	23	3
17	12:00	-	12:15	Driveway 1	in	4	4	
				Driveway 1	out	15	22	9
18	12:15	-	12:30	Driveway 1	in	2	3	
				Driveway 1	out	11	18	4
19	12:30	-	12:45	Driveway 1	in	4	8	4
				Driveway 1	out			
20	12:45	-	13:00	Driveway 1	in			
				Driveway 1	out			
21	13:00	-	13:15	Driveway 1	in	1	1	1
				Driveway 1	out	2	3	1
22	13:15	-	13:30	Driveway 1	in			
				Driveway 1	out	1	1	

Date: Tuesday, November 20, 2018

118187

Bridgehead - 2140 Carling Ave (Fairlawn Plaza)

Interval	Time Period	In	Out	Tot
1	7:00 - 7:15	11	6	17
2	7:15 - 7:30	6	6	12
3	7:30 - 7:45	9	7	16
4	7:45 - 8:00	7	3	10
5	8:00 - 8:15	8	5	13
6	8:15 - 8:30	20	8	28
7	8:30 - 8:45	16	11	27
8	8:45 - 9:00	19	9	28
9	9:00 - 9:15	6	5	11
10	9:15 - 9:30	14	9	23
11	9:30 - 9:45	19	14	33
12	9:45 - 10:00	7	5	12
13	15:00 - 15:15	5	7	12
14	15:15 - 15:30	5	7	12
15	15:30 - 15:45	7	8	15
16	15:45 - 16:00	4	7	11
17	16:00 - 16:15	10	4	14
18	16:15 - 16:30	7	2	9
19	16:30 - 16:45	5	6	11
20	16:45 - 17:00	10	6	16
21	17:00 - 17:15	4	7	11
22	17:15 - 17:30	0	7	7
23	17:30 - 17:45	4	3	7
24	17:45 - 18:00	1	5	6

AM PEAK HOUR 8:00 - 9:00

in	out	tot
63	33	96

PM PEAK HOUR 15:15 - 16:15

in	out	tot
26	26	52

Date: Saturday, Novemeber 17, 2018
118187

Bridgehead - 2140 Carling Ave (Fairlawn Plaza)

Interval	Time Period	in	out	tot
1	10:00 - 10:15	15	12	27
2	10:15 - 10:30	11	18	29
3	10:30 - 10:45	15	20	35
4	10:45 - 11:00	13	8	21
5	11:00 - 11:15	10	10	20
6	11:15 - 11:30	15	12	27
7	11:30 - 11:45	6	8	14
8	11:45 - 12:00	6	10	16
9	12:00 - 12:15	8	6	14
10	12:15 - 12:30	7	6	13
11	12:30 - 12:45	6	9	15
12	12:45 - 13:00	14	17	31
13	13:00 - 13:15	7	6	13
14	13:15 - 13:30	3	2	5
15	13:30 - 13:45	4	6	10
16	13:45 - 14:00	14	4	18

PEAK HOUR 10:00 - 11:00

in	out	tot
54	58	112

APPENDIX E

Collision Records



City Operations - Transportation Services

Collision Details Report - Public Version

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

Location: GREENBANK RD @ Highbury Park Dr

Traffic Control: Traffic signal

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2017-Jul-14, Fri,22:40	Rain	Rear end	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Dec-20, Wed,18:21	Clear	Rear end	P.D. only	Ice	North	Slowing or stopping	Pick-up truck	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	



City Operations - Transportation Services

Collision Details Report - Public Version

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

Location: GREENBANK RD @ BERRIGAN DR/WESSEX RD

Traffic Control: Traffic signal

Total Collisions: 65

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2013-Feb-26, Tue,18:19	Clear	Turning movement	Non-fatal injury	Dry	North	Going ahead	Passenger van	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2013-Mar-18, Mon,15:20	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Pick-up truck	Other motor vehicle	
2013-Mar-24, Sun,13:15	Clear	Rear end	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2013-Jul-23, Tue,17:38	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Passenger van	Other motor vehicle	
					South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Slowing or stopping	Passenger van	Other motor vehicle	

2013-Aug-12, Mon,16:00	Clear	Turning movement	P.D. only	Dry	North	Turning left	Pick-up truck	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
2013-Aug-17, Sat,17:30	Clear	Rear end	Non-reportable	Dry	West	Turning right	Police vehicle	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle
2013-Sep-10, Tue,18:00	Clear	Rear end	P.D. only	Dry	North	Unknown	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2013-Oct-19, Sat,20:30	Clear	Sideswipe	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2014-Jan-03, Fri,16:58	Clear	Rear end	Non-fatal injury	Ice	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Passenger van	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2014-Jan-16, Thu,17:17	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Feb-01, Sat,15:41	Snow	Angle	P.D. only	Loose snow	West	Turning right	Pick-up truck	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle

2014-Feb-10, Mon,15:04	Clear	Angle	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2014-Apr-05, Sat,12:26	Clear	Rear end	Non-fatal injury	Dry	South	Going ahead	Pick-up truck	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2014-May-14, Wed,16:45	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Stopped	Delivery van	Other motor vehicle
2014-May-16, Fri,20:54	Rain	Turning movement	P.D. only	Wet	South	Turning left	Pick-up truck	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Jun-30, Mon,17:49	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2014-Jul-30, Wed,16:23	Rain	SMV other	P.D. only	Wet	North	Slowing or stopping	Automobile, station wagon	Curb
2014-Aug-13, Wed,17:22	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Passenger van	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle

2014-Aug-17, Sun,14:34	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2014-Aug-21, Thu,21:30	Rain	Rear end	P.D. only	Wet	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Stopped	Pick-up truck	Other motor vehicle
2014-Sep-25, Thu,08:10	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2014-Oct-15, Wed,15:03	Rain	Rear end	P.D. only	Wet	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Pick-up truck	Other motor vehicle
2014-Oct-18, Sat,14:22	Rain	Rear end	P.D. only	Wet	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
					South	Stopped	Passenger van	Other motor vehicle
2014-Oct-26, Sun,13:45	Clear	Rear end	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Pick-up truck	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle

2014-Nov-19, Wed,15:00	Clear	Rear end	P.D. only	Wet	South	Turning right	Truck - closed	Other motor vehicle
					South	Turning right	Passenger van	Other motor vehicle
2014-Dec-13, Sat,18:50	Clear	Rear end	P.D. only	Wet	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2014-Dec-26, Fri,13:29	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2015-Jan-10, Sat,17:30	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-Jan-16, Fri,14:03	Clear	Angle	P.D. only	Wet	West	Going ahead	Pick-up truck	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
2015-Jan-18, Sun,19:49	Freezing Rain	Rear end	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Unknown	Other motor vehicle
2015-Jan-20, Tue,19:10	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle

2015-Feb-06, Fri,18:18	Clear	Rear end	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
2015-Feb-07, Sat,12:25	Clear	Sideswipe	P.D. only	Wet	South	Changing lanes	Automobile, station wagon	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2015-Feb-19, Thu,11:43	Clear	Angle	Non-fatal injury	Wet	South	Going ahead	Pick-up truck	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2015-Feb-21, Sat,12:10	Snow	Approaching	P.D. only	Loose snow	South	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Mar-09, Mon,14:00	Clear	Rear end	Non-fatal injury	Dry	South	Unknown	Unknown	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2015-May-12, Tue,21:20	Clear	Rear end	Non-fatal injury	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Passenger van	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2015-May-19, Tue,14:57	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Unknown	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle

2015-Aug-31, Mon,13:00	Clear	Sideswipe	P.D. only	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Turning left	Passenger van	Other motor vehicle	
2015-Sep-19, Sat,11:00	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Oct-03, Sat,13:57	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2015-Dec-13, Sun,08:57	Clear	Rear end	Non-fatal injury	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Mar-01, Tue,19:55	Snow	Turning movement	P.D. only	Loose snow	South	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Mar-14, Mon,14:47	Rain	SMV other	Non-fatal injury	Wet	West	Turning left	Pick-up truck	Pedestrian	3
2016-May-13, Fri,15:25	Clear	Rear end	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Pick-up truck	Other motor vehicle	
2016-May-26, Thu,08:51	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	

					North	Going ahead	Pick-up truck	Other motor vehicle
2016-Jun-24, Fri,17:24	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Jul-30, Sat,13:23	Clear	Turning movement	P.D. only	Dry	South	Turning left	Pick-up truck	Other motor vehicle
					North	Going ahead	Passenger van	Other motor vehicle
2016-Aug-27, Sat,11:46	Clear	Rear end	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2016-Sep-05, Mon,16:13	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Sep-09, Fri,15:39	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Nov-14, Mon,17:22	Clear	Angle	P.D. only	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2016-Nov-17, Thu,16:19	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle

					South	Stopped	Pick-up truck	Other motor vehicle	
2016-Nov-21, Mon,19:28	Snow	Rear end	P.D. only	Loose snow	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	
2016-Nov-24, Thu,10:34	Snow	Rear end	P.D. only	Slush	North	Going ahead	Unknown	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Dec-11, Sun,10:30	Clear	SMV other	Non-fatal injury	Dry	West	Turning left	Passenger van	Pedestrian	1
2017-Jan-04, Wed,22:49	Clear	Rear end	P.D. only	Ice	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Jan-05, Thu,21:57	Clear	Turning movement	P.D. only	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Feb-14, Tue,22:27	Snow	Angle	P.D. only	Loose snow	North	Turning right	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Fire vehicle	Other motor vehicle	
2017-Feb-16, Thu,09:36	Snow	Turning movement	P.D. only	Loose snow	North	Turning right	Passenger van	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	

2017-Apr-04, Tue,18:00	Rain	Rear end	P.D. only	Wet	North	Going ahead	Unknown	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2017-May-18, Thu,20:29	Rain	SMV other	P.D. only	Wet	South	Going ahead	Pick-up truck	Curb
2017-Jun-05, Mon,21:02	Rain	Angle	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Turning left	Pick-up truck	Other motor vehicle
2017-Jul-24, Mon,13:00	Rain	Turning movement	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Aug-10, Thu,16:12	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Slowing or stopping	Unknown	Other motor vehicle



CITY OPERATIONS - PUBLIC WORKS

Collision Details Report - Public Version

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

Location: GREENBANK RD btwn Highbury Park Dr & Wessex Rd

Traffic Control: No control

Total Collisions: 5

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2014-Apr-15, Tue,18:08	Clear	Rear end	P.D. only	Wet	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Slowing or stopping	Pick-up truck	Other motor vehicle	
2014-May-16, Fri,16:30	Rain	Rear end	P.D. only	Wet	South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2014-Jun-11, Wed,19:09	Rain	Approaching	Non-fatal injury	Spilled liquid	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Pick-up truck	Other motor vehicle	
2014-Dec-06, Sat,13:15	Clear	Rear end	Non-fatal injury	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Pick-up truck	Other motor vehicle	
					South	Stopped	Pick-up truck	Other motor vehicle	
2014-Jan-13, Mon,17:24	Clear	Rear end	Non-fatal injury	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	

APPENDIX F

Background Growth Analysis

2011 Version V 1.12 - last updated January 18, 2018

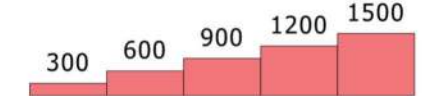
Barrhaven

Modifications from base version:
Updated Speeds and Number of Lanes in Area



TRANS

AM Peak Hour Total Traffic Volume



Distance (m) 50 100 150 200 250

The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.

Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.

As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

TRANS Regional Model

2031 Version V 1.13 - last updated August 1, 2018

AM Peak Hour Total Traffic Volume
Barrhaven

Scenario 11326

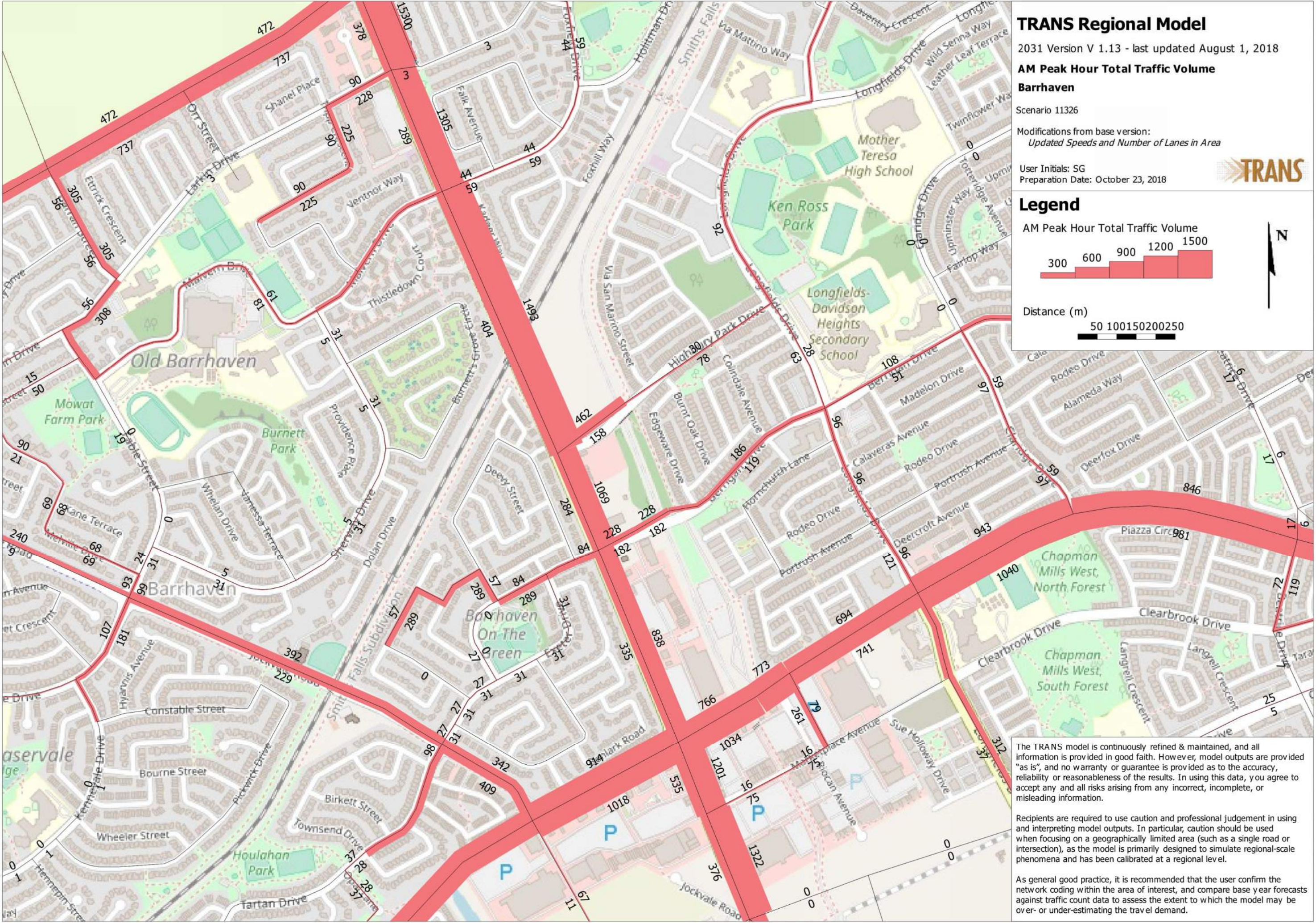
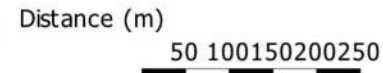
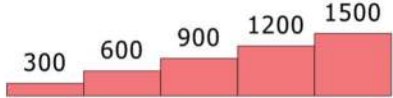
Modifications from base version:
Updated Speeds and Number of Lanes in Area

User Initials: SG
Preparation Date: October 23, 2018



Legend

AM Peak Hour Total Traffic Volume



The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.

Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.

As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

Greenbank/Berrigan
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2005	Thursday 4 August	4357	4752	3682	3857	1302	1458	1607	881	21896
2007	Tuesday 10 July	6170	6477	5058	5104	2133	2007	1757	1530	30236
2008	Wednesday 23 July	5305	6418	5187	4686	2159	1604	1383	1326	28068
2010	Thursday 12 August	6038	6924	5891	5121	2020	2064	1497	1337	30892
2015	Tuesday 8 December	5650	6414	4734	4475	2824	2509	1638	1448	29692

North Leg

Year	Counts				% Change			
	NB	SB	NB+SB	INT	NB	SB	NB+SB	INT
2005	4752	4357	9109	21896				
2007	6477	6170	12647	30236	36.3%	41.6%	38.8%	38.1%
2008	6418	5305	11723	28068	-0.9%	-14.0%	-7.3%	-7.2%
2010	6924	6038	12962	30892	7.9%	13.8%	10.6%	10.1%
2015	6414	5650	12064	29692	-7.4%	-6.4%	-6.9%	-3.9%

Regression Estimate 2005 5712 5168 10881
Regression Estimate 2015 6924 6007 12931

Average Annual Change 1.94% 1.52% 1.74%

West Leg

Year	Counts				% Change			
	EB	WB	EB+WB	INT	EB	WB	EB+WB	INT
2005	1607	881	2488	21896				
2007	1757	1530	3287	30236	9.3%	73.7%	32.1%	38.1%
2008	1383	1326	2709	28068	-21.3%	-13.3%	-17.6%	-7.2%
2010	1497	1337	2834	30892	8.2%	0.8%	4.6%	10.1%
2015	1638	1448	3086	29692	9.4%	8.3%	8.9%	-3.9%

Regression Estimate 2005 1576 1159 2735
Regression Estimate 2015 1576 1523 3100

Average Annual Change 0.00% 2.77% 1.26%

East Leg

Year	Counts				% Change			
	EB	WB	EB+WB	INT	EB	WB	EB+WB	INT
2005	1458	1302	2760	21896				
2007	2007	2133	4140	30236	37.7%	63.8%	50.0%	38.1%
2008	1604	2159	3763	28068	-20.1%	1.2%	-9.1%	-7.2%
2010	2064	2020	4084	30892	28.7%	-6.4%	8.5%	10.1%
2015	2509	2824	5333	29692	21.6%	39.8%	30.6%	-3.9%

Regression Estimate 2005 1538 1582 3120
Regression Estimate 2015 2515 2846 5361

Average Annual Change 5.04% 6.05% 5.56%

South Leg

Year	Counts				% Change			
	NB	SB	NB+SB	INT	NB	SB	NB+SB	INT
2005	3682	3857	7539	21896				
2007	5058	5104	10162	30236	37.4%	32.3%	34.8%	38.1%
2008	5187	4686	9873	28068	2.6%	-8.2%	-2.8%	-7.2%
2010	5891	5121	11012	30892	13.6%	9.3%	11.5%	10.1%
2015	4734	4475	9209	29692	-19.6%	-12.6%	-16.4%	-3.9%

Regression Estimate 2005 4616 4535 9151
Regression Estimate 2015 5352 4819 10171

Average Annual Change 1.49% 0.61% 1.06%

Greenbank/Berrigan
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2005	Thursday 4 August	278	701	397	263	216	109	257	75	2296
2007	Tuesday 10 July	431	1042	532	368	400	159	304	98	3334
2008	Wednesday 23 July	398	979	562	381	341	149	282	74	3166
2010	Thursday 12 August	463	1081	699	429	358	183	253	80	3546
2015	Tuesday 8 December	482	951	574	371	519	367	273	159	3696

North Leg

Year	Counts				% Change			
	NB	SB	NB+SB	INT	NB	SB	NB+SB	INT
2005	701	278	979	2296				
2007	1042	431	1473	3334	48.6%	55.0%	50.5%	45.2%
2008	979	398	1377	3166	-6.0%	-7.7%	-6.5%	-5.0%
2010	1081	463	1544	3546	10.4%	16.3%	12.1%	12.0%
2015	951	482	1433	3696	-12.0%	4.1%	-7.2%	4.2%

Regression Estimate 2005 887 343 1230
Regression Estimate 2015 1046 512 1558

Average Annual Change 1.66% 4.10% 2.39%

West Leg

Year	Counts				% Change			
	EB	WB	EB+WB	INT	EB	WB	EB+WB	INT
2005	257	75	332	2296				
2007	304	98	402	3334	18.3%	30.7%	21.1%	45.2%
2008	282	74	356	3166	-7.2%	-24.5%	-11.4%	-5.0%
2010	253	80	333	3546	-10.3%	8.1%	-6.5%	12.0%
2015	273	159	432	3696	7.9%	98.8%	29.7%	4.2%

Regression Estimate 2005 276 65 341
Regression Estimate 2015 271 145 416

Average Annual Change -0.17% 8.34% 2.02%

East Leg

Year	Counts				% Change			
	EB	WB	EB+WB	INT	EB	WB	EB+WB	INT
2005	109	216	325	2296				
2007	159	400	559	3334	45.9%	85.2%	72.0%	45.2%
2008	149	341	490	3166	-6.3%	-14.8%	-12.3%	-5.0%
2010	183	358	541	3546	22.8%	5.0%	10.4%	12.0%
2015	367	519	886	3696	100.5%	45.0%	63.8%	4.2%

Regression Estimate 2005 91 266 357
Regression Estimate 2015 347 519 865

Average Annual Change 14.29% 6.92% 9.26%

South Leg

Year	Counts				% Change			
	NB	SB	NB+SB	INT	NB	SB	NB+SB	INT
2005	397	263	660	2296				
2007	532	368	900	3334	34.0%	39.9%	36.4%	45.2%
2008	562	381	943	3166	5.6%	3.5%	4.8%	-5.0%
2010	699	429	1128	3546	24.4%	12.6%	19.6%	12.0%
2015	574	371	945	3696	-17.9%	-13.5%	-16.2%	4.2%

Regression Estimate 2005 489 329 818
Regression Estimate 2015 649 413 1062

Average Annual Change 2.88% 2.30% 2.65%

Greenbank/Berrigan
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2005	Thursday 4 August	753	680	644	653	191	371	313	197	3802
2007	Tuesday 10 July	1344	933	901	999	380	518	256	431	5762
2008	Wednesday 23 July	1082	829	829	896	383	377	179	371	4946
2010	Thursday 12 August	1192	815	863	961	259	497	218	259	5064
2015	Tuesday 8 December	1037	853	674	767	435	449	241	318	4774

North Leg

Year	Counts				% Change			
	NB	SB	NB+SB	INT	NB	SB	NB+SB	INT
2005	680	753	1433	3802				
2007	933	1344	2277	5762	37.2%	78.5%	58.9%	51.6%
2008	829	1082	1911	4946	-11.1%	-19.5%	-16.1%	-14.2%
2010	815	1192	2007	5064	-1.7%	10.2%	5.0%	2.4%
2015	853	1037	1890	4774	4.7%	-13.0%	-5.8%	-5.7%

Regression Estimate 2005 786 1038 1824
Regression Estimate 2015 876 1147 2023

Average Annual Change 1.08% 1.00% 1.04%

West Leg

Year	Counts				% Change			
	EB	WB	EB+WB	INT	EB	WB	EB+WB	INT
2005	313	197	510	3802				
2007	256	431	687	5762	-18.2%	118.8%	34.7%	51.6%
2008	179	371	550	4946	-30.1%	-13.9%	-19.9%	-14.2%
2010	218	259	477	5064	21.8%	-30.2%	-13.3%	2.4%
2015	241	318	559	4774	10.6%	22.8%	17.2%	-5.7%

Regression Estimate 2005 261 305 566
Regression Estimate 2015 213 330 543

Average Annual Change -2.02% 0.80% -0.41%

East Leg

Year	Counts				% Change			
	EB	WB	EB+WB	INT	EB	WB	EB+WB	INT
2005	371	191	562	3802				
2007	518	380	898	5762	39.6%	99.0%	59.8%	51.6%
2008	377	383	760	4946	-27.2%	0.8%	-15.4%	-14.2%
2010	497	259	756	5064	31.8%	-32.4%	-0.5%	2.4%
2015	449	435	884	4774	-9.7%	68.0%	16.9%	-5.7%

Regression Estimate 2005 422 263 685
Regression Estimate 2015 473 429 902

Average Annual Change 1.14% 5.01% 2.78%

South Leg

Year	Counts				% Change			
	NB	SB	NB+SB	INT	NB	SB	NB+SB	INT
2005	644	653	1297	3802				
2007	901	999	1900	5762	39.9%	53.0%	46.5%	51.6%
2008	829	896	1725	4946	-8.0%	-10.3%	-9.2%	-14.2%
2010	863	961	1824	5064	4.1%	7.3%	5.7%	2.4%
2015	674	767	1441	4774	-21.9%	-20.2%	-21.0%	-5.7%

Regression Estimate 2005 803 851 1654
Regression Estimate 2015 751 861 1612

Average Annual Change -0.66% 0.11% -0.26%

APPENDIX G

Relevant Excerpts from Other Transportation Studies

Comment 18f: The size of developments (retail, medical office, pharmacy...) identified in the TIS which provides the basis for Impact Assessment differs from the Proposal Summary. Which one is correct?

Response 18f: The revised Site Plan identifies the following land use sizes: 213 m² of fast-food restaurant, 2,702 m² of retail and 740 m² of medical office. The pharmacy is not confirmed as a land use, however, for the purposes of our analysis, a 1,200 m² pharmacy was assumed as it has a higher trip-generation rate than 'specialty retail'. The total site trip generation based on these revised land use values is outlined in Table 1.

Table 1: Revised Vehicle Trip Generation

Travel Mode	AM Peak (veh/hr)			PM Peak (veh/hr)		
	In	Out	Total	In	Out	Total
Medical Office Trip Generation	12	4	16	6	18	24
Specialty Retail Trip Generation	13	11	24	21	27	48
Fast-Food Restaurant Trip Generation	41	41	82	30	29	59
Pharmacy Trip Generation	29	16	45	42	44	86
Specialty Retail Pass-by (30%)	-4	-4	-8	-7	-7	-14
Fast-Food Restaurant Pass-by (50%)	-21	-21	-42	-15	-15	-30
Pharmacy Pass-by (30%)	-7	-7	-14	-13	-13	-26
Multi-purpose Trips (10%)	-6	-4	-10	-7	-8	-15
Total 'New' Auto Trips	57	36	93	57	75	132

Following the same method outlined in the original TIS, the revised site is projected to generate approximately 95 and 135 veh/h during the morning and afternoon peak hours, respectively. This is less than the 150 to 175 veh/h projected in the original TIS. As such, the findings and recommendations outlined in the original TIS remain valid.

Comment 18g: City's OP identifies protection of 44.5 m right-of-way (ROW) along Greenbank Road between Fallowfield Rd and Strandherd Dr. Measurements taken from geoOttawa shows that the existing ROW is less than what is identified in the OP. Please ensure to protect 44.5 m ROW along the frontage (approx. 115 m) of proposed development site where it abuts the Greenbank Rd.

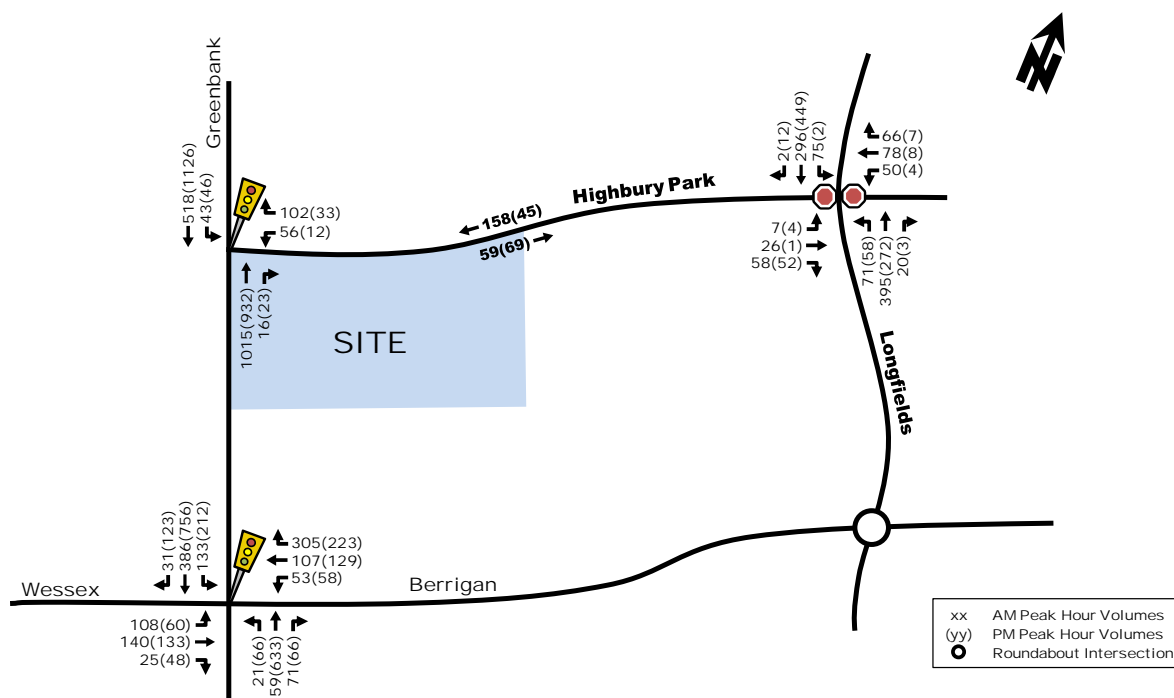
Response 18g: Noted and the proponent has been advised.

Comment 18h: Section 3.3 Background Traffic Growth (p-8): As mentioned in section 3.1, widening of Greenbank Road to 4-lane between Malvern Dr and Market Place is expected to complete in 2017. This widening has the potential to draw additional traffic (on top of weighted average annual background growth traffic) along Greenbank Road due to increased roadway capacity. Clarification is required if consideration has been given to this additional traffic in the analysis undertake as part of the TIS report?

Response 18h: The weighted annual background traffic growth assumptions outlined in the TIS account for future traffic along Greenbank Road. The widening of the roadway is not expected to affect this historical background traffic growth rate. As such, no additional assumptions for traffic growth based on road widening or "induced travel" have been included in the TIS.

As mentioned in section 3.1, some assumptions were made regarding travel patterns for local traffic travelling on roadways adjacent to the 'new' Highbury Park Drive (i.e. Berrigan Road and Longfields Drive). This diverted traffic is included in the Projected Baseline Traffic Volumes (Figures 6 and 7 in the original TIS) and is outlined in Figure 1 below.

Figure 7: Projected 2022 Baseline Traffic Volumes



3.4 Site Trip Generation

Appropriate trip generation rates for the proposed development consisting of approximate 8,880 ft² of retail, a 5,000 ft² fast-food restaurant, a 9,000 ft² medical office and a 16,416 ft² pharmacy were obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 3.

Table 3: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Medical Office	ITE 720	$T = 2.39(X)$	$T = 3.57(X);$ $\ln(T) = 0.90 \ln(X) + 1.53$
Specialty Retail Centre	ITE 826	$T = 1.36(X);$ $T = 1.20(X) + 10.74$	$T = 2.71(X);$ $T = 2.40(X) + 21.48$
Fast Food Restaurant w/Drive-Through	ITE 934	$T = 45.42(X)$	$T = 32.65(X)$
Pharmacy	ITE 880	$T = 2.94(X);$ $T = 10.22(X) - 75.80$	$T = 8.40(X)$

Notes: T = Average Vehicle Trip Ends
 X = 1000 ft² Gross Floor Area
 Specialty Retail AM Peak is assumed to be 50% of the PM Peak

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development. This approach is considered appropriate within the industry for urban infill developments.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. As such, the person trip generation for the proposed site is summarized in Table 4.

Table 4: Modified Person Trip Generation

Land Use	Area	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Medical Office	9,000 ft ²	22	6	28	12	31	43
Specialty Retail Centre	8,880 ft ²	15	13	28	24	32	56
Fast Food Restaurant w/Drive-Through	5,000 ft ²	150	145	295	110	102	212
Pharmacy	16,415 ft ²	78	42	120	87	92	179
Total Person Trips		265	206	471	233	257	490
<i>Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%</i>							

The person trips shown in Table 4 for the proposed site were then reduced by modal share values, including a reduction for 'pass-by' trips based on the site's location and proximity to adjacent communities, employment, other shopping uses and transit availability. Modal share and 'pass-by' values for medical office, specialty retail, fast food restaurant and pharmacy land uses within the proposed development are summarized in Tables 5, 6, 7, and 8 respectively, with the total site-generated vehicle traffic summarized in Table 9.

Table 5: Medical Office Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	14	4	18	8	19	27
Auto Passenger	10%	2	1	3	2	4	6
Transit	15%	3	1	4	1	4	5
Non-motorized	15%	3	0	3	1	4	5
Total Person Trips	100%	22	6	28	12	31	43
Total 'New' Auto Trips		14	4	18	8	19	27

Table 6: Specialty Retail Centre Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	9	8	17	15	20	35
Auto Passenger	10%	2	2	4	3	4	7
Transit	15%	2	2	4	3	4	7
Non-motorized	15%	2	1	3	3	4	7
Total Person Trips	100%	15	13	28	24	32	56
Less Retail 30% Pass-By		-3	-3	-6	-5	-5	-10
Total 'New' Auto Trips		6	5	11	10	15	25

Table 7: Fast Food Restaurant w/Drive-Through Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	90	87	177	66	62	128
Auto Passenger	10%	15	15	30	11	10	21
Transit	15%	23	22	45	17	15	32
Non-motorized	15%	22	21	43	16	15	31
Total Person Trips	100%	150	145	295	110	102	212
Less Retail 50% Pass-By		-44	-44	-88	-32	-32	-64
Total 'New' Auto Trips		46	43	89	34	30	64

Table 8: Pharmacy Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	47	26	73	53	56	109
Auto Passenger	10%	8	4	12	8	10	18
Transit	15%	12	6	18	13	13	26
Non-motorized	15%	11	6	17	13	13	26
Total Person Trips	100%	78	42	120	87	92	179
Less Retail 30% Pass-By		-11	-11	-22	-16	-16	-32
Total 'New' Auto Trips		36	15	51	37	40	77

The following Table 9 provides a summary of potential two-way vehicle trips to/from the proposed development. Given the land use types, a 10% reduction was applied to the total vehicle trip generation to account for multi-purpose trip within the development.

Table 9: Total Site Vehicle Trip Generation

Land Use	AM Peak (veh/h)			PM Peak (veh/h)		
	In	Out	Total	In	Out	Total
Medical Office	14	4	18	8	19	27
Specialty Retail Centre	9	8	17	15	20	35
Fast Food Restaurant	90	87	177	66	62	128
Pharmacy	47	26	73	53	56	109
Specialty Retail Pass-by (30%)	-3	-3	-6	-5	-5	-10
Fast-Food Restaurant Pass-by (50%)	-44	-44	-88	-32	-32	-64
Pharmacy Pass-by (30%)	-11	-11	-22	-16	-16	-32
Less 10% Multi-purpose Trips	-10	-7	-17	-9	-10	-19
Total 'New' Auto Trips	92	60	152	80	94	174

As shown in Table 9, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 150 and 175 veh/h during the weekday morning and afternoon peak hours, respectively.

3.5 Vehicle Traffic Distribution and Assignment

Traffic distribution was based on the existing volume splits at study area intersections and our knowledge of the surrounding area. The resultant distribution is outlined as follows:

- 50% to/from the south via Greenbank Road and Longfields Drive;
 - 35% to/from the north via Greenbank Road and Longfields Drive;
 - 5% to/from the east via Berrigan Drive; and
 - 10% to/from the west via Wessex Road;
- 100%

Based on these distributions, 'new' and 'pass-by' site-generated trips were assigned to study area intersections, which are illustrated as Figures 8 and 9, respectively.

Figure 8: 'New' Site-Generated Traffic Volumes

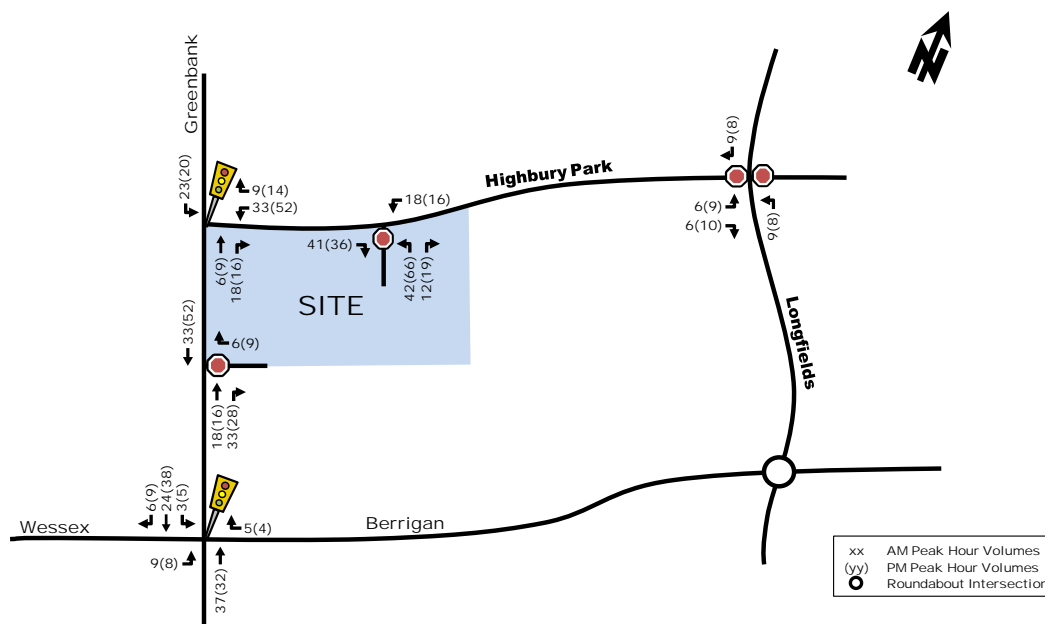
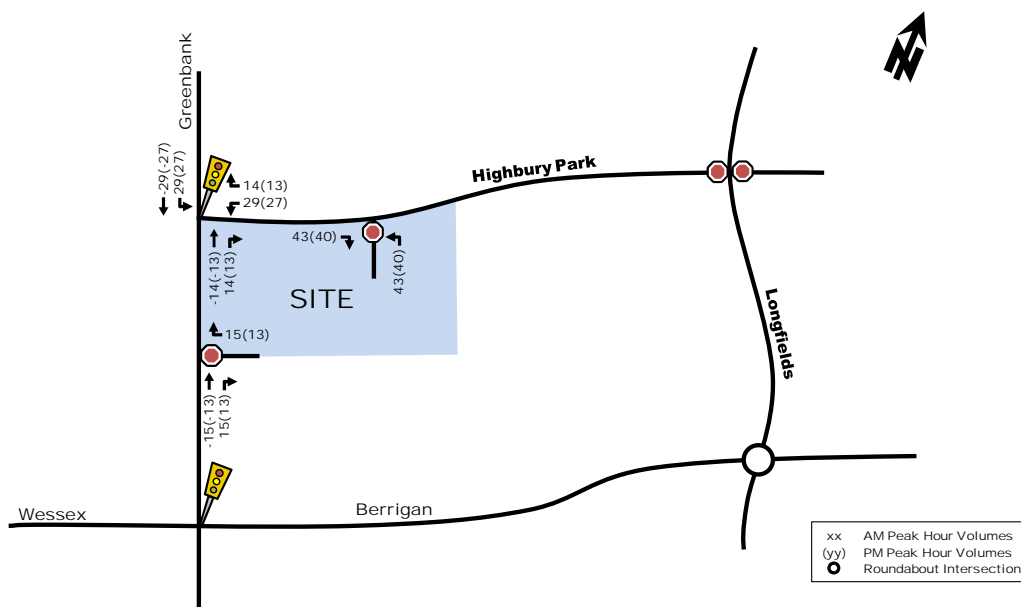


Figure 9: 'Pass-by' Site-Generated Traffic Volumes

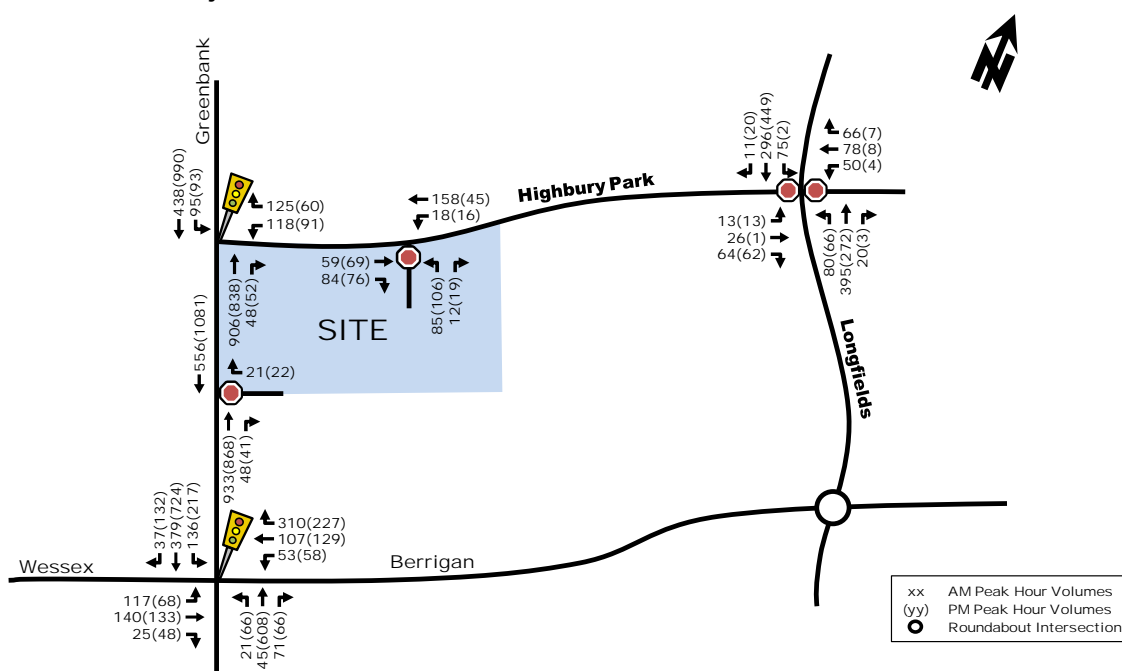


4. Future Traffic Operations

4.1 Projected 2017 Conditions at Full Site Development

The total projected 2017 volumes associated with the proposed development were derived by superimposing 'new' site-generated traffic volumes (Figure 8) and 'pass-by' site-generated traffic volumes (Figure 9) onto projected 2017 background traffic volumes (Figure 6). The resulting total projected 2017 volumes are illustrated as Figure 10.

Figure 10: Total Projected 2017 Peak Hour Traffic Volumes



APPENDIX H

TDM – Supportive Development Design Checklist

TDM-Supportive Development Design and Infrastructure Checklist: *Non-Residential Developments (office, institutional, retail or industrial)*

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

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

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

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
2. WALKING & CYCLING: END-OF-TRIP FACILITIES		
2.1 Bicycle parking		
REQUIRED	2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i>)	<input checked="" type="checkbox"/>
REQUIRED	2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas (see <i>Zoning By-law Section 111</i>)	<input checked="" type="checkbox"/>
REQUIRED	2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (see <i>Zoning By-law Section 111</i>)	<input checked="" type="checkbox"/>
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	<input type="checkbox"/>
BETTER	2.1.5 Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	<input type="checkbox"/>
2.2 Secure bicycle parking		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see <i>Zoning By-law Section 111</i>)	<input type="checkbox"/>
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	<input type="checkbox"/>
2.3 Shower & change facilities		
BASIC	2.3.1 Provide shower and change facilities for the use of active commuters	<input type="checkbox"/>
BETTER	2.3.2 In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	<input type="checkbox"/>
2.4 Bicycle repair station		
BETTER	2.4.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
3. TRANSIT		
3.1 Customer amenities		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	<input type="checkbox"/>
BASIC	3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	<input type="checkbox"/>
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>
4. RIDESHARING		
4.1 Pick-up & drop-off facilities		
BASIC	4.1.1 Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	<input type="checkbox"/>
4.2 Carpool parking		
BASIC	4.2.1 Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	<input type="checkbox"/>
BETTER	4.2.2 At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	<input type="checkbox"/>
5. CARSHARING & BIKESHARING		
5.1 Carshare parking spaces		
BETTER	5.1.1 Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces (<i>see Zoning By-law Section 94</i>)	<input type="checkbox"/>
5.2 Bikeshare station location		
BETTER	5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
6. PARKING		
6.1 Number of parking spaces		
REQUIRED	6.1.1 Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	<input checked="" type="checkbox"/>
BASIC	6.1.2 Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	<input type="checkbox"/>
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (<i>see Zoning By-law Section 104</i>)	<input type="checkbox"/>
BETTER	6.1.4 Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking (<i>see Zoning By-law Section 111</i>)	<input type="checkbox"/>
6.2 Separate long-term & short-term parking areas		
BETTER	6.2.1 Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	<input type="checkbox"/>
7. OTHER		
7.1 On-site amenities to minimize off-site trips		
BETTER	7.1.1 Provide on-site amenities to minimize mid-day or mid-commute errands	<input type="checkbox"/>

APPENDIX I

Segment MMLOS Analysis

I.1 - Pedestrian Level of Service (PLOS)

Exhibit 4 of the MMLOS guidelines has been used to evaluate the segment PLOS of Highbury Park Drive. Exhibit 22 of the MMLOS guidelines suggests a target PLOS A for all road classes located within 600m of a rapid transit station. The results of the segment PLOS analysis are summarized in **Table 6**.

Table 1: PLOS Segment Analysis

Sidewalk Width	Boulevard Width	Avg. Daily Curb Lane Traffic Volume	Presence of On-Street Parking	Operating Speed ¹	Segment PLOS
Highbury Park Drive					
2m	2m	< 3,000	Yes	50 km/h	A

1. Operating Speed identified as 10 km/h above the speed limit

I.2 - Bicycle Level of Service (BLOS)

Exhibit 4 of the MMLOS guidelines has been used to evaluate the segment BLOS of Highbury Park Drive. Exhibit 22 of the MMLOS guidelines suggests a target BLOS D for other routes on collector roads located within 600m of a rapid transit station. The results of the BLOS analysis are summarized in **Table 7**.

BLOS Segment Analysis

Road Class	Bike Route	Type of Bikeway	Travel Lanes	Operating Speed	Segment BLOS
Highbury Park Drive					
Collector	N/A	Bike Lane	2	50 km/h	A

I.3 - Vehicular Level of Service (Auto LOS)

Exhibit 22 of the MMLOS guidelines suggest a target Auto LOS E for all roadways located within 600m of a rapid transit station. The typical lane capacity along Highbury Park Drive has been estimated based on roadway classification and general characteristics (i.e. suburban with limited access, urban with on-street parking, etc.). The results of the Auto LOS analysis are summarized in **Table 8**.

Auto LOS Segment Analysis

Direction	Directional Capacity	Traffic Volumes		V/C Ratio and LOS			
		Saturday Peak	Sunday Peak	SAT Peak		SUN Peak	
				V/C	LOS	V/C	LOS
Highbury Park Drive							
EB	600	189	68	0.32	A	0.11	A
WB	600	188	100	0.31	A	0.17	A

APPENDIX J

Intersection MMLoS Analysis

K. 1 - Pedestrian Level of Service (PLOS)

Exhibit 5 of the Addendum to the MMLOS guidelines has been used to evaluate the existing PLOS at the Greenbank Road/Highbury Park Drive and Greenbank Road/Berrigan Drive/Wessex Road intersections. Exhibit 22 of the MMLOS guidelines suggests a target PLOS A for all roadways within 600m of a rapid transit station. The results of the intersection PLOS are summarized in the following tables.

PLOS Intersection Analysis - Greenbank Road/Highbury Park Drive

Criteria	North Approach		South Approach		East Approach	
Greenbank Road/Highbury Park Drive						
PETSI SCORE						
CROSSING DISTANCE CONDITIONS						
Median > 2.4m in Width	Yes	45	Yes	45	No	72
Lanes Crossed (3.5m Lane Width)	7		7		5	
SIGNAL PHASING AND TIMING						
Left Turn Conflict	No Left Turn/Prohibited	0	Permissive	-8	Permissive	-8
Right Turn Conflict	Permissive or Yield	-5	No Right Turn/Prohibited	0	Permissive or Yield	-5
Right Turn on Red	N/A	0	RTOR Allowed	-3	RTOR Allowed	-3
Leading Pedestrian Interval	No	-2	No	-2	No	-2
CORNER RADIUS						
Parallel Radius	> 10m to 15m	-6	No Right Turn	0	> 10m to 15m	-6
Parallel Right Turn Channel	No Right Turn Channel	-4	No Right Turn	0	No Right Turn Channel	-4
Perpendicular Radius	N/A	0	N/A	0	N/A	0
Perpendicular Right Turn Channel	N/A	0	N/A	0	N/A	0
CROSSING TREATMENT						
Treatment	Standard	-7	Standard	-7	Standard	-7
PETSI SCORE		21			25	37
LOS		F			F	E
DELAY SCORE						
Cycle Length	120		120		120	
Pedestrian Walk Time	6.8		6.8		68	
DELAY SCORE		53.4	53.4		11.3	
LOS		E	E		B	
OVERALL		F	F		E	

PLOS Intersection Analysis - Greenbank Road/Berrigan Drive/Wessex Road

Criteria	North Approach		South Approach		East Approach		West Approach	
Greenbank Road/Berrigan Drive/Wessex Road								
PETSI SCORE								
CROSSING DISTANCE CONDITIONS								
Median > 2.4m in Width	No	6	No	6	No	72	No	72
Lanes Crossed (3.5m Lane Width)	9		9		5		5	
SIGNAL PHASING AND TIMING								
Left Turn Conflict	Perm + Prot	-8	Permissive	-8	Perm + Prot	-8	Perm + Prot	-8
Right Turn Conflict	Permissive or Yield	-5	Permissive or Yield	-5	Permissive or Yield	-5	Permissive or Yield	-5
Right Turn on Red	RTOR Allowed	-3	RTOR Allowed	-3	RTOR Allowed	-3	RTOR Allowed	-3
Leading Pedestrian Interval	No	-2	No	-2	No	-2	No	-2
CORNER RADIUS								
Parallel Radius	> 10m to 15m	-6	> 10m to 15m	-6	> 10m to 15m	-6	> 10m to 15m	-6
Parallel Right Turn Channel	No Right Turn Channel	-4	No Right Turn Channel	-4	No Right Turn Channel	-4	No Right Turn Channel	-4
Perpendicular Radius	N/A	0	N/A	0	N/A	0	N/A	0
Perpendicular Right Turn Channel	N/A	0	N/A	0	N/A	0	N/A	0
CROSSING TREATMENT								
Treatment	Standard	-7	Standard	-7	Standard	-7	Standard	-7
PETSI SCORE		-29			-29			37
LOS		F			F			E
DELAY SCORE								
Cycle Length		120		120		120		120
Pedestrian Walk Time		7.5		20.5		20.1		31.1
DELAY SCORE		52.7			41.3			32.9
LOS		E			E			D
OVERALL		F			F			E

K.2 - Bicycle Level of Service (BLOS)

Exhibit 12 of the MMLOS guidelines has been used to evaluate the existing BLOS at the Greenbank Road/Highbury Park Drive and Greenbank Road/Berrigan Drive/Wessex Road intersections. Exhibit 22 of the MMLOS guidelines suggests a target C for a Spine Route (Greenbank Road), a target B for a local route (Berrigan Drive and Wessex Road), and a target D for all other routes (Highbury Park Drive) located within 600m of a rapid transit station. The results of the intersection BLOS are summarized in the following table.

BLOS Intersection Analysis

Approach	Bikeway Facility Type	Criteria	Travel Lanes and/or Speed	BLOS
Greenbank Road/Highbury Park Drive				
North Approach	Multi-Use Pathway	Right Turn Lane Characteristics	No Right Turn Lane	-
		Left Turn Accommodation	Two-stage Left Turn	A
	Bike Lane	Right Turn Lane Characteristics	No Right Turn Lane	-
		Left Turn Accommodation	Two-stage Left Turn	A
South Approach	Bike Lane	Right Turn Lane Characteristics	No Right Turn Lane	-
		Left Turn Accommodation	Two-stage Left Turn	A
East Approach	Bike Lane	Right Turn Lane Characteristics	Cycling Facility Remains to the Right of Any Turn Lane	-
		Left Turn Accommodation	Two-stage Left Turn	A
Greenbank Road/Berrigan Drive/Wessex Road				
North Approach	Multi-Use Pathway	Right Turn Lane Characteristics	MUP Remains to the Right of Any Turn Lane	-
		Left Turn Accommodation	2 Lanes Crossed; Operating Speed of Motorists >50 km/h	F
	Pocket Bike Lane	Right Turn Lane Characteristics	Right Turn Lane Longer Than 50m	D
		Left Turn Accommodation	2 Lanes Crossed; Operating Speed of Motorists >50 km/h	F
South Approach	Pocket Bike Lane	Right Turn Lane Characteristics	Right Turn Lane Shorter Than 50m	B
		Left Turn Accommodation	2 Lanes Crossed; Operating Speed of Motorists >50 km/h	F
East Approach	Mixed Traffic	Right Turn Lane Characteristics	Right Turn Lane Shorter Than 50m	D
		Left Turn Accommodation	One Lane Crossed, Operating Speed of Motorists 50km/h	D
West Approach	Mixed Traffic	Right Turn Lane Characteristics	No Right Turn Lane	-
		Left Turn Accommodation	One Lane Crossed, Operating Speed of Motorists 50km/h	D

K.3 - Transit Level of Service (TLOS)

There are no TLOS targets identified in Exhibit 22 of the MMLOS guidelines for the study area intersections. However, the Greenbank Road/Highbury Park Drive and Greenbank Road/Berrigan Drive/Wessex Road intersections have bus routes. These intersections have been evaluated for TLOS despite having no target. The results of the intersection TLOS are summarized in the following table.

TLOS Intersection Analysis

Approach	Delay (sec.)	TLOS
Greenbank Road/Highbury Park Drive		
East Approach	N/A ¹	-
North Approach	7.6	B
South Approach	4.1	B
Greenbank Road/Berrigan Drive/Wessex Road		
East Approach	34.6	E
West Approach	50.7	F
North Approach	13.1	C
South Approach	14.3	C

1 – No transit service provided on Highbury Park Drive

K.4 - Truck Level of Service (TkLOS)

Exhibit 21 of the MMLOS guidelines has been used to evaluate the existing TkLOS at the Greenbank Road/Highbury Park Drive and Greenbank Road/Berrigan Drive/Wessex Road intersections. Exhibit 22 of the MMLOS guidelines suggest a target TkLOS D for arterial truck routes (Greenbank Road) located within 600m of a rapid transit station. There is no target TkLOS for local or collector non-truck routes (Highbury Park Drive, Berrigan Drive, and Wessex Road) in a General Urban Area. The results of the intersection TkLOS are summarized in the following table.

TkLOS Intersection Analysis

Approach	Effective Corner Radius	Number of Receiving Lanes on Departure from Intersection	LOS
Greenbank Road/Highbury Park Drive			
South	10 to 15m	One	E
East	10 to 15m	Two	B
Greenbank Road/Berrigan Drive/Wessex Road			
North	10 to 15m	One	E
South	10 to 15m	One	E
East	10 to 15m	Two	B
West	10 to 15m	Two	B

K.5 - Vehicular Level of Service (Auto LOS)

The MMLOS guidelines have been used to evaluate the existing Auto LOS at the Greenbank Road/Highbury Park Drive and Greenbank Road/Berrigan Drive/Wessex Road intersections. Exhibit 22 of the MMLOS guidelines suggests a target Auto LOS E for all roadways within 600m of a rapid transit station. The intersection parameters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800 vphpl, PHF: 0.9). Signal timing plans obtained from the City of Ottawa can be found in **Appendix I**. Detailed reports are included in **Appendix J**. The results of the intersection Auto LOS are summarized in the following table.

Auto LOS Intersection Analysis

Intersection	SAT Peak			SUN Peak		
	Max V/C or Delay	LOS	Mvmt	Max V/C or Delay	LOS	Mvmt
<i>Existing Traffic</i>						
Greenbank Road/Highbury Park Drive	0.58	A	SBL	0.41	A	WBL
Greenbank Road/Berrigan Drive/Wessex Road	0.69	B	WBL	0.48	A	EBL/WBR

APPENDIX K

Signal Timing Data

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Signal Operations Unit

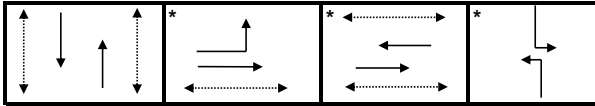
Intersection:	Main: Greenbank	Side: Berrigan/Wessex
Controller:	MS-3200	TSD: 6210
Author:	Yassine Bennani	Date: 01-Nov-2018

Existing Timing Plans†

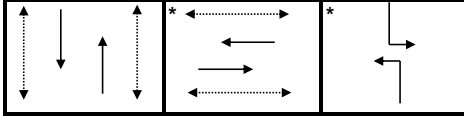
	Plan						Ped Minimum Time		
	AM Peak 1	Off Peak 2	PM Peak 3	Night 4	Weekend 5	Weekend 15	Walk	DW	A+R
Cycle	120	110	120	80	110	120			
Offset	115	15	114	X	0	1			
NB Thru	53	58	45	41	58	66	7	19	3.7+2.2
SB Thru	53	58	56	41	58	66	7	19	3.7+2.2
EB Left	16	-	13	-	-	-	-	-	3.0+3.8
EB Thru	55	39	52	39	39	39	7	24	3.0+4.5
WB Thru	39	39	39	39	39	39	7	24	3.0+4.5
NB Left	12	13	12	-	13	15	-	-	3.7+2.2
SB Left	12	13	23	-	13	15	-	-	3.7+2.2

Phasing Sequence‡

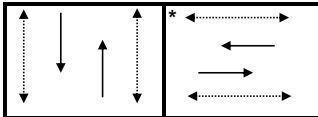
Plan: 1 & 3



Plan: 2, 5 & 15



Plan: 4



Schedule

Weekday		Saturday		Sunday	
Time	Plan	Time	Plan	Time	Plan
0:15	4	0:15	4	0:15	4
6:30	1	8:30	5	8:30	5
9:30	2	11:00	15	11:00	15
15:00	3	18:00	5	16:00	5
18:30	2	22:30	4	22:30	4
22:30	4				

Notes

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

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

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◀.....▶ Pedestrian signal

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

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Signal Operations Unit

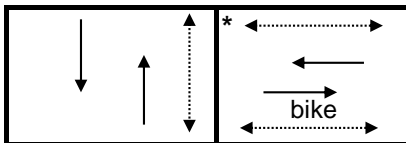
Intersection:	Main: Greenbank	Side: Highbury Park
Controller:	ATC-3	TSD: 6823
Author:	Yassine Bennani	Date: 31-Oct-2018

Existing Timing Plans†

	Plan						Ped Minimum Time		
	AM Peak	Off Peak	PM Peak	Night	Weekend	Weekend	Walk	DW	A+R
	1	2	3	4	5	15			
Cycle	120	110	120	80	110	120			
Offset	95	0	95	X	0	0			
NB Thru	86	76	86	46	76	86	18	12	3.7+2.3
SB Thru	86	76	86	46	76	86	18	12	3.7+2.3
EB Thru (bike)	34	34	34	34	34	34	7	20	3.0+4.2
WB Thru	34	34	34	34	34	34	7	20	3.0+4.2

Phasing Sequence‡

Plan:



Schedule

Weekday		Saturday		Sunday	
Time	Plan	Time	Plan	Time	Plan
0:15	4	0:15	4	0:15	4
6:30	1	8:30	5	8:30	5
9:30	2	11:00	15	11:00	15
15:00	3	18:00	5	16:00	5
18:30	2	22:30	4	22:30	4
22:30	4				

Notes

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

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

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◄.....► Pedestrian signal

























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

APPENDIX L

Synchro Reports













3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
Existing Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	99	85	64	94	76	211	74	911	88	208	944	78
Future Volume (vph)	99	85	64	94	76	211	74	911	88	208	944	78
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.96	1.00		0.97
Frt		0.935				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1652	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.702			0.555			0.237			0.215		
Satd. Flow (perm)	1240	1652	0	982	1784	1481	422	3390	1462	383	3390	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				205			95			95
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	110	94	71	104	84	234	82	1012	98	231	1049	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	110	165	0	104	84	234	82	1012	98	231	1049	87
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	15.0	66.0	66.0	15.0	66.0	66.0
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	12.5%	55.0%	55.0%	12.5%	55.0%	55.0%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	9.1	60.1	60.1	9.1	60.1	60.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
Existing Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	18.4	18.4		18.4	18.4	18.4	79.4	72.1	72.1	86.0	77.3	77.3
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.66	0.60	0.60	0.72	0.64	0.64
v/c Ratio	0.58	0.59		0.69	0.31	0.58	0.23	0.50	0.11	0.60	0.48	0.09
Control Delay	57.6	45.4		69.6	45.6	14.3	7.8	16.0	3.4	19.4	10.3	1.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.6	45.4		69.6	45.6	14.3	7.8	16.0	3.4	19.4	10.3	1.4
LOS	E	D		E	D	B	A	B	A	B	B	A
Approach Delay		50.3			34.1			14.4			11.3	
Approach LOS		D			C			B			B	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	9.6	60.1	60.1	9.6	60.1	60.1
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	20.7	20.7		20.7	20.7	20.7	7.8	67.1	67.1	12.9	72.2	72.2
70th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	16.7	16.7		16.7	16.7	16.7	7.0	73.0	73.0	11.0	77.0	77.0
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	13.5	13.5		13.5	13.5	13.5	6.4	77.6	77.6	9.6	80.8	80.8
30th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	82.7	82.7	8.0	96.6	96.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
Stops (vph)	89	109		87	64	39	26	512	9	89	296	4
Fuel Used(l)	8	10		8	5	7	2	42	2	11	40	2
CO Emissions (g/hr)	146	186		152	95	133	45	774	35	205	744	39
NOx Emissions (g/hr)	28	36		29	18	26	9	149	7	40	144	8
VOC Emissions (g/hr)	34	43		35	22	31	10	178	8	47	172	9
Dilemma Vehicles (#)	0	0		0	0	0	0	38	0	0	37	0
Queue Length 50th (m)	24.8	30.2		23.9	18.1	6.1	4.4	65.8	0.3	12.9	46.5	0.1
Queue Length 95th (m)	37.9	45.5		37.6	28.7	26.1	13.2	106.9	8.8	#48.5	53.7	3.3
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	325	456		257	468	539	383	2036	916	388	2184	983
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.36		0.40	0.18	0.43	0.21	0.50	0.11	0.60	0.48	0.09

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 18.7

Intersection LOS: B

Intersection Capacity Utilization 83.0%

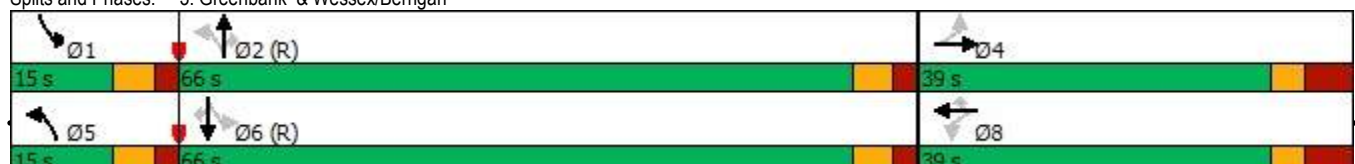
ICU Level of Service E

Analysis Period (min) 15

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












Queue shown is maximum after two cycles.

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
Existing Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	65	123	1157	64	125	1163
Future Volume (vph)	65	123	1157	64	125	1163
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.992			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3358	0	1695	3390
Flt Permitted	0.950				0.175	
Satd. Flow (perm)	1688	1493	3358	0	312	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		82	10			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	72	137	1286	71	139	1292
Shared Lane Traffic (%)						
Lane Group Flow (vph)	72	137	1357	0	139	1292
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	85.8		85.8	85.8
Total Split (%)	28.5%	28.5%	71.5%		71.5%	71.5%
Maximum Green (s)	27.0	27.0	79.8		79.8	79.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
Existing Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.1	14.1	92.7		92.7	92.7
Actuated g/C Ratio	0.12	0.12	0.77		0.77	0.77
v/c Ratio	0.37	0.55	0.52		0.58	0.49
Control Delay	52.0	29.0	4.2		20.1	6.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	52.0	29.0	4.2		20.1	6.6
LOS	D	C	A		C	A
Approach Delay	37.0		4.2			7.9
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	79.8		79.8	79.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	12.9	12.9	93.9		93.9	93.9
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	10.5	10.5	96.3		96.3	96.3
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	57	49	212		63	408
Fuel Used(l)	5	7	40		6	41
CO Emissions (g/hr)	102	136	752		119	770
NOx Emissions (g/hr)	20	26	145		23	149
VOC Emissions (g/hr)	23	31	174		27	178
Dilemma Vehicles (#)	0	0	8		0	48
Queue Length 50th (m)	16.4	12.5	23.8		9.4	41.1
Queue Length 95th (m)	26.5	28.1	37.8		#57.5	96.8
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	379	399	2596		241	2619
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	0.19	0.34	0.52		0.58	0.49

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

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

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.2

Intersection LOS: A

Intersection Capacity Utilization 69.9%

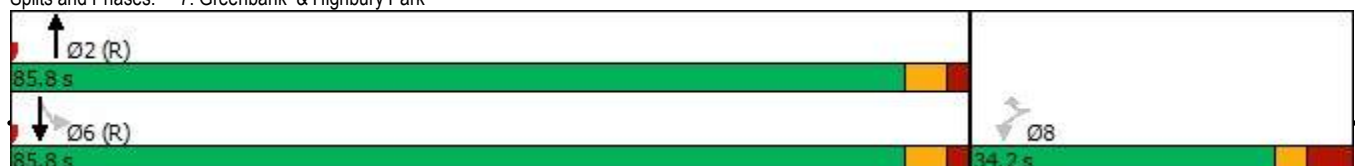
ICU Level of Service C

Analysis Period (min) 15

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
























Queue shown is maximum after two cycles.

Splits and Phases: 7: Greenbank & Highbury Park



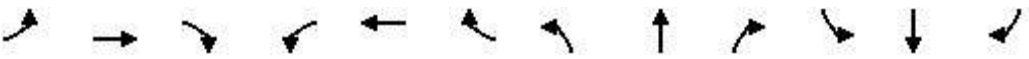
3: Greenbank & Wessex/Berrigan
SUN Peak

35 Highbury Park Drive
Existing Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	53	49	55	43	157	30	542	27	69	444	34
Future Volume (vph)	79	53	49	55	43	157	30	542	27	69	444	34
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.97	0.99		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.726			0.684			0.472			0.398		
Satd. Flow (perm)	1283	1639	0	1210	1784	1483	839	3390	1464	706	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				174			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	88	59	54	61	48	174	33	602	30	77	493	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	88	113	0	61	48	174	33	602	30	77	493	38
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Peak

35 Highbury Park Drive
Existing Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	15.9	15.9		15.9	15.9	15.9	75.5	70.4	70.4	77.5	73.2	73.2
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.69	0.64	0.64	0.70	0.67	0.67
v/c Ratio	0.48	0.41		0.35	0.19	0.48	0.05	0.28	0.03	0.14	0.22	0.04
Control Delay	49.4	29.6		45.0	39.6	9.8	6.4	11.0	0.1	5.4	7.7	0.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.4	29.6		45.0	39.6	9.8	6.4	11.0	0.1	5.4	7.7	0.1
LOS	D	C		D	D	A	A	B	A	A	A	A
Approach Delay		38.3			22.5			10.3			7.0	
Approach LOS		D			C			B			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.5	52.1	52.1	7.6	52.2	52.2
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	15.3	15.3		15.3	15.3	15.3	6.3	68.1	68.1	7.3	69.1	69.1
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	12.9	12.9		12.9	12.9	12.9	6.0	71.1	71.1	6.7	71.8	71.8
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	10.5	10.5		10.5	10.5	10.5	0.0	74.0	74.0	6.2	86.1	86.1
30th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	68	56		47	35	20	11	239	0	17	138	0
Fuel Used(l)	6	5		4	3	5	1	21	0	3	18	1
CO Emissions (g/hr)	106	100		69	50	87	18	382	8	47	333	15
NOx Emissions (g/hr)	21	19		13	10	17	3	74	1	9	64	3
VOC Emissions (g/hr)	25	23		16	12	20	4	88	2	11	77	4
Dilemma Vehicles (#)	0	0		0	0	0	0	25	0	0	17	0
Queue Length 50th (m)	18.2	14.3		12.4	9.5	0.0	1.5	26.7	0.0	3.0	16.4	0.0
Queue Length 95th (m)	27.8	25.6		20.7	16.7	15.5	6.6	55.5	0.0	9.3	30.6	0.1
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	367	499		346	510	548	636	2168	973	562	2254	1014
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.23		0.18	0.09	0.32	0.05	0.28	0.03	0.14	0.22	0.04

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 14.3

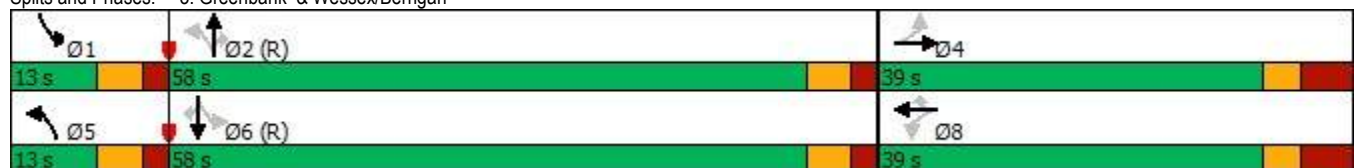
Intersection LOS: B

Intersection Capacity Utilization 62.8%

ICU Level of Service B












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SUN Peak

35 Highbury Park Drive
Existing Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	81	19	752	26	42	528
Future Volume (vph)	81	19	752	26	42	528
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.995			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3370	0	1695	3390
Flt Permitted	0.950				0.318	
Satd. Flow (perm)	1689	1493	3370	0	566	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		21	6			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	90	21	836	29	47	587
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	21	865	0	47	587
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			CI+Ex			CI+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SUN Peak

35 Highbury Park Drive
Existing Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.2	14.2	87.2		87.2	87.2
Actuated g/C Ratio	0.13	0.13	0.79		0.79	0.79
v/c Ratio	0.41	0.10	0.32		0.10	0.22
Control Delay	47.9	15.3	3.7		6.0	4.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.9	15.3	3.7		6.0	4.7
LOS	D	B	A		A	A
Approach Delay	41.8		3.7			4.8
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	13.0	13.0	83.8		83.8	83.8
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	11.2	11.2	85.6		85.6	85.6
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	86.8		86.8	86.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	0.0	0.0	104.0		104.0	104.0
10th %ile Term Code	Skip	Skip	Coord		Coord	Coord
Stops (vph)	72	6	126		13	137
Fuel Used(l)	7	1	25		1	16
CO Emissions (g/hr)	122	17	468		26	306
NOx Emissions (g/hr)	24	3	90		5	59
VOC Emissions (g/hr)	28	4	108		6	71
Dilemma Vehicles (#)	0	0	10		0	21
Queue Length 50th (m)	18.6	0.0	15.0		2.0	14.5
Queue Length 95th (m)	28.9	6.2	27.8		8.9	35.5
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	382	2672		448	2687
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	0.22	0.05	0.32		0.10	0.22

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.41

Intersection Signal Delay: 6.7

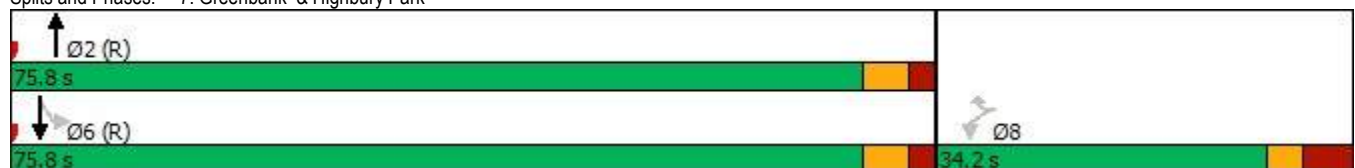
Intersection LOS: A

Intersection Capacity Utilization 57.5%

ICU Level of Service B

























Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park



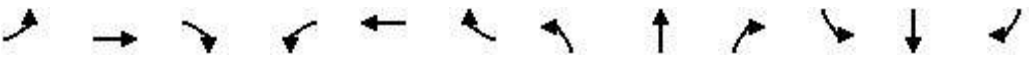
3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2020 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	85	64	97	78	218	74	954	91	213	987	79
Future Volume (vph)	100	85	64	97	78	218	74	954	91	213	987	79
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.96	1.00		0.97
Frt		0.936				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1654	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Flt Permitted	0.706			0.597			0.258			0.241		
Satd. Flow (perm)	1247	1654	0	1056	1784	1481	460	3390	1462	429	3390	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				216			95			95
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	85	64	97	78	218	74	954	91	213	987	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	149	0	97	78	218	74	954	91	213	987	79
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	15.0	66.0	66.0	15.0	66.0	66.0
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	12.5%	55.0%	55.0%	12.5%	55.0%	55.0%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	9.1	60.1	60.1	9.1	60.1	60.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2020 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	17.6	17.6		17.6	17.6	17.6	81.0	73.9	73.9	86.1	78.3	78.3
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.68	0.62	0.62	0.72	0.65	0.65
v/c Ratio	0.55	0.55		0.63	0.30	0.54	0.19	0.46	0.10	0.53	0.45	0.08
Control Delay	56.7	43.6		63.9	46.0	10.6	7.1	14.6	2.9	14.5	9.8	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.7	43.6		63.9	46.0	10.6	7.1	14.6	2.9	14.5	9.8	1.1
LOS	E	D		E	D	B	A	B	A	B	A	A
Approach Delay		48.8			30.7			13.1			10.1	
Approach LOS		D			C			B			B	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	9.3	60.1	60.1	9.6	60.4	60.4
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	19.2	19.2		19.2	19.2	19.2	7.5	70.3	70.3	11.2	74.0	74.0
70th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	15.4	15.4		15.4	15.4	15.4	6.8	75.7	75.7	9.6	78.5	78.5
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	12.5	12.5		12.5	12.5	12.5	6.2	79.8	79.8	8.4	82.0	82.0
30th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	83.6	83.6	7.1	96.6	96.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
Stops (vph)	87	105		88	67	26	24	504	8	90	313	3
Fuel Used(l)	8	10		8	5	7	2	41	2	10	42	2
CO Emissions (g/hr)	145	182		149	99	122	43	771	34	195	773	39
NOx Emissions (g/hr)	28	35		29	19	24	8	149	7	38	149	7
VOC Emissions (g/hr)	34	42		34	23	28	10	178	8	45	178	9
Dilemma Vehicles (#)	0	0		0	0	0	0	40	0	0	39	0
Queue Length 50th (m)	22.7	26.6		22.2	17.0	0.4	3.7	56.5	0.0	10.9	44.3	0.0
Queue Length 95th (m)	34.7	40.8		34.8	27.0	18.8	12.1	98.7	7.6	37.1	51.5	2.5
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	327	457		277	468	548	412	2087	936	410	2211	994
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.33		0.35	0.17	0.40	0.18	0.46	0.10	0.52	0.45	0.08

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 17.0

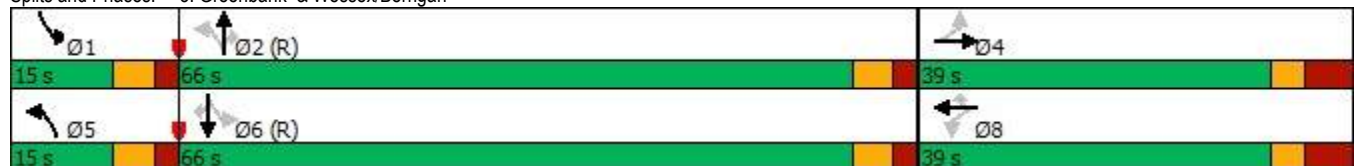
Intersection LOS: B

Intersection Capacity Utilization 84.5%

ICU Level of Service E












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2020 Background Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	78	133	1201	72	136	1206
Future Volume (vph)	78	133	1201	72	136	1206
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.992			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3358	0	1695	3390
Flt Permitted	0.950				0.194	
Satd. Flow (perm)	1688	1493	3358	0	346	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		98	11			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	78	133	1201	72	136	1206
Shared Lane Traffic (%)						
Lane Group Flow (vph)	78	133	1273	0	136	1206
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	85.8		85.8	85.8
Total Split (%)	28.5%	28.5%	71.5%		71.5%	71.5%
Maximum Green (s)	27.0	27.0	79.8		79.8	79.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2020 Background Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.1	14.1	92.7		92.7	92.7
Actuated g/C Ratio	0.12	0.12	0.77		0.77	0.77
v/c Ratio	0.39	0.51	0.49		0.51	0.46
Control Delay	52.9	21.7	3.8		15.5	6.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	52.9	21.7	3.8		15.5	6.3
LOS	D	C	A		B	A
Approach Delay	33.3		3.8			7.2
Approach LOS	C		A			A
90th %ile Green (s)	27.0	27.0	79.8		79.8	79.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	12.7	12.7	94.1		94.1	94.1
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	10.9	10.9	95.9		95.9	95.9
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	69	39	204		65	405
Fuel Used(l)	7	7	41		6	42
CO Emissions (g/hr)	123	129	767		118	782
NOx Emissions (g/hr)	24	25	148		23	151
VOC Emissions (g/hr)	28	30	177		27	180
Dilemma Vehicles (#)	0	0	9		0	50
Queue Length 50th (m)	17.8	7.8	18.9		8.6	37.7
Queue Length 95th (m)	28.5	23.2	33.3		42.1	87.1
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	379	411	2595		267	2618
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	0.21	0.32	0.49		0.51	0.46

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

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

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 7.6

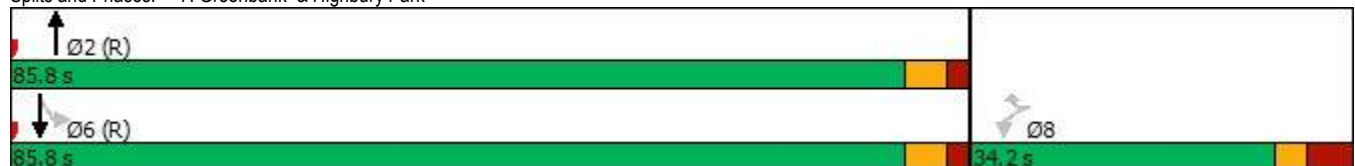
Intersection LOS: A

Intersection Capacity Utilization 71.5%

ICU Level of Service C
























Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park















3: Greenbank & Wessex/Berrigan
SUN Peak

35 Highbury Park Drive
2020 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	53	49	57	44	162	30	567	28	71	465	35
Future Volume (vph)	80	53	49	57	44	162	30	567	28	71	465	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.97	0.99		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.728			0.691			0.485			0.416		
Satd. Flow (perm)	1286	1639	0	1223	1784	1483	862	3390	1464	738	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				162			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	80	53	49	57	44	162	30	567	28	71	465	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	102	0	57	44	162	30	567	28	71	465	35
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Peak

35 Highbury Park Drive
2020 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	15.5	15.5		15.5	15.5	15.5	75.9	70.9	70.9	77.9	73.6	73.6
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.69	0.64	0.64	0.71	0.67	0.67
v/c Ratio	0.44	0.38		0.33	0.17	0.47	0.05	0.26	0.03	0.12	0.21	0.03
Control Delay	48.6	28.0		44.8	39.7	9.9	6.3	10.6	0.1	5.2	7.5	0.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.6	28.0		44.8	39.7	9.9	6.3	10.6	0.1	5.2	7.5	0.1
LOS	D	C		D	D	A	A	B	A	A	A	A
Approach Delay		37.0			22.5			10.0			6.8	
Approach LOS		D			C			A			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.4	52.1	52.1	7.6	52.3	52.3
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	14.5	14.5		14.5	14.5	14.5	6.2	69.1	69.1	7.1	70.0	70.0
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	12.2	12.2		12.2	12.2	12.2	5.9	71.9	71.9	6.6	72.6	72.6
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	74.6	74.6	6.1	86.6	86.6
30th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	70	53		47	37	22	10	243	0	18	140	0
Fuel Used(l)	6	5		4	3	5	1	21	0	3	19	1
CO Emissions (g/hr)	107	97		71	51	90	17	392	8	48	344	16
NOx Emissions (g/hr)	21	19		14	10	17	3	76	2	9	66	3
VOC Emissions (g/hr)	25	22		16	12	21	4	90	2	11	79	4
Dilemma Vehicles (#)	0	0		0	0	0	0	26	0	0	18	0
Queue Length 50th (m)	16.5	12.1		11.6	8.8	0.0	1.3	24.3	0.0	2.6	15.3	0.0
Queue Length 95th (m)	25.8	22.7		19.6	15.5	15.1	6.3	51.9	0.0	8.6	29.5	0.1
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	368	499		350	510	540	654	2183	979	585	2268	1020
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.20		0.16	0.09	0.30	0.05	0.26	0.03	0.12	0.21	0.03

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 13.8

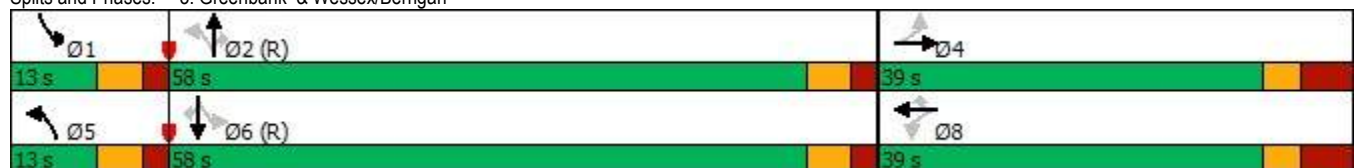
Intersection LOS: B

Intersection Capacity Utilization 63.1%

ICU Level of Service B












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SUN Peak

35 Highbury Park Drive
2020 Background Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	91	25	779	31	50	545
Future Volume (vph)	91	25	779	31	50	545
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.994			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3366	0	1695	3390
Flt Permitted	0.950				0.338	
Satd. Flow (perm)	1689	1493	3366	0	602	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		25	7			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	91	25	779	31	50	545
Shared Lane Traffic (%)						
Lane Group Flow (vph)	91	25	810	0	50	545
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			CI+Ex			CI+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SUN Peak

35 Highbury Park Drive
2020 Background Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.3	14.3	87.2		87.2	87.2
Actuated g/C Ratio	0.13	0.13	0.79		0.79	0.79
v/c Ratio	0.42	0.12	0.30		0.10	0.20
Control Delay	48.0	14.5	3.6		5.9	4.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	48.0	14.5	3.6		5.9	4.6
LOS	D	B	A		A	A
Approach Delay	40.8		3.6			4.7
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	13.1	13.1	83.7		83.7	83.7
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	11.3	11.3	85.5		85.5	85.5
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	86.8		86.8	86.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	0.0	0.0	104.0		104.0	104.0
10th %ile Term Code	Skip	Skip	Coord		Coord	Coord
Stops (vph)	80	9	128		14	138
Fuel Used(l)	7	1	26		2	17
CO Emissions (g/hr)	137	22	485		31	314
NOx Emissions (g/hr)	26	4	94		6	61
VOC Emissions (g/hr)	32	5	112		7	72
Dilemma Vehicles (#)	0	0	10		0	22
Queue Length 50th (m)	18.9	0.0	13.6		2.1	13.3
Queue Length 95th (m)	29.4	6.7	25.7		9.2	32.8
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	385	2668		477	2686
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	0.22	0.06	0.30		0.10	0.20

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 6.9

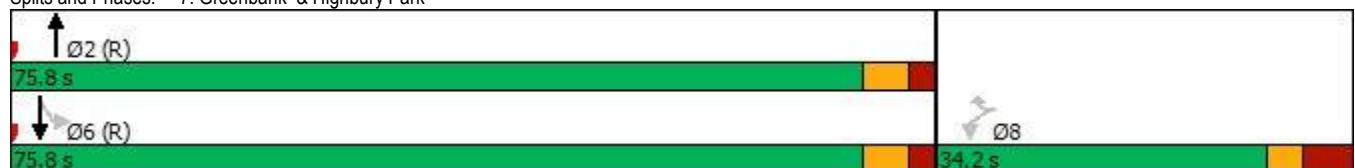
Intersection LOS: A

Intersection Capacity Utilization 59.0%

ICU Level of Service B
























Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park















3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2025 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	85	64	104	84	235	74	1052	98	230	1089	79
Future Volume (vph)	100	85	64	104	84	235	74	1052	98	230	1089	79
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.96	1.00		0.97
Frt		0.936				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1654	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Flt Permitted	0.702			0.599			0.227			0.202		
Satd. Flow (perm)	1240	1654	0	1060	1784	1481	405	3390	1462	360	3390	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				198			95			95
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	85	64	104	84	235	74	1052	98	230	1089	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	149	0	104	84	235	74	1052	98	230	1089	79
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	15.0	66.0	66.0	15.0	66.0	66.0
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	12.5%	55.0%	55.0%	12.5%	55.0%	55.0%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	9.1	60.1	60.1	9.1	60.1	60.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2025 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	18.0	18.0		18.0	18.0	18.0	79.3	72.2	72.2	86.6	77.9	77.9
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.66	0.60	0.60	0.72	0.65	0.65
v/c Ratio	0.54	0.54		0.65	0.31	0.60	0.22	0.52	0.11	0.61	0.50	0.08
Control Delay	55.8	42.8		65.3	46.0	15.8	7.7	16.3	3.4	20.6	10.2	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.8	42.8		65.3	46.0	15.8	7.7	16.3	3.4	20.6	10.2	1.1
LOS	E	D		E	D	B	A	B	A	C	B	A
Approach Delay		48.0			34.0			14.8			11.4	
Approach LOS		D			C			B			B	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	9.3	60.1	60.1	9.6	60.4	60.4
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	20.0	20.0		20.0	20.0	20.0	7.5	66.9	66.9	13.8	73.2	73.2
70th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	16.1	16.1		16.1	16.1	16.1	6.8	73.5	73.5	11.1	77.8	77.8
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	13.1	13.1		13.1	13.1	13.1	6.2	77.9	77.9	9.7	81.4	81.4
30th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	82.5	82.5	8.2	96.6	96.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
Stops (vph)	87	105		95	71	49	26	601	10	115	345	3
Fuel Used(l)	8	10		9	6	8	2	49	2	13	46	2
CO Emissions (g/hr)	144	180		162	106	155	45	904	38	241	859	39
NOx Emissions (g/hr)	28	35		31	20	30	9	174	7	46	166	7
VOC Emissions (g/hr)	33	42		37	24	36	10	208	9	56	198	9
Dilemma Vehicles (#)	0	0		0	0	0	0	44	0	0	43	0
Queue Length 50th (m)	22.5	26.4		23.8	18.2	7.9	3.8	68.6	0.3	12.4	48.8	0.0
Queue Length 95th (m)	34.8	40.8		37.0	28.7	28.0	12.1	112.7	8.8	#52.8	56.1	2.6
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	325	457		278	468	534	372	2038	917	378	2199	989
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.33		0.37	0.18	0.44	0.20	0.52	0.11	0.61	0.50	0.08

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 18.3

Intersection LOS: B

Intersection Capacity Utilization 88.4%

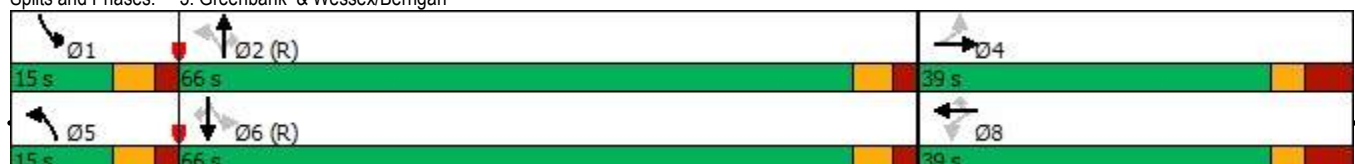
ICU Level of Service E

Analysis Period (min) 15

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












Queue shown is maximum after two cycles.

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2025 Background Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	83	143	1326	77	145	1332
Future Volume (vph)	83	143	1326	77	145	1332
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.992			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3358	0	1695	3390
Flt Permitted	0.950				0.164	
Satd. Flow (perm)	1688	1493	3358	0	292	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		75	10			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	83	143	1326	77	145	1332
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	143	1403	0	145	1332
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	85.8		85.8	85.8
Total Split (%)	28.5%	28.5%	71.5%		71.5%	71.5%
Maximum Green (s)	27.0	27.0	79.8		79.8	79.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2025 Background Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.4	14.4	92.4		92.4	92.4
Actuated g/C Ratio	0.12	0.12	0.77		0.77	0.77
v/c Ratio	0.41	0.58	0.54		0.65	0.51
Control Delay	53.1	32.9	4.2		25.6	6.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	53.1	32.9	4.2		25.6	6.9
LOS	D	C	A		C	A
Approach Delay	40.3		4.2			8.7
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	79.8		79.8	79.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	13.9	13.9	92.9		92.9	92.9
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	11.2	11.2	95.6		95.6	95.6
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	73	65	239		75	483
Fuel Used(l)	7	9	46		8	48
CO Emissions (g/hr)	131	168	862		150	897
NOx Emissions (g/hr)	25	32	166		29	173
VOC Emissions (g/hr)	30	39	199		35	207
Dilemma Vehicles (#)	0	0	9		0	56
Queue Length 50th (m)	19.0	15.5	23.9		11.2	44.9
Queue Length 95th (m)	30.0	31.5	37.6		#64.2	101.7
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	379	394	2587		224	2609
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	0.22	0.36	0.54		0.65	0.51

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

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

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 9.0

Intersection LOS: A

Intersection Capacity Utilization 75.5%

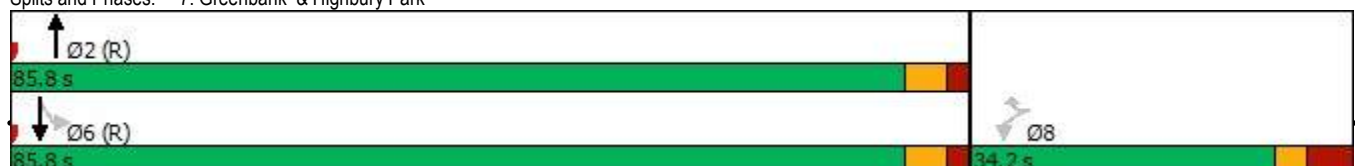
ICU Level of Service D

Analysis Period (min) 15

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
























Queue shown is maximum after two cycles.

Splits and Phases: 7: Greenbank & Highbury Park















3: Greenbank & Wessex/Berrigan
SUN Peak

35 Highbury Park Drive
2025 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	53	49	61	48	174	30	626	30	77	513	35
Future Volume (vph)	80	53	49	61	48	174	30	626	30	77	513	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.97	0.99		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.726			0.691			0.463			0.386		
Satd. Flow (perm)	1283	1639	0	1223	1784	1483	823	3390	1464	685	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				174			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	80	53	49	61	48	174	30	626	30	77	513	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	102	0	61	48	174	30	626	30	77	513	35
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Peak

35 Highbury Park Drive
2025 Background Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	15.5	15.5		15.5	15.5	15.5	75.8	70.8	70.8	77.9	73.6	73.6
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.69	0.64	0.64	0.71	0.67	0.67
v/c Ratio	0.44	0.38		0.35	0.19	0.48	0.05	0.29	0.03	0.14	0.23	0.03
Control Delay	48.6	28.0		45.6	40.1	10.0	6.3	10.9	0.1	5.3	7.6	0.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.6	28.0		45.6	40.1	10.0	6.3	10.9	0.1	5.3	7.6	0.1
LOS	D	C		D	D	B	A	B	A	A	A	A
Approach Delay		37.1			22.8			10.2			6.9	
Approach LOS		D			C			B			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.4	52.1	52.1	7.6	52.3	52.3
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	14.5	14.5		14.5	14.5	14.5	6.2	68.9	68.9	7.3	70.0	70.0
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	12.2	12.2		12.2	12.2	12.2	5.9	71.8	71.8	6.7	72.6	72.6
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	74.5	74.5	6.2	86.6	86.6
30th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	70	53		52	40	22	11	274	0	19	155	0
Fuel Used(l)	6	5		4	3	5	1	24	0	3	20	1
CO Emissions (g/hr)	107	97		77	56	96	18	439	8	52	381	16
NOx Emissions (g/hr)	21	19		15	11	19	3	85	2	10	73	3
VOC Emissions (g/hr)	25	22		18	13	22	4	101	2	12	88	4
Dilemma Vehicles (#)	0	0		0	0	0	0	28	0	0	20	0
Queue Length 50th (m)	16.6	12.1		12.4	9.6	0.0	1.3	27.4	0.0	2.9	17.0	0.0
Queue Length 95th (m)	25.8	22.7		20.7	16.7	15.5	6.3	57.8	0.0	9.2	32.0	0.2
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	367	499		350	510	548	629	2181	978	552	2268	1020
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.20		0.17	0.09	0.32	0.05	0.29	0.03	0.14	0.23	0.03

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 13.8

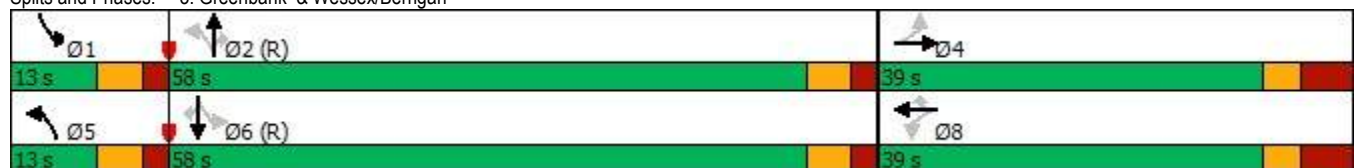
Intersection LOS: B

Intersection Capacity Utilization 63.6%

ICU Level of Service B












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SUN Peak

35 Highbury Park Drive
2025 Background Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	98	26	861	33	54	603
Future Volume (vph)	98	26	861	33	54	603
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.994			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3366	0	1695	3390
Flt Permitted	0.950				0.304	
Satd. Flow (perm)	1689	1493	3366	0	541	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		26	7			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	98	26	861	33	54	603
Shared Lane Traffic (%)						
Lane Group Flow (vph)	98	26	894	0	54	603
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			CI+Ex			CI+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SUN Peak

35 Highbury Park Drive
2025 Background Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.5	14.5	82.3		82.3	82.3
Actuated g/C Ratio	0.13	0.13	0.75		0.75	0.75
v/c Ratio	0.44	0.12	0.35		0.13	0.24
Control Delay	48.6	14.1	4.0		6.4	5.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	48.6	14.1	4.0		6.4	5.2
LOS	D	B	A		A	A
Approach Delay	41.4		4.0			5.3
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	13.6	13.6	83.2		83.2	83.2
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	11.7	11.7	85.1		85.1	85.1
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	86.8		86.8	86.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	86.8		86.8	86.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	86	9	175		16	176
Fuel Used(l)	8	1	30		2	20
CO Emissions (g/hr)	148	23	561		34	366
NOx Emissions (g/hr)	29	4	108		7	71
VOC Emissions (g/hr)	34	5	129		8	84
Dilemma Vehicles (#)	0	0	14		0	27
Queue Length 50th (m)	20.3	0.0	14.5		2.4	15.3
Queue Length 95th (m)	31.1	6.9	27.2		10.1	36.6
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	386	2521		404	2537
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	0.24	0.07	0.35		0.13	0.24

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 7.3

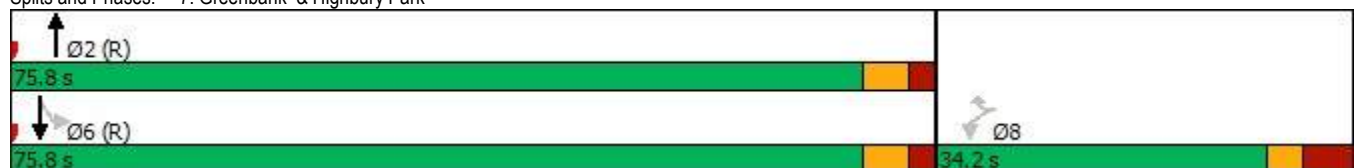
Intersection LOS: A

Intersection Capacity Utilization 60.3%

ICU Level of Service B
























Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park















3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2019 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	85	64	97	78	218	74	963	91	213	994	81
Future Volume (vph)	103	85	64	97	78	218	74	963	91	213	994	81
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.96	1.00		0.97
Frt		0.936				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1654	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.706			0.597			0.255			0.238		
Satd. Flow (perm)	1247	1654	0	1056	1784	1481	454	3390	1462	423	3390	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				214			95			95
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	103	85	64	97	78	218	74	963	91	213	994	81
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	149	0	97	78	218	74	963	91	213	994	81
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	15.0	66.0	66.0	15.0	66.0	66.0
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	12.5%	55.0%	55.0%	12.5%	55.0%	55.0%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	9.1	60.1	60.1	9.1	60.1	60.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2019 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	17.6	17.6		17.6	17.6	17.6	81.0	73.9	73.9	86.1	78.3	78.3
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.68	0.62	0.62	0.72	0.65	0.65
v/c Ratio	0.56	0.55		0.63	0.30	0.55	0.20	0.46	0.10	0.53	0.45	0.08
Control Delay	57.6	43.6		63.9	46.0	10.9	7.2	14.6	2.9	14.7	9.8	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.6	43.6		63.9	46.0	10.9	7.2	14.6	2.9	14.7	9.8	1.1
LOS	E	D		E	D	B	A	B	A	B	A	A
Approach Delay		49.3			30.9			13.2			10.1	
Approach LOS		D			C			B			B	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	9.3	60.1	60.1	9.6	60.4	60.4
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	19.2	19.2		19.2	19.2	19.2	7.5	70.3	70.3	11.2	74.0	74.0
70th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	15.4	15.4		15.4	15.4	15.4	6.8	75.7	75.7	9.6	78.5	78.5
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	12.5	12.5		12.5	12.5	12.5	6.2	79.8	79.8	8.4	82.0	82.0
30th %ile Term Code	Gap	Gap		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	83.6	83.6	7.1	96.6	96.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
Stops (vph)	92	105		88	67	28	24	510	8	91	319	3
Fuel Used(l)	8	10		8	5	7	2	42	2	11	42	2
CO Emissions (g/hr)	152	182		149	99	124	43	780	34	196	781	40
NOx Emissions (g/hr)	29	35		29	19	24	8	150	7	38	151	8
VOC Emissions (g/hr)	35	42		34	23	29	10	180	8	45	180	9
Dilemma Vehicles (#)	0	0		0	0	0	0	40	0	0	39	0
Queue Length 50th (m)	23.4	26.6		22.2	17.0	0.9	3.7	57.2	0.0	10.8	45.3	0.0
Queue Length 95th (m)	35.7	40.8		34.8	27.0	19.3	12.1	100.1	7.6	37.0	53.0	2.6
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	327	457		277	468	546	408	2087	936	406	2211	994
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.33		0.35	0.17	0.40	0.18	0.46	0.10	0.52	0.45	0.08

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 17.1

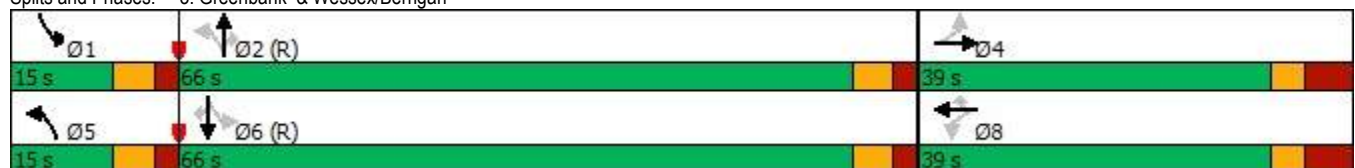
Intersection LOS: B

Intersection Capacity Utilization 84.8%

ICU Level of Service E












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2019 Total Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	92	146	1195	90	151	1201
Future Volume (vph)	92	146	1195	90	151	1201
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.989			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3346	0	1695	3390
Flt Permitted	0.950				0.191	
Satd. Flow (perm)	1688	1493	3346	0	340	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		99	14			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	92	146	1195	90	151	1201
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	146	1285	0	151	1201
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	85.8		85.8	85.8
Total Split (%)	28.5%	28.5%	71.5%		71.5%	71.5%
Maximum Green (s)	27.0	27.0	79.8		79.8	79.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2019 Total Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.5	14.5	92.3		92.3	92.3
Actuated g/C Ratio	0.12	0.12	0.77		0.77	0.77
v/c Ratio	0.45	0.54	0.50		0.58	0.46
Control Delay	54.3	24.7	3.9		19.3	6.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	54.3	24.7	3.9		19.3	6.4
LOS	D	C	A		B	A
Approach Delay	36.1		3.9			7.8
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	79.8		79.8	79.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	13.8	13.8	93.0		93.0	93.0
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	11.9	11.9	94.9		94.9	94.9
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
30th %ile Term Code	Min	Min	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	82	50	209		78	410
Fuel Used(l)	7	6	42		8	42
CO Emissions (g/hr)	124	113	779		142	785
NOx Emissions (g/hr)	24	22	150		27	152
VOC Emissions (g/hr)	29	26	180		33	181
Dilemma Vehicles (#)	0	0	9		0	50
Queue Length 50th (m)	21.0	10.5	19.8		11.0	39.5
Queue Length 95th (m)	32.5	27.0	33.7		#60.2	86.4
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	379	412	2575		261	2606
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	0.24	0.35	0.50		0.58	0.46

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

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

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.4

Intersection LOS: A

Intersection Capacity Utilization 72.4%

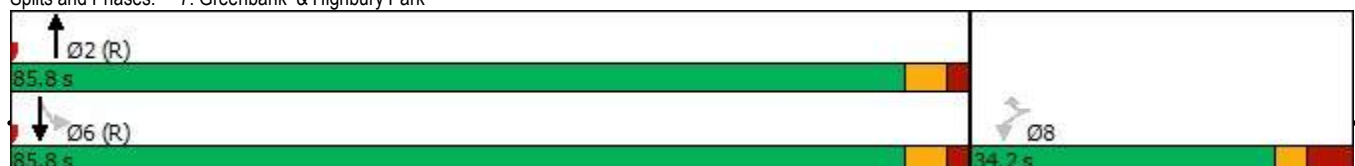
ICU Level of Service C

Analysis Period (min) 15

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










Queue shown is maximum after two cycles.

Splits and Phases: 7: Greenbank & Highbury Park


























8: Highbury Park & Access
SAT Peak

35 Highbury Park Drive
2019 Total Traffic Volumes

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	34	197	196	5	4	28
Future Volume (Veh/h)	34	197	196	5	4	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	34	197	196	5	4	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	201				464	198
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	201				464	198
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				99	97
cM capacity (veh/h)	1371				543	843
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	231	201	32			
Volume Left	34	0	4			
Volume Right	0	5	28			
cSH	1371	1700	788			
Volume to Capacity	0.02	0.12	0.04			
Queue Length 95th (m)	0.6	0.0	1.0			
Control Delay (s)	1.3	0.0	9.8			
Lane LOS	A		A			
Approach Delay (s)	1.3	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			37.5%	ICU Level of Service		A
Analysis Period (min)			15			













3: Greenbank & Wessex/Berrigan
SUN Arrival Peak

35 Highbury Park Drive
2020 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	53	49	57	44	162	30	629	28	71	480	39
Future Volume (vph)	98	53	49	57	44	162	30	629	28	71	480	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99			1.00		0.97	0.99		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.728			0.691			0.478			0.384		
Satd. Flow (perm)	1286	1639	0	1223	1784	1517	849	3390	1464	682	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				162			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9			4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	98	53	49	57	44	162	30	629	28	71	480	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	102	0	57	44	162	30	629	28	71	480	39
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Arrival Peak

35 Highbury Park Drive
2020 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	16.4	16.4		16.4	16.4	16.4	75.0	69.9	69.9	77.0	72.7	72.7
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.68	0.64	0.64	0.70	0.66	0.66
v/c Ratio	0.51	0.36		0.31	0.17	0.45	0.05	0.29	0.03	0.13	0.21	0.04
Control Delay	50.4	27.0		43.3	38.7	9.3	6.5	11.3	0.1	5.3	7.7	0.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.4	27.0		43.3	38.7	9.3	6.5	11.3	0.1	5.3	7.7	0.2
LOS	D	C		D	D	A	A	B	A	A	A	A
Approach Delay		38.5			21.6			10.6			6.9	
Approach LOS		D			C			B			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.4	52.1	52.1	7.6	52.3	52.3
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	16.3	16.3		16.3	16.3	16.3	6.3	67.2	67.2	7.2	68.1	68.1
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	13.7	13.7		13.7	13.7	13.7	5.9	70.4	70.4	6.6	71.1	71.1
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	11.2	11.2		11.2	11.2	11.2	0.0	73.4	73.4	6.1	85.4	85.4
30th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	85	53		47	37	22	12	283	0	18	154	0
Fuel Used(l)	7	5		4	3	5	1	24	0	3	19	1
CO Emissions (g/hr)	134	95		69	51	89	18	449	8	48	362	18
NOx Emissions (g/hr)	26	18		13	10	17	4	87	2	9	70	3
VOC Emissions (g/hr)	31	22		16	12	20	4	104	2	11	84	4
Dilemma Vehicles (#)	0	0		0	0	0	0	29	0	0	18	0
Queue Length 50th (m)	20.2	11.9		11.4	8.6	0.0	1.4	28.8	0.0	2.7	15.2	0.0
Queue Length 95th (m)	30.6	22.7		19.6	15.5	15.1	6.3	58.3	0.0	8.3	31.8	0.3
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	368	499		350	510	550	639	2155	968	544	2240	1009
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.20		0.16	0.09	0.29	0.05	0.29	0.03	0.13	0.21	0.04

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 14.2

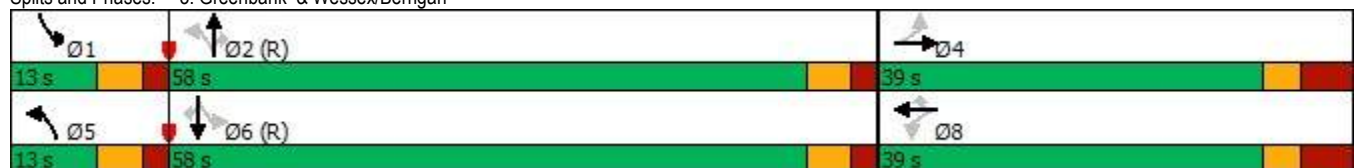
Intersection LOS: B

Intersection Capacity Utilization 58.0%

ICU Level of Service B












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SUN Arrival Peak

35 Highbury Park Drive
2020 Total Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	115	49	773	117	125	540
Future Volume (vph)	115	49	773	117	125	540
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.980			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3311	0	1695	3390
Flt Permitted	0.950				0.304	
Satd. Flow (perm)	1689	1493	3311	0	541	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		49	30			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	49	773	117	125	540
Shared Lane Traffic (%)						
Lane Group Flow (vph)	115	49	890	0	125	540
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SUN Arrival Peak

35 Highbury Park Drive
2020 Total Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	15.1	15.1	81.7		81.7	81.7
Actuated g/C Ratio	0.14	0.14	0.74		0.74	0.74
v/c Ratio	0.50	0.20	0.36		0.31	0.21
Control Delay	49.8	12.0	4.3		8.7	5.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	49.8	12.0	4.3		8.7	5.3
LOS	D	B	A		A	A
Approach Delay	38.5		4.3			5.9
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	14.9	14.9	81.9		81.9	81.9
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	12.8	12.8	84.0		84.0	84.0
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.7	10.7	86.1		86.1	86.1
30th %ile Term Code	Gap	Gap	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	86.8		86.8	86.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	101	12	179		46	158
Fuel Used(l)	8	2	30		5	18
CO Emissions (g/hr)	147	28	565		88	329
NOx Emissions (g/hr)	28	5	109		17	63
VOC Emissions (g/hr)	34	6	130		20	76
Dilemma Vehicles (#)	0	0	13		0	25
Queue Length 50th (m)	23.8	0.0	15.6		6.9	14.3
Queue Length 95th (m)	35.6	9.3	27.2		24.2	32.5
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	403	2467		401	2518
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	0.28	0.12	0.36		0.31	0.21

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 8.2

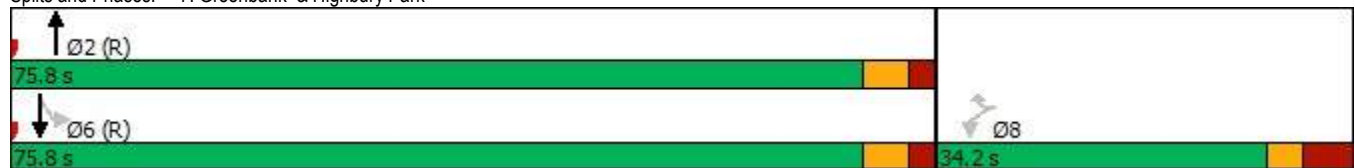
Intersection LOS: A

Intersection Capacity Utilization 60.6%

ICU Level of Service B










Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park


























8: Highbury Park & Access
SUN Arrival Peak

35 Highbury Park Drive
2020 Total Traffic Volumes

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	162	70	103	28	7	49
Future Volume (Veh/h)	162	70	103	28	7	49
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	162	70	103	28	7	49
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	131				511	117
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	131				511	117
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	89				98	95
cM capacity (veh/h)	1454				464	935
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	232	131	56			
Volume Left	162	0	7			
Volume Right	0	28	49			
cSH	1454	1700	830			
Volume to Capacity	0.11	0.08	0.07			
Queue Length 95th (m)	2.9	0.0	1.6			
Control Delay (s)	5.7	0.0	9.7			
Lane LOS	A		A			
Approach Delay (s)	5.7	0.0	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization			34.5%	ICU Level of Service		A
Analysis Period (min)			15			

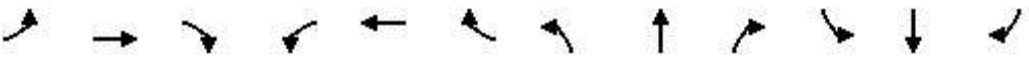
3: Greenbank & Wessex/Berrigan
SUN Departure Pe

35 Highbury Park Drive
2020 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	53	49	57	44	162	30	582	28	71	527	53
Future Volume (vph)	84	53	49	57	44	162	30	582	28	71	527	53
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99			1.00		0.97	0.99		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.728			0.691			0.456			0.408		
Satd. Flow (perm)	1286	1639	0	1223	1784	1517	811	3390	1464	724	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				162			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9			4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	84	53	49	57	44	162	30	582	28	71	527	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	102	0	57	44	162	30	582	28	71	527	53
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Departure Pe

35 Highbury Park Drive
2020 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	15.7	15.7		15.7	15.7	15.7	75.7	70.7	70.7	77.7	73.5	73.5
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.69	0.64	0.64	0.71	0.67	0.67
v/c Ratio	0.46	0.38		0.33	0.17	0.46	0.05	0.27	0.03	0.12	0.23	0.05
Control Delay	49.0	27.8		44.5	39.5	9.7	6.3	10.8	0.1	4.7	7.1	0.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.0	27.8		44.5	39.5	9.7	6.3	10.8	0.1	4.7	7.1	0.4
LOS	D	C		D	D	A	A	B	A	A	A	A
Approach Delay		37.4			22.2			10.1			6.3	
Approach LOS		D			C			B			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.4	52.1	52.1	7.6	52.3	52.3
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	14.9	14.9		14.9	14.9	14.9	6.2	68.7	68.7	7.1	69.6	69.6
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	12.5	12.5		12.5	12.5	12.5	5.9	71.6	71.6	6.6	72.3	72.3
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	10.1	10.1		10.1	10.1	10.1	0.0	74.5	74.5	6.1	86.5	86.5
30th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	73	53		47	37	22	11	253	0	16	158	1
Fuel Used(l)	6	5		4	3	5	1	22	0	3	21	1
CO Emissions (g/hr)	113	97		70	51	89	18	406	8	47	387	25
NOx Emissions (g/hr)	22	19		14	10	17	3	78	2	9	75	5
VOC Emissions (g/hr)	26	22		16	12	21	4	94	2	11	89	6
Dilemma Vehicles (#)	0	0		0	0	0	0	26	0	0	18	0
Queue Length 50th (m)	17.4	12.0		11.6	8.7	0.0	1.3	25.3	0.0	2.3	15.3	0.0
Queue Length 95th (m)	26.8	22.7		19.6	15.5	15.1	6.3	53.5	0.0	7.5	38.5	1.5
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	368	499		350	510	550	621	2178	977	575	2263	1018
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.20		0.16	0.09	0.29	0.05	0.27	0.03	0.12	0.23	0.05

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 13.4

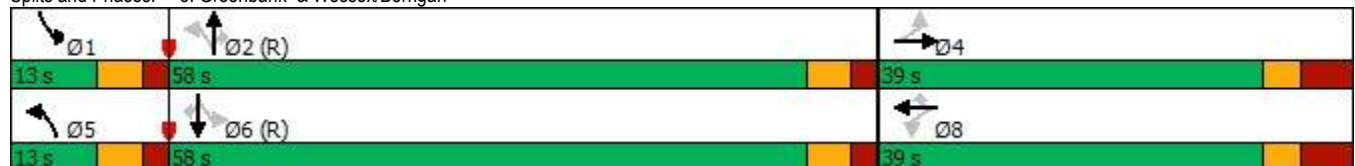
Intersection LOS: B












Intersection Capacity Utilization 58.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	176	101	773	56	73	540
Future Volume (vph)	176	101	773	56	73	540
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3350	0	1695	3390
Flt Permitted	0.950				0.323	
Satd. Flow (perm)	1689	1493	3350	0	575	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		101	13			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	176	101	773	56	73	540
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	101	829	0	73	540
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			CI+Ex			CI+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	17.5	17.5	79.3		79.3	79.3
Actuated g/C Ratio	0.16	0.16	0.72		0.72	0.72
v/c Ratio	0.65	0.31	0.34		0.18	0.22
Control Delay	54.0	9.6	4.7		7.6	6.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	54.0	9.6	4.7		7.6	6.0
LOS	D	A	A		A	A
Approach Delay	37.8		4.7			6.2
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	19.3	19.3	77.5		77.5	77.5
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	16.7	16.7	80.1		80.1	80.1
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	14.2	14.2	82.6		82.6	82.6
30th %ile Term Code	Gap	Gap	Coord		Coord	Coord
10th %ile Green (s)	10.5	10.5	86.3		86.3	86.3
10th %ile Term Code	Gap	Gap	Coord		Coord	Coord
Stops (vph)	160	17	172		24	172
Fuel Used(l)	13	3	29		3	18
CO Emissions (g/hr)	237	52	534		48	343
NOx Emissions (g/hr)	46	10	103		9	66
VOC Emissions (g/hr)	55	12	123		11	79
Dilemma Vehicles (#)	0	0	12		0	25
Queue Length 50th (m)	36.2	0.0	15.0		4.2	17.0
Queue Length 95th (m)	52.5	12.9	26.0		13.1	32.5
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	442	2417		414	2442
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	0.23	0.34		0.18	0.22

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 10.6

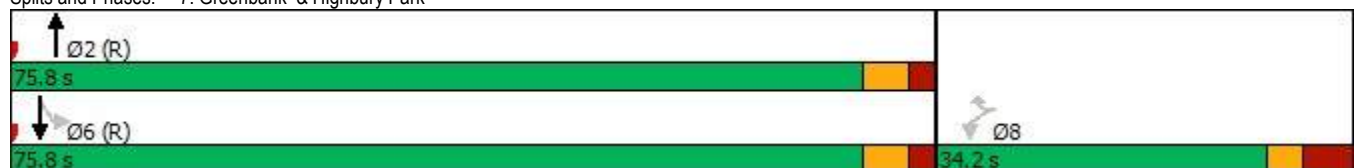
Intersection LOS: B

Intersection Capacity Utilization 60.8%

ICU Level of Service B










Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park


























8: Highbury Park & Access
SUN Departure Pe

35 Highbury Park Drive
2020 Total Traffic Volumes

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	49	70	103	7	28	162
Future Volume (Veh/h)	49	70	103	7	28	162
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	49	70	103	7	28	162
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	110				274	106
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	110				274	106
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				96	83
cM capacity (veh/h)	1480				691	948
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	119	110	190			
Volume Left	49	0	28			
Volume Right	0	7	162			
cSH	1480	1700	899			
Volume to Capacity	0.03	0.06	0.21			
Queue Length 95th (m)	0.8	0.0	6.1			
Control Delay (s)	3.2	0.0	10.1			
Lane LOS	A		B			
Approach Delay (s)	3.2	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			5.5			
Intersection Capacity Utilization			32.3%	ICU Level of Service		A
Analysis Period (min)			15			











3: Greenbank & Wessex/Berrigan
SAT Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	85	64	104	84	235	74	1061	98	230	1096	81
Future Volume (vph)	103	85	64	104	84	235	74	1061	98	230	1096	81
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99		0.98	1.00		0.96	1.00		0.97
Frt		0.936				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1654	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.702			0.599			0.225			0.199		
Satd. Flow (perm)	1240	1654	0	1060	1784	1481	401	3390	1462	354	3390	1473
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				197			95			95
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9		10	4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	103	85	64	104	84	235	74	1061	98	230	1096	81
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	149	0	104	84	235	74	1061	98	230	1096	81
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	15.0	66.0	66.0	15.0	66.0	66.0
Total Split (%)	32.5%	32.5%		32.5%	32.5%	32.5%	12.5%	55.0%	55.0%	12.5%	55.0%	55.0%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	9.1	60.1	60.1	9.1	60.1	60.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

SAT Peak

2025 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0	None	7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	18.0	18.0		18.0	18.0	18.0	79.1	72.1	72.1	86.7	77.9	77.9
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.66	0.60	0.60	0.72	0.65	0.65
v/c Ratio	0.55	0.54		0.65	0.31	0.60	0.22	0.52	0.11	0.62	0.50	0.08
Control Delay	56.6	42.8		65.3	46.0	16.0	7.7	16.5	3.4	21.0	10.2	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.6	42.8		65.3	46.0	16.0	7.7	16.5	3.4	21.0	10.2	1.1
LOS	E	D		E	D	B	A	B	A	C	B	A
Approach Delay		48.4			34.1			14.9			11.5	
Approach LOS		D			C			B			B	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	9.3	60.1	60.1	9.6	60.4	60.4
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	20.0	20.0		20.0	20.0	20.0	7.5	66.7	66.7	14.0	73.2	73.2
70th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	16.1	16.1		16.1	16.1	16.1	6.8	73.4	73.4	11.2	77.8	77.8
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	13.1	13.1		13.1	13.1	13.1	6.2	77.8	77.8	9.8	81.4	81.4
30th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	82.3	82.3	8.4	96.6	96.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Gap	Coord	Coord
Stops (vph)	92	105		95	71	49	26	610	10	115	353	3
Fuel Used(l)	8	10		9	6	8	2	49	2	13	47	2
CO Emissions (g/hr)	150	180		162	106	155	45	916	38	242	868	40
NOx Emissions (g/hr)	29	35		31	20	30	9	177	7	47	168	8
VOC Emissions (g/hr)	35	42		37	24	36	10	211	9	56	200	9
Dilemma Vehicles (#)	0	0		0	0	0	0	44	0	0	43	0
Queue Length 50th (m)	23.2	26.4		23.8	18.2	8.1	3.8	69.7	0.3	12.2	49.8	0.0
Queue Length 95th (m)	35.7	40.8		37.0	28.7	28.3	12.1	114.1	8.8	#54.1	57.5	2.6
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	325	457		278	468	534	369	2035	915	375	2199	989
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.33		0.37	0.18	0.44	0.20	0.52	0.11	0.61	0.50	0.08

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 18.4

Intersection Capacity Utilization 88.6%

Intersection LOS: B

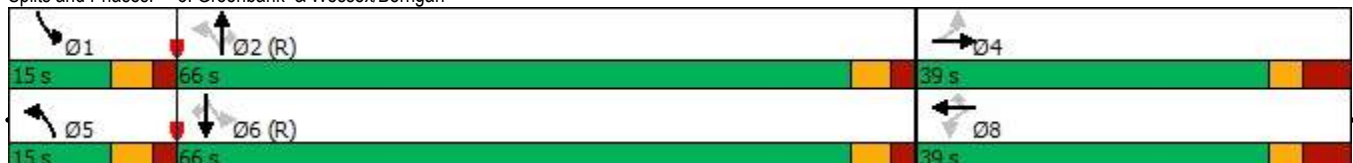
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	97	156	1320	95	161	1327
Future Volume (vph)	97	156	1320	95	161	1327
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3350	0	1695	3390
Flt Permitted	0.950				0.161	
Satd. Flow (perm)	1688	1493	3350	0	287	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		76	13			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	97	156	1320	95	161	1327
Shared Lane Traffic (%)						
Lane Group Flow (vph)	97	156	1415	0	161	1327
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			CI+Ex			CI+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	85.8		85.8	85.8
Total Split (%)	28.5%	28.5%	71.5%		71.5%	71.5%
Maximum Green (s)	27.0	27.0	79.8		79.8	79.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SAT Peak

35 Highbury Park Drive
2025 Total Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	14.9	14.9	91.9		91.9	91.9
Actuated g/C Ratio	0.12	0.12	0.77		0.77	0.77
v/c Ratio	0.46	0.62	0.55		0.74	0.51
Control Delay	54.3	35.4	4.4		33.3	7.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	54.3	35.4	4.4		33.3	7.0
LOS	D	D	A		C	A
Approach Delay	42.7		4.4			9.9
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	79.8		79.8	79.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	15.1	15.1	91.7		91.7	91.7
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	12.2	12.2	94.6		94.6	94.6
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	10.2	10.2	96.6		96.6	96.6
30th %ile Term Code	Gap	Gap	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	96.8		96.8	96.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	87	76	244		88	490
Fuel Used(l)	7	8	47		10	49
CO Emissions (g/hr)	131	151	875		187	903
NOx Emissions (g/hr)	25	29	169		36	174
VOC Emissions (g/hr)	30	35	202		43	208
Dilemma Vehicles (#)	0	0	9		0	55
Queue Length 50th (m)	22.1	18.2	24.6		15.0	47.1
Queue Length 95th (m)	34.0	35.3	38.1		#74.8	101.1
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	379	394	2568		219	2596
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	0.26	0.40	0.55		0.74	0.51

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

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

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 10.0

Intersection LOS: B

Intersection Capacity Utilization 76.8%

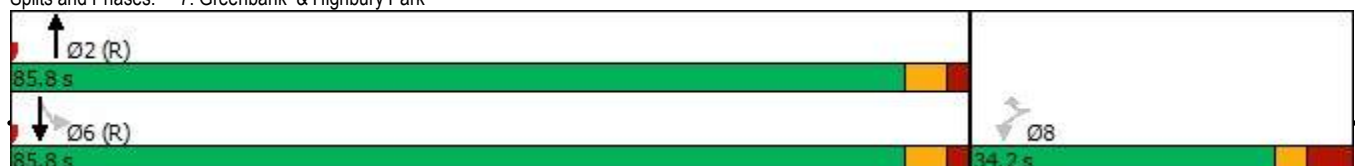
ICU Level of Service D

Analysis Period (min) 15

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










Queue shown is maximum after two cycles.

Splits and Phases: 7: Greenbank & Highbury Park


























8: Highbury Park & Access
SAT Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	34	212	211	5	4	28
Future Volume (Veh/h)	34	212	211	5	4	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	34	212	211	5	4	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	216				494	214
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	216				494	214
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				99	97
cM capacity (veh/h)	1354				522	827
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	246	216	32			
Volume Left	34	0	4			
Volume Right	0	5	28			
cSH	1354	1700	770			
Volume to Capacity	0.03	0.13	0.04			
Queue Length 95th (m)	0.6	0.0	1.0			
Control Delay (s)	1.3	0.0	9.9			
Lane LOS	A		A			
Approach Delay (s)	1.3	0.0	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			39.1%	ICU Level of Service		A
Analysis Period (min)			15			

3: Greenbank & Wessex/Berrigan
SUN Arrival Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	53	49	61	48	174	30	688	30	77	528	39
Future Volume (vph)	98	53	49	61	48	174	30	688	30	77	528	39
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99			1.00		0.97	1.00		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.726			0.691			0.456			0.355		
Satd. Flow (perm)	1283	1639	0	1223	1784	1517	811	3390	1464	630	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				174			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9			4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	98	53	49	61	48	174	30	688	30	77	528	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	102	0	61	48	174	30	688	30	77	528	39
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Arrival Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	16.5	16.5		16.5	16.5	16.5	74.9	69.8	69.8	77.0	72.7	72.7
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.68	0.63	0.63	0.70	0.66	0.66
v/c Ratio	0.51	0.36		0.33	0.18	0.46	0.05	0.32	0.03	0.15	0.24	0.04
Control Delay	50.4	27.0		44.0	39.0	9.4	6.5	11.6	0.1	5.4	7.8	0.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.4	27.0		44.0	39.0	9.4	6.5	11.6	0.1	5.4	7.8	0.1
LOS	D	C		D	D	A	A	B	A	A	A	A
Approach Delay		38.5			21.9			10.9			7.0	
Approach LOS		D			C			B			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.4	52.1	52.1	7.6	52.3	52.3
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	16.3	16.3		16.3	16.3	16.3	6.3	67.0	67.0	7.4	68.1	68.1
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	13.8	13.8		13.8	13.8	13.8	5.9	70.2	70.2	6.7	71.0	71.0
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	11.2	11.2		11.2	11.2	11.2	0.0	73.3	73.3	6.2	85.4	85.4
30th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	85	53		52	39	22	12	317	0	18	169	0
Fuel Used(l)	7	5		4	3	5	1	27	0	3	21	1
CO Emissions (g/hr)	134	95		75	55	95	18	499	8	52	399	18
NOx Emissions (g/hr)	26	18		15	11	18	4	96	2	10	77	3
VOC Emissions (g/hr)	31	22		17	13	22	4	115	2	12	92	4
Dilemma Vehicles (#)	0	0		0	0	0	0	31	0	0	20	0
Queue Length 50th (m)	20.2	11.9		12.2	9.4	0.0	1.4	32.4	0.0	3.0	16.8	0.0
Queue Length 95th (m)	30.6	22.7		20.7	16.7	15.5	6.3	64.5	0.0	8.9	34.4	0.3
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	367	499		350	510	558	614	2152	966	511	2239	1008
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.20		0.17	0.09	0.31	0.05	0.32	0.03	0.15	0.24	0.04

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 14.2

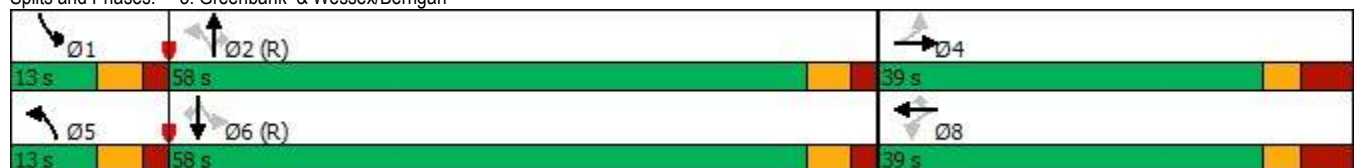
Intersection LOS: B

Intersection Capacity Utilization 58.8%

ICU Level of Service B












Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



7: Greenbank & Highbury Park
SUN Arrival Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	122	50	855	119	129	598
Future Volume (vph)	122	50	855	119	129	598
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.982			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3318	0	1695	3390
Flt Permitted	0.950				0.275	
Satd. Flow (perm)	1689	1493	3318	0	490	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		50	27			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	122	50	855	119	129	598
Shared Lane Traffic (%)						
Lane Group Flow (vph)	122	50	974	0	129	598
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0

7: Greenbank & Highbury Park
SUN Arrival Peak

35 Highbury Park Drive
2025 Total Traffic Volumes



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	15.4	15.4	81.4		81.4	81.4
Actuated g/C Ratio	0.14	0.14	0.74		0.74	0.74
v/c Ratio	0.52	0.20	0.40		0.36	0.24
Control Delay	50.3	11.9	4.3		9.9	5.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	50.3	11.9	4.3		9.9	5.5
LOS	D	B	A		A	A
Approach Delay	39.1		4.3			6.3
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	15.4	15.4	81.4		81.4	81.4
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	13.3	13.3	83.5		83.5	83.5
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	11.1	11.1	85.7		85.7	85.7
30th %ile Term Code	Gap	Gap	Coord		Coord	Coord
10th %ile Green (s)	10.0	10.0	86.8		86.8	86.8
10th %ile Term Code	Min	Min	Coord		Coord	Coord
Stops (vph)	107	12	201		51	180
Fuel Used(l)	8	2	33		5	20
CO Emissions (g/hr)	157	28	621		95	369
NOx Emissions (g/hr)	30	5	120		18	71
VOC Emissions (g/hr)	36	7	143		22	85
Dilemma Vehicles (#)	0	0	14		0	27
Queue Length 50th (m)	25.2	0.0	16.5		7.6	16.5
Queue Length 95th (m)	37.5	9.3	28.6		27.0	36.3
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	404	2463		362	2510
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	0.29	0.12	0.40		0.36	0.24

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 8.3

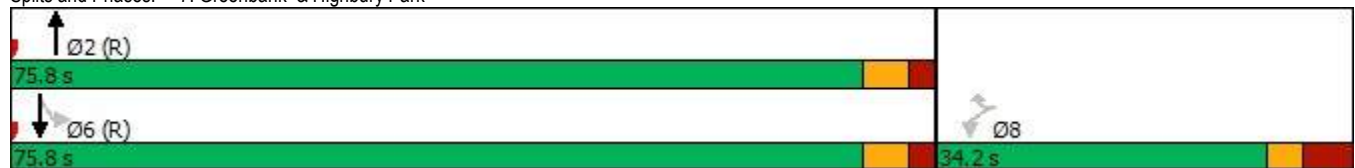
Intersection LOS: A

Intersection Capacity Utilization 63.0%

ICU Level of Service B










Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park


























8: Highbury Park & Access
SUN Arrival Peak

35 Highbury Park Drive
2025 Total Traffic Volumes

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	162	75	111	28	7	49
Future Volume (Veh/h)	162	75	111	28	7	49
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	162	75	111	28	7	49
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	139				524	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	139				524	125
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	89				98	95
cM capacity (veh/h)	1445				456	926
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	237	139	56			
Volume Left	162	0	7			
Volume Right	0	28	49			
cSH	1445	1700	820			
Volume to Capacity	0.11	0.08	0.07			
Queue Length 95th (m)	2.9	0.0	1.7			
Control Delay (s)	5.6	0.0	9.7			
Lane LOS	A		A			
Approach Delay (s)	5.6	0.0	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization			35.2%	ICU Level of Service	A	
Analysis Period (min)			15			













3: Greenbank & Wessex/Berrigan
SUN Departure Pe

35 Highbury Park Drive
2025 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	53	49	61	48	174	30	641	30	77	575	53
Future Volume (vph)	84	53	49	61	48	174	30	641	30	77	575	53
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	30.0		0.0	35.0		45.0	50.0		45.0	100.0		90.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	30.0			30.0			30.0			30.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	0.99	0.99		0.99			1.00		0.97	0.99		0.97
Frt		0.928				0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1695	1639	0	1695	1784	1517	1695	3390	1517	1695	3390	1517
Fit Permitted	0.726			0.691			0.434			0.379		
Satd. Flow (perm)	1283	1639	0	1223	1784	1517	772	3390	1464	673	3390	1474
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				174			103			103
Link Speed (k/h)		40			40			60			60	
Link Distance (m)		208.5			191.5			174.7			280.0	
Travel Time (s)		18.8			17.2			10.5			16.8	
Confl. Peds. (#/hr)	10		9	9			4		7	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	84	53	49	61	48	174	30	641	30	77	575	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	102	0	61	48	174	30	641	30	77	575	53
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7			3.7	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.5	38.5		38.5	38.5	38.5	10.9	31.9	31.9	10.9	31.9	31.9
Total Split (s)	39.0	39.0		39.0	39.0	39.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	35.5%	35.5%		35.5%	35.5%	35.5%	11.8%	52.7%	52.7%	11.8%	52.7%	52.7%
Maximum Green (s)	31.5	31.5		31.5	31.5	31.5	7.1	52.1	52.1	7.1	52.1	52.1
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	4.5	4.5		4.5	4.5	4.5	2.2	2.2	2.2	2.2	2.2	2.2
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

3: Greenbank & Wessex/Berrigan
SUN Departure Pe

35 Highbury Park Drive
2025 Total Traffic Volumes

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Lost Time (s)	7.5	7.5		7.5	7.5	7.5	5.9	5.9	5.9	5.9	5.9	5.9
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
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	24.0	24.0		24.0	24.0	24.0		19.0	19.0		19.0	19.0
Pedestrian Calls (#/hr)	9	9		10	10	10		7	7		4	4
Act Effct Green (s)	15.7	15.7		15.7	15.7	15.7	75.6	70.6	70.6	77.8	73.4	73.4
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.69	0.64	0.64	0.71	0.67	0.67
v/c Ratio	0.46	0.38		0.35	0.19	0.48	0.05	0.29	0.03	0.14	0.25	0.05
Control Delay	49.1	27.8		45.2	39.9	9.8	6.3	11.1	0.1	4.8	7.2	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.1	27.8		45.2	39.9	9.8	6.3	11.1	0.1	4.8	7.2	0.3
LOS	D	C		D	D	A	A	B	A	A	A	A
Approach Delay		37.4			22.5			10.4			6.4	
Approach LOS		D			C			B			A	
90th %ile Green (s)	31.0	31.0		31.0	31.0	31.0	7.4	52.1	52.1	7.6	52.3	52.3
90th %ile Term Code	Ped	Ped		Ped	Ped	Ped	Gap	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	14.9	14.9		14.9	14.9	14.9	6.2	68.5	68.5	7.3	69.6	69.6
70th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	12.6	12.6		12.6	12.6	12.6	5.9	71.4	71.4	6.7	72.2	72.2
50th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	10.1	10.1		10.1	10.1	10.1	0.0	74.4	74.4	6.2	86.5	86.5
30th %ile Term Code	Gap	Gap		Hold	Hold	Hold	Skip	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	10.0	10.0		10.0	10.0	10.0	0.0	86.6	86.6	0.0	86.6	86.6
10th %ile Term Code	Min	Min		Min	Min	Min	Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	73	53		52	39	22	12	284	0	18	175	1
Fuel Used(l)	6	5		4	3	5	1	24	0	3	23	1
CO Emissions (g/hr)	113	97		76	56	96	18	453	8	51	425	25
NOx Emissions (g/hr)	22	19		15	11	18	4	87	2	10	82	5
VOC Emissions (g/hr)	26	22		18	13	22	4	104	2	12	98	6
Dilemma Vehicles (#)	0	0		0	0	0	0	29	0	0	20	0
Queue Length 50th (m)	17.4	12.0		12.4	9.5	0.0	1.3	28.6	0.0	2.6	16.8	0.0
Queue Length 95th (m)	26.8	22.7		20.7	16.7	15.5	6.3	59.5	0.0	8.2	40.9	1.2
Internal Link Dist (m)		184.5			167.5			150.7			256.0	
Turn Bay Length (m)	30.0			35.0		45.0	50.0		45.0	100.0		90.0
Base Capacity (vph)	367	499		350	510	558	595	2175	976	543	2263	1018
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.20		0.17	0.09	0.31	0.05	0.29	0.03	0.14	0.25	0.05

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 13.4

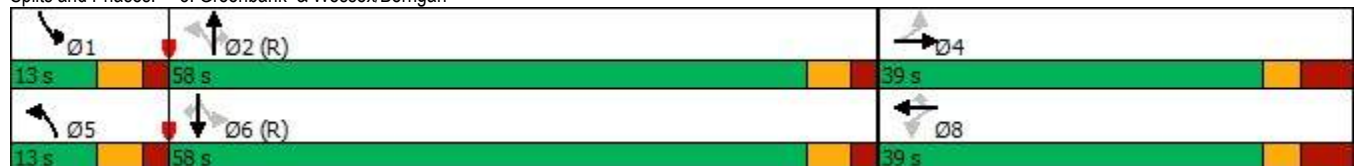
Intersection LOS: B












Intersection Capacity Utilization 58.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Greenbank & Wessex/Berrigan



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	183	102	855	58	77	598
Future Volume (vph)	183	102	855	58	77	598
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	50.0		0.0	60.0	
Storage Lanes	1	1		0	1	
Taper Length (m)	30.0				30.0	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	1.00	0.98	1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1695	1517	3350	0	1695	3390
Flt Permitted	0.950				0.291	
Satd. Flow (perm)	1689	1493	3350	0	518	3390
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		102	12			
Link Speed (k/h)	40		60			60
Link Distance (m)	168.4		280.0			221.4
Travel Time (s)	15.2		16.8			13.3
Confl. Peds. (#/hr)	3	3		4	4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	183	102	855	58	77	598
Shared Lane Traffic (%)						
Lane Group Flow (vph)	183	102	913	0	77	598
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		3.7			3.7
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.9		4.9			4.9
Two way Left Turn Lane						
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06
Turning Speed (k/h)	24	14		14	24	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (m)	6.1	6.1	30.5		6.1	30.5
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	6.1	6.1	1.8		6.1	1.8
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)			28.7			28.7
Detector 2 Size(m)			1.8			1.8
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Perm	Perm	NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8	8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		10.0	10.0
Minimum Split (s)	34.2	34.2	36.0		36.0	36.0
Total Split (s)	34.2	34.2	75.8		75.8	75.8
Total Split (%)	31.1%	31.1%	68.9%		68.9%	68.9%
Maximum Green (s)	27.0	27.0	69.8		69.8	69.8
Yellow Time (s)	3.0	3.0	3.7		3.7	3.7
All-Red Time (s)	4.2	4.2	2.3		2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Lost Time (s)	7.2	7.2	6.0		6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	C-Max		C-Max	C-Max
Walk Time (s)	7.0	7.0	18.0		18.0	18.0
Flash Dont Walk (s)	20.0	20.0	12.0		12.0	12.0
Pedestrian Calls (#/hr)	3	3	4		0	0
Act Effct Green (s)	17.9	17.9	78.9		78.9	78.9
Actuated g/C Ratio	0.16	0.16	0.72		0.72	0.72
v/c Ratio	0.67	0.31	0.38		0.21	0.25
Control Delay	54.3	9.5	4.7		8.2	6.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	54.3	9.5	4.7		8.2	6.3
LOS	D	A	A		A	A
Approach Delay	38.3		4.7			6.5
Approach LOS	D		A			A
90th %ile Green (s)	27.0	27.0	69.8		69.8	69.8
90th %ile Term Code	Ped	Ped	Coord		Coord	Coord
70th %ile Green (s)	19.8	19.8	77.0		77.0	77.0
70th %ile Term Code	Gap	Gap	Coord		Coord	Coord
50th %ile Green (s)	17.2	17.2	79.6		79.6	79.6
50th %ile Term Code	Gap	Gap	Coord		Coord	Coord
30th %ile Green (s)	14.6	14.6	82.2		82.2	82.2
30th %ile Term Code	Gap	Gap	Coord		Coord	Coord
10th %ile Green (s)	10.8	10.8	86.0		86.0	86.0
10th %ile Term Code	Gap	Gap	Coord		Coord	Coord
Stops (vph)	166	17	188		29	196
Fuel Used(l)	13	3	32		3	21
CO Emissions (g/hr)	247	52	587		54	385
NOx Emissions (g/hr)	48	10	113		10	74
VOC Emissions (g/hr)	57	12	135		12	89
Dilemma Vehicles (#)	0	0	14		0	27
Queue Length 50th (m)	37.6	0.0	16.0		4.7	19.6
Queue Length 95th (m)	54.3	12.9	27.4		14.4	36.3
Internal Link Dist (m)	144.4		256.0			197.4
Turn Bay Length (m)		50.0			60.0	
Base Capacity (vph)	414	443	2406		371	2432
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	0.23	0.38		0.21	0.25

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 10.4

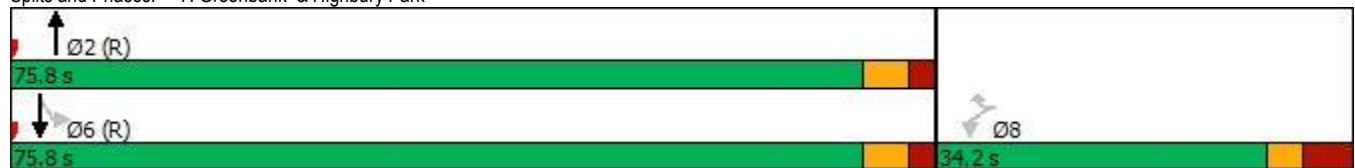
Intersection LOS: B

Intersection Capacity Utilization 63.1%

ICU Level of Service B










Analysis Period (min) 15

Splits and Phases: 7: Greenbank & Highbury Park



8: Highbury Park & Access
SUN Departure Pe

35 Highbury Park Drive
2025 Total Traffic Volumes

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	49	75	111	7	28	162
Future Volume (Veh/h)	49	75	111	7	28	162
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	49	75	111	7	28	162
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	118				288	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	118				288	114
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				96	83
cM capacity (veh/h)	1470				680	938
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	124	118	190			
Volume Left	49	0	28			
Volume Right	0	7	162			
cSH	1470	1700	888			
Volume to Capacity	0.03	0.07	0.21			
Queue Length 95th (m)	0.8	0.0	6.1			
Control Delay (s)	3.1	0.0	10.2			
Lane LOS	A		B			
Approach Delay (s)	3.1	0.0	10.2			
Approach LOS			B			
Intersection Summary						
Average Delay			5.4			
Intersection Capacity Utilization			32.6%	ICU Level of Service		A
Analysis Period (min)			15			