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Kizell Lands
5618 Hazeldean Road

Community Transportation Study/ Transportation Impact Study

Engineering excellence. Planning precision. Inspired landscapes.

Kizell Lands

5618 Hazeldean Road

Community Transportation Study/Transportation Impact Study

Prepared By:

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

November 2016
Revised February 2020
Revised May 2020

Novatech File: 108195
Ref: R-2016-161

May 20th, 2020

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

Attention: **Mike Giampa**
Project Manager, Infrastructure Approvals

Dear Mr. Giampa:

Reference: **Kizell Lands – 5618 Hazeldean Road**
Community Transportation Study/Transportation Impact Study
Our File No.: 108195

We are pleased to submit the following revised Community Transportation Study (CTS) and Transportation Impact Study (TIS) in support of the Zoning By-Law Amendment and Draft Plan of Subdivision applications for the lands located at 5618 Hazeldean Road.

A CTS/TIS was submitted in November 2016. This report has been revised to address changes to the proposed draft plan.

A PDF version of this report and copies of the digital Synchro software files are provided on the enclosed disk.

If you have any questions or require anything else during your review, please call.

Yours truly,

NOVATECH

B. Byvelds

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

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

TIA Plan Reports

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

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

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

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] 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 (City) this 20th day of May, 2020 .

Name: Brad Byvelds
(Please Print)

Professional Title: P. Eng. - Project Coordinator

B. Byvelds

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

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EXECUTIVE SUMMARY

This combined Community Transportation Study (CTS) and Transportation Impact Study (TIS) has been prepared in support of Zoning By-Law Amendment and Draft Plan of Subdivision applications for the lands located at 5618 Hazeldean Road and is henceforth referred to as the Kizell Lands.

The Kizell Lands are located in the Fernbank Community Design Plan (CDP) and consist of approximately 86 ha of vacant lands, bound by Hazeldean Road to the north, Abbott Street/residential development to the south, future development to the east and industrial land uses along Iber Road to the west. The subject lands are currently zoned Development Reserve (DR).

The Concept Plan prepared for the subject lands accommodates the following development:

- 288 Single Detached Dwellings
- 469 Townhouse Dwellings
- 878 Multi-Family Housing Dwellings (Low Rise)
- 360 Apartment Units (High Density)
- 760 Apartments and 351,334ft^2 of Retail (Mixed Use)
- 580 Student Elementary School
- 375 Parking Space Parking and Ride

The proposed development will generally be accessed through the extension of Robert Grant Avenue from Abbott Street to Hazeldean Road, as well as internal connections to the adjacent subdivision to the east. Detailed design of the Robert Grant Avenue extension will be completed as part of the detailed design of the subdivision. Auxiliary lane requirements and intersection control types are recommended as part of this study.

Construction is anticipated to commence in 2020, with full build-out and occupancy expected in 2030.

The study area for the report will includes all access intersections as well as the following:

- Robert Grant Avenue/Abbott Street
- Hazeldean Road/Toys R Us Access/Future Robert Grant Avenue (Existing Signal)
- Hazeldean Road/Lowe's Access (west)/Future Mixed-Use Access (Existing Signal)

The selected time periods for the analysis are the weekday AM and PM peak hours. The weekday AM and PM peak hours are considered to represent the 'worst case' combination of site-generated traffic and adjacent street traffic.

The main findings, conclusions and recommendations of this report are as follows:

Development Design, Parking, and Boundary Streets

- The internal road pattern is generally consistent with the Fernbank CDP and will promote the safe and efficient movement of vehicles, cyclists and pedestrians.
- Parking will be provided in the form of driveways accessing a garage/carport located on the same lot for each dwelling unit, as well as on-site parking lots for the multi-family residential units, high density residential, mixed use and elementary school sites.

- On-street visitor parking can be accommodated within the ROW along the major collector roads as required.
- Hazeldean Road adjacent to the proposed subdivision meets all MMLOS targets.

Access Intersection Design

- The spacing of intersections along Robert Grant Avenue is generally consistent with the recommendations of the Fernbank CDP and the constructed portion of Robert Grant Avenue to the south.
- The Robert Grant Avenue/Cranesbill Road/Street 15 intersection will operate under roundabout control during the interim. Once Robert Grant Avenue is widened to accommodate median BRT in the future, this intersection will be signalized.
- The Robert Grant Avenue/Abbott Street intersection currently operates under roundabout control. Once Robert Grant Avenue is widened to accommodate median BRT in the future, this intersection will be signalized.
- Three additional full movement intersections (Streets 3, 8, and 13) are proposed on Robert Grant Avenue in the interim until restriction of the left turn movements is required for safety or capacity reasons (i.e. excessive delays exiting onto Robert Grant Avenue). This approach is consistent with the Robert Grant Avenue/Haliburton Heights intersection to the south, along the constructed portion of Robert Grant Avenue.
- Street 1, 11 and 12 will be accessed via full movement unsignalized intersections along Abbott Street.
- The mixed-use block located along Hazeldean Road will tie into the existing signalized Lowe's access intersection.

Transportation Demand Management, Neighbourhood Traffic Management, and Transit

- The following TDM measures will be implemented as the proposed subdivision is built:
    - Display local area maps with walking/cycling routes and key destinations (at sales centre);
    - Display relevant transit schedules and route maps (at sales centre);
    - Provide multimodal travel option information packages to new residents (at sales centre).
- The proposed street layout conforms to the initiatives identified in the Fernbank CDP. The subject lands are located adjacent to two arterial roadways (i.e. Robert Grant Avenue and Hazeldean Road) and are not anticipated to have any measurable impact on the future residential communities in the site's vicinity.
- The detail design of the Robert Grant Avenue extension should accommodate transit priority measures in accordance with the City's 2031 Affordable plan. Per the City's TMP, at-grade BRT lanes will ultimately be constructed in the median of Robert Grant Avenue in the future.
- The collector roads will be constructed to support future transit service.

Network Concept

- The proposed screenlines are anticipated to operate with a LOS B or better during the AM and PM peak hours under background traffic conditions.
- Abbott Street is anticipated to operate above capacity during the AM peak hour under the future total traffic condition. Although Abbott Street is anticipated to operate above capacity, the overall north-south screenline is anticipated to operate with LOS C or better during the AM and PM peak hours. If traffic congestion is realized along Abbott Street, drivers can use alternative routes to travel east (i.e. Hazeldean Road) to Terry Fox Drive.

Network Intersections – MMLOS Analysis

- The Hazeldean Road/Shoppes at Fairwinds and Hazeldean Road/Grant Crossing intersections currently meet the target TLOS, TkLOS and Auto LOS. The PLOS and BLOS at these intersections do not meet the target for the General Urban Area. The poor PLOS and BLOS at these intersections are attributable to the number of travel lanes along Hazeldean Road.
- All approaches to the Robert Grant Avenue/Hazeldean Road and Hazeldean Road/Grant Crossing/Mixed-Use Access intersections will not meet the target PLOS for the General Urban Area. Improvement of the PLOS at these intersections is limited by the number of travel lanes and turn lanes required along Hazeldean Road and Robert Grant Avenue. Consideration could be given to implementing leading pedestrian intervals and zebra striped or textured crosswalks, subject to meeting warrants, during the detailed design of the intersections.
- The east and west approaches to the Robert Grant Avenue/Hazeldean Road and Hazeldean Road/Grant Crossing/Mixed-Use Access intersections will not meet the target BLOS for the General Urban Area. Consideration could be given to implementing a protected intersection as part of the detailed design of these intersections, to be completed as part of future applications. A protected intersection would improve these intersections to a BLOS A.
- All approaches to the Robert Grant Avenue/Hazeldean Road intersection will not meet the target transit LOS. The ultimate design of Robert Grant Avenue provides a north-south grade separated crossing for the median BRT at the Hazeldean Road/Robert Grant Avenue intersection. This grade separated crossing will improve the TLOS on the north and south approaches to this intersection.

Network Intersections – Scenario One

- When this transit station is developed, the target Auto LOS will be reduced to LOS E.
- All intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station under background and total traffic conditions.

Network Intersections – Scenario Two

- All intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station under background and total traffic conditions.
- With the shift to non-auto modes anticipated as development progresses and the future BRT/LRT extension to this area, the development permitted under the proposed zoning is anticipated be accommodated by the study area intersections.
- The storage length requirements for the future Hazeldean Road/Grant Crossing/Mixed-Use Access will be reviewed during a future Site Plan Control application.
- The recommended storage lengths for the future Hazeldean Road/Robert Grant Avenue intersection are summarized as follows:
    - Eastbound Left: 65m
    - Westbound Left: 50m
    - Westbound Right: 55m
    - Northbound left: 25m
    - Northbound Right: 50m
    - Southbound Left: 75m
    - Southbound Right: 85m

1.0 INTRODUCTION

This combined Community Transportation Study (CTS) and Transportation Impact Study (TIS) has been prepared in support of Zoning By-Law Amendment and Draft Plan of Subdivision applications for the lands located at 5618 Hazeldean Road. The subject lands are shown in **Figures 1** and **2** below and are henceforth referred to as the Kizell Lands.

Figure 1: Local Area Context

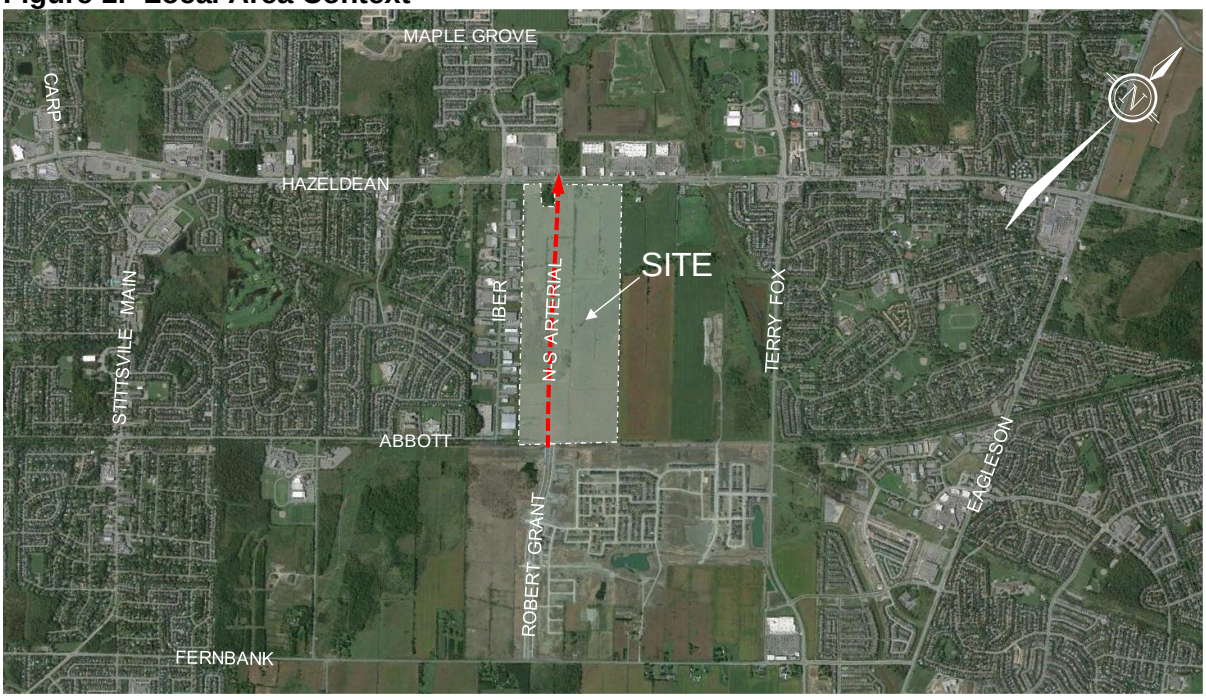


Figure 2: Hazeldean Road Context

The Kizell Lands are located in the Fernbank Community Design Plan (CDP) and consist of approximately 86 ha of vacant lands, bound by Hazeldean Road to the north, Abbott Street/residential development to the south, a draft approved residential subdivision to the east and industrial land uses along Iber Road to the west. The subject lands are currently zoned Development Reserve (DR).

1.1 Proposed Development

The Concept Plan prepared for the subject lands accommodates the following potential development:

- 288 Single Detached Dwellings
- 469 Townhouse Dwellings
- 878 Multi-Family Housing Dwellings (Low Rise)
- 360 Apartment Units (High Density)
- 760 Apartments and 351,334ft^2 of Retail (Mixed Use)
- 580 Student Elementary School
- 375 Parking Space Parking and Ride

The proposed development will generally be accessed through the extension of Robert Grant Avenue from Abbott Street to Hazeldean Road, as well as internal connections to the adjacent subdivision to the east. The road allowance for Robert Grant Avenue will be conveyed to the City through this application, however the detailed design of the roadway will be completed in the future by others. Auxiliary lane requirements and intersection control types are recommended as part of this study.

The Draft Plan of Subdivision is included in **Appendix A**. Construction is anticipated to commence in 2020, with full build-out and occupancy expected in 2030.

2.0 EXISTING AND PLANNED CONDITIONS

2.1 Existing Roadways

Hazeldean Road, is an east-west arterial roadway that extends from Spruce Ridge Road in the west to Eagleson Road in the east, where it continues east as Robertson Road. Within the vicinity of the subject development, Hazeldean Road is a four-lane divided roadway with a posted speed limit of 60 km/h. The City's *Official Plan* (OP) protects a right-of-way (ROW) width of 44.5m between Fringewood Drive and Terry Fox Drive.

Abbott Street, is an east-west major collector roadway that extends from West Ridge Drive in the west to Terry Fox Drive in the east. Within the vicinity of the subject development, Abbott Street is a two-lane undivided roadway with a posted speed limit of 40 km/hr.

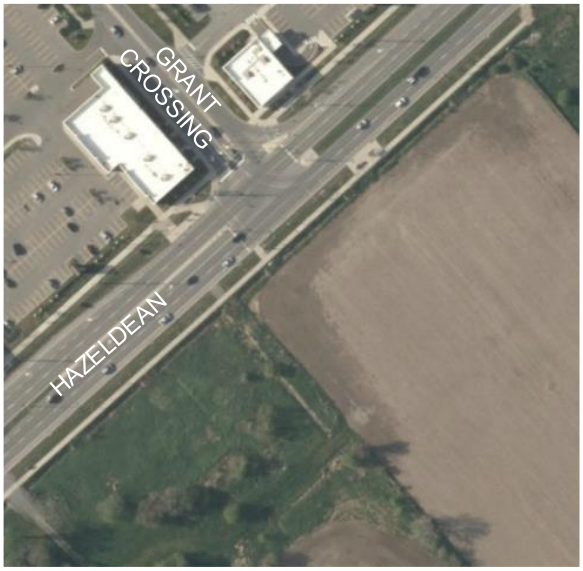
Robert Grant Avenue, is a recently constructed north-south arterial roadway that extends from Fernbank Road to Abbott Street. In the vicinity of the subject development, Robert Grant Avenue has a two-lane undivided urban cross section with a posted speed limit of 60 km/hr.

2.2 Existing Intersections

The lane configurations and traffic control at each of the study area intersections can be summarized as follows:

Hazeldean/The Shoppes at Fairwinds SC (330m East of Iber)

- Southbound – One left turn lane and one right turn lane
- Eastbound – Two through lanes and one left turn lane
- Westbound – Two through lanes and one channelized right turn lane



Hazeldean/Grant Crossing (630m East of Iber)

- Southbound – Two left turn lanes and one right turn lane
- Eastbound – Two through lanes and one left turn lane
- Westbound – Two through lanes and one channelized right turn lane
- The westbound U-Turn movement is restricted

2.3 Existing Driveways

Three existing driveways are provided along Abbott Street west of Robert Grant Avenue. These driveways serve Paul-Desmarais Catholic High School at 5315 Abbott Street.

Two right-in right-out driveways and one signalized access are provided along Hazeldean Road west of the future Robert Grant Avenue. These driveways serve the Shoppes at Fairwinds retail development at 5705 Hazeldean Road. The signalized access will be converted to the future Hazeldean Road/Robert Grant Avenue intersection once Robert Grant Avenue is extended north to Palladium Drive.

One right-in right-out driveway and one signalized access are provided along Hazeldean Road east of the future Robert Grant Avenue. These driveways serve the Grant Crossing retail development at 5527, 5577, and 5617 Hazeldean Road.

2.4 Existing Pedestrian and Bicycle Facilities

Hazeldean Road has sidewalks and bicycle lanes on both sides of the roadway in the vicinity of the subject site. Robert Grant Avenue has sidewalks and raised cycle tracks along both sides of the roadway. Both Hazeldean Road and Robert Grant Avenue are identified as spine cycling routes in the City's Ultimate Cycling Network. The Trans Canada Trail extends along the south side of Abbott Street between West Ridge Drive and Robert Grant Avenue, where it continues east towards Terry Fox Drive. The existing pedestrian and cycling network in the vicinity of the subject development is shown in **Figure 3** below.

2.5 Existing Area Traffic Management Measures

There are no Area Traffic Management (ATM) studies that have been completed or are currently in progress within the study area. There are no traffic calming measures in place along the study area roadways.

2.6 Existing Transit Facilities

OC Transpo bus stops #1154 and #1155 are currently located along Hazeldean Road just west of the Shoppes at Fairwinds signalized intersection. OC Transpo bus stops #0774 and #0775 are located along Hazeldean Road in the northwest and southeast corners of the Grant Crossing signalized intersection. These bus stops provide service to OC Transpo Route 61, which travels between the Goulbourn Recreation Complex (Stittsville) and the Tunney's Pasture Transit Station. During the peak hour, this route is extended across the Chaudiere Bridge to Gatineau.

2.7 Existing Traffic Volumes

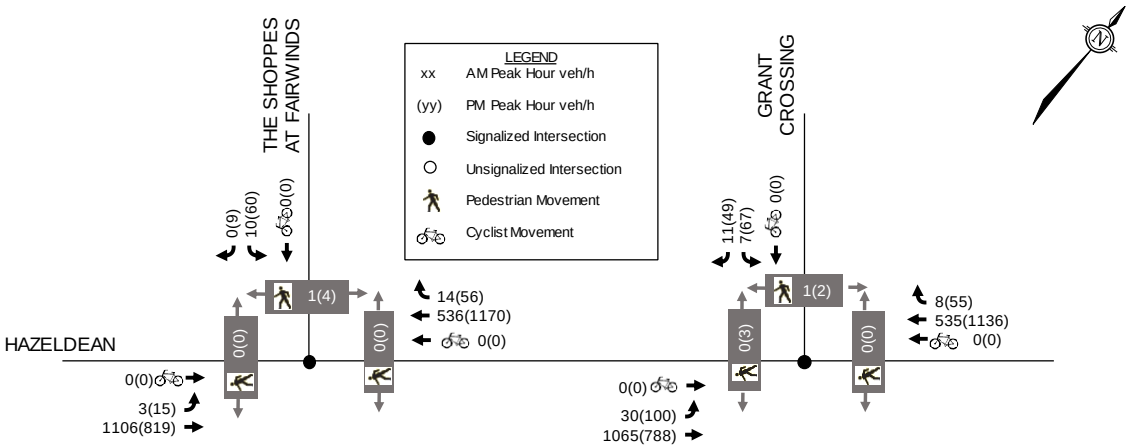
Eight-hour traffic counts were completed by the City of Ottawa at the Hazeldean Road/Shoppes at Fairwinds and Hazeldean Road/Grant Crossing signalized intersections on January 19th, 2016. All other study area intersections are to be constructed as part of the subject development. Peak hour summary sheets of the aforementioned traffic counts are included in **Appendix B**.

Existing traffic volumes at the Hazeldean Road/Shoppes at Fairwinds and Hazeldean Road/Grant Crossing signalized intersections are shown in **Figure 4**.

Figure 3: Existing Pedestrian and Cycling Network

Source: http://maps.ottawa.ca/geoOttawa/

Figure 4: Existing Traffic Volumes



2.8 Collision Records

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

The collision data has been evaluated to determine if there are any identifiable collision patterns. The number of collisions at each intersection from January 1, 2014 to December 31, 2018 is summarized in the following table.

Table 1: Reported Collisions

Intersection	Number of Reported Collisions
Hazeldean Road/Shoppes at Fairwinds	0
Hazeldean Road/Grant Crossing	5

No collisions were reported at the Hazeldean Road/Shoppes at Fairwinds signalized intersection over the last five years.

A total of five collisions were reported at the Hazeldean Road/Grant Crossing signalized intersection over the last five years. Three of the reported collisions were turning movement impacts involving eastbound left turning vehicles. One of the reported collisions was an angle impact between a vehicle and a cyclist. One of the reported collisions was a sideswipe impact involving eastbound vehicles.

None of the above noted collisions meet the City's criteria for further analysis with respect to patterns or total number of collisions.

2.9 Planned Conditions

2.9.1 Planned Roadway Improvements

The Kizell Lands form a part of a larger area that is to become the Fernbank Community, and is subject to the objectives and recommendations of the Fernbank Community Design Plan (CDP).

One of the major supporting documents for the CDP is the Fernbank Transportation Master Plan (TMP). This document outlines the projects and initiatives that will be required to meet the specific transportation needs to fully build-out the Fernbank Community, and help to service future growth of the West Urban Community.

A major element of this transportation plan is Robert Grant Avenue, which will bisect the Fernbank Community and provide it with links to the existing major arterial links in the area. The Fernbank TMP concludes that a two-lane cross-section will be required for Robert Grant Avenue to accommodate estimated future transport. A ROW of 45.5m is identified to ensure that this road can be widened to a divided four lane roadway when the traffic volumes warrant it in the years beyond 2031. The road allowance for Robert Grant Avenue will be conveyed to the City through this application, however the detailed design of the roadway will be completed in the future by others. Based on discussions with City staff, it is understood that the extension of Robert Grant Avenue from Hazeldean Road to Palladium Drive is scheduled for 2027-2028.

2.9.2 Planned Transit Improvements

The City's TMP identifies transit signal priority and queue jump lanes at select intersections along Robert Grant Avenue between Fernbank Road and Palladium Drive in its 2031 Affordable Rapid Transit and Transit Priority (RTTP) Network. Transit signal priority and queue jump lanes are also identified at select intersections along Hazeldean Road between Stittsville Main Street and Eagleson Road in the 2031 Affordable Network.

The TMP's 2031 RTTP Network Concept identifies exclusive Bus Rapid Transit between Fernbank Road and Eagleson station as part of the West Transitway Extension. Between Fernbank Road and Hazeldean Road the BRT facility will be constructed in the median of Robert Grant Avenue with at grade crossings. North of Hazeldean the BRT will follow its own alignment independent of the Stittsville North-South Arterial (Robert Grant Avenue) with grade separated crossings. The extension will include new transit stations at Didsbury, Carp, Campeau, Canadian Tire Center, Maple Grove, Hazeldean (Park and Ride), Abbott (Park and Ride), and Fernbank (Park and Ride). The Hazeldean Park and Ride is anticipated to contain two parking lots containing 325 spaces each in the northeast and southeast corners of the Robert Grant Avenue/Hazeldean Road intersection.

The Kanata Light Rail Transit (LRT) Planning and Environmental Assessment Study was prepared in January 2019. The Kanata LRT facility will convert a portion of the aforementioned West Transitway Extension to LRT. This facility will extend LRT from the Moodie Transit Station (terminus of Stage 2 LRT) to the future Hazeldean Transit Station. New LRT stations will be developed at March, Kanata Town Centre, Didsbury, Campeau, Palladium (Canadian Tire Centre), Maple Grove, and Hazeldean.

Based on the foregoing transit improvements in this area, the transit modal split (TMS) for the Kizell Lands may be quite low initially, but is anticipated to increase over time as the extent and quality of public transit service improves in line with the overall development of the Fernbank Community. The Kizell Lands are anticipated to be well served by the transit facilities following the completion of the overall Fernbank Community due to the proximity to improved transit facilities along Robert Grant Avenue and Hazeldean Road.

2.9.3 Planned Pedestrian and Cycling Projects

Robert Grant Avenue between Abbott Street and Hazeldean Road is identified as spine cycling route, and Cranesbill Road is identified as a local cycling route in the City's Ultimate Cycling Network. Cycle tracks will be constructed as part of Robert Grant Avenue between Abbott Street and Hazeldean Road. Future off-road major pathways include the hydro corridor between Robert Grant Avenue and the Trans Canada Trail, and a corridor along the Carp River, east of the Fernbank CDP lands.

No other pedestrian or cycling projects are identified for the subject study area roadways as part of the City's 2031 Affordable Plan.

2.9.4 Other Area Developments

In proximity of the proposed development, there are multiple other developments that are under construction, approved, or in the approval process. The other area developments included in this analysis are summarized below. An aerial photo showing the location of other area developments is provided in **Figure 5**.

A TIS dated September 2013 was prepared by Stantec in support of Draft Plan of Subdivision application for 590 Hazeldean Road (Richcraft subdivision) immediately east of the subject lands. This development consists of 227 single family detached dwellings and 518 townhouse dwellings. Construction of preliminary phases of this development is currently ongoing.

A Transportation Brief dated March 2013 was prepared by Stantec in support of Draft Plan of Subdivision application for 570 Hazeldean Road (Mattamy subdivision) east of the subject lands and adjacent to the Carp river. This development consists of approximately 600 residential units. Construction of this development is currently ongoing.

Figure 5: Other Area Developments

Phases 1-3 of the Abbott-Fernbank subdivision are generally built-out. Construction of Phase 4 and 5 of the subdivision is currently ongoing and is anticipated to be built-out by 2021. The Abbott-Fernbank subdivision is located north of Fernbank Road, between Robert Grant Avenue and Phase 5 of the Blackstone subdivision. A TIA dated March 2019 was prepared by Novatech in support of Site Plan Control application for 360 Haliburton Heights within the Phase 3 of the Fernbank Crossing subdivision. The development consists of 58 residential units.

Phases 1-3 of the Blackstone subdivision are generally built-out. A TIS dated May 2017 and Addendum dated February 2018 were prepared by Parsons in support of a Draft Plan of Subdivision application for 5505 Fernbank Road, also known as Blackstone Phases 4-8. The development consists of 219 townhouse units, 241 single detached dwelling units, a condominium block containing 156 units, an elementary school accommodating 650 students (the subject site), and a high school accommodating 1916 students. A subsequent TIA dated May 2019 was prepared by Parsons in support of a Site Plan Control application for the condominium block within the aforementioned subdivision.

A Transportation Letter dated January 2011 was prepared by IBI Group in support of Draft Plan of Subdivision applications for 5786 Fernbank Road, also known as the CRT Lands Phases 1-2. The development consists of 510 single family detached dwellings, 364 townhouses, an elementary school, and a high school. Construction of Phase 1 of the CRT Lands is currently ongoing. A TIA dated July 2019 was prepared Parsons in support of a Site Plan Control application for 700 Cope Drive, which forms part of the CRT lands. The proposed development consists of a High School (Grades 7-12) with a capacity of 1800 students.

A TIA dated June 2019 was prepared by Parsons in support of a Zoning By-law Amendment application for 1000 Robert Grant Avenue. The proposed development consists of three residential towers with a total of 566 units.

A TIA dated August 2019 was prepared by D.J. Halpenny & Associates Ltd. In support of a Site Plan Control application for 5705 Hazeldean Road. The proposed development consists of a 47,710ft^2 expansion to the existing retail development.

2.10 Study Area and Time Periods

The study area for the report will includes all access intersections as well as the following:

- Robert Grant Avenue/Abbott Street
- Hazeldean Road/Shoppes at Fairwinds/Future Robert Grant Avenue (Existing Signal)
- Hazeldean Road/Grant Crossing/Future Mixed-Use Access (Existing Signal)

The selected time periods for the analysis are the weekday AM and PM peak hours. The weekday AM and PM peak hours are considered to represent the ‘worst case’ combination of site-generated traffic and adjacent street traffic. For the purposes of this analysis, two scenarios have been reviewed.

The first scenario assumes the subdivision adheres to the Fernbank CDP density requirements and is fully built-out by 2028. Due to the extended development period, a five-year period beyond build-out has not been analyzed for this scenario. This scenario assumes the following development for the subject lands.

- 288 Single Detached Dwellings
- 469 Townhouse Dwellings
- 878 Multi-Family Housing Dwellings (Low Rise)
- 297 Apartment Units (High Density)
- 191 Apartments and 140,910ft^2 of Retail (Mixed Use)
- 580 Student Elementary School
- 375 Parking Space Parking and Ride

However, the proposed development intends to subdivide the property and rezone the respective lots and blocks to facilitate development that aligns with the direction of the Fernbank CDP, and to address the introduction of a future LRT station at the northern end of the property, which was not accounted for in the preparation of the CDP. This is achieved by providing transit supportive uses within a 600 metre walking distance of the LRT station in accordance with the City of Ottawa's Transit Oriented Development (TOD) Guidelines.

Blocks 318 and 319 will accommodate high density development, with approximately 360 apartment units. Blocks 315 to 317 will accommodate mixed-use development, with approximately 760 apartment units and 351,334ft^2 of retail development, and will surround and be integrated with the planned Hazeldean transit station and park and ride. Due to the higher density, these blocks are anticipated to be developed in line with the future BRT or LRT extension to this area. As the timing for the BRT/LRT extension is unknown at this point in time, a future scenario has been developed to review the impacts of the development permitted under the proposed zoning once the BRT/LRT is extended.

3.0 FORECASTING

3.1 Development Generated Travel Demand

3.1.1 Trip Generation

Trips generated by the residential portion of the proposed development have been estimated using relevant rates for the suburban area in Table 3.18 of the *2009 TRANS Trip Generation Study Report*. Trips generated by the proposed retail, school, and park and ride developments have been estimated using the relevant peak hour rates identified in the Institute of Transportation Engineers (ITE) *Trip Generation Manual,10th Edition*. The trips generated by the proposed development during the weekday AM and PM peak hours for each scenario are summarized in **Table 2** below.

Table 2: ITE Trip Generation – Scenario One

Land Use	Code	Units/ GFA (ft^2)	AM Peak			PM Peak		
			In	Out	Total	In	Out	Total
Scenario One								
Single Detached Dwellings	210	288	59	143	202	163	96	259
Townhouse Dwellings	224	469	94	159	253	210	123	333
Multi-Family Dwellings	232	878	125	279	404	226	178	404
High Density	223	297	21	65	86	68	42	110
Mixed-Use (Residential)	222	191	13	42	55	43	26	69
Mixed-Use (Retail)	820	140,910	138	84	222	336	364	700
Elementary School	520	580	210	179	389	47	52	99
Park and Ride	090	325	100	27	127	38	114	152
Scenario Two								
Single Detached Dwellings	210	288	59	143	202	163	96	259
Townhouse Dwellings	224	94	159	253	210	123	333	234
Multi-Family Dwellings	232	878	125	279	404	226	178	404
High Density	223	360	25	79	104	82	51	133
Mixed-Use (Residential)	222	760	53	167	220	170	104	274
Mixed-Use (Retail)	820	351,334	203	124	327	661	716	1,377
Elementary School	520	580	210	179	389	47	52	99
Park and Ride	090	325	100	27	127	38	114	152

Trips generated using the TRANS rates have been converted to person trips using the modal shares presented in Table 3.13 of the TRANS report. Trips generated using the ITE rates have been converted to person trips using a factor of 1.28, consistent the City's 2017 Transportation Impact Assessment Guidelines. It is noteworthy that the trips generated by the elementary school and park and ride have not been converted to person trips due to the nature of the land uses. Person trips generated by the proposed residential and retail developments are summarized in **Table 3** below.

Table 3: Person Trip Generation – Scenario One

Land Use	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Scenario One						
Single Detached Dwellings	106	261	367	255	150	405
Townhouse Dwellings	180	307	487	338	199	537
Multi-Family Dwellings	285	633	918	514	404	918
High Density	47	148	195	155	95	250
Mixed-Use (Residential)	30	95	125	97	60	157
Mixed-Use (Retail)	176	108	284	430	466	896
Total	**824**	**1,552**	**2,376**	**1,789**	**1,374**	**3,163**
Scenario Two						
Single Detached Dwellings	106	261	367	255	150	405
Townhouse Dwellings	180	307	487	338	199	537
Multi-Family Dwellings	285	633	918	514	404	918
High Density	57	179	236	187	115	302
Mixed-Use (Residential)	120	380	500	386	237	623
Mixed-Use (Retail)	260	159	419	846	917	1,763
Total	**1,008**	**1,919**	**2,927**	**2,526**	**2,022**	**4,548**

As the high-density blocks are located in close proximity to the mixed-use developments, a portion of the person trips generated by the high density and mixed-use blocks will be internally captured and will not show up at the area intersections. Internal capture rates identified in the ITE Trip Generation Handbook, 3rd Edition were applied to the person trips generated by the development of Blocks 315 to 319 to determine the number of trips to be internally captured. Internal capture summary sheets are included in **Appendix D**. A summary of the person trips that are internally captured between Blocks 315 to 319 is provided in **Table 4**.

Table 4: Internally Captured Person Trips (Blocks 315 to 319)

Land Use	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Scenario One						
Residential	2	2	4	116	43	159
Retail	2	2	4	43	116	159
Scenario Two						
Residential	4	6	10	238	85	323
Retail	6	4	10	85	238	323

A review of the modal share data in the City's TRANS O-D Survey report has been conducted. A review of trips from/within the district during the AM peak and to/within the district during the PM peak has been conducted to understand the modal shares for residential developments within the Kanata/Stittsville District. The following modal shares have been derived from the TRANS report:

- 60% Auto Driver
- 20% Auto Passenger
- 10% Transit
- 10% Non-Auto

The approved Fernbank Community Design Plan (CDP) Transportation Master Plan (TMP) identifies a minimum target transit modal share of 20% within the Fernbank Community. As such, the TRANS modal shares have been adjusted to reflect the target 20% transit modal share. The following modal shares adjust the above Auto Driver and Auto Passenger modal shares down by 5% to increase the Transit modal share by 10%.

- 55% Auto Driver
- 15% Auto Passenger
- 20% Transit
- 10% Non-Auto

Table 5 below summarizes the person trips by modal share for scenario one.

Table 5: Person Trips by Modal Share – Scenario One

Travel Mode		AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Single Detached Dwellings							
Total Person Trips		*106*	*261*	*367*	*255*	*150*	*405*
Auto Driver	**55%**	**58**	**144**	**202**	**140**	**82**	**222**
Auto Passenger	15%	16	39	55	38	23	61
Transit	20%	21	52	73	51	30	81
Bike/Walk	10%	11	26	37	26	15	41
Townhouse Dwellings							
Total Person Trips		*180*	*307*	*487*	*338*	*199*	*537*
Auto Driver	**55%**	**99**	**169**	**268**	**185**	**110**	**295**
Auto Passenger	15%	27	46	73	51	30	81
Transit	20%	36	61	97	68	39	107
Bike/Walk	10%	18	31	49	34	20	54
Multi-Family Dwellings							
Total Person Trips		*285*	*633*	*918*	*514*	*404*	*918*
Auto Driver	**55%**	**156**	**348**	**504**	**283**	**221**	**504**
Auto Passenger	15%	43	95	138	77	61	138
Transit	20%	57	127	184	103	81	184
Bike/Walk	10%	29	63	92	51	41	92
High Density and Mixed-Use Dwellings							
Total Person Trips		*75*	*241*	*316*	*136*	*112*	*248*
Auto Driver	**55%**	**41**	**133**	**174**	**75**	**61**	**136**
Auto Passenger	15%	11	36	47	20	17	37
Transit	20%	15	48	63	27	23	50
Bike/Walk	10%	8	24	32	14	11	25
Mixed-Use (Retail)							
Total Person Trips		*174*	*106*	*280*	*387*	*350*	*737*
Auto Driver	**55%**	**96**	**58**	**154**	**213**	**192**	**405**
Auto Passenger	15%	26	16	42	58	53	111
Transit	20%	35	21	56	77	70	147
Bike/Walk	10%	17	11	28	39	35	74
Total Auto Driver		**450**	**852**	**1,302**	**896**	**666**	**1,562**
Total Auto Passenger		123	232	355	244	184	428
Total Transit		164	309	473	326	243	569
Total Bike/Walk		83	155	238	164	122	286

When the future BRT/LRT is extended to this area, the development within 600m of the future Hazeldean Road LRT/BRT station will be located within a Transit Oriented Development (TOD) zone. For the purposes of scenario two, all developments north of Cranesbill Road/Street 15 have been assumed to be located within the future TOD zone. The modal shares associated with developments within the TOD zone reflect a higher transit modal share, and reduced auto modal share. However, as the proposed development is located in a suburban context, the City's TOD modal shares have been adjusted to reflect a higher auto modal share associated with the Kanata/Stittsville District.

For the purposes of scenario two, the adjusted TOD modal shares have been applied to all residential development north of Cranesbill Road/Street 15, while the modal shares presented in

scenario one have been applied to all other residential development. Although the retail uses are located in close proximity to the future Hazeldean BRT/LRT station, the modal shares are anticipated to be generally consistent with the Kanata/Stittsville area. As such, the modal shares used for the retail development in scenario one have been maintained.

Table 6 below summarizes the person trips by modal share for scenario two.

Table 6: Person Trips by Modal Share – Scenario Two

Travel Mode		AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Single Detached Dwellings							
Total Person Trips		*106*	*261*	*367*	*255*	*150*	*405*
Auto Driver	**55%/30%**	**54**	**135**	**189**	**130**	**77**	**207**
Auto Passenger	15%/5%	15	35	50	35	20	55
Transit	20%/50%	26	63	89	62	38	100
Bike/Walk	10%/15%	11	28	39	28	15	43
Townhouse Dwellings							
Total Person Trips		*180*	*307*	*487*	*338*	*199*	*537*
Auto Driver	**55%/30%**	**78**	**135**	**213**	**148**	**87**	**235**
Auto Passenger	15%/5%	19	32	51	36	20	56
Transit	20%/50%	61	102	163	112	68	180
Bike/Walk	10%/15%	22	38	60	42	24	66
Multi-Family Dwellings							
Total Person Trips		*285*	*633*	*918*	*514*	*404*	*918*
Auto Driver	**55%/30%**	**131**	**293**	**424**	**238**	**186**	**414**
Auto Passenger	15%/5%	33	73	106	59	47	106
Transit	20%/50%	87	193	280	157	123	280
Bike/Walk	10%/15%	34	74	108	60	48	108
High Density and Mixed-Use Dwellings							
Total Person Trips		*173*	*553*	*726*	*335*	*267*	*602*
Auto Driver	**30%**	**52**	**166**	**218**	**101**	**80**	**181**
Auto Passenger	5%	9	27	36	17	13	30
Transit	50%	86	277	363	167	134	301
Bike/Walk	15%	26	83	109	50	40	90
Mixed-Use (Retail)							
Total Person Trips		*254*	*155*	*409*	*761*	*679*	*1,440*
Auto Driver	**55%**	**140**	**85**	**225**	**419**	**373**	**792**
Auto Passenger	15%	38	23	61	114	102	216
Transit	20%	51	31	82	152	136	288
Bike/Walk	10%	25	16	41	76	68	144
Total Auto Driver		**455**	**814**	**1,269**	**1,036**	**803**	**1,839**
Total Auto Passenger		114	190	304	261	202	463
Total Transit		311	666	977	650	499	1,149
Total Bike/Walk		118	239	357	256	195	451

The commercial land uses are 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 34%. The *ITE Trip Generation Handbook, 10th*

Edition identifies this percentage as an average rate for the Shopping Centre land use. The pass-by trips generated by the retail development 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 retail development is summarized in the following table.

Table 7: Retail Primary and Pass-by Trips

Trip Type	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Scenario One						
Total Auto Trips	*140*	*85*	*225*	*419*	*373*	*792*
Pass-by Trips	39	39	78	135	135	270
Primary Trips	101	46	147	284	238	522
Scenario Two						
Total Auto Trips	*76*	*47*	*123*	*228*	*204*	*432*
Pass-by Trips	21	21	42	74	74	148
Primary Trips	55	26	81	154	130	284

3.1.2 Trip Distribution

The projected distribution of vehicular trips generated by the proposed development has been derived with appropriate consideration given to several key factors, including:

- The size and nature of the proposed development
- The location of the subdivision access roadways with respect to the adjacent roadway system
- The principles of logical trip routing

Trips generated by the proposed residential, commercial, park and ride and elementary school have been distributed differently due to the nature of the land uses.

Residential Trips
The distribution of trips generated by the residential development is consistent with the Fernbank TMP as well as similar development applications within the Fernbank CDP lands. Residential trips generated by the proposed development were distributed to the road network as follows:

- 35% to/from the north via Robert Grant Avenue
- 55% to/from the east via Abbott Street/Hazeldean Road/Street 3
- 5% to/from the south via Robert Grant Avenue
- 5% to/from the west via Abbott Street/Hazeldean Road

The proposed residential dwellings will be accessed via the proposed local and collector road network. The Robert Grant Avenue/Cranesbill Road/Street 15 and Robert Grant Avenue/Abbott Street intersections will be full movement roundabouts. The Mixed-Use Block 317 will be accessed via a signalized intersection along Hazeldean Road. The Abbott Street/Street 1 intersection will provide full movement access. The Street 3, Street 8, Street 13, and Street 16 intersections along Robert Grant Avenue are anticipated to be restricted to right-in right-out by build-out due to safety and capacity reasons (i.e. excessive delays exiting onto Robert Grant Avenue).

Residential trips generated by the proposed development were assigned to the access roadways based on density location and principles of logical trip routing. All trips to/from the north, south, and west are assumed to arrive and depart the subject lands using the intersections along Robert Grant Avenue. A portion of the trips from the residential dwellings east of Robert Grant Avenue, who are destined to/from the east are assumed to travel through the adjacent subdivision to Hazeldean Road. The remainder of trips to/from the east will use Robert Grant Avenue to connect to Hazeldean Road, or travel east through the Fernbank CDP lands via Abbott Street.

Commercial Trips

The proposed retail developments have been assumed to serve the overall Fernbank Community. The Fernbank Community was split into zones based on the existing/future road network. Trips were then distributed to/from each zone within the Fernbank Community based on the size of the zone. Retail trips generated by the proposed development were distributed to the road network as follows:

- 35% to/from the west via Hazeldean Road and Abbott Street
- 40% to/from the south via Robert Grant Avenue
- 15% to/from the east via Hazeldean Road and Cranesbill Road
- 10% to/from the subject development via intersections along Robert Grant Avenue

Pass-by trips generated by the commercial development have been distributed to the commercial accesses based on the background traffic projections.

Park and Ride Trips

The proposed park and ride has been assumed to serve the Fernbank Community north of Abbott Street. The proposed park and ride is assumed to have right-in right-out access along Hazeldean Road. Similar to the commercial distribution, the Fernbank Community north of Abbott Street was split into zones based on the existing/future road network. Trips were then distributed to/from each zone within the Fernbank Community north of Abbott Street based on the size of the zone. A high-level concept of the park and ride was obtained from City staff, and is included in **Appendix E**. Due to the proximity to adjacent signalized intersections along Hazeldean Road, and consistent with the high-level concept, the park and ride is assumed to only have right-in right-out access on Hazeldean Road. As access is assumed to be limited to right-in right-out on Hazeldean Road, the arrival and departure distributions will be different. Park and ride trips generated by the proposed development were distributed to the road network as follows:

Arrival

- 55% from the west via Hazeldean Road and Abbott Street
- 20% from the east via Abbott Street and Cranesbill Road
- 25% from the subject development via intersections along Robert Grant Avenue

Departure

- All trips will depart the study area to the east via Hazeldean Road

Elementary School Trips

For the purposes of this analysis, the proposed elementary school has been assumed to serve the subject lands, as well as the 570 Hazeldean Road (Mattamy) and 590 Hazeldean Road (Richcraft) lands to the east. Based on the overall unit counts for the three subdivisions, approximately 75% of the trips to/from the elementary school will be internally captured within the

local road network and will not appear at the study area intersections. The remaining 25% have been assumed to cross Robert Grant Avenue to the western portion of the subject subdivision.

Traffic volumes generated by the proposed development under scenario one are shown in **Figure 6**. Traffic volumes generated by the proposed development under scenario two are shown in **Figure 7**.

3.2 Background Network Travel Demand

3.2.1 Transportation Network Plans

3.2.2 Background Growth

The 590 Hazeldean Road Transportation Impact Study (September 2013) prepared for the Richcraft Homes subdivision, assessed 2020 traffic projections for Richcraft's buildout year, as well as a 2025 five-year horizon. The 2025 analysis included the Hazeldean Road/North-South Arterial (Robert Grant Avenue) intersection and reflected the future extension of the North-South Arterial (Robert Grant Avenue) to Palladium Drive. An excerpt from the 590 Hazeldean Road TIS showing the approved 2025 traffic projections is included in **Appendix F**.

For the purpose of this study, a 2% annual growth rate has been applied to the 2025 traffic projections identified in the 590 Hazeldean Road TIS for the following movements at the Hazeldean Road/existing Toys R Us access/future North-South Arterial intersection in order to estimate 2030 background traffic volumes:

- eastbound and westbound through movements, and
- eastbound left and southbound right turn movements.

This 2% growth rate is consistent with the Fernbank TMP and other recent transportation studies prepared for development parcels within the Fernbank Community.

The Fernbank TMP estimated through traffic growth along the North-South Arterial (Robert Grant Avenue) from Hazeldean Road to Fernbank Road and along Abbott Street from Iber Road to Terry Fox Drive. The Fernbank TMP's screenline analysis indicated that during the 2031 PM peak hour, the North-South Arterial (Robert Grant Avenue) is expected to carry a southbound 'through' traffic volume of 200 vehicles from Hazeldean Road to Fernbank Road, functioning as a bypass for traffic to and from Stittsville that would otherwise use Stittsville Main Street. The corresponding northbound 'through' traffic volume is assumed to be 110 vehicles, which results in a 65/35 split in favour of southbound traffic. This split was a previous assumption of the TMP's screenline analysis and is carried forward for the purpose of this study.

Similarly, Abbott Street is expected to carry a westbound traffic volume of 200 vehicles during the 2031 PM peak hour. Based on the aforementioned assumption of a 65/35 split, Abbott Street is expected to carry an eastbound PM peak traffic volume of 110 vehicles.

The above assumptions regarding through traffic on the North-South Arterial and Abbott Street were developed as part of an addendum to the Transportation Brief (October 2012) prepared in support of the Abbott-Fernbank subdivision. The Abbott-Fernbank subdivision included the construction of Robert Grant Avenue between Abbott Street and Fernbank Road. These assumptions are carried forward for the purpose of this study.

Figure 6: Site Generated Traffic Volumes – Scenario One

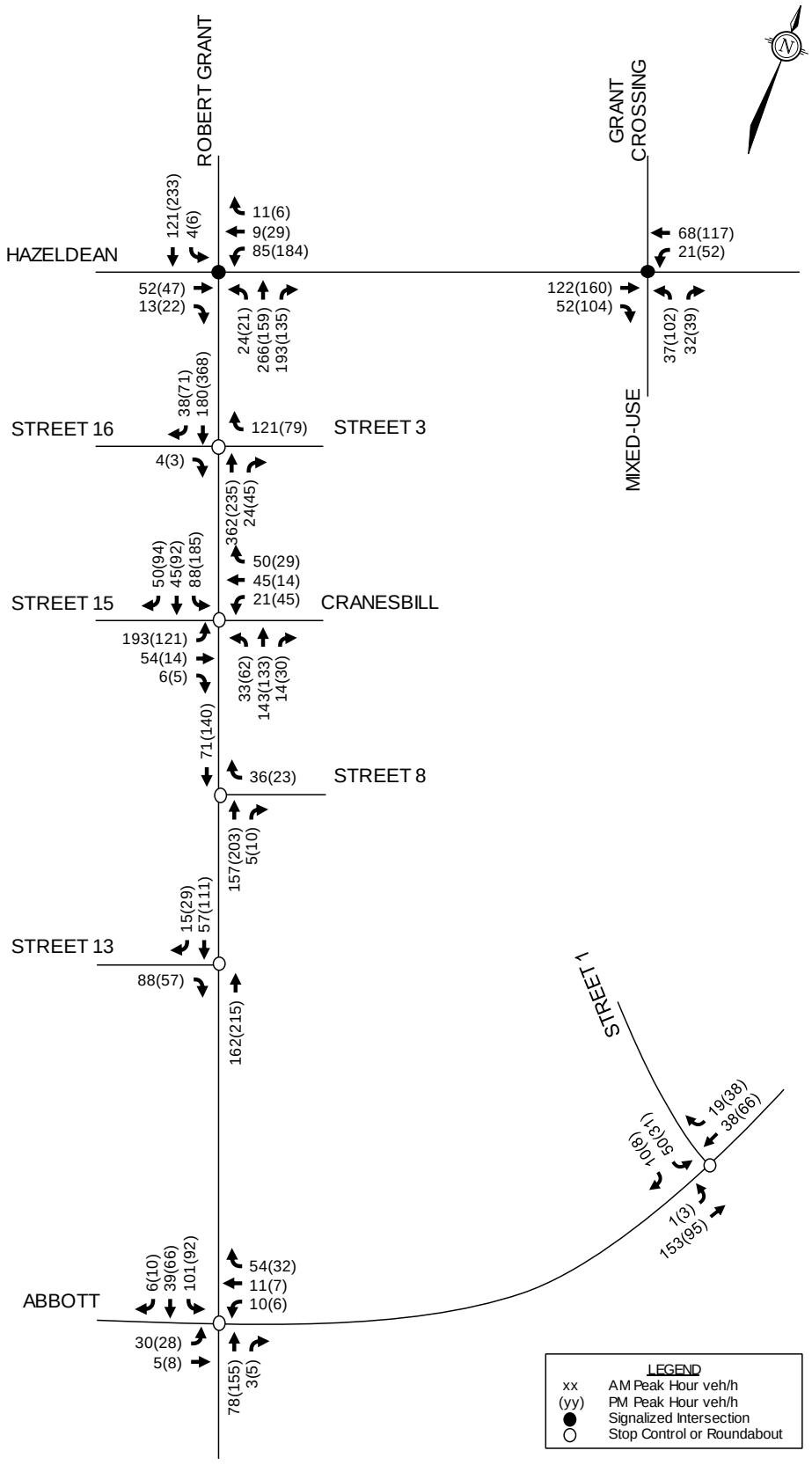
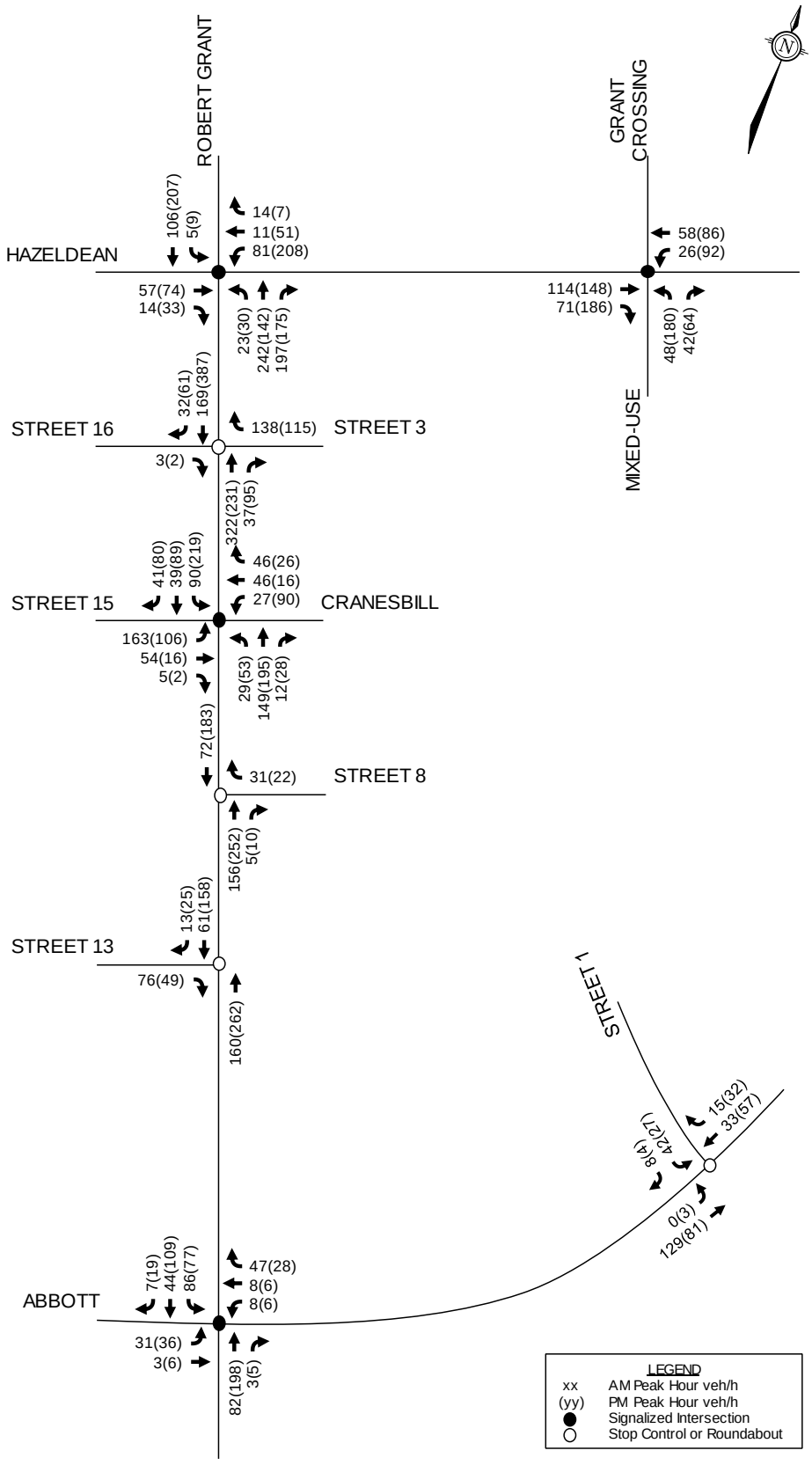


Figure 7: Site Generated Traffic – Scenario Two



As described in the next section, it is estimated that development within the Fernbank Community will be approximately 80% complete by 2030. Similarly, it is estimated that the 2030 background through traffic on the North-South Arterial (Robert Grant Avenue) south of Hazeldean Road and on Abbott Street east of Iber Road will be approximately 80% of the projected 2031 background through volumes.

3.2.3 Other Developments

The Fernbank TMP assumed a development rate of 500 units/year within the Fernbank Community, starting in 2015 and continuing until full build-out. This rate of development has been carried forward in other recent transportation studies prepared for development within the Fernbank Community, including the following:

- 590 Hazeldean Road TIS, prepared in September 2013 for Richcraft Homes
- 570 Hazeldean Road Transportation Brief, prepared in March 2013 for Mattamy Homes

Based on a development rate of 500 units/year, it is estimated that 80% of other developments within the Fernbank CDP will be completed by the assumed 2030 buildout year of the subject development.

As part of the transportation reports prepared for 570 Hazeldean Road (Mattamy) and 590 Hazeldean Road (Richcraft), a model of the Fernbank Community was developed with the future community divided into several traffic zones that followed a logical pattern of physical features (i.e. hydro corridor), primary roads (i.e. planned arterials and collectors) and proposed intersections along the boundary road network. An excerpt from the 590 Hazeldean Road TIS showing the 11 distinct traffic zones established as part of the transportation model is included in **Appendix F**. A summary of the traffic generated by the Fernbank Community by traffic zone, including the subject Kizell lands identified as zones N7 and N8, is also provided in **Appendix F**.

The 2025 traffic projections identified in the 590 Hazeldean Road TIS represent 50% buildout within the Fernbank CDP. Traffic generated by the subject lands (traffic zones N7 and N8) was deducted from the 2025 traffic projections so that the subject site traffic could be accounted for separately. The adjusted 2025 traffic projections were pro-rated to estimate 2030 development traffic at the Hazeldean Road/North-South Arterial intersection, with the exception of the following movements which were already accounted for as background through traffic:

- eastbound and westbound through movements, and
- eastbound left and southbound right turn movements.

Development traffic at the Robert Grant Avenue/Abbott Street intersection was estimated using 80% of the 2031 traffic projections identified in the October 2012 Abbott-Fernbank Transportation Brief addendum, less the through traffic already accounted for along Robert Grant Avenue and Abbott Street.

The northbound traffic projections for Robert Grant Avenue between Hazeldean Road and Abbott Street were balanced by assuming the higher volume between the two studies for each peak hour, i.e. AM peak northbound traffic is based on the 590 Hazeldean Road TIS projections, and PM peak northbound traffic is based on the Abbott-Fernbank Transportation Brief addendum. Balancing was not required for the southbound traffic projections.

The Fernbank TMP assumed that, overall, 90% of trips would have origins or destinations to/from to the north/east while 10% would have origins or destinations to/from the south/west. With the extension of Robert Grant Avenue from Abbott Street to Hazeldean Road, it was assumed that 10% of trips from the Richcraft Homes and Mattamy developments to the east would use the Robert Grant Avenue/Abbott Street intersection for travel to and from the south/west.

Traffic generated by the 5705 Hazeldean Road expansion were further added to the background traffic projections based on the projections presented in the TIA dated August 2019.

Background and total traffic for the 2030 buildout year of scenario one are shown in **Figures 8** and **9** for the weekday AM and PM peaks.

3.2.4 Future Background Traffic – Scenario Two

Scenario two is intended to reflect a build-out of the development permitted under the proposed zoning once the BRT/LRT is extended to this area. The availability of rapid transit in this area is anticipated to increase transit usage and reduce the overall traffic volumes along the area roadways.

Exhibit 2.13 in the City of Ottawa's 2013 Transportation Master Plan identifies suggests the transit modal share within the Kanata/Stittsville area will increase from 15% to 21% prior to 2031. For the purposes of this analysis, the increased transit modal share is anticipated to be achieved once rapid transit is extended to the study area. For scenario two, the 2031 background traffic projections presented above have been reduced to reflect the anticipated 21% transit modal share.

The projected background and total traffic for scenario two is shown in **Figure 10** and **11** for the weekday AM and PM peaks.

Figure 8: 2030 Background Traffic (Scenario One)

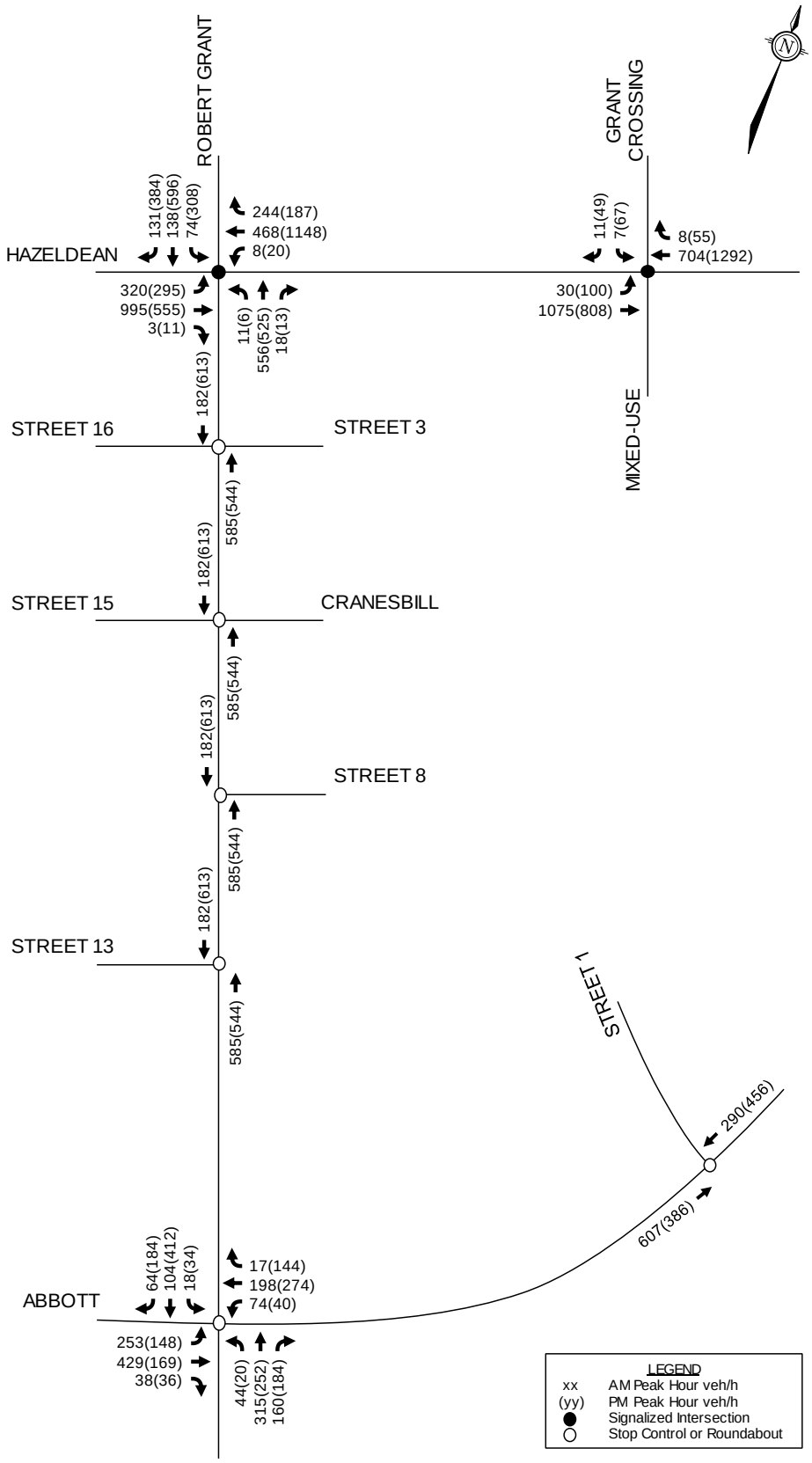


Figure 9: 2030 Total Traffic Volumes (Scenario One)

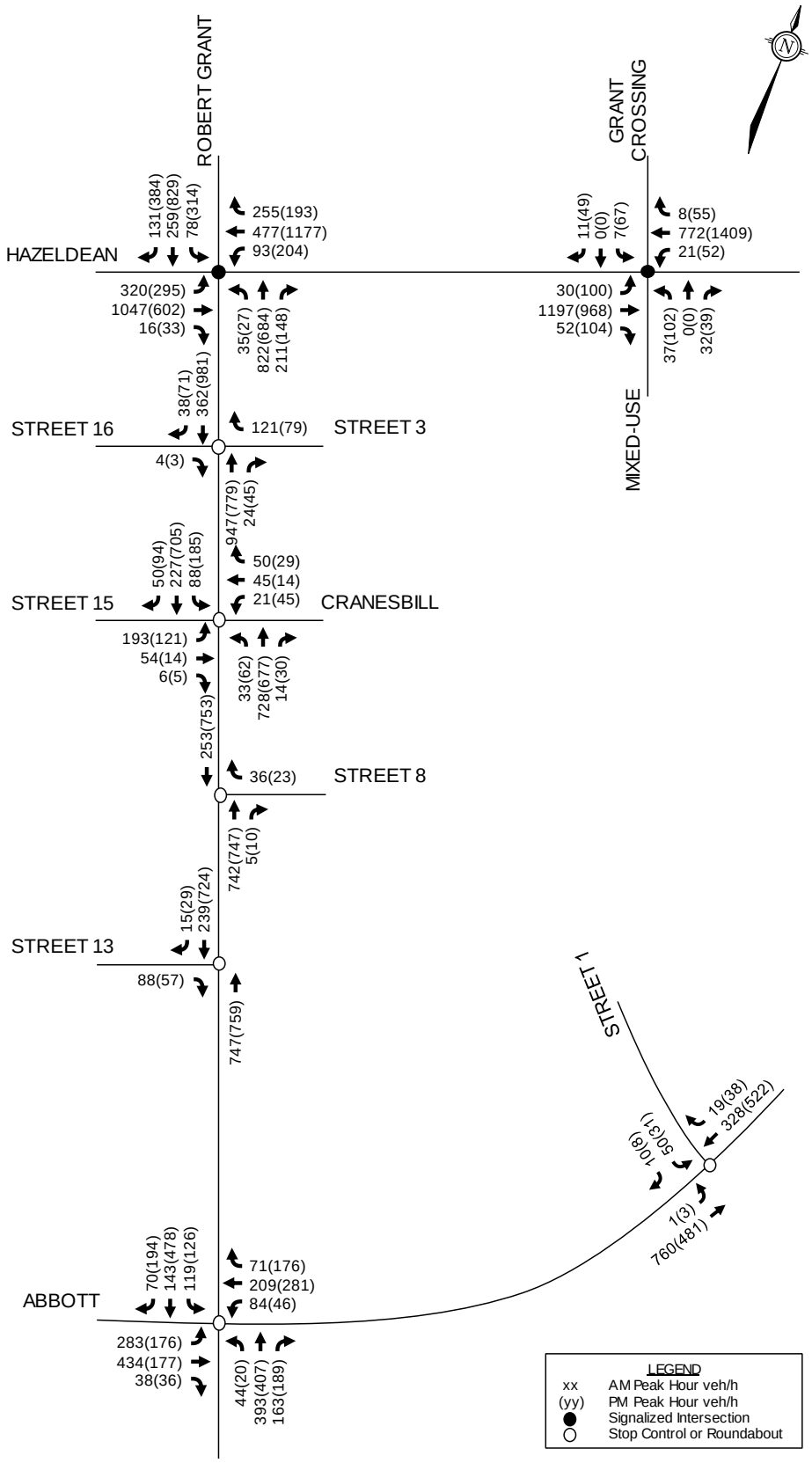


Figure 10: Future Background Traffic (Scenario Two)

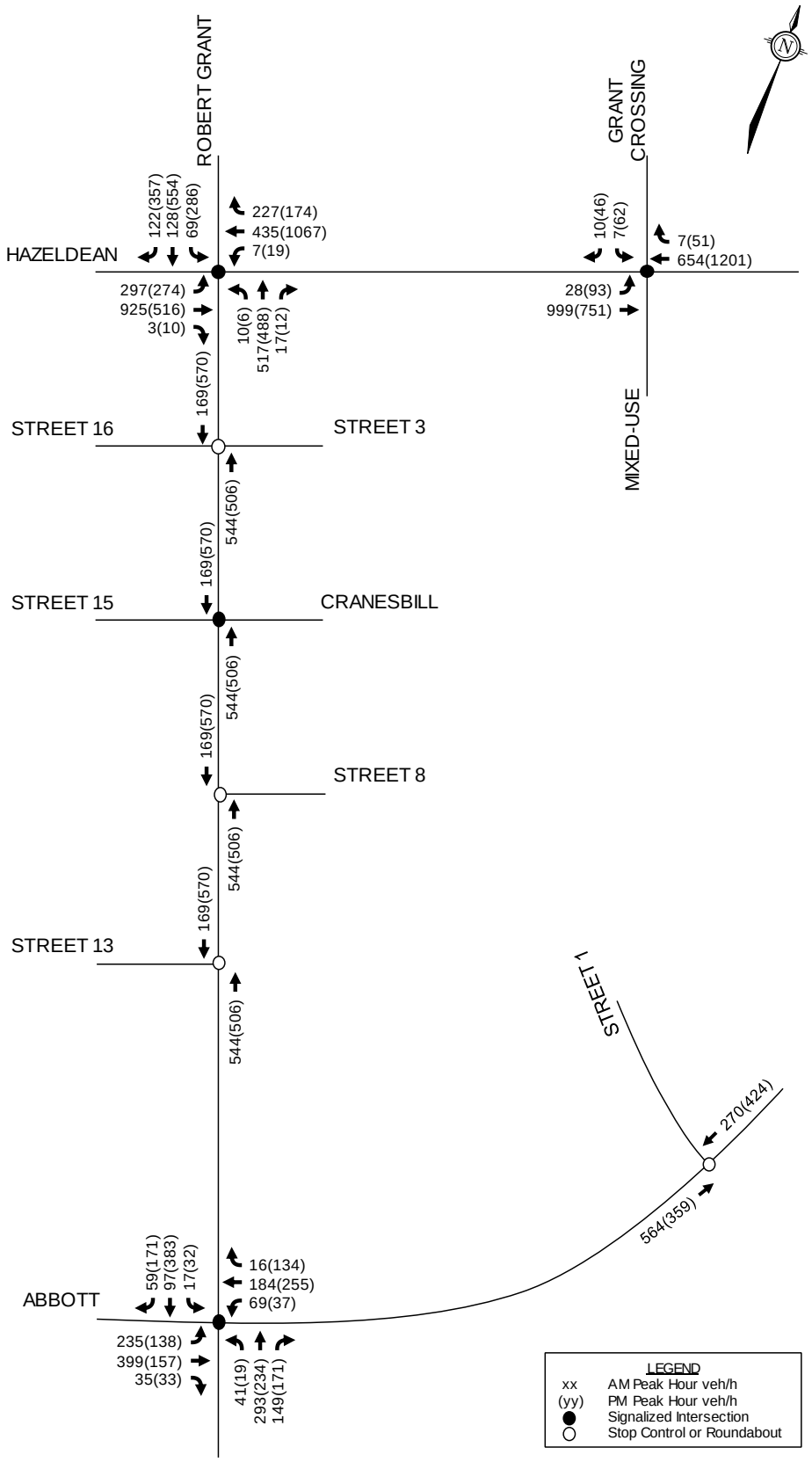
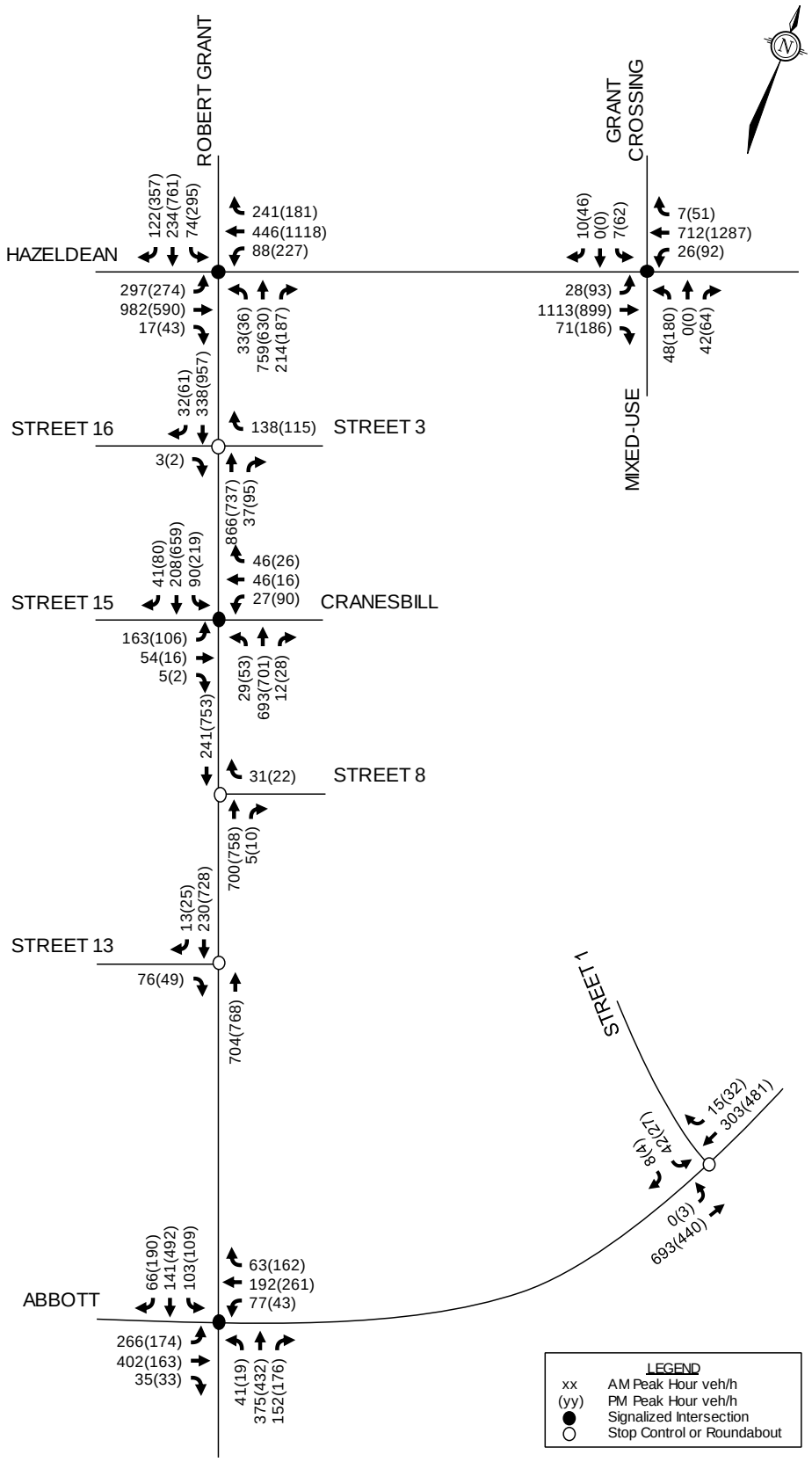


Figure 11: Future Total Traffic (Scenario Two)



4.0 ANALYSIS

4.1 Development Design

Robert Grant Avenue is a north-south arterial road that will extend through the subdivision with a Right-of-Way (ROW) width of 45.5m. A paved surface of 8m with sidewalks and cycle tracks will be provided initially, consistent with constructed portion between Abbott Street and Fernbank Road to the south.

The subdivision will include two east-west major collector roads including the Abbott Street extension to the south, and Cranesbill Road which is approximately midblock. The two major collector roads will have ROW widths of 26m. Abbott Street is currently under construction and will have a 1.8m sidewalk and 1.5m cycle track on both sides of the roadway. The design of Cranesbill Road will be consistent with the adjacent subdivision to the east and will consist of an 11m road platform with sidewalks on both sides of the roadway.

Street 1 will be a minor collector road with a ROW of 22m and will provide north-south access between Cranesbill Road and Abbott Street in the south half of the development. Street 3 will have also have a ROW of 22m and provide east-west access through the north half of the development. Street 1 and Street 3 will be designed to City of Ottawa standards.

All other streets will be classified as local roadways and will have an 18m ROW widths. All local roadways will be designed to City of Ottawa standards.

Sidewalks will be provided on some local roads to provide critical connections to destinations or locations of higher pedestrian traffic. A pathways plan showing the proposed sidewalk locations is provided in **Appendix G**.

The internal road pattern is generally consistent with the Fernbank CDP and will promote the safe and efficient movement of vehicles, cyclists and pedestrians. An off-road pathway will also be constructed along the hydro corridor extending from Robert Grant Avenue to the east limit of the site, consistent with the Fernbank CDP.

4.2 Parking

Parking will be provided in the form of driveways accessing a garage/carport located on the same lot for each dwelling unit, as well as on-site parking lots for the multi-family residential units, high density residential, mixed use and elementary school sites. On-street visitor parking can be accommodated within the ROW along the major collector roads as required.

4.3 Boundary Streets

The MMLOS guidelines produced by IBI Group in October 2015 were used to evaluate the LOS of all roadway segments for each mode of transportation. Schedule B of the City of Ottawa's *Official Plan* indicates that the study area roadway segments are located in the General Urban Policy Area.

A summary of the segment MMLOS analysis is provided in **Table 8** below. Detailed MMLOS calculations are provided in **Appendix H**.

Table 8: Segment MMLOS

Segment	PLOS	BLOS	TLOS	TkLOS	Auto LOS
Hazeldean Road	C	C	D	A	A
Target	**C**	**C**	**D**	**D**	**D**

Based on the foregoing, Hazeldean Road adjacent to the proposed subdivision meets all MMLOS targets.

4.4 Access Intersections

Along Robert Grant Avenue, an intersection spacing of approximately 930m will be provided between Abbott Street and the proposed roundabout at Cranesbill Road, and approximately 650m between Hazeldean Road and the proposed roundabout at Cranesbill Road. This spacing is generally consistent with the recommendations of the Fernbank CDP and the constructed portion of Robert Grant Avenue to the south.

A review of traffic signalization warrants was conducted at the Robert Grant Avenue/Cranesbill Road/Street 15 intersection and are included in **Appendix I**. Based on the traffic projections for Scenario One, signalization warrants are 94% met at this intersection. Intersection analysis has been conducted in Section 4.9.4 for both side street stop and roundabout control at this intersection. Based on the findings of the intersection analysis, it is proposed that the Robert Grant Avenue/Cranesbill Road/Street 15 intersection will operate under roundabout control during the interim. For scenario one, it has been assumed that this roundabout will have an inscribed circle diameter of 40m, consistent with roundabouts constructed along Robert Grant Avenue south of Abbott Street. Once Robert Grant Avenue is widened to accommodate median BRT in the future, this intersection will be signalized. For the future scenario two, the lane configuration at this intersection have been assumed as follows:

- Northbound/Southbound – One through lane, one shared through/right turn lane and one left turn lane
- Eastbound/Westbound – One shared through/right turn lane and one left turn lane

The Robert Grant Avenue/Abbott Street intersection currently operates under roundabout control. Once Robert Grant Avenue is widened to accommodate median BRT in the future, this intersection will be signalized. For the future scenario two, the lane configuration at this intersection have been assumed as follows:

- Northbound/Southbound – Two through lane, one right turn lane and one left turn lane
- Eastbound/Westbound – One shared through/right turn lane and one left turn lane

Three additional full movement intersections are proposed on Robert Grant Avenue in the interim until restriction of the left turn movements is required for safety or capacity reasons (i.e. excessive delays exiting onto Robert Grant Avenue). These intersections would operate under side street stop control and are described as follows:

- Street 3 and 16, 280m south of Hazeldean and 370m north of Cranesbill Road
- Street 8, 240m south of Cranesbill Road and 120m north of Street 13

- Street 13, 120m south of Street 8 and 580m north of Abbott Street

These intersections would be restricted to right-in right-out operation only when required. This approach is consistent with the Robert Grant Avenue/Haliburton Heights intersection to the south, along the constructed portion of Robert Grant Avenue.

Street 1, 11 and 12 will be accessed via full movement unsignalized intersections along Abbott Street. Transportation Association of Canada (TAC) Geometric Design Guidelines identify a minimum spacing of 60m for intersections along collector roadways. The Street 11 and 12 intersections along Abbott Street are located a minimum of spacing 80m between adjacent intersections, measured centreline to centreline.

The mixed-use block located along Hazeldean Road will tie into the existing signalized Grant Crossing intersection. The lane configurations at the Hazeldean Road/Grant Crossing Access/Mixed-Use Access intersection will reviewed as part of a future Site Plan Control application. For the purposes of this report, the future lane configurations at this intersection have been assumed as follows:

- Northbound – One left turn lane and one through/right turn lane
- Southbound – Dual left turn lanes and one through/right turn lane
- Eastbound – One left turn lane, one through lane and one through/right turn lane
- Westbound – One left turn lane, two through lanes and one right turn lane

4.5 Transportation Demand Management

A review of the TDM Measures Checklist was conducted, and can be found in **Appendix J**.

The following measures will be implemented as the proposed subdivision is built:

- Display local area maps with walking/cycling routes and key destinations (at sales centre);
- Display relevant transit schedules and route maps (at sales centre);
- Provide multimodal travel option information packages to new residents (at sales centre).

4.6 Neighbourhood Traffic Management

The proposed street layout conforms to the initiatives identified in the Fernbank CDP. The subject lands are located adjacent to two arterial roadways (i.e. Robert Grant Avenue and Hazeldean Road) and are not anticipated to have any measurable impact on the future residential communities in the site's vicinity.

Parking provisions are anticipated to meet the requirements of the City's Zoning By-Law. Parking will be provided in the form of driveways accessing a garage/carport located on the same lot for each dwelling unit, as well as on-site parking lots for the multi-family residential units, high density residential, mixed use and elementary school sites. On-street visitor parking can be accommodated within the ROW along the major collector roads as required. Parking infiltration into the surrounding communities is not anticipated.

4.7 Transit

OC Transpo bus service is currently provided along Hazeldean Road at the existing stops located at the signalized Shoppes at Fairwinds and Grant Crossing intersections.

The detail design of the Robert Grant Avenue extension should accommodate transit priority measures in accordance with the City's 2031 Affordable plan. Per the City's 2013 TMP, at-grade BRT lanes will ultimately be constructed in the median of Robert Grant Avenue in the future.

The collector roads will be constructed to support future transit service.

4.8 Network Concept

As the proposed development is anticipated to generate more than 200 peak hour person trips more than the established zoning, a review of the network concept has been conducted. For the purposes of this analysis, an east-west screenline has been developed north of the study area and a north-south screenline has been developed east of the study area. The east-west screenline is crossed by Robert Grant Avenue, while the north-south screenline is crossed by Hazeldean Road and Abbott Street.

Typical lane capacities are established based on roadway classification and general characteristics (i.e. suburban with limited access, urban with on-street parking, etc.). The typical lane capacities used in this study are based on the City's guidelines for the TRANS Long-Range Transportation Model.

4.8.1 Future Background – Scenario Two Screenline Analysis

A summary of the future background screenline analysis is provided in the following table.

Table 9: Future Background Screenline Analysis

Roadway	Directional Capacity	AM Peak			PM Peak		
		Vol.	V/C Ratio	LOS	Vol.	V/C Ratio	LOS
East-West Screenline							
Robert Grant Avenue (North of Hazeldean Road)							
Northbound	2,000	1,041	0.52	A	936	0.47	A
Southbound	2,000	319	0.16	A	1,197	0.60	A
Total							
Northbound	**2,000**	**1,041**	**0.52**	**A**	**936**	**0.47**	**A**
Southbound	**2,000**	**319**	**0.16**	**A**	**1,197**	**0.60**	**A**
North-South Screenline							
Hazeldean Road (East of Lowe's Access)							
Eastbound	2,000	1006	0.50	A	813	0.41	A
Westbound	2,000	661	0.33	A	1,252	0.63	B
Abbott Street (East of Street 1)							
Eastbound	600	564	0.94	E	359	0.60	A
Westbound	600	270	0.45	A	424	0.71	C
Total							
Eastbound	**2,600**	**1,570**	**0.60**	**A**	**1,172**	**0.45**	**A**
Westbound	**2,600**	**931**	**0.36**	**A**	**1,676**	**0.64**	**B**

Based on the foregoing, the proposed screenlines are anticipated to operate with a LOS B or better during the AM and PM peak hours under background traffic conditions.

4.8.2 Future Total – Scenario Two Screenline Analysis

A summary of the future total screenline analysis is provided in the following table.

Table 10: Future Total Traffic – Screenline Analysis

Roadway	Directional Capacity	AM Peak			PM Peak		
		Vol.	V/C Ratio	LOS	Vol.	V/C Ratio	LOS
East-West Screenline							
Robert Grant Avenue (North of Hazeldean Road)							
Northbound	2,000	1,297	0.65	B	1,085	0.54	A
Southbound	2,000	430	0.22	A	1,413	0.71	C
Total							
Northbound	**2,000**	**1,297**	**0.65**	**B**	**1,085**	**0.54**	**A**
Southbound	**2,000**	**430**	**0.22**	**A**	**1,413**	**0.71**	**C**
North-South Screenline							
Hazeldean Road (East of Lowe's Access)							
Eastbound	2,000	1,162	0.56	A	1,025	0.50	A
Westbound	2,000	745	0.36	A	1,430	0.71	C
Abbott Street (East of Street 1)							
Eastbound	600	735	1.23	F	467	0.78	C
Westbound	600	318	0.53	A	513	0.86	D
Total							
Eastbound	**2,600**	**1,897**	**0.73**	**C**	**1,492**	**0.57**	**A**
Westbound	**2,600**	**1,063**	**0.41**	**A**	**1,943**	**0.75**	**C**

Based on the foregoing, Abbott Street is anticipated to operate above capacity during the AM peak hour. Although Abbott Street is anticipated to operate above capacity, the overall north-south screenline is anticipated to operate with LOS C or better during the AM and PM peak hours. If traffic congestion is realized along Abbott Street, drivers can use alternative routes to travel east (i.e. Hazeldean Road) to Terry Fox Drive.

4.9 Network Intersections

4.9.1 Existing MMLOS Analysis

This section provides a review of the existing signalized study area intersections using complete streets principles. The MMLOS guidelines produced by IBI Group in October 2015 were used to evaluate the LOS of all study area intersections for each mode of transportation. Schedule B of the City of Ottawa's Official Plan indicates the study area intersections are located within the General Urban policy area.

Aerial photos of the study area intersections are provided in Section 4.1.2. The following table summarizes the findings of the MMLOS intersection analysis. Detailed intersection MMLOS calculations are included in **Appendix K**.

Table 11: Intersection MMLOS Summary

Segment	PLOS	BLOS	TLOS	TkLOS	Auto LOS
Hazeldean Road/ Shoppes at Fairwinds	**F**	**F**	A	C	A
Target	**C**	**C**	**D**	**D**	**D**
Hazeldean Road/ Grant Crossing	**F**	**F**	A	C	A
Target	**C**	**C**	**D**	**D**	**D**

Based on the foregoing, the Hazeldean Road/Shoppes at Fairwinds and Hazeldean Road/Grant Crossing intersections meet the target TLOS, TkLOS and Auto LOS. The PLOS and BLOS at these intersections do not meet the target for the General Urban Area. The poor PLOS and BLOS at these intersections are attributable to the number of travel lanes along Hazeldean Road.

The geometry of the existing study area intersections will change as the subject lands are developed. As such, improvements have not been identified to improve the PLOS and BLOS at these intersections.

4.9.2 2030 Background Traffic – Scenario One

Intersection capacity analysis has been completed for the 2030 background traffic condition for scenario one. The analysis is based on the future roadway lane configurations within the study area. A two-lane cross section has been assumed for Robert Grant Avenue south of Hazeldean Road. A four-lane cross section has been assumed for Robert Grant Avenue north of Hazeldean Road and on the south leg approach to the intersection.

The traffic signal timing plan for the Hazeldean Road/Robert Grant Avenue intersection has been developed using methodology presented in Ontario Traffic Manual (OTM) Book 12 and optimized to show the capacity of the intersection. The lane configurations at this intersection have been assumed as follows:

- Southbound and westbound – Dual left turn lanes, two through lanes and one channelized right turn lane
- Northbound – One left turn lane, two through lanes and one channelized right turn lane
- Eastbound – Dual left turn lanes, one through lane and one through/right turn lane

The design of the roundabout at the Robert Grant Avenue/Abbott Street intersection is included in **Appendix L**.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in **Appendix M**.

Table 12: Intersection Capacity Analysis – 2030 Background Traffic (Scenario One)

Intersection	AM Peak			PM Peak		
	Max V/C or Delay	LOS	Mvmt	Max V/C or Delay	LOS	Mvmt
Hazeldean Road/ Robert Grant Avenue[1]	0.75	C	NBT	0.96	E	SBL
Hazeldean Road/ Grant Crossing[1]	0.37	A	EBT	0.51	A	WBT
Robert Grant Avenue/ Abbott Street[2]	0.60	A	NB	0.59	A	SB

1. Signalized Intersection
2. Roundabout Intersection

As described in Section 2.9.2, a new transit station and park and ride lot will be provided in the southeast corner of the Hazeldean Road/Robert Grant Avenue intersection. When this transit station is developed, the target Auto LOS will be reduced to LOS E. Once the Hazeldean transit station and park and ride lot is developed, all intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station.

4.9.3 Future Background Traffic – Scenario Two

Intersection capacity analysis has been completed for the future background traffic condition for scenario two. The analysis is based on the future roadway lane configurations within the study area. A four-lane cross section has been assumed for Robert Grant Avenue south of Hazeldean Road. This analysis assumes that the Robert Grant Avenue/Abbott Street intersection will be signalized once the median BRT is constructed along Robert Grant Avenue.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in **Appendix K**.

Table 13: Intersection Capacity Analysis – Future Background Traffic (Scenario Two)

Intersection	AM Peak			PM Peak		
	Max V/C or Delay	LOS	Mvmt	Max V/C or Delay	LOS	Mvmt
Hazeldean Road/ Robert Grant Avenue[1]	0.73	C	NBT	0.88	D	SBL
Hazeldean Road/ Grant Crossing[1]	0.35	A	EBT	0.48	A	WBT
Robert Grant Avenue/ Abbott Street[1]	0.60	A	EBT/R	0.81	D	WBT/R

1. Signalized Intersection

The reduction in traffic volumes associated with the availability of improved transit facilities is anticipated to improve the operations at the Hazeldean Road/Robert Grant Avenue intersection to a critical LOS D or better during the AM and PM peak hours. All other intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station.

4.9.4 2030 Total Traffic – Scenario One

Intersection capacity analysis has been completed for the 2030 total traffic conditions for scenario one. The intersection control and lane configurations at the Robert Grant Avenue/Hazeldean Road and Robert Grant Avenue/Abbott Street intersections are consistent with the background traffic conditions. The intersection control and lane configurations at all access intersections is described in Section 4.4. For the purposes of this analysis, the Robert Grant Avenue/Cranesbill Road/Street 15 intersection has been analyzed as both side street stop (including northbound and southbound left turn lanes on Robert Grant Avenue) and roundabout control.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in **Appendix M**.

Table 14: Intersection Capacity Analysis – 2030 Total (Scenario One)

Intersection	AM Peak			PM Peak		
	Max V/C or Delay	LOS	Mvmt	Max V/C or Delay	LOS	Mvmt
Hazeldean Road/ Robert Grant Avenue[1]	0.87	D	EBT/R	0.98	E	SBL
Hazeldean Road/ Grant Crossing/ Mixed-Use Access[1]	0.47	A	EBT	0.81	D	NBL
Robert Grant Avenue/ Street 3/ Street 16[3]	24 sec	C	WBR	19 sec	C	EBR
Robert Grant Avenue/ Cranesbill Road/ Street 15[2]	0.79	C	NB	0.84	D	NB
Robert Grant Avenue/ Cranesbill Road/ Street 15[3]	**863 sec**	**F**	**EB**	**Error V/C=4.76**	**F**	**EB**
	55 sec	**F**	**WB**	**555 sec**	**F**	**WB**
Robert Grant Avenue/ Street 8[3]	15 sec	B	WBR	14 sec	B	WBR
Robert Grant Avenue/ Street 13[3]	10 sec	B	EBR	15 sec	B	EBR
Robert Grant Avenue/ Abbott Street[2]	0.75	C	NB	0.75	C	SB
Abbott Street/ Street 1[3]	22 sec	C	SB	20 sec	C	SB

1. Signalized Intersection
2. Roundabout Intersection
3. Stop Controlled Intersection

As the Robert Grant Avenue/Cranesbill Road/Street 15 intersection is anticipated to operate with a LOS F during the AM and PM peak hours under side street stop control, roundabout control is recommended for this intersection. Under roundabout control, this intersection is anticipated to operate with a LOS D or better during the AM and PM peak hours.

All other intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station.

As the existing signalized intersections within the study area will be altered as part of the proposed development, the MMLOS analysis has also been completed for the future condition. When the Hazeldean Park and Ride is developed, the MMLOS targets for the study area intersections are anticipated to be altered. The MMLOS targets for the study area intersections are based on the targets within 600m of a rapid transit station. The following table summarizes the findings of the MMLOS intersection analysis. Detailed intersection MMLOS calculations are included in **Appendix K**.

Table 15: Intersection MMLOS Summary

Segment	PLOS	BLOS	TLOS	TkLOS	Auto LOS
Hazeldean Road/ Robert Grant Avenue	**F**	**F**	**F**	B	E
Target	**A**	**C**	**D**	**D**	**E**
Hazeldean Road/ Grant Crossing/ Mixed-Use Access	**F**	**F**	D	C	D
Target	**A**	**C**	**D**	**D**	**E**

All approaches to the Hazeldean Road/Robert Grant Avenue and Hazeldean Road/Grant Crossing/Mixed-Use Access intersections do not meet the target PLOS. Improvement of the PLOS at these intersections is limited by the number of travel lanes and turn lanes required. Consideration could be given to implementing leading pedestrian intervals and zebra striped or textured crosswalks, subject to meeting warrants, during the detailed design of the intersections.

The east and west approaches to the Hazeldean Road/Robert Grant Avenue and Hazeldean Road/Grant Crossing/Mixed-Use access intersections do not meet the target BLOS. Consideration could be given to implementing a protected intersection design as part of the detailed design of the intersections. A protected intersection design would improve this intersection to a BLOS A.

All approaches to the Hazeldean Road/Robert Grant Avenue intersections will not meet the target TLOS. As identified above, the City's TMP identifies a median BRT system along Robert Grant Avenue between Hazeldean Road and Fernbank Road. The ultimate design of Robert Grant Avenue provides a north-south grade separated crossing for the median BRT at the Hazeldean Road/Robert Grant Avenue intersection. This grade separated crossing will improve the TLOS on the north and south approaches to this intersection.

As described in Section 2.9.1, the detailed design of the Hazeldean Road/Robert Grant Avenue intersection will be completed as part of Robert Grant Avenue, to be constructed by others. The detailed design of the Hazeldean Road/Grant Crossing/Mixed-Use Access intersection will be completed as part of a future Site Plan Control application for the Block 318. A further review of the MMLOS at these intersections will be completed as part of the future applications.

4.9.5 Future Total Traffic – Scenario Two

Intersection capacity analysis has been completed for the future total traffic conditions for scenario two. The intersection control and lane configurations at the Robert Grant Avenue/Hazeldean Road and Robert Grant Avenue/Abbott Street intersections are consistent with the background traffic

conditions. The intersection control and lane configurations at all access intersections is described in Section 4.4.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in **Appendix M**.

Table 16: Intersection Capacity Analysis – Future Total (Scenario Two)

Intersection	AM Peak			PM Peak		
	Max V/C or Delay	LOS	Mvmt	Max V/C or Delay	LOS	Mvmt
Hazeldean Road/ Robert Grant Avenue[1]	0.82	D	EBT	0.93	E	WBT
Hazeldean Road/ Grant Crossing/ Mixed-Use Access[1]	0.47	A	EBT	0.91	E	NBL
Robert Grant Avenue/ Street 3/ Street 16[2]	11 sec	B	WBR	10 sec	A	WBR
Robert Grant Avenue/ Cranesbill Road/ Street 15[1]	0.62	B	SBL	0.80	C	SBL
Robert Grant Avenue/ Street 8[2]	11 sec	B	WBR	11 sec	B	WBR
Robert Grant Avenue/ Street 13[2]	9 sec	A	EBR	10 sec	A	EBR
Robert Grant Avenue/ Abbott Street[1]	0.70	B	WBT/R	0.88	D	WBT/R
Abbott Street/ Street 1[2]	20 sec	C	SB	18 sec	C	SB

1. Signalized Intersection
2. Stop Controlled Intersection

Based on the foregoing, all intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station. With the shift to non-auto modes anticipated as development progresses and the future BRT/LRT extension to this area, the development permitted under the proposed zoning is anticipated be accommodated by the study area intersections.

The storage length for the proposed turn lanes at the Hazeldean Road/Robert Grant Avenue intersection have been taken as the higher of either the 95th percentile queue length from the Synchro analysis or the calculated storage using the future total traffic volumes and the TAC Geometric Design Guidelines. The storage length requirements for the future Hazeldean Road/Grant Crossing/Mixed-Use Access will be reviewed during a future Site Plan Control application. The recommended storage lengths for the future Hazeldean Road/Robert Grant Avenue intersection are summarized as follows:

- Eastbound Left: 65m
- Westbound Left: 50m
- Westbound Right: 55m
- Northbound left: 25m
- Northbound Right: 50m
- Southbound Left: 75m
- Southbound Right: 85m

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the foregoing analysis, the main conclusions and recommendations of this report are as follows:

Development Design, Parking, and Boundary Streets

- The internal road pattern is generally consistent with the Fernbank CDP and will promote the safe and efficient movement of vehicles, cyclists and pedestrians.
- Parking will be provided in the form of driveways accessing a garage/carport located on the same lot for each dwelling unit, as well as on-site parking lots for the multi-family residential units, high density residential, mixed use and elementary school sites.
- On-street visitor parking can be accommodated within the ROW along the major collector roads as required.
- Hazeldean Road adjacent to the proposed subdivision meets all MMLOS targets.

Access Intersection Design

- The spacing of intersections along Robert Grant Avenue is generally consistent with the recommendations of the Fernbank CDP and the constructed portion of Robert Grant Avenue to the south.
- The Robert Grant Avenue/Cranesbill Road/Street 15 intersection will operate under roundabout control during the interim. Once Robert Grant Avenue is widened to accommodate median BRT in the future, this intersection will be signalized.
- The Robert Grant Avenue/Abbott Street intersection currently operates under roundabout control. Once Robert Grant Avenue is widened to accommodate median BRT in the future, this intersection will be signalized.
- Three additional full movement intersections (Streets 3, 8, and 13) are proposed on Robert Grant Avenue in the interim until restriction of the left turn movements is required for safety or capacity reasons (i.e. excessive delays exiting onto Robert Grant Avenue). This approach is consistent with the Robert Grant Avenue/Haliburton Heights intersection to the south, along the constructed portion of Robert Grant Avenue.
- Street 1, 11 and 12 will be accessed via full movement unsignalized intersections along Abbott Street.
- The mixed-use block located along Hazeldean Road will tie into the existing signalized Lowe's access intersection.

Transportation Demand Management, Neighbourhood Traffic Management, and Transit

- The following TDM measures will be implemented as the proposed subdivision is built:
    - Display local area maps with walking/cycling routes and key destinations (at sales centre);
    - Display relevant transit schedules and route maps (at sales centre);
    - Provide multimodal travel option information packages to new residents (at sales centre).
- The proposed street layout conforms to the initiatives identified in the Fernbank CDP. The subject lands are located adjacent to two arterial roadways (i.e. Robert Grant Avenue and Hazeldean Road) and are not anticipated to have any measurable impact on the future residential communities in the site's vicinity.
- The detail design of the Robert Grant Avenue extension should accommodate transit priority measures in accordance with the City's 2031 Affordable plan. Per the City's TMP, at-grade BRT lanes will ultimately be constructed in the median of Robert Grant Avenue in the future.

- The collector roads will be constructed to support future transit service.

Network Concept

- The proposed screenlines are anticipated to operate with a LOS B or better during the AM and PM peak hours under background traffic conditions.
- Abbott Street is anticipated to operate above capacity during the AM peak hour under the future total traffic condition. Although Abbott Street is anticipated to operate above capacity, the overall north-south screenline is anticipated to operate with LOS C or better during the AM and PM peak hours. If traffic congestion is realized along Abbott Street, drivers can use alternative routes to travel east (i.e. Hazeldean Road) to Terry Fox Drive.

Network Intersections – MMLOS Analysis

- The Hazeldean Road/Shoppes at Fairwinds and Hazeldean Road/Grant Crossing intersections currently meet the target TLOS, TkLOS and Auto LOS. The PLOS and BLOS at these intersections do not meet the target for the General Urban Area. The poor PLOS and BLOS at these intersections are attributable to the number of travel lanes along Hazeldean Road.
- All approaches to the Robert Grant Avenue/Hazeldean Road and Hazeldean Road/Grant Crossing/Mixed-Use Access intersections will not meet the target PLOS for the General Urban Area. Improvement of the PLOS at these intersections is limited by the number of travel lanes and turn lanes required along Hazeldean Road and Robert Grant Avenue. Consideration could be given to implementing leading pedestrian intervals and zebra striped or textured crosswalks, subject to meeting warrants, during the detailed design of the intersections.
- The east and west approaches to the Robert Grant Avenue/Hazeldean Road and Hazeldean Road/Grant Crossing/Mixed-Use Access intersections will not meet the target BLOS for the General Urban Area. Consideration could be given to implementing a protected intersection as part of the detailed design of these intersections, to be completed as part of future applications. A protected intersection would improve these intersections to a BLOS A.
- All approaches to the Robert Grant Avenue/Hazeldean Road intersection will not meet the target transit LOS. The ultimate design of Robert Grant Avenue provides a north-south grade separated crossing for the median BRT at the Hazeldean Road/Robert Grant Avenue intersection. This grade separated crossing will improve the TLOS on the north and south approaches to this intersection.

Network Intersections – Scenario One

- When Hazeldean BRT/LRT transit station is developed, the target Auto LOS will be reduced to LOS E.
- As the Robert Grant Avenue/Cranesbill Road/Street 15 intersection is anticipated to operate with a LOS F during the AM and PM peak hours under side street stop control, roundabout control is recommended for this intersection. Under roundabout control, this intersection is anticipated to operate with a LOS D or better during the AM and PM peak hours.
- All other intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station.

Network Intersections – Scenario Two

- All intersections within the study area are anticipated to meet the target Auto LOS E within 600m of a rapid transit station under background and total traffic conditions.

- With the shift to non-auto modes anticipated as development progresses and the future BRT/LRT extension to this area, the development permitted under the proposed zoning is anticipated be accommodated by the study area intersections.
- The storage length requirements for the future Hazeldean Road/Grant Crossing/Mixed-Use Access will be reviewed during a future Site Plan Control application.
- The recommended storage lengths for the future Hazeldean Road/Robert Grant Avenue intersection are summarized as follows:
    - Eastbound Left: 65m
    - Westbound Left: 50m
    - Westbound Right: 55m
    - Northbound left: 25m
    - Northbound Right: 50m
    - Southbound Left: 75m
    - Southbound Right: 85m

NOVATECH

Prepared by:

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

Appendix A

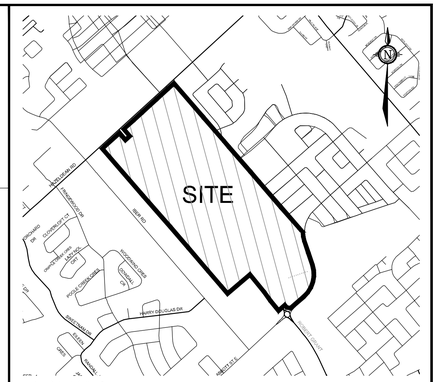
Proposed Draft Plan of Subdivision

SCHEDULE OF LANDUSE

BLOCK #'s	LAND USE	UNITS	AREA (hectares)
1 – 288	Singles	288	12.34
289 – 307	Towns	469	12.05
308 – 315	Multi–Family	878	15.98
319, 320	High Density Residential	360	4.40
321	Institutional		3.23
317, 318	Mixed Use	460	4.09
316	MU / Park & Ride	300	2.27
322	SWM		4.41
323 – 326	Park		3.25
327	Open Space		1.19
328, 329	Transmission Corridor		2.69
330 – 332	Pathway Blocks		0.10
333	Private Access Block		0.06
334	Servicing Block		0.11
	Roads		19.84
TOTAL			86.00

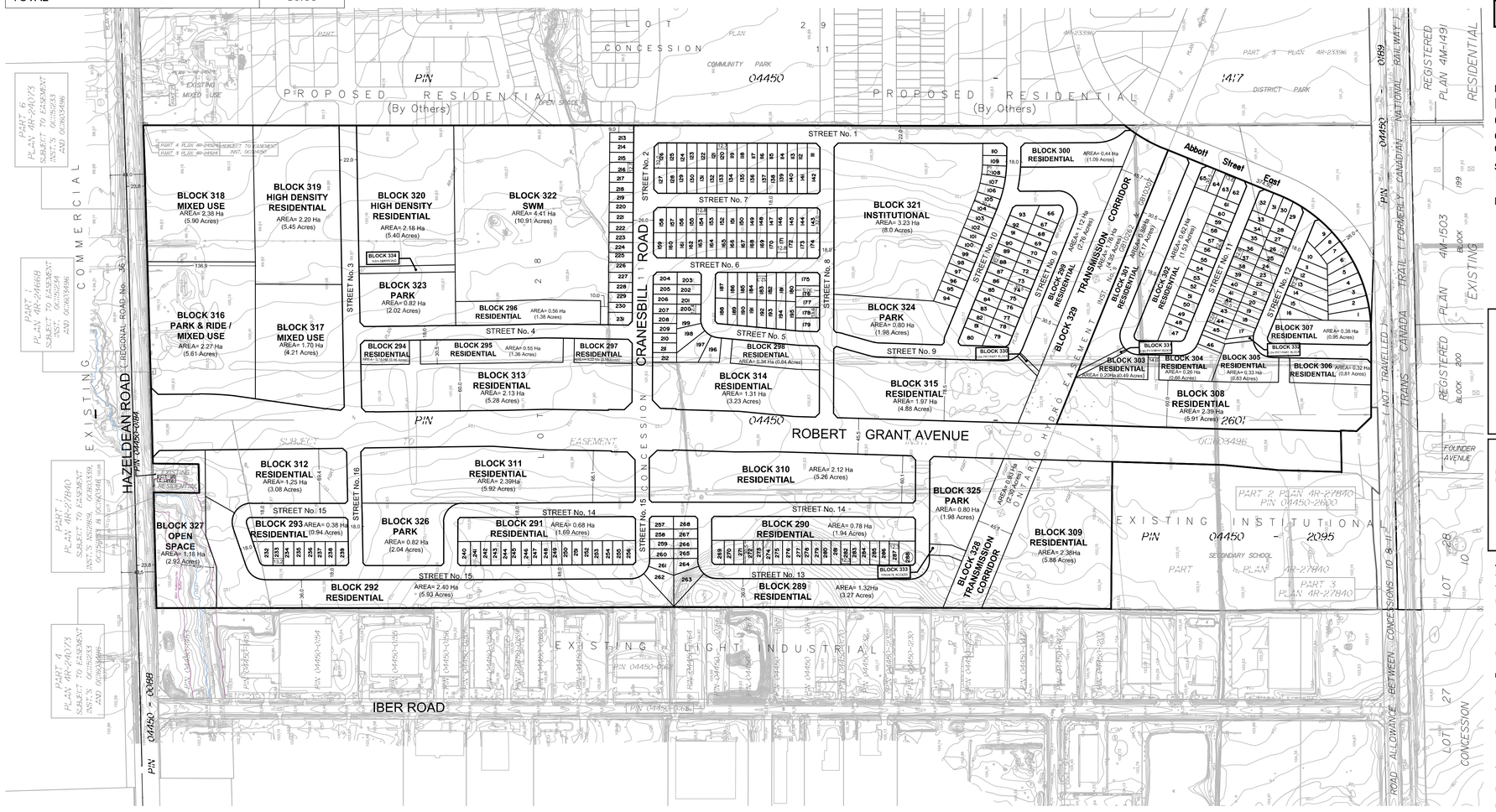
SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____, THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT THIS _____DAY OF _____, 20___ .

_____
DERRICK MOODIE
MANAGER, DEVELOPMENT REVIEW-WEST
PLANNING, INFRASTRUCTURE AND ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY MAP
NOT TO SCALE

METRIC : MEASUREMENTS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.


PROPOSED RESIDENTIAL (By Others)
PIN 04450
LOT 29 CONCESSION 11
COMMUNITY PARK
DISTRICT PARK
EXISTING MIXED USE
EXISTING COMMERCIAL
EXISTING RESIDENTIAL
EXISTING INSTITUTIONAL
EXISTING LIGHT INDUSTRIAL
BLOCK 318 MIXED USE AREA= 2.36 Ha (5.90 Acres)
BLOCK 319 HIGH DENSITY RESIDENTIAL AREA= 2.20 Ha (5.45 Acres)
BLOCK 320 HIGH DENSITY RESIDENTIAL AREA= 2.16 Ha (5.40 Acres)
BLOCK 322 SWM AREA= 4.41 Ha (10.91 Acres)
BLOCK 316 PARK & RIDE / MIXED USE AREA= 2.27 Ha (5.61 Acres)
BLOCK 317 MIXED USE AREA= 1.70 Ha (4.21 Acres)
BLOCK 323 PARK AREA= 0.82 Ha (2.02 Acres)
BLOCK 334
BLOCK 296 RESIDENTIAL AREA= 0.56 Ha (1.38 Acres)
BLOCK 294 RESIDENTIAL AREA= 0.38 Ha (0.94 Acres)
BLOCK 295 RESIDENTIAL AREA= 0.55 Ha (1.36 Acres)
BLOCK 297 RESIDENTIAL AREA= 0.76 Ha (1.88 Acres)
BLOCK 313 RESIDENTIAL AREA= 2.13 Ha (5.28 Acres)
BLOCK 314 RESIDENTIAL AREA= 1.31 Ha (3.23 Acres)
BLOCK 298 RESIDENTIAL AREA= 0.34 Ha (0.84 Acres)
BLOCK 321 INSTITUTIONAL AREA= 3.23 Ha (8.0 Acres)
BLOCK 324 PARK AREA= 0.80 Ha (1.98 Acres)
BLOCK 315 RESIDENTIAL AREA= 1.97 Ha (4.88 Acres)
BLOCK 300 RESIDENTIAL AREA= 0.44 Ha (1.09 Acres)
BLOCK 299 RESIDENTIAL AREA= 1.21 Ha (2.98 Acres)
BLOCK 329 TRANSMISSION CORRIDOR AREA= 4.08 Ha (10.07 Acres)
BLOCK 301 RESIDENTIAL AREA= 0.82 Ha (1.93 Acres)
BLOCK 302 RESIDENTIAL AREA= 0.82 Ha (1.93 Acres)
BLOCK 303 RESIDENTIAL AREA= 0.20 Ha (0.49 Acres)
BLOCK 304 RESIDENTIAL AREA= 0.26 Ha (0.66 Acres)
BLOCK 305 RESIDENTIAL AREA= 0.33 Ha (0.83 Acres)
BLOCK 307 RESIDENTIAL AREA= 0.38 Ha (0.95 Acres)
BLOCK 306 RESIDENTIAL AREA= 0.32 Ha (0.81 Acres)
BLOCK 308 RESIDENTIAL AREA= 2.39 Ha (5.91 Acres)
BLOCK 325 PARK AREA= 0.80 Ha (1.98 Acres)
BLOCK 309 RESIDENTIAL AREA= 2.39 Ha (5.86 Acres)
BLOCK 328 TRANSMISSION CORRIDOR AREA= 0.97 Ha (2.39 Acres)
BLOCK 310 RESIDENTIAL AREA= 2.12 Ha (5.26 Acres)
BLOCK 311 RESIDENTIAL AREA= 2.39Ha (5.92 Acres)
BLOCK 312 RESIDENTIAL AREA= 1.25 Ha (3.08 Acres)
BLOCK 327 OPEN SPACE AREA= 1.16 Ha (2.92 Acres)
BLOCK 326 PARK AREA= 0.82 Ha (2.04 Acres)
BLOCK 293 RESIDENTIAL AREA= 0.38 Ha (0.94 Acres)
BLOCK 291 RESIDENTIAL AREA= 0.68 Ha (1.69 Acres)
BLOCK 290 RESIDENTIAL AREA= 0.78 Ha (1.94 Acres)
BLOCK 292 RESIDENTIAL AREA= 2.40 Ha (5.93 Acres)
BLOCK 289 RESIDENTIAL AREA= 1.32Ha (3.27 Acres)
BLOCK 333
STREET No. 1
STREET No. 2
STREET No. 3
STREET No. 4
STREET No. 5
STREET No. 6
STREET No. 7
STREET No. 8
STREET No. 9
STREET No. 10
STREET No. 11
STREET No. 12
STREET No. 13
STREET No. 14
STREET No. 15
STREET No. 16
CRANESBILL ROAD
HAZELDEAN ROAD
IBER ROAD
ROBERT GRANT AVENUE
Abbott Street East
CONCESSION 11
LOT 28
LOT 27
CONCESSION 10
HYDRO EASEMENT
TRANSMISSION CORRIDOR
SUBJECT TO EASEMENT
PART 6 PLAN 4R-24073 SUBJECT TO EASEMENT INST.'S 0611523 AND OC1153234
PART 1 PLAN 4R-24668 SUBJECT TO EASEMENT INST.: 0611523 AND OC1153234
PART 4 PLAN 4R-24073 SUBJECT TO EASEMENT INST.: OC1153233
PART 1 PLAN 4R-27840 SUBJECT TO EASEMENT INST.'S NS12819, OC810339, OC1153234 & OC1153233
PART 2 PLAN 4R-27840 PIN 04450-2600
PART 3 PLAN 4R-27840
PART 4 PLAN 4R-24073 SUBJECT TO EASEMENT INST.'S 0611523 AND OC1153233
PIN 04450-0088
PIN 04450-0189
PIN 04450-0189
PIN 04450-0189

Appendix B

Traffic Count and Signal Timing Data

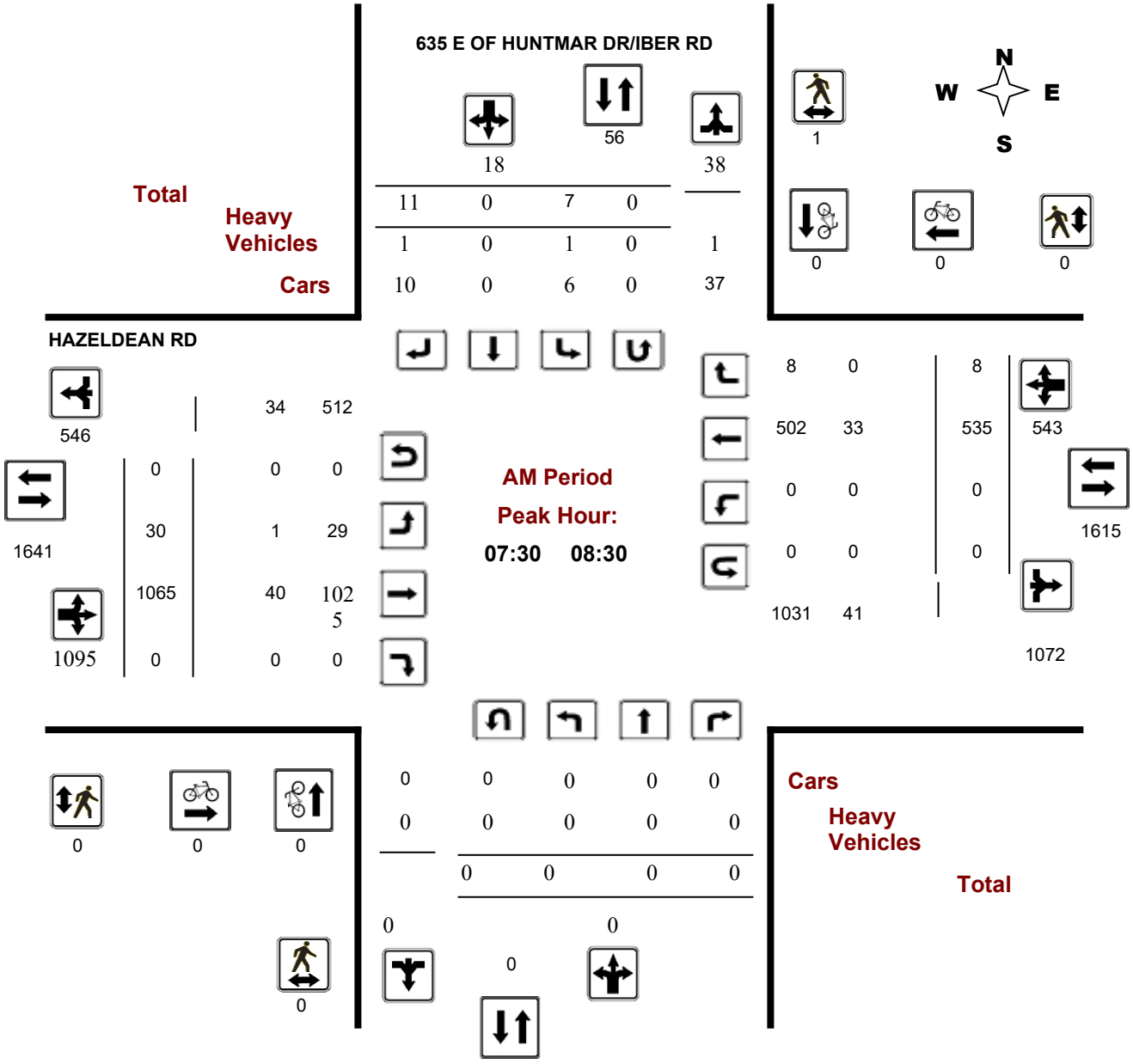
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

635 E OF HUNTMAR DR/IBER RD @ HAZELDEAN RD

Survey Date: Tuesday, January 19, 2016
Start Time: 07:00

WO No: 35663
Device: Miovision



Comments

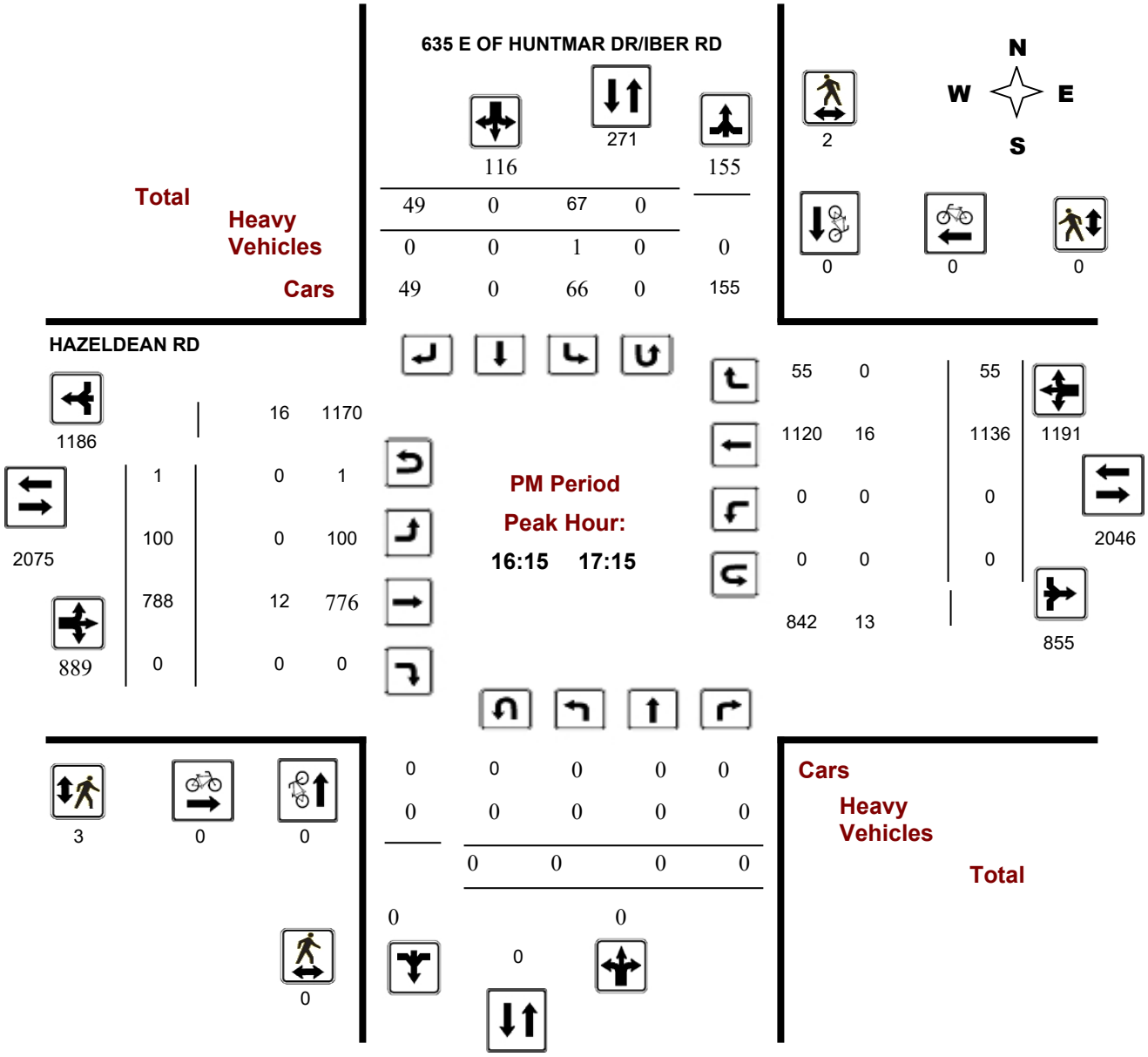
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

635 E OF HUNTMAR DR/IBER RD @ HAZELDEAN RD

Survey Date: Tuesday, January 19, 2016 **WO No:** 35663

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



Comments

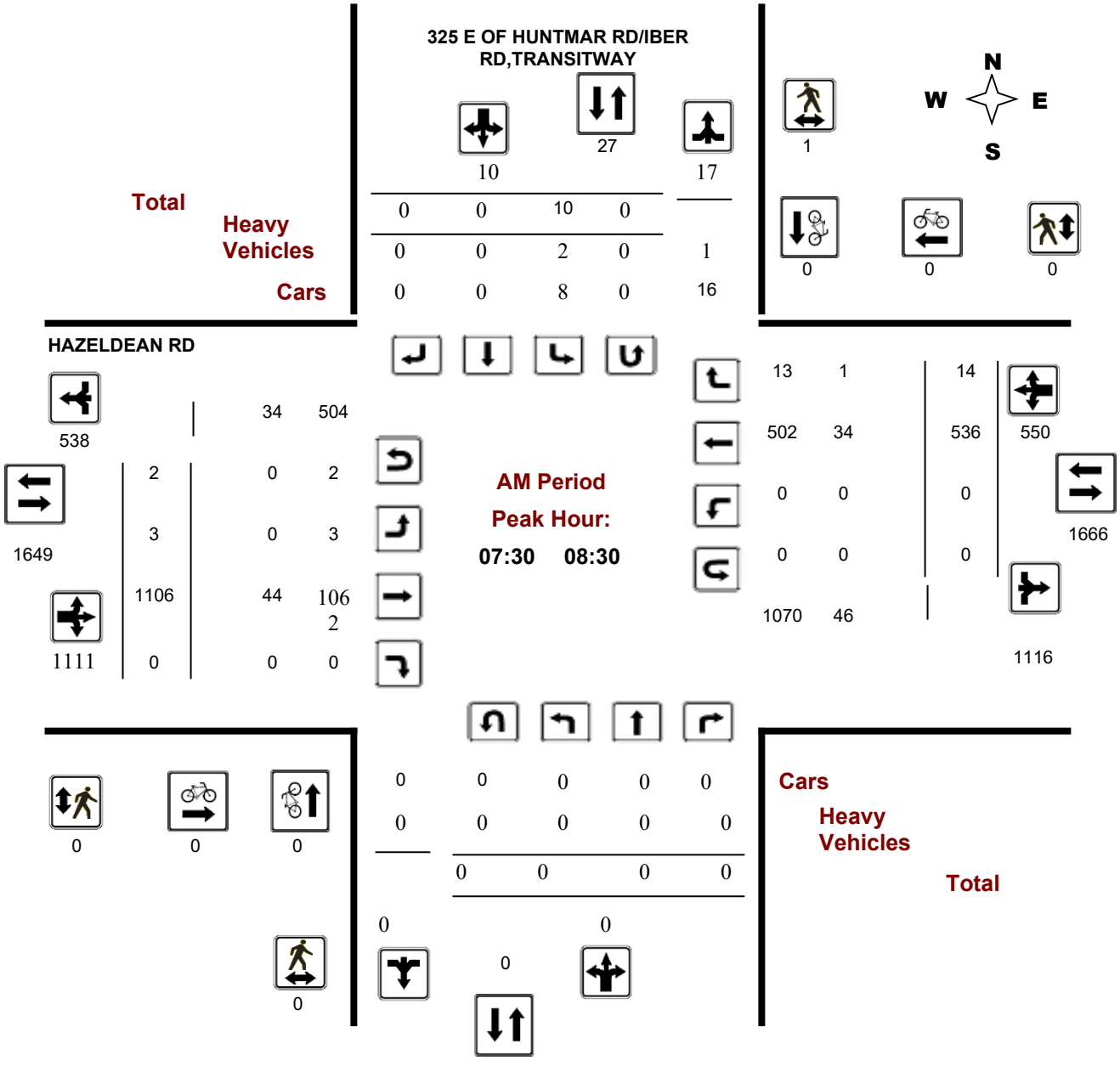
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

325 E OF HUNTMAR RD/IBER RD,TRANSITWAY @ HAZELDEAN RD

Survey Date: Tuesday, January 19, 2016 **WO No:** 35664

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



Comments

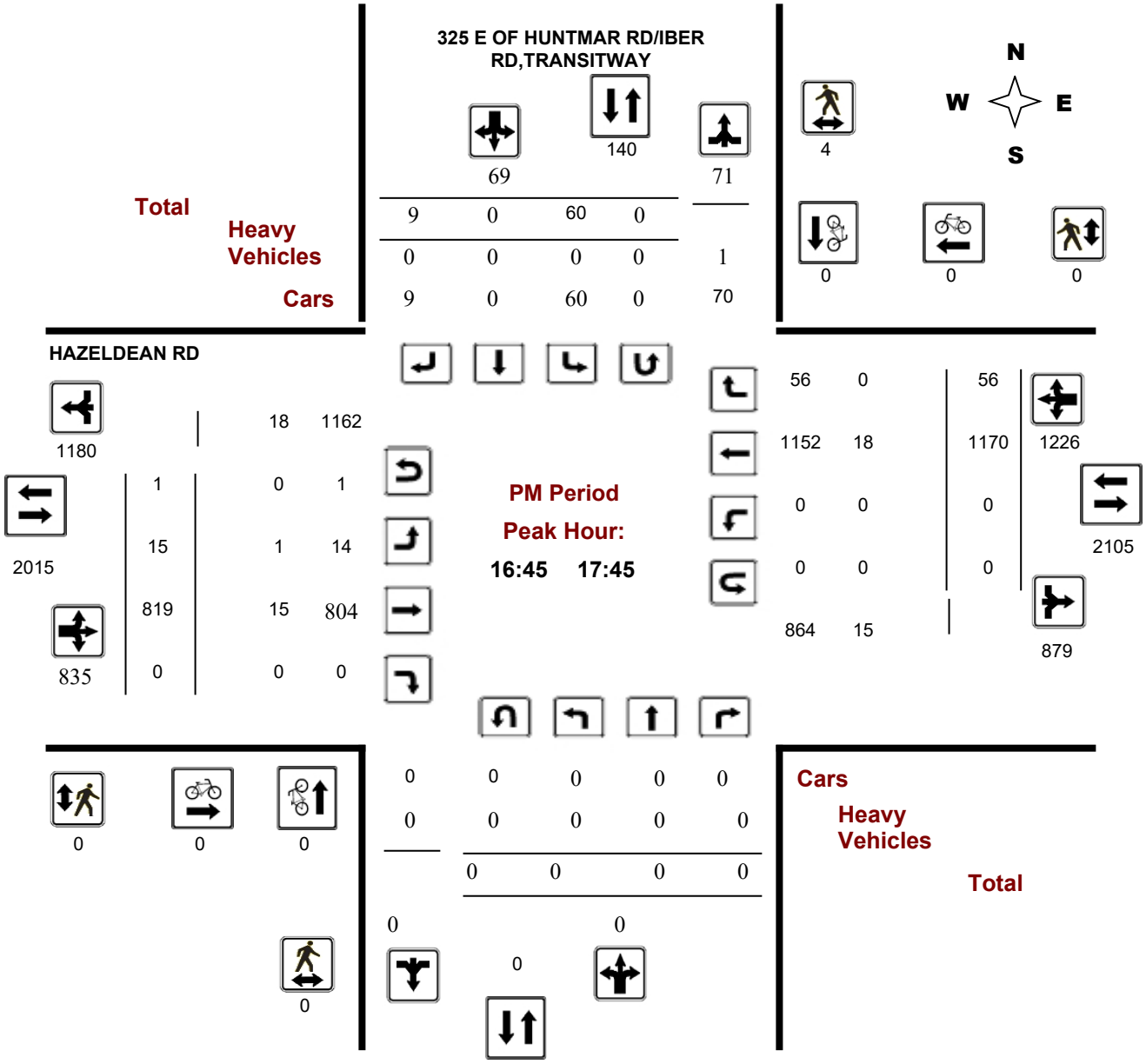
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

325 E OF HUNTMAR RD/IBER RD,TRANSITWAY @ HAZELDEAN RD

Survey Date: Tuesday, January 19, 2016 **WO No:** 35664

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



Comments

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Operations Unit

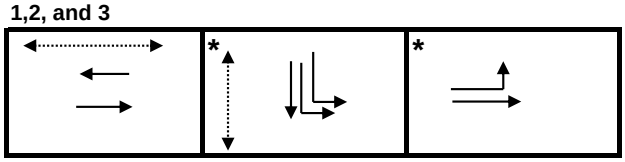
Intersection:	**Main:**	Hazeldean	**Side:**	635m E of Iber	
Controller:		MS 3200A		**TSD:**	**6761**
Author:		Matthew Anderson		**Date:**	27-Sep-2016

Existing Timing Plans†

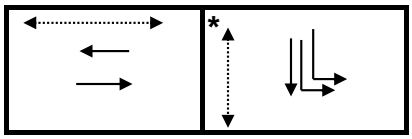
	Plan				**Ped Minimum Time**		
	AM Peak 1	**Off Peak** 2	**PM Peak** 3	**Night** 4	***Walk***	***DW***	***A+R***
Cycle	110	100	120	80			
Offset	43	79	4	X			
EB Thru	77	66	87	47	-	-	3.7 + 2.7
WB Thru	57	51	67	47	7	10	3.7 + 2.7
SB	33	34	33	33	7	19	3.3 + 3.3
EB Left	20	15	20	-	-	-	3.7 + 2.7

Phasing Sequence‡

Plans: **1,2, and 3**



Plans: **4**



Schedule

Weekday

Time	Plan
0:10	4
6:30	1
9:30	2
15:00	3
19:00	2
23:00	4

Saturday

Time	Plan
0:10	4
9:00	2
22:30	4

Sunday

Time	Plan
0:10	4
8:00	2
23:30	4

Notes

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

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

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◄·····► Pedestrian signal

Cost is $56.50 ($50 + HST)

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Operations Unit

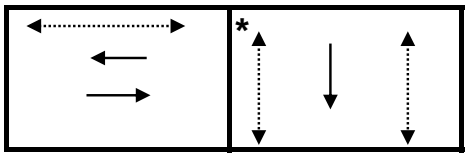
Intersection:	**Main:**	Hazeldean	**Side:**	325m E of Iber	
Controller:		ATC-3		**TSD:**	**6762**
Author:		Matthew Anderson		**Date:**	27-Sep-2016

Existing Timing Plans†

	Plan				**Ped Minimum Time**		
	AM Peak 1	**Off Peak** 2	**PM Peak** 3	**Night** 4	***Walk***	***DW***	***A+R***
Cycle	110	100	120	100			
Offset	38	0	0	X			
EB Thru	78	68	88	68	-	-	3.7 + 2.3
WB Thru	78	68	88	68	7	12	3.7 + 2.3
SB Thru	32	32	32	32	7	18	3.0 + 3.6

Phasing Sequence‡

Plan:



Schedule

Weekday

Time	Plan
0:10	4
6:30	1
9:30	2
15:00	3
19:00	2
23:00	4

Saturday

Time	Plan
0:10	4
9:00	2
22:30	4

Sunday

Time	Plan
0:10	4
8:00	2
22:30	4

Notes

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

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

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◄·····► Pedestrian signal

Cost is $56.50 ($50 + HST)

Appendix C

Collision Data

Brad Byvelds

From: Conley, Caitlin <caitlin.conley@ottawa.ca>
Sent: Monday, December 9, 2019 11:01 AM
To: Brad Byvelds
Subject: RE: Request for Collision Data
Attachments: 635 E of Hazeldean_Iber - Collision Details Report - Public Version 2014-2018.pdf

Good morning Brad,

Attached is the data as requested. Please note that in the last 5 years, there have been no reportable collisions at the intersection of 325 E of Huntmar Dr/Iber Rd @ Hazeldean Rd.

Thank you,

Caitlin Conley
Coord, Collision Data Systems & Analytics
City of Ottawa | Transportation Services | Traffic Collison Data Systems Sect.
Phone: 613-580-2424 ext. 12815
caitlin.conley@ottawa.ca

Collision data for 2013 to 2018, are now available on OpenData Ottawa
Les statistiques sur les collisions sont accessibles sur Données ouvertes Ottawa.

From: Brad Byvelds <B.Byvelds@novatech-eng.com>
Sent: December 06, 2019 3:59 PM
To: Hemlow, Byron <Byron.Hemlow@ottawa.ca>
Cc: Conley, Caitlin <caitlin.conley@ottawa.ca>
Subject: Request for Collision Data

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hello Byron,

Can you please send me the collision history within the last five years at the following intersections:

- Hazeldean Road/Toys 'R' Us Signalized Access (5705 Hazeldean) – 325m east of Iber Road
- Hazeldean Road/Lowe's/Michaels/Winners Signalized Access (5617 and 5577 Hazeldean) – 620m east of Iber Road

I have included an aerial showing the above intersections.

Thanks, have a good weekend

Brad Byvelds, P.Eng., Project Coordinator | Transportation/Traffic
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 286 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'

City Operations - Transportation Services

Collision Details Report - Public Version

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

Location: 635 E OF HUNTMAR DR/IBER RD @ HAZELDEAN RD

Traffic Control: Traffic signal

Total Collisions: 5

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Oct-29, Wed,20:22	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Mar-17, Tue,16:41	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Bicycle	Other motor vehicle	
					South	Turning right	Pick-up truck	Cyclist	
2015-Dec-04, Fri,15:36	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2017-May-31, Wed,21:07	Rain	Turning movement	P.D. only	Wet	East	Turning left	Passenger van	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2018-Sep-22, Sat,17:32	Clear	Turning movement	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	

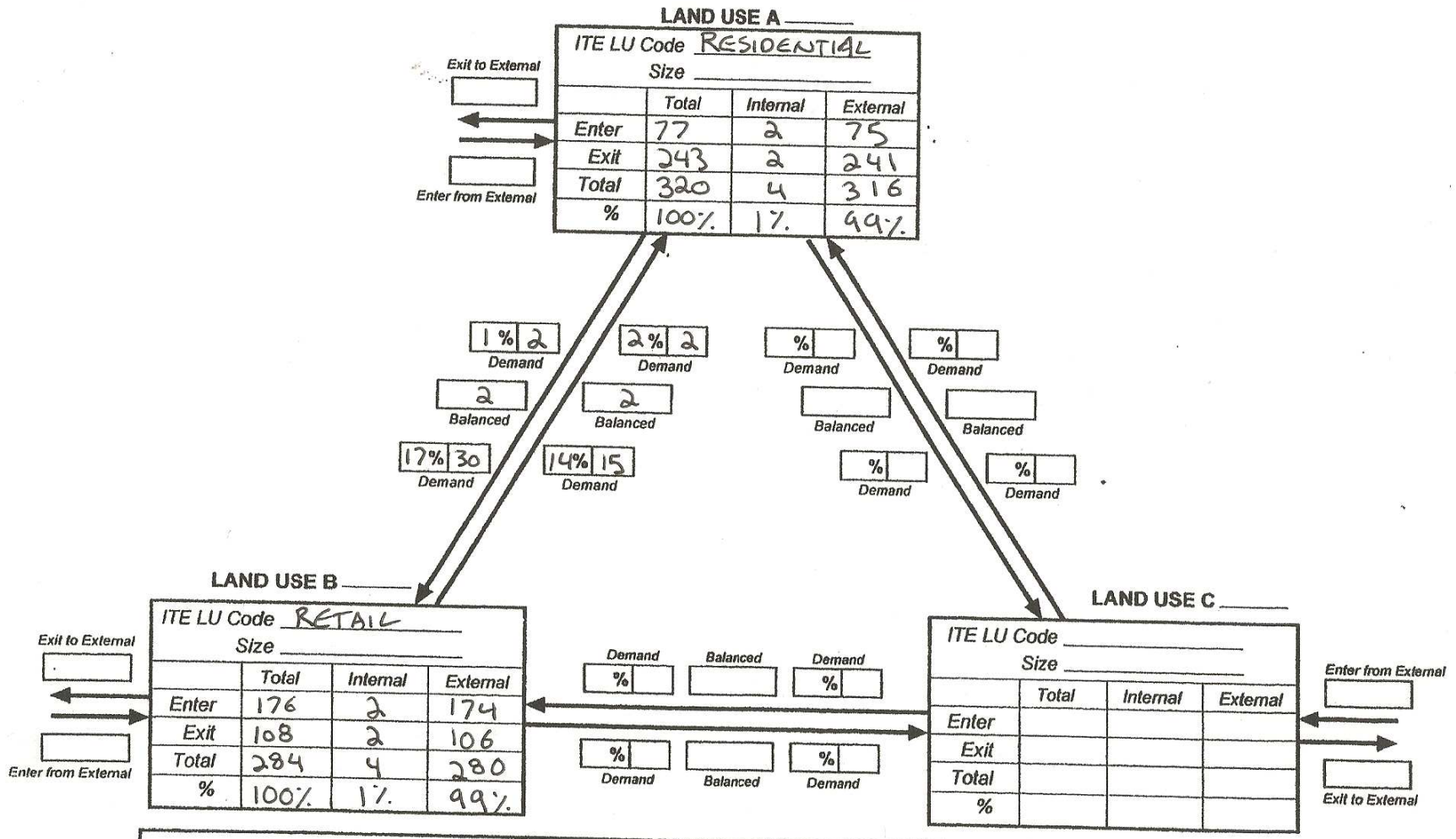
Appendix D

ITE Internal Capture Summary Sheets

Analyst BRAD BYVELDS
Date SCENARIO ONE

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt KIZELL LANDS
Time Period AM PEAK



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter				
Exit				
Total				
Single-Use Trip Gen. Est.				

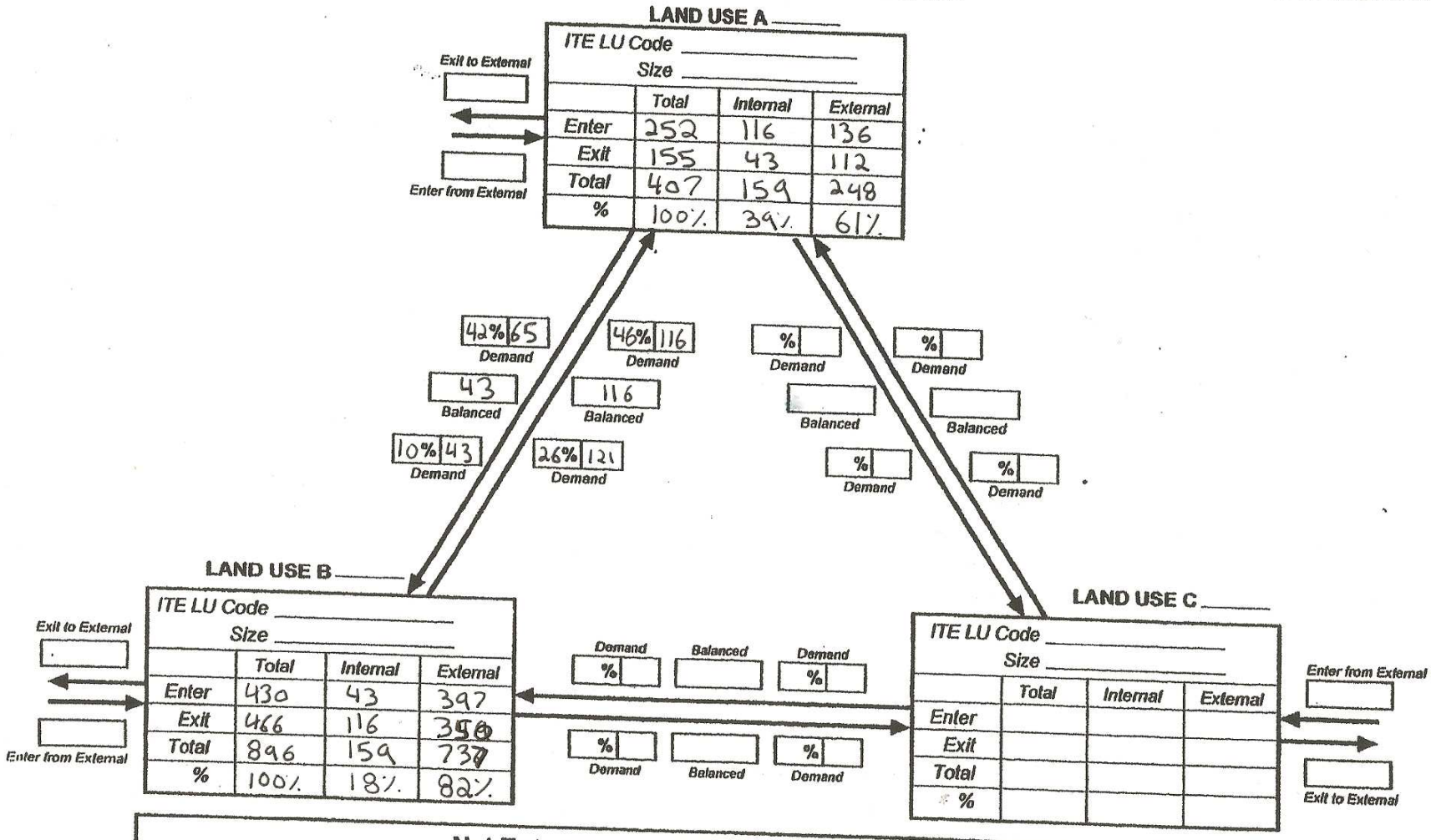
INTERNAL CAPTURE

Source: Kaku Associates, Inc.

Analyst BRAD BYVELDS
Date SCENARIO ONE

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt KIZELL LANDS
Time Period PM PEAK



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter				
Exit				
Total				
Single-Use Trip Gen. Est.				

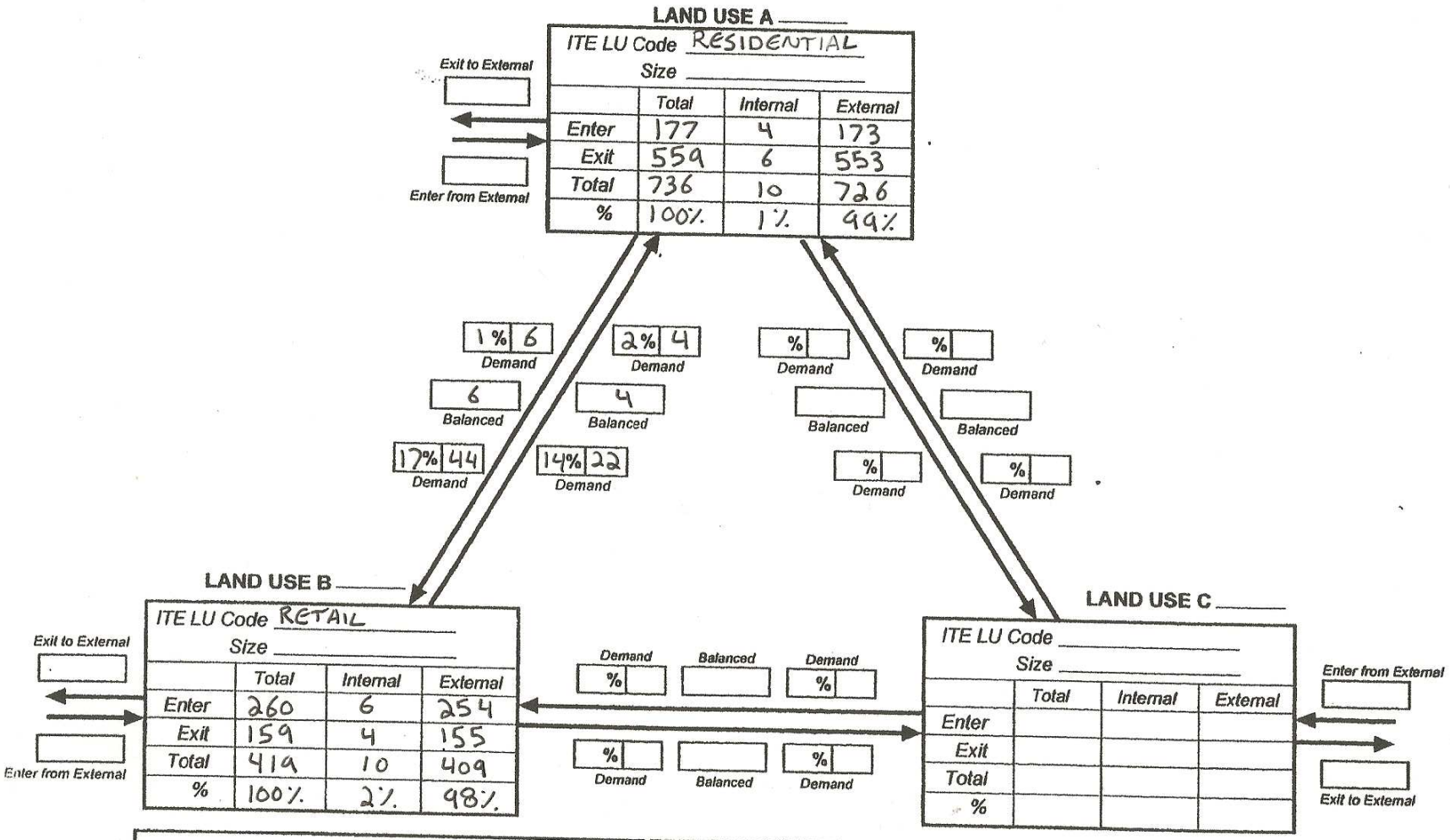
INTERNAL CAPTURE

Source: Kaku Associates, Inc.

Analyst BRAD BYVELDS
Date SCENARIO 2

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt KIZELL LANDS
Time Period AM PEAK



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter				
Exit				
Total				
Single-Use Trip Gen. Est.				

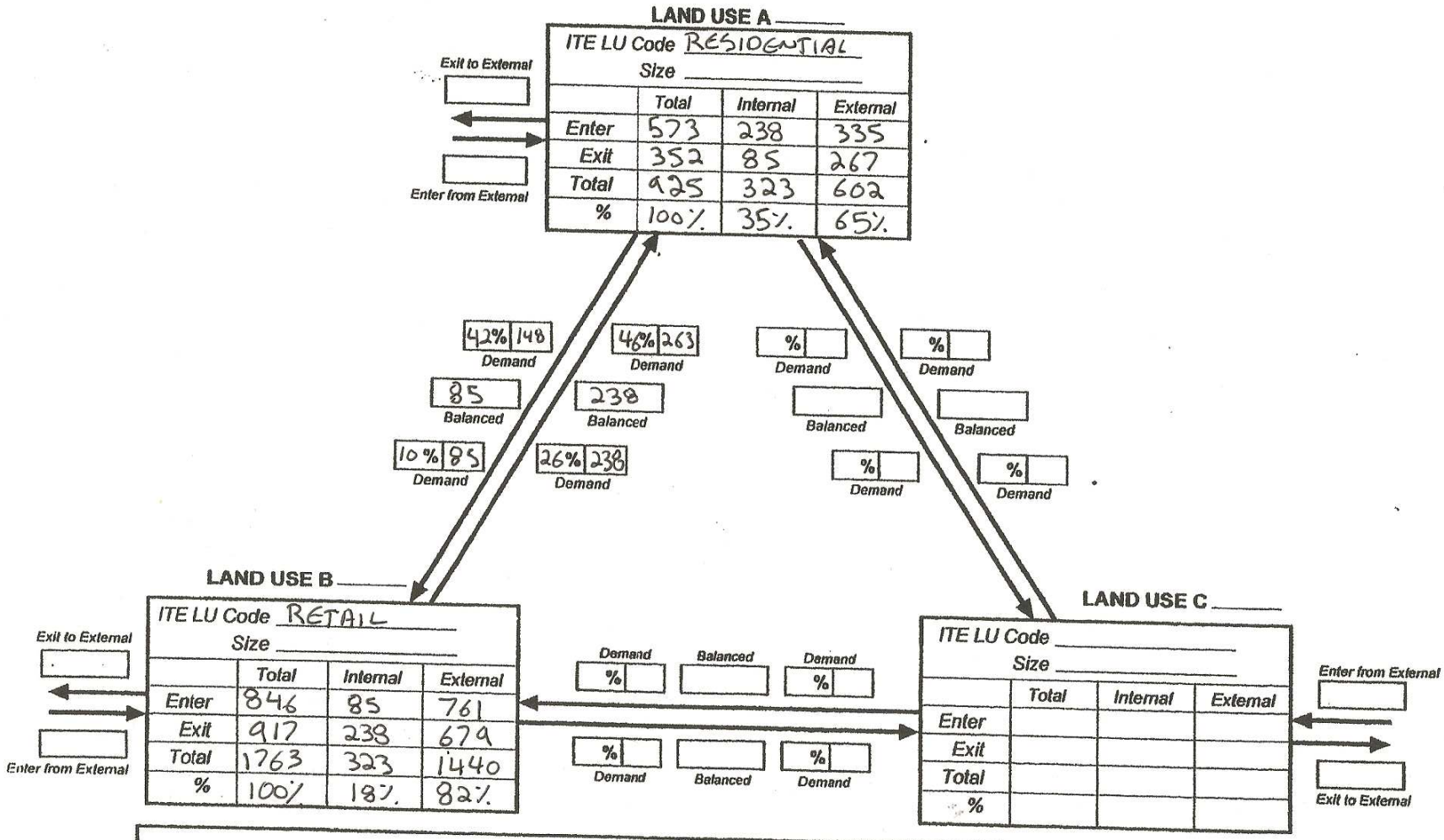
INTERNAL CAPTURE

Source: Kaku Associates, Inc.

Analyst BRAD BYVELDS
Date SCENARIO 2

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt KIZELL LANDS
Time Period PM PEAK



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter				
Exit				
Total				
Single-Use Trip Gen. Est.				

INTERNAL CAPTURE

Source: Kaku Associates, Inc.

Appendix E

Preliminary Hazeldean Park and Ride Design

9+826

9+900

POB9+826.399

PARK & RIDE - P.P.U.D.O.

HAZELDEAN ST

BUS PLATFORM

OPERATOR FACILITY

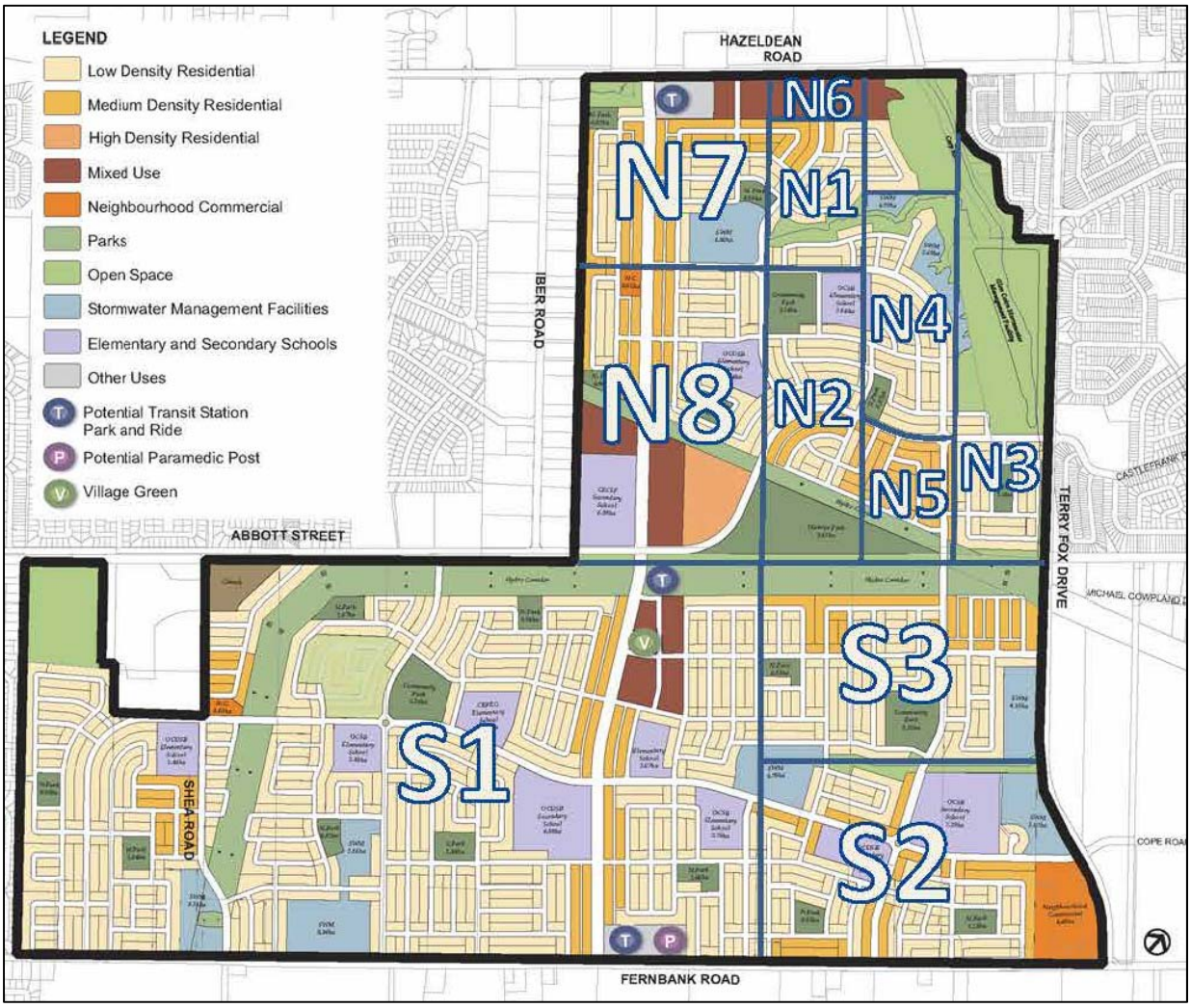
BUS LAY-BY

Hazeldean

Appendix F

Relevant Transportation Study Excerpts

Figure 10
Fernbank Community Traffic Zones



3.4.2 Background Traffic Growth

Consistent with the Fernbank CDP TMP and with other recent transportation studies prepared for development parcels within the Fernbank Community, a 2% annual growth rate was deemed to be appropriate. This rate was then applied to the existing traffic volumes at the study area intersections until the 2025 horizon. In addition, the trips generated by the other areas of the Fernbank Community (i.e. all areas excluding the subject Richcraft site) were added to the boundary road network.

3.4.3 Future Background Traffic Conditions

The build-out horizons for the background developments must recognize the scale of the developments under consideration. An absorption rate of 500 units per year was applied to the background

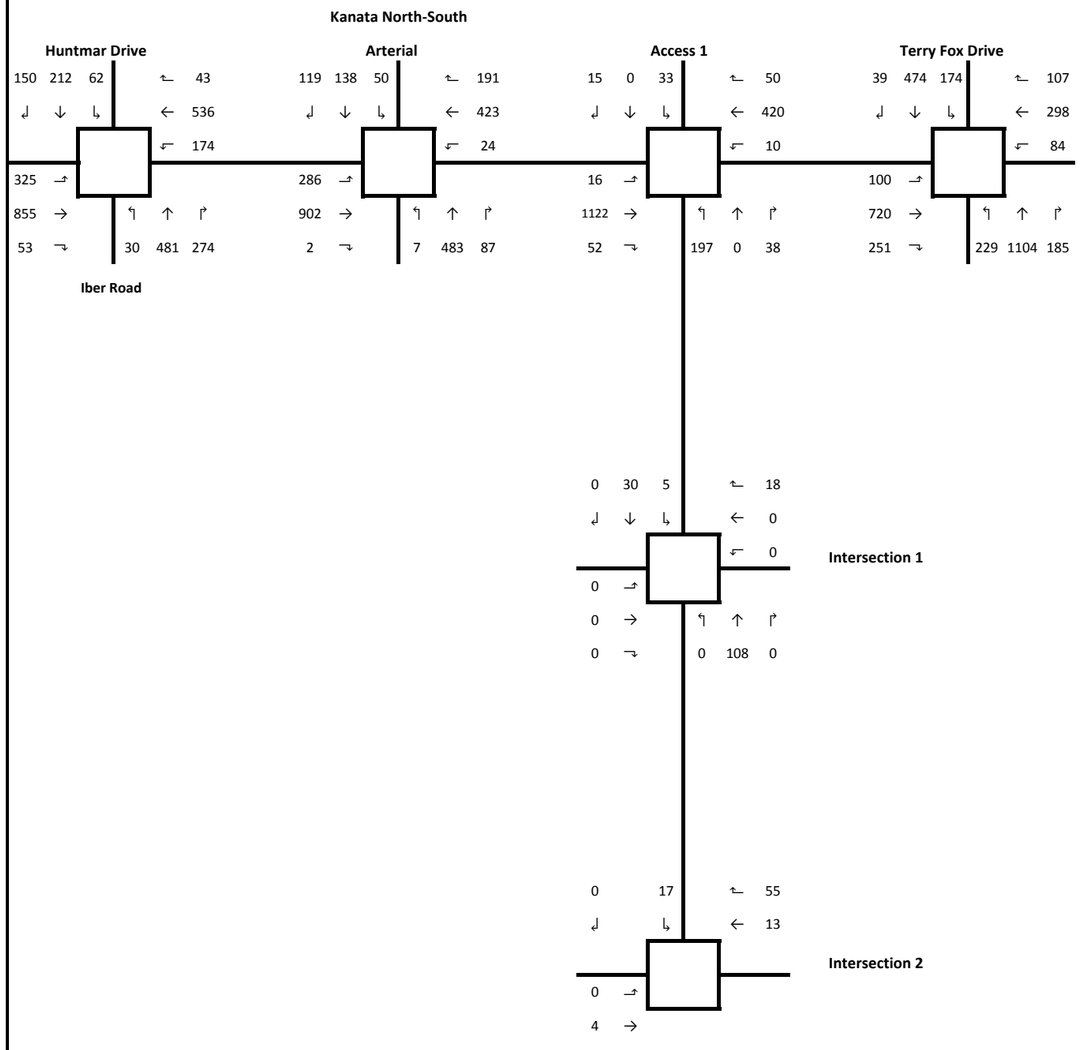
Table 3
Fernbank Community Traffic Generation

Zone	Modes	Split	Morning Peak Hour			Afternoon Peak Hour		
			In	Out	Total	In	Out	Total
N1 (Richcraft)	Auto	55%	29	109	138	113	62	174
	Passenger	15%	8	30	38	31	17	48
	Transit	25%	13	50	63	51	28	79
	Active Modes	5%	3	10	13	10	6	16
	N1 Subtotal (person trips)	100%	53	198	251	205	112	317
N2 (Richcraft)	Auto	55%	30	123	154	125	65	190
	Passenger	15%	8	34	42	34	18	52
	Transit	25%	14	56	70	57	30	87
	Active Modes	5%	3	11	14	11	6	17
	N2 Subtotal (person trips)	100%	55	224	280	227	119	346
N3	Auto	55%	23	69	91	76	44	121
	Passenger	15%	6	19	25	21	12	33
	Transit	25%	10	31	42	35	20	55
	Active Modes	5%	2	6	8	7	4	11
	N3 Subtotal (person trips)	100%	41	125	166	139	80	220
N4	Auto	55%	36	126	162	133	74	207
	Passenger	15%	10	34	44	36	20	57
	Transit	25%	16	57	74	61	34	94
	Active Modes	5%	3	11	15	12	7	19
	N4 Subtotal (person trips)	100%	65	229	294	242	134	377
N5	Auto	55%	24	84	108	89	50	138
	Passenger	15%	6	23	30	24	14	38
	Transit	25%	11	38	49	41	23	63
	Active Modes	5%	2	8	10	8	5	13
	N5 Subtotal (person trips)	100%	43	152	197	162	90	251
N6 (Richcraft)	Auto	55%	3	7	10	6	4	10
	Passenger	15%	1	2	3	2	1	3
	Transit	25%	2	3	5	3	2	5
	Active Modes	5%	0	1	1	1	0	1
	N6 Subtotal (person trips)	100%	6	12	18	10	8	19
N7	Auto	55%	73	281	353	285	153	439

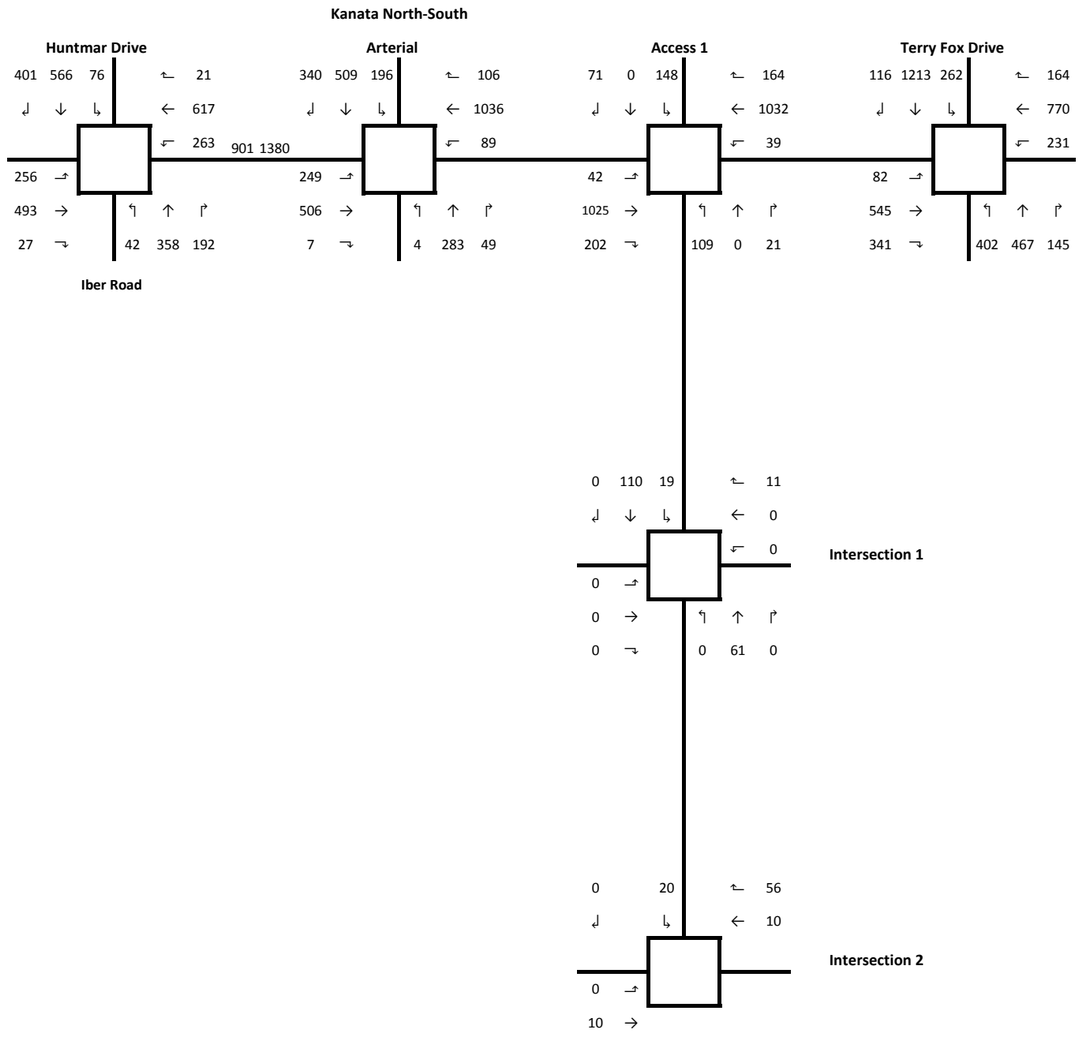
	Passenger	15%	20	77	96	78	42	120
	Transit	25%	33	128	161	130	70	200
	Active Modes	5%	7	26	32	26	14	40
	N7 Subtotal (person trips)	100%	132	510	642	518	278	798
N8	Auto	55%	87	347	435	349	185	535
	Passenger	15%	24	95	119	95	51	146
	Transit	25%	40	158	198	159	84	243
	Active Modes	5%	8	32	40	32	17	49
	N8 Subtotal (person trips)	100%	158	631	790	635	337	972
S1	Auto	55%	503	1604	2108	1756	1009	2765
	Passenger	15%	137	438	575	479	275	754
	Transit	25%	229	729	958	798	459	1257
	Active Modes	5%	46	146	192	160	92	251
	S1 Subtotal (person trips)	100%	914	2917	3833	3193	1835	5028
S2	Auto	55%	91	314	405	334	187	521
	Passenger	15%	25	86	111	91	51	142
	Transit	25%	42	143	184	152	85	237
	Active Modes	5%	8	29	37	30	17	47
	S2 Subtotal (person trips)	100%	166	571	737	607	340	947
S3	Auto	55%	93	321	414	342	191	532
	Passenger	15%	25	87	113	93	52	145
	Transit	25%	42	146	188	156	87	242
	Active Modes	5%	8	29	38	31	17	48
	S3 Subtotal (person trips)	100%	169	583	752	622	347	968
Richcraft Totals	Auto	55%	63	239	302	243	131	375
	Passenger	15%	17	65	82	66	36	102
	Transit	25%	29	109	137	111	60	171
	Active Modes	5%	6	22	27	22	12	34
	Richcraft Subtotals (person trips)	100%	114	434	549	442	239	682
2020 Background Trips (25% Total)	Auto	55%	232	786	1019	841	473	1315
	Passenger	15%	63	214	278	229	129	359
	Transit	25%	106	357	463	382	215	598
	Active Modes	5%	21	71	93	76	43	120

	Subtotal (person trips)	100%	422	1430	1853	1530	860	2390
2025 Background Trips (50% Total)	Auto	55%	464	1572	2038	1682	946	2629
	Passenger	15%	127	429	556	459	258	717
	Transit	25%	211	715	926	765	430	1195
	Active Modes	5%	42	143	185	153	86	239
	Subtotal (person trips)	100%	844	2859	3706	3059	1721	4781
Fernbank Total	Auto	55%	991	3384	4378	3608	2024	5634
	Passenger	15%	270	923	1194	984	552	1536
	Transit	25%	451	1538	1990	1640	920	2561
	Active Modes	5%	90	308	398	328	184	512
	Subtotal (person trips)	100%	1802	6152	7960	6560	3680	10243

AM PEAK



PM PEAK

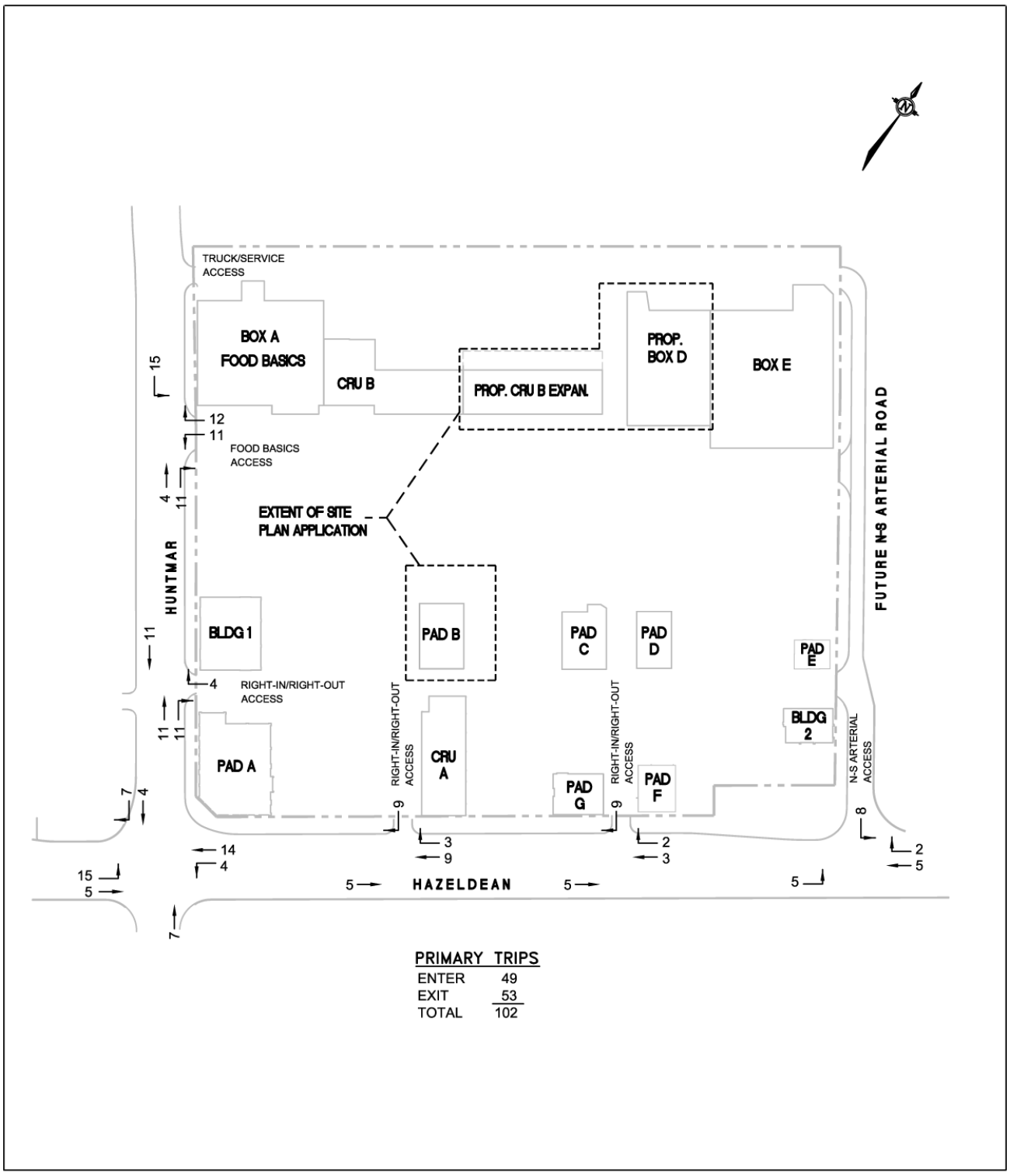


Stantec Consulting Ltd.
1331 Clyde Avenue
ON, Canada K2C 3G4
Tel: (613) 722-4420
www.stantec.com

FIGURE: 14
TITLE: 2025 Ultimate Traffic Volumes

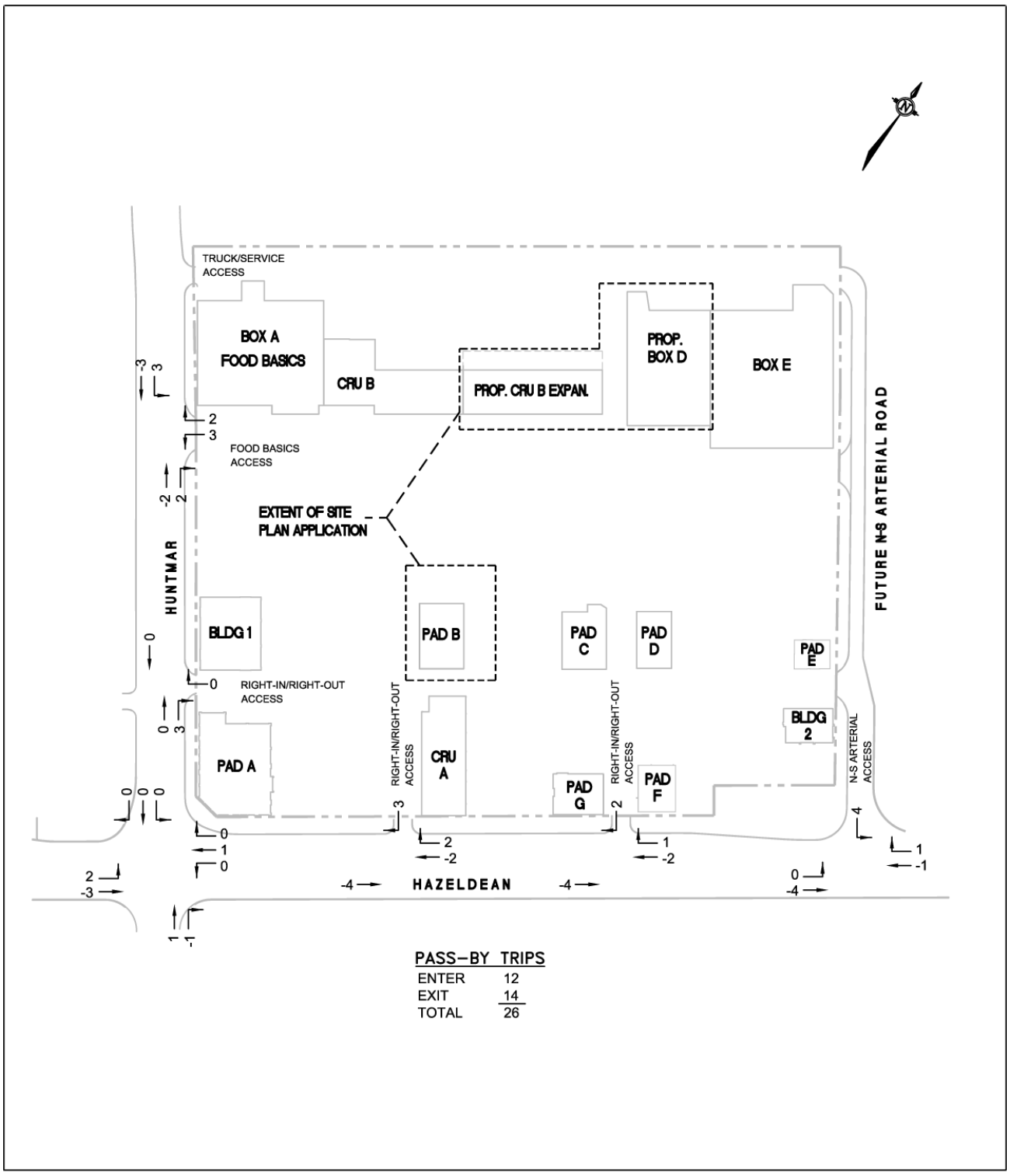
CLIENT: Richcraft Homes
PROJECT: 590 Hazeldean Road

FIGURE 3.1
PEAK PM HOUR SITE GENERATED PRIMARY TRIPS



NOT TO SCALE

FIGURE 3.2
PEAK PM HOUR SITE GENERATED PASS-BY TRIPS



NOT TO SCALE

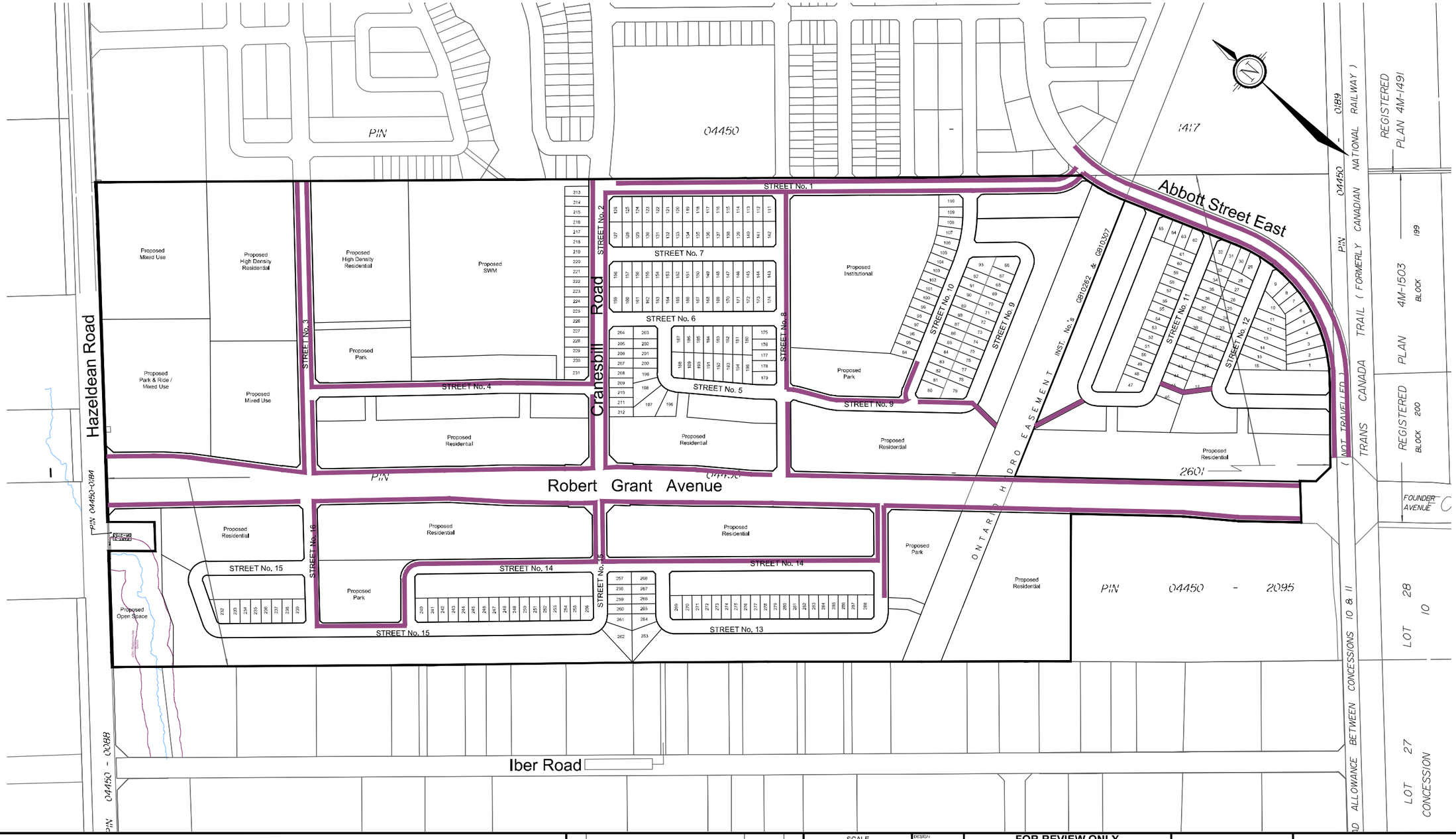
Appendix G

Proposed Pathways Plan

LEGEND

Subject Lands

Proposed Concrete Sidewalk



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

No.	REVISION	DATE	BY

SCALE
1:2500 (A1) / 1:5000 (11x17)
1:2500
0 25 50 75 100

DESIGN XXX
CHECKED XXX
DRAWN wls
CHECKED XXX
APPROVED XXX

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

BRIDLEWOOD 3

DRAWING NAME
PROPOSED PATHWAY PLAN

PROJECT No. 117153-00
REV REV #1
DRAWING No. 117153-PN

PLANA4x36.DWG - 914.4mmx609.6mm

M:\2008\108195\Subdivision\CAD\Design\Figures\Traffic\108195-Pathway.dwg, Concept Plan - Dual Scale, May 04, 2020 - 9:47am, wsloss

Appendix H

Segment MMLOS Analysis

Pedestrian Level of Service (PLOS)

Sidewalk Width	Boulevard Width	Avg. Daily Curb Lane Traffic Volume	Presence of On-Street Parking	Operating Speed	Segment PLOS
Hazeldean Road					
2.0m +	2.0m +	>3,000 vpd	No	60 km/hr	C

Bicycle Level of Service (BLOS)

Road Class	Bike Route	Type of Bikeway	Travel Lanes	Centerline Markings	Operating Speed	Segment BLOS
Hazeldean Road						
Arterial	Spine Route	Bike Lanes	2	Raised Median	60 km/hr	C

Transit Level of Service (TLOS)

Facility Type	Level/Exposure to Congestion Delay, Friction and Incidents			Segment TLOS
	Congestion	Friction	Incident Potential	
Hazeldean Road				
Mixed Traffic	Yes	Low	Medium	D

Truck Level of Service (TkLOS)

Curb Lane Width	Number of Travel Lanes (Per Direction)	Segment TkLOS
Hazeldean Road		
3.5m	2	A

Auto LOS

Direction	Directional Capacity[1]	Traffic Volumes		V/C Ratio and LOS				Auto LOS
		AM Peak	PM Peak	AM Peak		PM Peak		
				V/C	LOS	V/C	LOS	
Hazeldean Road								
EB	2,000 vph	1,095	888	0.55	A	0.44	A	A
WB	2,000 vph	546	1,185	0.27	A	0.59	A	

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

Appendix I

Traffic Signalization Warrants

NOVATECH
Engineers, Planners & Landscape Architects

TRAFFIC SIGNAL JUSTIFICATION
USING PROJECTED VOLUMES

LOCATION: Robert Grant Avenue **at** Cranesbill Road/ Street 15

YEAR: 2030 (Scenario One)

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENT		COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	SECTIONAL		ENTIRE % (2)
		OPERATING SPEED ≥ 70KM/H	OPERATING SPEED < 70 KM/H	NUMERICAL	PERCENT	
1. MINIMUM VEHICULAR WARRANT	A. Vehicle volume, all approaches (average hour)	480 600 (2 or more lane approach	720 900 (2 or more lane approach	873	121%	88%
	B. Vehicle volume along minor street (average hour)	120 180 (tee intersection)	170 255 (tee intersection)	149	88%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volume along major street (average hour)	480 600 (2 or more lane approach)	720 900 (2 or more lane approach	676	94%	94%
	B (1). Combined vehicle and pedestrian volume crossing the major street (average hour)	50	75	146	195%	

NOTES

1) For definition of crossing volume refer to the Ontario Traffic Manual Book 12, Section 4.5 (Nov. 2007).
2) The lowest sectional percentage governs the entire Justification.
3) Average hourly volumes estimated from peak hour volumes, AHV = PM / 2 or AHV = (AM + PM) / 4.

Appendix J

Transportation Demand Management Checklist

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

Legend

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

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

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

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

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

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

Appendix K

Intersection MMLOS Analysis

Pedestrian Level of Service (PLOS)

Criteria	North Approach		East Approach		West Approach	
Hazeldean Road/Toys 'R' Us Access						
PETSI SCORE						
CROSSING DISTANCE CONDITIONS						
Median > 2.4m in Width	No	72	No	23	No	23
Lanes Crossed (3.5m Lane Width)	5		8		8	
SIGNAL PHASING AND TIMING						
Left Turn Conflict	Permissive	-8	Permissive	-8	No Left Turn/Prohibited	0
Right Turn Conflict	Permissive or Yield	-5	No Right Turn/Prohibited	0	Permissive or Yield	-5
Right Turn on Red	RTOR Allowed	-3	N/A	0	N/A	0
Leading Pedestrian Interval	No	-2	No	-2	No	-2
CORNER RADIUS						
Parallel Radius	> 25m	-9	No Right Turn	0	> 15m to 25m	-8
Parallel Right Turn Channel	Smart Channel	2	No Right Turn	0	No Right Turn Channel	-4
Perpendicular Radius	N/A	0	> 25m	-9	N/A	0
Perpendicular Right Turn Channel	N/A	0	Smart Channel	2	N/A	0
CROSSING TREATMENT						
Treatment	Standard	-7	Standard	-7	Standard	-7
PETSI SCORE		**40**		**-1**		**-3**
LOS		**E**		**F**		**F**
DELAY SCORE						
Cycle Length		110		120		120
Pedestrian Walk Time		54		13.4		13.4
DELAY SCORE		**14.3**		**47.3**		**47.3**
LOS		**B**		**E**		**E**
OVERALL		**E**		**F**		**F**

Criteria	North Approach		East Approach		West Approach	
Hazeldean Road/Lowe's Access						
PETSI SCORE						
CROSSING DISTANCE CONDITIONS						
Median > 2.4m in Width	No	39	N/A	N/A	No	39
Lanes Crossed (3.5m Lane Width)	7		N/A		7	
SIGNAL PHASING AND TIMING						
Left Turn Conflict	Perm + Prot	-8	N/A	N/A	No Left Turn/Prohibited	0
Right Turn Conflict	Permissive or Yield	-5	N/A	N/A	Permissive or Yield	-5
Right Turn on Red	RTOR Allowed	-3	N/A	N/A	N/A	0
Leading Pedestrian Interval	No	-2	N/A	N/A	No	-2
CORNER RADIUS						
Parallel Radius	> 25m	-9	N/A	N/A	> 15m to 25m	-8
Parallel Right Turn Channel	Smart Channel	2	N/A	N/A	No Right Turn Channel	-4
Perpendicular Radius	N/A	0	N/A	N/A	N/A	0
Perpendicular Right Turn Channel	N/A	0	N/A	N/A	N/A	0
CROSSING TREATMENT						
Treatment	Standard	-7	N/A	N/A	Standard	-7
PETSI SCORE		**7**		**N/A**		**13**
LOS		**F**		**N/A**		**F**
DELAY SCORE						
Cycle Length		110		120		120
Pedestrian Walk Time		31.6		N/A		16.4
DELAY SCORE		**27.9**		**N/A**		**44.7**
LOS		**C**		**N/A**		**E**
OVERALL		**F**		**N/A**		**F**

Bicycle Level of Service (BLOS)

Approach	Bikeway Facility Type	Criteria	Travel Lanes and/or Speed	BLOS
Hazeldean Road/Toys 'R' Us Access				
North Approach	Mixed Traffic	Right Turn Lane Characteristics	Right turn lane 25m to 50m long, turning speed ≤ 25km/hr	D
		Left Turn Accommodation	One lane crossed; 40km/hr	B
East Approach	Bike Lanes	Right Turn Lane Characteristics	Right turn lane shifts to the left of right turn lane	D
		Left Turn Accommodation	N/A	-
West Approach	Bike Lanes	Right Turn Lane Characteristics	N/A	-
		Left Turn Accommodation	Two Lanes Crossed; 60km/hr	**F**
Hazeldean Road/Lowe's Access				
North Approach	Mixed Traffic	Right Turn Lane Characteristics	Right turn lane 25m to 50m long, turning speed ≤ 25km/hr	D
		Left Turn Accommodation	One lane crossed; 40km/hr	B
East Approach	Bike Lanes	Right Turn Lane Characteristics	Right turn lane shifts to the left of right turn lane	D
		Left Turn Accommodation	N/A	-
West Approach	Bike Lanes	Right Turn Lane Characteristics	N/A	-
		Left Turn Accommodation	Two Lanes Crossed; 60km/hr	**F**
		Left Turn Accommodation	No lane crossed, 50km/hr	B

Transit Level of Service (TLOS)

Approach	Facility Type	Delay[1]	Movement	TLOS
Hazeldean Road/Toys 'R' Us Access				
North Approach[2]	Mixed Traffic (No TSP)	-	-	-
East Approach	Mixed Traffic (No TSP)	1 sec	WBT/R	A
West Approach	Mixed Traffic (No TSP)	4 sec	EBT	A
Hazeldean Road/Lowe's Access				
North Approach[2]	Mixed Traffic (No TSP)	-	-	-
East Approach	Mixed Traffic (No TSP)	10 sec	WBT	A
West Approach	Mixed Traffic (No TSP)	3 sec	EBT	A

1. Mixed traffic delay based on the critical approach delay in Synchro analysis
2. No OC Transpo Service in private developments

Truck Level of Service (TkLOS)

Approach	Effective Corner Radius	Number of Receiving Lanes on Departure from Intersection	LOS
Hazeldean Road/Toys 'R' Us Access			
North Approach	10m to 15m	2	B
East Approach	> 15m	1	C
West Approach	N/A	N/A	-
Hazeldean Road/Lowe's Access			
North Approach	> 15m	2	A
East Approach	> 15m	1	C
West Approach	N/A	N/A	-

Auto LOS

Intersection	AM Peak			PM Peak		
	Max V/C or Delay	LOS	Mvmt	Max V/C or Delay	LOS	Mvmt
Hazeldean Road/ Toys 'R' Us Access	0.40	A	EBT	0.47	A	WBT
Hazeldean Road/Lowe's Access	0.40	A	EBT	0.52	A	WBT

Notes:

- Intersection parameters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800vphpl, PHF: 0.90).
- Traffic signal timings obtained from City of Ottawa, included in Appendix B.
- Detailed Synchro reports are included in Appendix L.

Pedestrian Level of Service (PLOS)

Criteria	North Approach		South Approach		East Approach		West Approach	
Hazeldean Road/Robert Grant Avenue								
PETSI SCORE								
CROSSING DISTANCE CONDITIONS								
Median > 2.4m in Width	No	23	No	23	No	23	No	23
Lanes Crossed (3.5m Lane Width)	8		8		8		8	
SIGNAL PHASING AND TIMING								
Left Turn Conflict	Protected	0	Protected	0	Protected	0	Protected	0
Right Turn Conflict	Permissive or Yield	-5	Permissive or Yield	-5	Permissive or Yield	-5	Permissive or Yield	-5
Right Turn on Red	N/A	0	N/A	0	N/A	0	RTOR Allowed	-3
Leading Pedestrian Interval	No	-2	No	-2	No	-2	No	-2
CORNER RADIUS								
Parallel Radius	> 25m	-9	> 10m to 15m	-6	> 25m	-9	> 25m	-9
Parallel Right Turn Channel	Smart Channel	2	No Right Turn Channel	-4	Smart Channel	2	Smart Channel	2
Perpendicular Radius	> 25m	-9	> 25m	-9	> 25m	-9	N/A	0
Perpendicular Right Turn Channel	Smart Channel	2	Smart Channel	2	Smart Channel	2	N/A	0
CROSSING TREATMENT								
Treatment	Standard	-7	Standard	-7	Standard	-7	Standard	-7
PETSI SCORE		**-5**		**-8**		**-5**		**-1**
LOS		**F**		**F**		**F**		**F**
DELAY SCORE								
Cycle Length		120		120		140		140
Pedestrian Walk Time		7.8		17.4		7		16
DELAY SCORE		**52.5**		**43.9**		**63.2**		**54.9**
LOS		**E**		**E**		**F**		**E**
OVERALL		**F**		**F**		**F**		**F**

Criteria	North Approach		South Approach		East Approach		West Approach	
Hazeldean Road/Lowe's Access/Mixed-Use Access								
PETSI SCORE								
CROSSING DISTANCE CONDITIONS								
Median > 2.4m in Width	No	39	No	88	No	39	No	39
Lanes Crossed (3.5m Lane Width)	7		4		7		7	
SIGNAL PHASING AND TIMING								
Left Turn Conflict	Perm + Prot	-8	Permissive	-8	Protected	0	Protected	0
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	N/A	0	RTOR Allowed	-3
Leading Pedestrian Interval	No	-2	No	-2	No	-2	No	-2
CORNER RADIUS								
Parallel Radius	> 25m	-9	> 10m to 15m	-6	> 15m to 25m	-8	> 15m to 25m	-8
Parallel Right Turn Channel	Smart Channel	2	No Right Turn Channel	-4	No Right Turn Channel	-4	No Right Turn Channel	-4
Perpendicular Radius	N/A	0	N/A	0	> 25m	-9	N/A	0
Perpendicular Right Turn Channel	N/A	0	N/A	0	Smart Channel	2	N/A	0
CROSSING TREATMENT								
Treatment	Standard	-7	Standard	-7	Standard	-7	Standard	-7
PETSI SCORE		**7**		**53**		**6**		**10**
LOS		**F**		**D**		**F**		**F**
DELAY SCORE								
Cycle Length		120		140		140		140
Pedestrian Walk Time		25.3		49.3		14.8		7
DELAY SCORE		**37.4**		**29.4**		**56**		**63.2**
LOS		**D**		**C**		**E**		**F**
OVERALL		**F**		**D**		**F**		**F**

Bicycle Level of Service (BLOS)

Approach	Bikeway Facility Type	Criteria	Travel Lanes and/or Speed	BLOS
Hazeldean Road/Robert Grant Avenue				
North Approach	Cycle Track	Right Turn Lane Characteristics	No impact to LTS	A
		Left Turn Accommodation	Two-Stage	A
South Approach	Cycle Track	Right Turn Lane Characteristics	No impact to LTS	A
		Left Turn Accommodation	Two-Stage	A
East Approach	Bike Lanes	Right Turn Lane Characteristics	Right turn lane shifts to the left of right turn lane	D
		Left Turn Accommodation	Dual left turn lanes	**F**
West Approach	Bike Lanes	Right Turn Lane Characteristics	No impact to LTS	A
		Left Turn Accommodation	Dual left turn lanes	**F**
Hazeldean Road/Lowe's Access/Mixed-Use Access				
North Approach	Mixed Traffic	Right Turn Lane Characteristics	Right turn lane 25m to 50m long, turning speed ≤ 25km/hr	D
		Left Turn Accommodation	One lane crossed; 40km/hr	B
South Approach	Mixed Traffic	Right Turn Lane Characteristics	No impact to LTS	A
		Left Turn Accommodation	One lane crossed; 40km/hr	A
East Approach	Bike Lanes	Right Turn Lane Characteristics	Right turn lane shifts to the left of right turn lane	D
		Left Turn Accommodation	Two Lanes Crossed; 60km/hr	**F**
West Approach	Bike Lanes	Right Turn Lane Characteristics	No impact to LTS	A
		Left Turn Accommodation	Two Lanes Crossed; 60km/hr	**F**

Transit Level of Service (TLOS)

Approach	Facility Type	Delay[1]	Movement	TLOS
Hazeldean Road/Robert Grant Avenue				
North Approach	Mixed Traffic (No TSP)	45 sec	SBT	F
South Approach	Mixed Traffic (No TSP)	51 sec	NBT	F
East Approach	Mixed Traffic (No TSP)	42 sec	WBT	F
West Approach	Mixed Traffic (No TSP)	41 sec	EBT/R	F
Hazeldean Road/Lowe's Access/Mixed-Use Access				
North Approach[2]	Mixed Traffic (No TSP)	-	-	-
South Approach[2]	Mixed Traffic (No TSP)	-	-	-
East Approach	Mixed Traffic (No TSP)	26 sec	WBT	D
West Approach	Mixed Traffic (No TSP)	16 sec	EBT/R	C

1. Mixed traffic delay based on the critical approach delay in Synchro analysis
2. No OC Transpo Service in private developments

Truck Level of Service (TkLOS)

Approach	Effective Corner Radius	Number of Receiving Lanes on Departure from Intersection	LOS
Hazeldean Road/Robert Grant Avenue			
North Approach	> 15m	2	A
South Approach	> 15m	2	A
East Approach	> 15m	2	A
West Approach	10m to 15m	2	B
Hazeldean Road/Lowe's Access/Mixed-Use Access			
North Approach	10m to 15m	2	B
South Approach	10m to 15m	2	B
East Approach	> 15m	1	C
West Approach	>15m	1	C

Auto LOS

Intersection	AM Peak			PM Peak		
	Max V/C	LOS	Mvmt	Max V/C	LOS	Mvmt
Hazeldean Road/ Robert Grant Avenue	0.87	D	EBT/R	0.98	E	SBL
Hazeldean Road/ Grant Crossing/ Mixed-Use Access	0.47	A	EBT	0.81	D	NBL

Notes:

- Intersection paramaters used in the analysis are consistent with the TIA guidelines (saturation flow rate: 1800vphpl, PHF: 1.0).
- Detailed Synchro reports are included in Appendix L.

Appendix L

Robert Grant Avenue/Abbott Street Roundabout

LEGEND

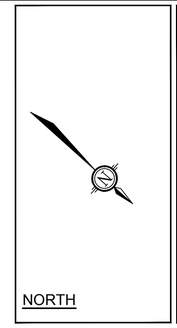
- AREA RESERVED FOR BUS SERVICE
- STREET NAME SIGN [SN-A] — STREET NAME SIGN
- STREET NAME SIGN [SN-B] — LARGE STREET NAME SIGN LOCATED ON TRAFFIC PLANT MAST ARM
- PROPOSED STREET SIGN LOCATION & DESIGNATION

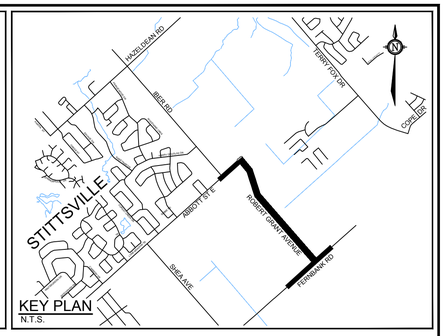
1 Ra-1 — 2 Rb-1 (60) — 3 Wa-8LR — 4 Wb-2 — 5 Wb-3 — 6 Rb-1 (80) — 7 Wa-11A — 8 Ra-2 — 9 Wa-37 (MUTCD) — 10 Wa-7t (30) — 11 Wa-33L — 12 Rb-25 — 13 Wa-38 (MUTCD) — 14 Cope Drive East Exit Sign — 15 Founder Avenue North Exit Sign

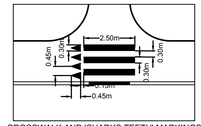
16 Founder/Cope Advance Directional Sign — 17 Rb-37 (TAC) — 18 Wc-44LR (TAC) — 19 Rb-21 — 20 Rb-91 — 21 Wa-74 — 22 Bikes Yield to Pedestrians — 23 Founder/Bobolink Advance Directional Sign — 24 Bobolink Ridge East Exit Sign — 25 Founder/Abbott Advance Directional Sign — 26 Abbott Street East Exit Sign — 27 Rb-71

28 Rb-72a — 29 Rb-72b — 30 POST-MOUNTED DELINEATOR — 31 Wa-33R — 32 Rb-70 — 33 Cope/Founder Advance Directional Sign — 34 Bobolink/Founder Advance Directional Sign — 35 Founder Avenue South Exit Sign — 36 Cope Drive West Exit Sign — 37 Bobolink Ridge West Exit Sign — 38 Abbott Street West Exit Sign — 39 Rb-84t (Bilingual) — 40 Rb-85A

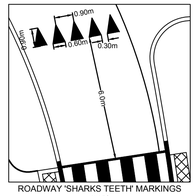
41 Ra-4T — 42 Ra-5R — 43 Ra-5L — 44 Wc-27R







CROSSWALK AND 'SHARKS TEETH' MARKINGS
1:150



ROADWAY 'SHARKS TEETH' MARKINGS
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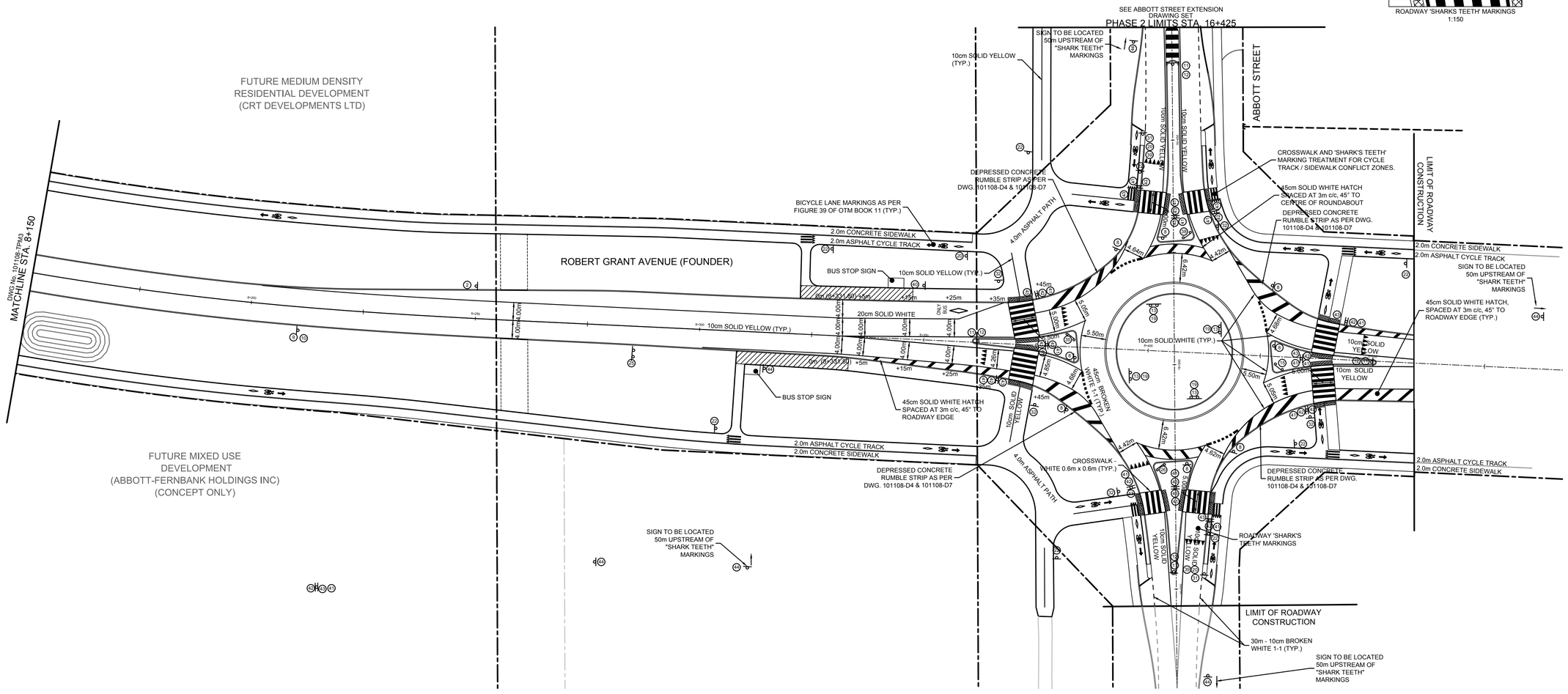


NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE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

No.	REVISION	DATE	BY
8.	RE-ISSUED FOR APPOVAL OF PXO AT ROUNDABOUTS	JUN 21/15	ERD
7.	ISSUED WITH COMMENCE WORK NOTICE	NOV 18/15	ERD
6.	ISSUED FOR CITY APPROVAL	SEPT 02/15	ERD
5.	RE-ISSUED TO CONTRACTOR FOR INFORMATION ONLY	JUN 12/15	ERD
4.	ISSUED FOR REVIEW AND APPROVAL	MAR 25/15	ERD
3.	RE-ISSUED FOR FRONT-ENDING AGREEMENT	NOV 4/14	ERD
2.	REVISED AS PER FRONT-ENDING AGREEMENT COMMENTS	MAR 12/14	ERD
1.	ISSUED WITH FRONT-ENDING AGREEMENT	DEC 6/13	ERD

SCALE
1:500
1:500
0 5 10 15 20

DESIGN GJO
CHECKED ERD
DRAWN JPB
CHECKED GJO
APPROVED ERD

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
City of Ottawa
Fernbank Community Robert Grant Avenue (Founder)

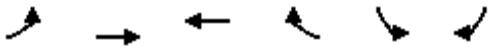
DRAWING NAME
PAVEMENT MARKINGS & SIGNAGE
ROBERT GRANT AVE (FOUNDER)
8+150 TO 4+475
ABBOTT STREET 16+425 TO 16+575

PROJECT No. 101108-07
REV REV # 8
DRAWING No. 101108-TPM4

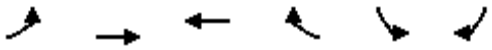
C:\Temp\AcPublish_6728\101108-TPM.dwg, TPM4, Jun 21, 2016 - 10:11am, jkennell
PLANAT.DWG - 841mmx594mm

Appendix M

Synchro and Rodel Analysis Reports



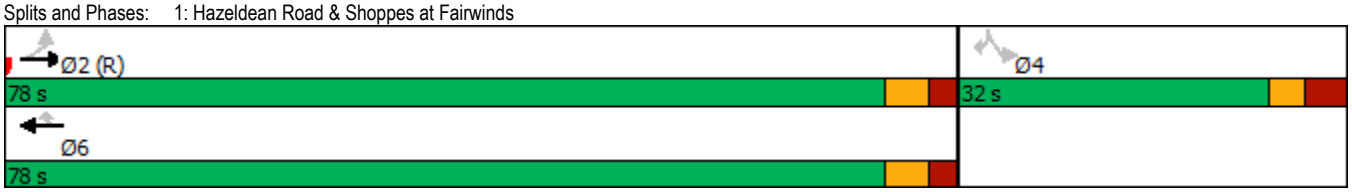
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	3	1106	536	14	10	0
Future Volume (vph)	3	1106	536	14	10	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0			170.0	0.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	1676	1765
Flt Permitted	0.427				0.950	
Satd. Flow (perm)	754	3353	3353	1500	1676	1765
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				16		
Link Speed (k/h)		60	60		60	
Link Distance (m)		151.7	294.0		152.9	
Travel Time (s)		9.1	17.6		9.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	1229	596	16	11	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3	1229	596	16	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		2	6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	16.0	16.0	31.0	31.0	25.6	25.6
Total Split (s)	78.0	78.0	78.0	78.0	32.0	32.0
Total Split (%)	70.9%	70.9%	70.9%	70.9%	29.1%	29.1%
Maximum Green (s)	72.0	72.0	72.0	72.0	25.4	25.4
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0
All-Red Time (s)	2.3	2.3	2.3	2.3	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.6	6.6
Lead/Lag						

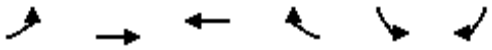


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	Max	Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			18.0	18.0	12.0	12.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	99.8	99.8	99.8	99.8	8.6	
Actuated g/C Ratio	0.91	0.91	0.91	0.91	0.08	
v/c Ratio	0.00	0.40	0.20	0.01	0.08	
Control Delay	3.3	3.0	0.4	0.0	44.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	3.3	3.0	0.4	0.0	44.9	
LOS	A	A	A	A	D	
Approach Delay		3.0	0.4		44.9	
Approach LOS		A	A		D	
Queue Length 50th (m)	0.0	0.0	0.0	0.0	2.4	
Queue Length 95th (m)	1.0	72.4	2.6	0.1	7.4	
Internal Link Dist (m)		127.7	270.0		128.9	
Turn Bay Length (m)	70.0			170.0		
Base Capacity (vph)	684	3042	3042	1362	387	
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	0.00	0.40	0.20	0.01	0.03	

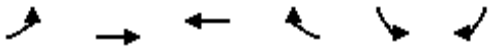
Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 38 (35%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 2.4		Intersection LOS: A	
Intersection Capacity Utilization 46.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Hazeldean Road & Shoppes at Fairwinds





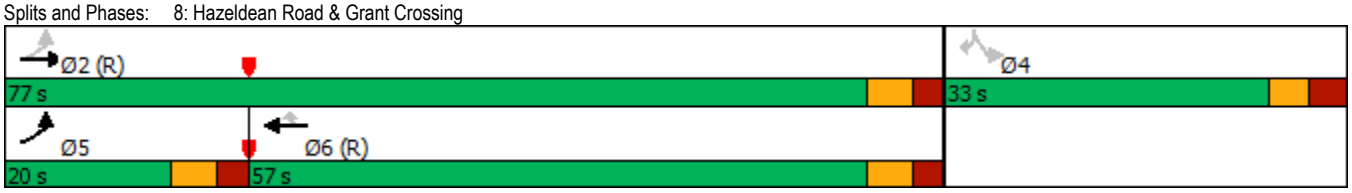
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	30	1065	535	8	7	11
Future Volume (vph)	30	1065	535	8	7	11
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0			170.0	0.0	0.0
Storage Lanes	1			1	2	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	3252	1500
Flt Permitted	0.396				0.950	
Satd. Flow (perm)	699	3353	3353	1500	3252	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				9		12
Link Speed (k/h)		60	60		40	
Link Distance (m)		294.0	278.5		148.0	
Travel Time (s)		17.6	16.7		13.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	33	1183	594	9	8	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	33	1183	594	9	8	12
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		7.2	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2			6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	11.4	22.4	32.4	32.4	24.6	24.6
Total Split (s)	20.0	77.0	57.0	57.0	33.0	33.0
Total Split (%)	18.2%	70.0%	51.8%	51.8%	30.0%	30.0%
Maximum Green (s)	13.6	70.6	50.6	50.6	26.4	26.4
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.6	6.6
Lead/Lag	Lead		Lag	Lag		

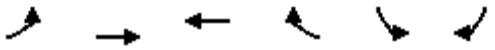


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			19.0	19.0	10.0	10.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	93.9	96.4	88.8	88.8	8.0	8.0
Actuated g/C Ratio	0.85	0.88	0.81	0.81	0.07	0.07
v/c Ratio	0.05	0.40	0.22	0.01	0.03	0.10
Control Delay	2.8	3.0	5.4	4.0	44.3	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	3.0	5.4	4.0	44.3	22.1
LOS	A	A	A	A	D	C
Approach Delay		3.0	5.4		31.0	
Approach LOS		A	A		C	
Queue Length 50th (m)	1.0	27.2	21.0	0.0	0.9	0.0
Queue Length 95th (m)	4.4	54.0	41.4	2.0	3.2	5.7
Internal Link Dist (m)		270.0	254.5		124.0	
Turn Bay Length (m)	90.0			170.0		
Base Capacity (vph)	717	2939	2708	1213	780	369
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.40	0.22	0.01	0.01	0.03

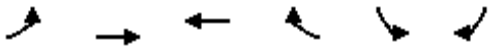
Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 43 (39%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 4.1		Intersection LOS: A	
Intersection Capacity Utilization 46.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 8: Hazeldean Road & Grant Crossing





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	15	819	1170	56	60	9
Future Volume (vph)	15	819	1170	56	60	9
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0			170.0	0.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	1676	1500
Flt Permitted	0.195				0.950	
Satd. Flow (perm)	344	3353	3353	1500	1676	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				62		10
Link Speed (k/h)		60	60		60	
Link Distance (m)		151.7	294.0		152.9	
Travel Time (s)		9.1	17.6		9.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	910	1300	62	67	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	910	1300	62	67	10
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		2	6			
Permitted Phases	2			6	4	4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	78.0	78.0	78.0	78.0	32.0	32.0
Total Split (s)	88.0	88.0	88.0	88.0	32.0	32.0
Total Split (%)	73.3%	73.3%	73.3%	73.3%	26.7%	26.7%
Maximum Green (s)	82.0	82.0	82.0	82.0	25.4	25.4
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0
All-Red Time (s)	2.3	2.3	2.3	2.3	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.6	6.6
Lead/Lag						

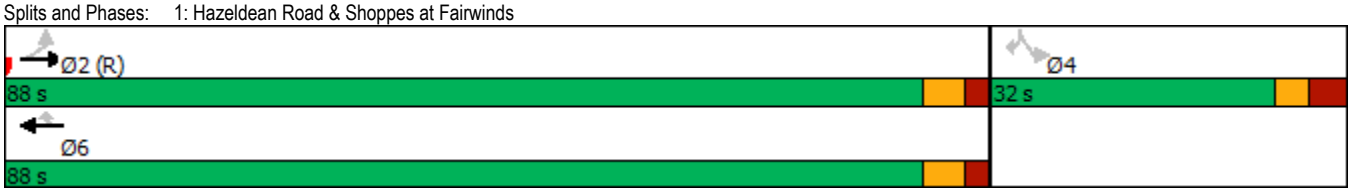


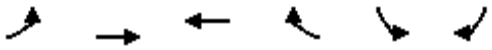
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	Max	Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			18.0	18.0	12.0	12.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	100.0	100.0	100.0	100.0	11.1	11.1
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.09	0.09
v/c Ratio	0.06	0.33	0.47	0.05	0.43	0.07
Control Delay	4.0	3.7	0.8	0.1	58.4	23.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.0	3.7	0.8	0.1	58.4	23.3
LOS	A	A	A	A	E	C
Approach Delay		3.7	0.8		53.8	
Approach LOS		A	A		D	
Queue Length 50th (m)	0.7	24.5	2.2	0.0	16.1	0.0
Queue Length 95th (m)	3.2	46.7	6.8	m0.1	29.0	5.2
Internal Link Dist (m)		127.7	270.0		128.9	
Turn Bay Length (m)	70.0			170.0		
Base Capacity (vph)	286	2794	2794	1260	354	325
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.33	0.47	0.05	0.19	0.03

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 110			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 3.6		Intersection LOS: A	
Intersection Capacity Utilization 48.8%		ICU Level of Service A	
Analysis Period (min) 15			

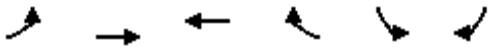
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Hazeldean Road & Shoppes at Fairwinds





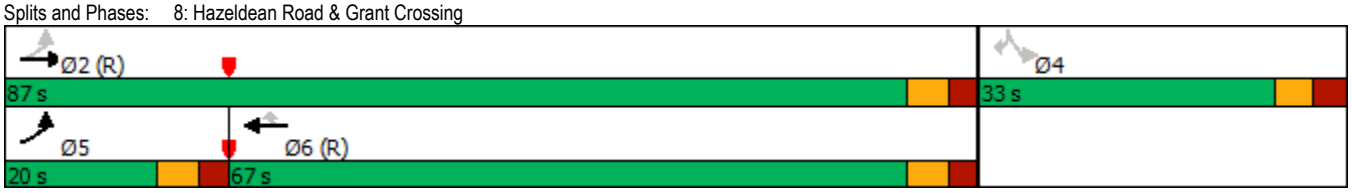
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	100	788	1136	55	67	49
Future Volume (vph)	100	788	1136	55	67	49
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0			170.0	0.0	0.0
Storage Lanes	1			1	2	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	3252	1500
Flt Permitted	0.172				0.950	
Satd. Flow (perm)	304	3353	3353	1500	3252	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				61		54
Link Speed (k/h)		60	60		40	
Link Distance (m)		294.0	278.5		148.0	
Travel Time (s)		17.6	16.7		13.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	111	876	1262	61	74	54
Shared Lane Traffic (%)						
Lane Group Flow (vph)	111	876	1262	61	74	54
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		7.2	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2			6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	11.4	22.4	32.4	32.4	24.6	24.6
Total Split (s)	20.0	87.0	67.0	67.0	33.0	33.0
Total Split (%)	16.7%	72.5%	55.8%	55.8%	27.5%	27.5%
Maximum Green (s)	13.6	80.6	60.6	60.6	26.4	26.4
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	3.3	3.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.6	6.6
Lead/Lag	Lead		Lag	Lag		

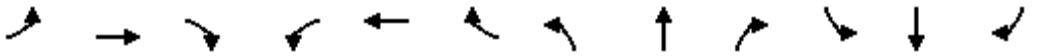


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			19.0	19.0	10.0	10.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	100.1	101.3	86.5	86.5	9.5	9.5
Actuated g/C Ratio	0.83	0.84	0.72	0.72	0.08	0.08
v/c Ratio	0.33	0.31	0.52	0.06	0.29	0.32
Control Delay	6.3	2.9	9.7	2.1	53.6	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.3	2.9	9.7	2.1	53.6	17.9
LOS	A	A	A	A	D	B
Approach Delay		3.2	9.4		38.5	
Approach LOS		A	A		D	
Queue Length 50th (m)	3.7	19.1	67.2	0.0	9.1	0.0
Queue Length 95th (m)	10.4	37.7	114.8	5.2	15.8	12.1
Internal Link Dist (m)		270.0	254.5		124.0	
Turn Bay Length (m)	90.0			170.0		
Base Capacity (vph)	409	2831	2417	1098	715	372
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.31	0.52	0.06	0.10	0.15

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 4 (3%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 8.4		Intersection LOS: A	
Intersection Capacity Utilization 59.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 8: Hazeldean Road & Grant Crossing





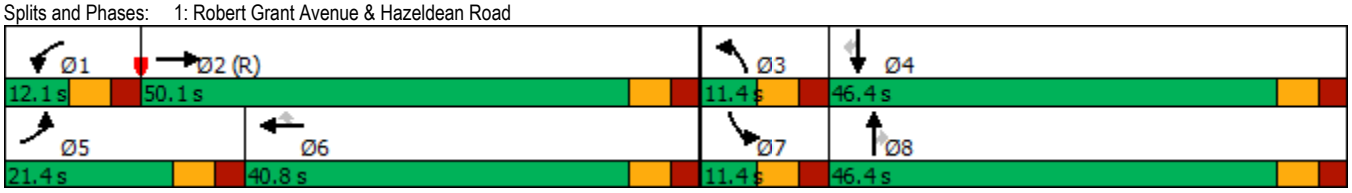
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	995	3	8	468	244	11	556	18	74	138	131
Future Volume (vph)	320	995	3	8	468	244	11	556	18	74	138	131
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt						0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3353	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3353	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						205			205			205
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			158.1			152.9	
Travel Time (s)		9.1			17.6			9.5			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	320	995	3	8	468	244	11	556	18	74	138	131
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	998	0	8	468	244	11	556	18	74	138	131
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	0
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	0.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	0.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	43.4	43.4	11.4	43.4	43.4
Total Split (s)	21.4	50.1		12.1	40.8	40.8	11.4	46.4	46.4	11.4	46.4	46.4
Total Split (%)	17.8%	41.8%		10.1%	34.0%	34.0%	9.5%	38.7%	38.7%	9.5%	38.7%	38.7%
Maximum Green (s)	15.0	43.7		5.7	34.4	34.4	5.0	40.0	40.0	5.0	40.0	40.0
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

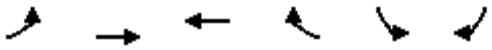
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	16.5	68.9		5.8	48.6	48.6	5.0	26.6	26.6	5.0	33.4	33.4
Actuated g/C Ratio	0.14	0.57		0.05	0.40	0.40	0.04	0.22	0.22	0.04	0.28	0.28
v/c Ratio	0.71	0.52		0.05	0.34	0.33	0.16	0.75	0.04	0.55	0.15	0.23
Control Delay	58.8	19.6		72.9	21.8	4.0	60.8	49.7	0.2	71.8	31.5	1.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.8	19.6		72.9	21.8	4.0	60.8	49.7	0.2	71.8	31.5	1.2
LOS	E	B		E	C	A	E	D	A	E	C	A
Approach Delay		29.1			16.3			48.4			28.6	
Approach LOS		C			B			D			C	
Queue Length 50th (m)	39.3	72.6		1.0	42.7	10.1	2.7	68.9	0.0	9.4	13.0	0.0
Queue Length 95th (m)	54.9	140.4		3.9	25.6	9.9	9.2	78.4	0.0	#18.0	21.2	1.0
Internal Link Dist (m)		127.7			270.0			134.1			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	460	1926		160	1357	729	69	1117	636	135	1117	636
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	0.70	0.52		0.05	0.34	0.33	0.16	0.50	0.03	0.55	0.12	0.21

Intersection Summary

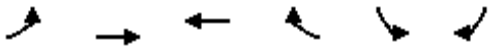
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 6 (5%), Referenced to phase 2:EBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 29.7 Intersection LOS: C
Intersection Capacity Utilization 75.0% ICU Level of 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: 1: Robert Grant Avenue & Hazeldean Road





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	30	1075	704	8	7	11
Future Volume (vph)	30	1075	704	8	7	11
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0			170.0	0.0	0.0
Storage Lanes	1			1	2	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	3252	1500
Flt Permitted	0.377				0.950	
Satd. Flow (perm)	665	3353	3353	1500	3252	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				8		11
Link Speed (k/h)		60	60		40	
Link Distance (m)		294.0	278.5		148.0	
Travel Time (s)		17.6	16.7		13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	1075	704	8	7	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	30	1075	704	8	7	11
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		7.2	7.2		7.2	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2			6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	11.4	16.4	38.4	38.4	38.3	38.3
Total Split (s)	12.0	68.7	56.7	56.7	51.3	51.3
Total Split (%)	10.0%	57.3%	47.3%	47.3%	42.8%	42.8%
Maximum Green (s)	5.6	62.3	50.3	50.3	45.0	45.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.3	6.3
Lead/Lag	Lag		Lead	Lead		

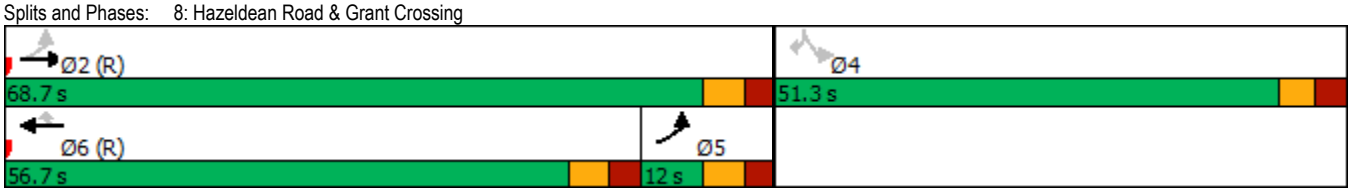


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			25.0	25.0	25.0	25.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	103.6	103.6	96.4	96.4	11.0	11.0
Actuated g/C Ratio	0.86	0.86	0.80	0.80	0.09	0.09
v/c Ratio	0.05	0.37	0.26	0.01	0.02	0.07
Control Delay	0.3	0.4	7.0	5.9	42.7	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.3	0.4	7.0	5.9	42.7	20.4
LOS	A	A	A	A	D	C
Approach Delay		0.4	6.9		29.1	
Approach LOS		A	A		C	
Queue Length 50th (m)	0.0	0.5	25.4	0.0	0.8	0.0
Queue Length 95th (m)	m0.2	1.8	67.4	2.5	2.6	4.8
Internal Link Dist (m)		270.0	254.5		124.0	
Turn Bay Length (m)	90.0			170.0		
Base Capacity (vph)	607	2894	2693	1206	1219	569
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.37	0.26	0.01	0.01	0.02

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 17 (14%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.37
Intersection Signal Delay: 3.2 Intersection LOS: A
Intersection Capacity Utilization 46.1% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Hazeldean Road & Grant Crossing



Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Robert Grant	0	0	4.00	1	4.68	1	28.00	15.00	15.00
2	Abbott	90	0	4.00	1	4.62	1	28.00	25.00	15.00
3	Robert Grant	180	0	4.00	1	4.68	1	28.00	15.00	15.00
4	Abbott	270	0	4.00	1	4.64	1	28.00	25.00	15.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Robert Grant	45.00	6.42	1	5.00	1	4.00	1
2	Abbott	45.00	5.50	1	4.42	1	4.00	1
3	Robert Grant	45.00	6.42	1	5.00	1	4.00	1
4	Abbott	45.00	5.50	1	4.42	1	4.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (m)	Default Capacity	Calib Capacity	V (m)	Default Capacity	Calib Capacity
1	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
2	Abbott	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
3	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
4	Abbott	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0

Operational Results

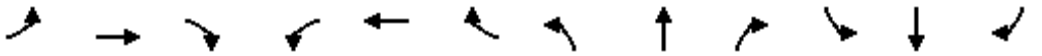
2030 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Robert Grant	None	519		700		216	871		0.5956	
2	Abbott	None	289		612		607	980		0.2948	
3	Robert Grant	None	186		316		585	1083		0.1718	
4	Abbott	None	720		196		306	1226		0.5875	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Robert Grant	None	10.53		10.53	5.53		B		B
2	Abbott	None	5.37		5.37	1.41		A		A
3	Robert Grant	None	3.93		3.93	0.63		A		A
4	Abbott	None	7.36		7.36	4.92		A		A



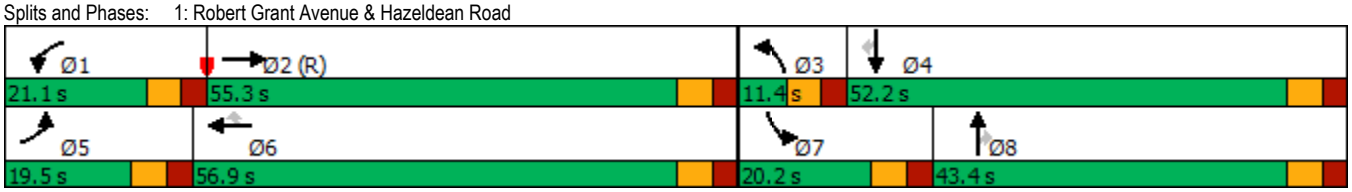
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	295	555	11	20	1148	187	6	525	13	308	596	384
Future Volume (vph)	295	555	11	20	1148	187	6	525	13	308	596	384
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3343	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3343	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				187			176			222
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			158.1			152.9	
Travel Time (s)		9.1			17.6			9.5			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	295	555	11	20	1148	187	6	525	13	308	596	384
Shared Lane Traffic (%)												
Lane Group Flow (vph)	295	566	0	20	1148	187	6	525	13	308	596	384
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	0
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	0.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	0.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	43.4	43.4	11.4	43.4	43.4
Total Split (s)	19.5	55.3		21.1	56.9	56.9	11.4	43.4	43.4	20.2	52.2	52.2
Total Split (%)	13.9%	39.5%		15.1%	40.6%	40.6%	8.1%	31.0%	31.0%	14.4%	37.3%	37.3%
Maximum Green (s)	13.1	48.9		14.7	50.5	50.5	5.0	37.0	37.0	13.8	45.8	45.8
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

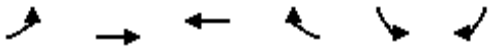
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	17.7	71.1		6.4	55.0	55.0	5.0	28.0	28.0	13.8	45.9	45.9
Actuated g/C Ratio	0.13	0.51		0.05	0.39	0.39	0.04	0.20	0.20	0.10	0.33	0.33
v/c Ratio	0.72	0.33		0.14	0.87	0.27	0.10	0.78	0.03	0.96	0.54	0.60
Control Delay	69.0	23.0		81.5	41.2	3.7	69.2	61.5	0.2	103.8	40.4	19.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.0	23.0		81.5	41.2	3.7	69.2	61.5	0.2	103.8	40.4	19.8
LOS	E	C		F	D	A	E	E	A	F	D	B
Approach Delay		38.8			36.6			60.1			49.4	
Approach LOS		D			D			E			D	
Queue Length 50th (m)	42.4	53.2		3.1	164.5	3.6	1.7	77.6	0.0	46.8	73.3	38.0
Queue Length 95th (m)	#75.3	78.6		m6.3	#211.2	12.1	6.7	90.4	0.0	#77.5	94.6	74.4
Internal Link Dist (m)		127.7			270.0			134.1			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	410	1698		341	1316	702	59	886	525	320	1124	650
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	0.72	0.33		0.06	0.87	0.27	0.10	0.59	0.02	0.96	0.53	0.59

Intersection Summary

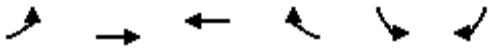
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 46 (33%), Referenced to phase 2:EBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 44.3 Intersection LOS: D
Intersection Capacity Utilization 88.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Robert Grant Avenue & Hazeldean Road





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	100	808	1292	55	67	49
Future Volume (vph)	100	808	1292	55	67	49
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0			170.0	0.0	0.0
Storage Lanes	1			1	2	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	3252	1500
Flt Permitted	0.184				0.950	
Satd. Flow (perm)	325	3353	3353	1500	3252	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				55		49
Link Speed (k/h)		60	60		40	
Link Distance (m)		294.0	278.5		148.0	
Travel Time (s)		17.6	16.7		13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	808	1292	55	67	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	100	808	1292	55	67	49
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		7.2	7.2		7.2	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2			6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	11.4	16.4	38.4	38.4	38.3	38.3
Total Split (s)	12.2	80.7	68.5	68.5	59.3	59.3
Total Split (%)	8.7%	57.6%	48.9%	48.9%	42.4%	42.4%
Maximum Green (s)	5.8	74.3	62.1	62.1	53.0	53.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.3	6.3
Lead/Lag	Lag		Lead	Lead		

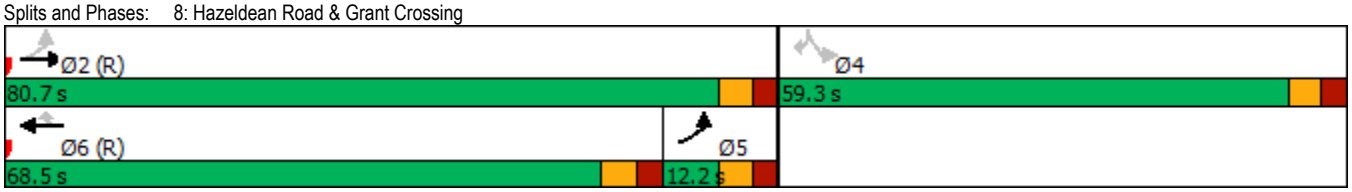


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			25.0	25.0	25.0	25.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	117.2	118.5	105.0	105.0	12.6	12.6
Actuated g/C Ratio	0.84	0.85	0.75	0.75	0.09	0.09
v/c Ratio	0.30	0.28	0.51	0.05	0.23	0.27
Control Delay	4.0	0.7	9.9	2.5	57.9	16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.0	0.7	9.9	2.5	57.9	16.6
LOS	A	A	A	A	E	B
Approach Delay		1.0	9.6		40.4	
Approach LOS		A	A		D	
Queue Length 50th (m)	0.8	0.8	67.0	0.0	9.8	0.0
Queue Length 95th (m)	m3.7	m3.6	149.1	5.9	14.8	11.0
Internal Link Dist (m)		270.0	254.5		124.0	
Turn Bay Length (m)	90.0			170.0		
Base Capacity (vph)	328	2837	2514	1138	1231	598
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.28	0.51	0.05	0.05	0.08

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 58 (41%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 7.9 Intersection LOS: A
Intersection Capacity Utilization 63.6% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Hazeldean Road & Grant Crossing



Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Robert Grant	0	0	4.00	1	4.68	1	28.00	15.00	15.00
2	Abbott	90	0	4.00	1	4.62	1	28.00	25.00	15.00
3	Robert Grant	180	0	4.00	1	4.68	1	28.00	15.00	15.00
4	Abbott	270	0	4.00	1	4.64	1	28.00	25.00	15.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Robert Grant	45.00	6.42	1	5.00	1	4.00	1
2	Abbott	45.00	5.50	1	4.42	1	4.00	1
3	Robert Grant	45.00	6.42	1	5.00	1	4.00	1
4	Abbott	45.00	5.50	1	4.42	1	4.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (m)	Default Capacity	Calib Capacity	V (m)	Default Capacity	Calib Capacity
1	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
2	Abbott	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
3	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
4	Abbott	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0

Operational Results

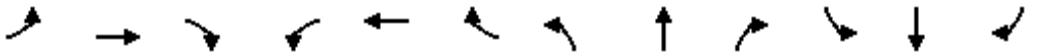
2030 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Robert Grant	None	456		351		488	1064		0.4287	
2	Abbott	None	458		420		387	1094		0.4188	
3	Robert Grant	None	630		334		544	1073		0.5872	
4	Abbott	None	353		486		478	1055		0.3347	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Robert Grant	None	5.82		5.82	2.41		A		A
2	Abbott	None	5.84		5.84	2.44		A		A
3	Robert Grant	None	8.09		8.09	4.83		A		A
4	Abbott	None	5.28		5.28	1.68		A		A



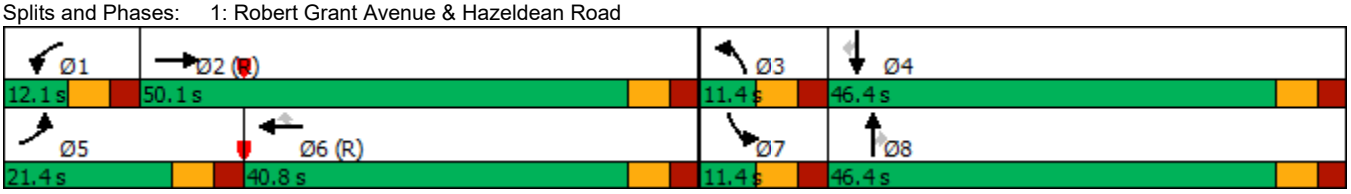
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	1047	16	93	477	255	35	822	211	78	259	131
Future Volume (vph)	320	1047	16	93	477	255	35	822	211	78	259	131
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3346	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3346	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				205			205			205
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			172.4			152.9	
Travel Time (s)		9.1			17.6			10.3			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	320	1047	16	93	477	255	35	822	211	78	259	131
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	1063	0	93	477	255	35	822	211	78	259	131
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	2.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	2.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	46.4	46.4	11.4	46.4	46.4
Total Split (s)	21.4	50.1		12.1	40.8	40.8	11.4	46.4	46.4	11.4	46.4	46.4
Total Split (%)	17.8%	41.8%		10.1%	34.0%	34.0%	9.5%	38.7%	38.7%	9.5%	38.7%	38.7%
Maximum Green (s)	15.0	43.7		5.7	34.4	34.4	5.0	40.0	40.0	5.0	40.0	40.0
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

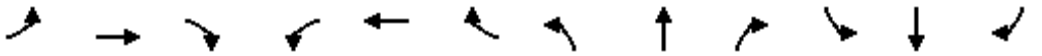
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	Max	Max
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	14.6	43.7		5.7	34.8	34.8	5.0	42.3	42.3	5.0	44.6	44.6
Actuated g/C Ratio	0.12	0.36		0.05	0.29	0.29	0.04	0.35	0.35	0.04	0.37	0.37
v/c Ratio	0.81	0.87		0.60	0.49	0.44	0.51	0.70	0.32	0.58	0.21	0.19
Control Delay	68.1	44.7		83.4	31.5	8.0	81.2	37.8	5.7	73.6	27.4	0.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.1	44.7		83.4	31.5	8.0	81.2	37.8	5.7	73.6	27.4	0.9
LOS	E	D		F	C	A	F	D	A	E	C	A
Approach Delay		50.1			30.1			32.9			27.7	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	40.2	128.0		9.3	52.6	20.7	8.7	94.2	1.0	10.0	24.2	0.0
Queue Length 95th (m)	#61.0	#158.4		#23.2	32.1	18.5	#22.8	118.5	18.2	#19.7	35.3	1.0
Internal Link Dist (m)		127.7			270.0			148.4			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	406	1219		154	973	581	69	1181	661	135	1245	685
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	0.79	0.87		0.60	0.49	0.44	0.51	0.70	0.32	0.58	0.21	0.19

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 6 (5%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 38.0 Intersection LOS: D
Intersection Capacity Utilization 84.7% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Robert Grant Avenue & Hazeldean Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	1197	52	21	772	8	37	0	32	7	0	11
Future Volume (vph)	30	1197	52	21	772	8	37	0	32	7	0	11
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0		30.0	0.0		170.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	1		0	2		0
Taper Length (m)	60.0			0.0			0.0			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.994				0.850		0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3333	0	1676	3353	1500	1676	1500	0	3252	1500	0
Flt Permitted	0.304			0.214			0.950			0.950		
Satd. Flow (perm)	536	3333	0	378	3353	1500	1676	1500	0	3252	1500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				145		146			215	
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		294.0			278.5			153.0			148.0	
Travel Time (s)		17.6			16.7			13.8			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	1197	52	21	772	8	37	0	32	7	0	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	30	1249	0	21	772	8	37	32	0	7	11	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	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	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	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	
Detector 1 Queue (s)	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	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	38.4		38.4	38.4	38.4	11.3	38.3		11.3	38.3	
Total Split (s)	11.6	67.7		56.1	56.1	56.1	14.0	40.9		11.4	38.3	
Total Split (%)	9.7%	56.4%		46.8%	46.8%	46.8%	11.7%	34.1%		9.5%	31.9%	
Maximum Green (s)	5.2	61.3		49.7	49.7	49.7	7.7	34.6		5.1	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.3	6.3		6.3	6.3	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag		Lead	Lag	

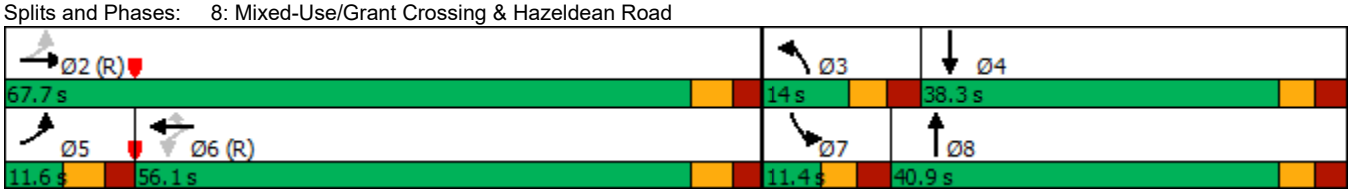
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0		7.0	7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		25.0		25.0	25.0	25.0		25.0			25.0	
Pedestrian Calls (#/hr)		5		5	5	5		5			5	
Act Effct Green (s)	93.8	96.4		89.0	89.0	89.0	7.5	17.7		5.1	14.4	
Actuated g/C Ratio	0.78	0.80		0.74	0.74	0.74	0.06	0.15		0.04	0.12	
v/c Ratio	0.06	0.47		0.07	0.31	0.01	0.35	0.09		0.05	0.03	
Control Delay	8.2	6.4		15.7	11.9	0.0	63.2	0.5		56.0	0.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	8.2	6.4		15.7	11.9	0.0	63.2	0.5		56.0	0.2	
LOS	A	A		B	B	A	E	A		E	A	
Approach Delay		6.5			11.9			34.1			21.9	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	1.0	24.8		1.4	34.0	0.0	8.8	0.0		0.8	0.0	
Queue Length 95th (m)	m3.3	63.1		9.4	95.4	0.0	20.6	0.0		3.5	0.0	
Internal Link Dist (m)		270.0			254.5			129.0			124.0	
Turn Bay Length (m)	90.0					170.0						
Base Capacity (vph)	473	2678		280	2487	1150	113	536		138	557	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.06	0.47		0.07	0.31	0.01	0.33	0.06		0.05	0.02	

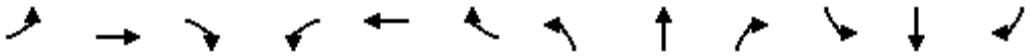
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 9.5 Intersection LOS: A
Intersection Capacity Utilization 56.1% ICU Level of Service B
Analysis Period (min) 15

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

Splits and Phases: 8: Mixed-Use/Grant Crossing & Hazeldean Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	4	0	0	121	0	947	24	0	362	38
Future Volume (Veh/h)	0	0	4	0	0	121	0	947	24	0	362	38
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	4	0	0	121	0	947	24	0	362	38
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											255	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	1461	1352	381	1344	1359	959	400			971		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1458	1339	281	1330	1346	959	302			971		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	61	100			100		
cM capacity (veh/h)	60	140	696	120	139	312	1156			710		

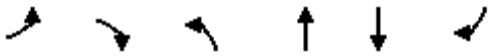
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	4	121	971	400
Volume Left	0	0	0	0
Volume Right	4	121	24	38
cSH	696	312	1700	1700
Volume to Capacity	0.01	0.39	0.57	0.24
Queue Length 95th (m)	0.1	14.2	0.0	0.0
Control Delay (s)	10.2	23.7	0.0	0.0
Lane LOS	B	C		
Approach Delay (s)	10.2	23.7	0.0	0.0
Approach LOS	B	C		

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	68.7%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	36	742	5	0	253
Future Volume (Veh/h)	0	36	742	5	0	253
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	36	742	5	0	253
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	998	744			747	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	998	744			747	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	91			100	
cM capacity (veh/h)	270	414			861	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	36	747	253
Volume Left	0	0	0
Volume Right	36	5	0
cSH	414	1700	1700
Volume to Capacity	0.09	0.44	0.15
Queue Length 95th (m)	2.3	0.0	0.0
Control Delay (s)	14.5	0.0	0.0
Lane LOS	B		
Approach Delay (s)	14.5	0.0	0.0
Approach LOS	B		

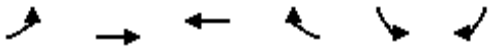
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	88	0	747	239	15
Future Volume (Veh/h)	0	88	0	747	239	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	88	0	747	239	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	994	246	254			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	994	246	254			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	89	100			
cM capacity (veh/h)	272	792	1311			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	88	747	254
Volume Left	0	0	0
Volume Right	88	0	15
cSH	792	1700	1700
Volume to Capacity	0.11	0.44	0.15
Queue Length 95th (m)	3.0	0.0	0.0
Control Delay (s)	10.1	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.1	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	760	328	19	50	10
Future Volume (Veh/h)	1	760	328	19	50	10
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)	1	760	328	19	50	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	347				1100	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	347				1100	338
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				79	99
cM capacity (veh/h)	1212				235	705

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	761	347	60
Volume Left	1	0	50
Volume Right	0	19	10
cSH	1212	1700	264
Volume to Capacity	0.00	0.20	0.23
Queue Length 95th (m)	0.0	0.0	6.8
Control Delay (s)	0.0	0.0	22.6
Lane LOS	A		C
Approach Delay (s)	0.0	0.0	22.6
Approach LOS			C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	193	54	6	21	45	50	62	677	30	88	227	50
Future Volume (Veh/h)	193	54	6	21	45	50	62	677	30	88	227	50
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	193	54	6	21	45	50	62	677	30	88	227	50
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1302	1259	252	1252	1269	692	277			707		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1302	1259	252	1252	1269	692	277			707		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	63	99	78	69	89	95			90		
cM capacity (veh/h)	83	146	787	95	144	444	1286			891		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	253	116	62	707	88	277
Volume Left	193	21	62	0	88	0
Volume Right	6	50	0	30	0	50
cSH	94	180	1286	1700	891	1700
Volume to Capacity	2.70	0.65	0.05	0.42	0.10	0.16
Queue Length 95th (m)	190.9	29.8	1.2	0.0	2.6	0.0
Control Delay (s)	863.2	55.7	7.9	0.0	9.5	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	863.2	55.7	0.6		2.3	
Approach LOS	F	F				

Intersection Summary				
Average Delay	150.5			
Intersection Capacity Utilization	76.0%	ICU Level of Service	D	
Analysis Period (min)	15			

Operational Data

Main Geometry (m)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	Robert Grant	0	0	4.00	1	4.68	1	28.00	15.00	15.00
2	Abbott	90	0	4.00	1	4.62	1	28.00	25.00	15.00
3	Robert Grant	180	0	4.00	1	4.68	1	28.00	15.00	15.00
4	Abbott	270	0	4.00	1	4.64	1	28.00	25.00	15.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Robert Grant	45.00	6.42	1	5.00	1	4.00	1
2	Abbott	45.00	5.50	1	4.42	1	4.00	1
3	Robert Grant	45.00	6.42	1	5.00	1	4.00	1
4	Abbott	45.00	5.50	1	4.42	1	4.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (m)	Default Capacity	Calib Capacity	V (m)	Default Capacity	Calib Capacity
1	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
2	Abbott	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
3	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
4	Abbott	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0

Operational Results

2030 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Robert Grant	None	600		836		265	797		0.7532	
2	Abbott	None	364		720		716	917		0.3970	
3	Robert Grant	None	332		337		747	1071		0.3099	
4	Abbott	None	755		346		323	1137		0.6639	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Robert Grant	None	21.64		21.64	14.87		C		C
2	Abbott	None	6.79		6.79	2.31		A		A
3	Robert Grant	None	4.77		4.77	1.40		A		A
4	Abbott	None	9.97		9.97	7.36		A		A

Operational Data

Main Geometry (m)

Geometry and Design Target

Leg	Leg Names	Approach Geometry (m)				Target	Circulating and Exit Geom		
		Bearing (deg)	Grade Sep G	Half Width V	Lanes n	Average VCR	Inscribed Diameter D	Half Width Vx	Lanes n
1	Robert Grant	0	0	4.00	1	0.850	40.00	4.00	1
2	Cranesbill	90	0	4.00	1	0.850	40.00	4.00	1
3	Robert Grant	180	0	4.00	1	0.850	40.00	4.00	1
4	Street 15	270	0	4.00	1	0.850	40.00	4.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (m)	Default Capacity	Calib Capacity	V (m)	Default Capacity	Calib Capacity
1	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
2	Cranesbill	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
3	Robert Grant	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0
4	Street 15	0	1.000	0	1.000	6.00	1960	0	4.00	1960	0

Operational Results

2030 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Robert Grant	None	775		335		254	986		0.7859	
2	Cranesbill	None	116		954		156	656		0.1769	
3	Robert Grant	None	365		99		971	1112		0.3282	
4	Street 15	None	253		336		128	986		0.2567	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Robert Grant	None	18.21		18.21	14.78		C		C
2	Cranesbill	None	6.65		6.65	0.72		A		A
3	Robert Grant	None	4.70		4.70	1.49		A		A
4	Street 15	None	4.81		4.81	1.07		A		A

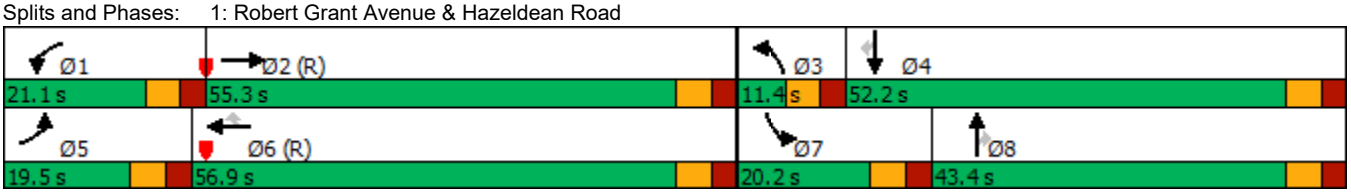
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	295	602	33	204	1177	193	27	684	148	314	829	384
Future Volume (vph)	295	602	33	204	1177	193	27	684	148	314	829	384
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		0.992				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3326	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3326	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				176			176			160
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			162.1			152.9	
Travel Time (s)		9.1			17.6			9.7			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	295	602	33	204	1177	193	27	684	148	314	829	384
Shared Lane Traffic (%)												
Lane Group Flow (vph)	295	635	0	204	1177	193	27	684	148	314	829	384
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	2.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	2.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	43.4	43.4	11.4	43.4	43.4
Total Split (s)	19.5	55.3		21.1	56.9	56.9	11.4	43.4	43.4	20.2	52.2	52.2
Total Split (%)	13.9%	39.5%		15.1%	40.6%	40.6%	8.1%	31.0%	31.0%	14.4%	37.3%	37.3%
Maximum Green (s)	13.1	48.9		14.7	50.5	50.5	5.0	37.0	37.0	13.8	45.8	45.8
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

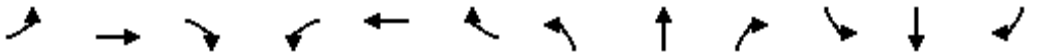
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	15.4	54.0		13.2	51.9	51.9	5.0	33.4	33.4	13.8	46.7	46.7
Actuated g/C Ratio	0.11	0.39		0.09	0.37	0.37	0.04	0.24	0.24	0.10	0.33	0.33
v/c Ratio	0.83	0.49		0.66	0.95	0.29	0.46	0.86	0.30	0.98	0.74	0.63
Control Delay	80.2	35.0		80.1	41.8	4.4	90.2	62.2	4.5	108.0	46.4	27.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.2	35.0		80.1	41.8	4.4	90.2	62.2	4.5	108.0	46.4	27.8
LOS	F	D		F	D	A	F	E	A	F	D	C
Approach Delay		49.4			42.2			53.2			54.4	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	43.9	74.7		26.0	178.6	15.7	7.9	100.1	0.0	47.8	117.0	58.0
Queue Length 95th (m)	#75.3	97.6		m42.6	#221.8	m5.1	#20.0	121.6	10.7	#79.6	139.2	93.7
Internal Link Dist (m)		127.7			270.0			138.1			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	356	1285		341	1242	666	59	886	525	320	1131	612
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	0.83	0.49		0.60	0.95	0.29	0.46	0.77	0.28	0.98	0.73	0.63

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 46 (33%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 49.3 Intersection LOS: D
Intersection Capacity Utilization 94.0% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Robert Grant Avenue & Hazeldean Road





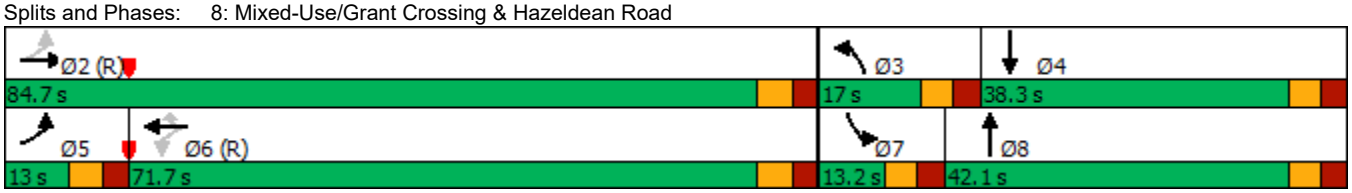
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	968	104	52	1409	55	102	0	39	67	0	49
Future Volume (vph)	100	968	104	52	1409	55	102	0	39	67	0	49
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0		30.0	0.0		170.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	1		0	2		0
Taper Length (m)	60.0			0.0			0.0			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.985				0.850		0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3303	0	1676	3353	1500	1676	1500	0	3252	1500	0
Flt Permitted	0.106			0.267			0.950			0.950		
Satd. Flow (perm)	187	3303	0	471	3353	1500	1676	1500	0	3252	1500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13				125		125			125	
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		294.0			278.5			153.0			148.0	
Travel Time (s)		17.6			16.7			13.8			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	968	104	52	1409	55	102	0	39	67	0	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	1072	0	52	1409	55	102	39	0	67	49	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	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	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	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	
Detector 1 Queue (s)	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	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	38.4		38.4	38.4	38.4	11.3	38.3		11.3	38.3	
Total Split (s)	13.0	84.7		71.7	71.7	71.7	17.0	42.1		13.2	38.3	
Total Split (%)	9.3%	60.5%		51.2%	51.2%	51.2%	12.1%	30.1%		9.4%	27.4%	
Maximum Green (s)	6.6	78.3		65.3	65.3	65.3	10.7	35.8		6.9	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.3	6.3		6.3	6.3	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag		Lead	Lag	

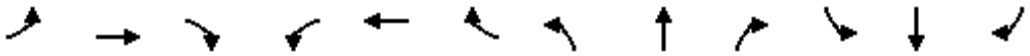
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0		7.0	7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		25.0		25.0	25.0	25.0		25.0			25.0	
Pedestrian Calls (#/hr)		5		5	5	5		5			5	
Act Effct Green (s)	99.3	99.3		84.5	84.5	84.5	10.6	17.4		6.7	14.4	
Actuated g/C Ratio	0.71	0.71		0.60	0.60	0.60	0.08	0.12		0.05	0.10	
v/c Ratio	0.45	0.46		0.18	0.70	0.06	0.81	0.13		0.43	0.18	
Control Delay	26.4	13.9		18.8	23.7	0.1	104.3	0.9		73.4	1.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	26.4	13.9		18.8	23.7	0.1	104.3	0.9		73.4	1.5	
LOS	C	B		B	C	A	F	A		E	A	
Approach Delay		15.0			22.7			75.7			43.1	
Approach LOS		B			C			E			D	
Queue Length 50th (m)	10.0	81.6		6.4	139.6	0.0	29.8	0.0		9.9	0.0	
Queue Length 95th (m)	m34.9	m126.3		19.6	231.7	0.0	#62.3	0.0		18.4	0.0	
Internal Link Dist (m)		270.0			254.5			129.0			124.0	
Turn Bay Length (m)	90.0					170.0						
Base Capacity (vph)	221	2346		284	2024	955	128	476		160	439	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.45	0.46		0.18	0.70	0.06	0.80	0.08		0.42	0.11	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 16 (11%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 23.0 Intersection LOS: C
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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Mixed-Use/Grant Crossing & Hazeldean Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	3	0	0	79	0	779	45	0	981	71
Future Volume (Veh/h)	0	0	3	0	0	79	0	779	45	0	981	71
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	3	0	0	79	0	779	45	0	981	71
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											260	
pX, platoon unblocked	0.70	0.70	0.70	0.70	0.70		0.70					
vC, conflicting volume	1897	1840	1016	1821	1854	802	1052			824		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2066	1985	811	1958	2004	802	861			824		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	79	100			100		
cM capacity (veh/h)	22	43	266	33	42	384	548			806		

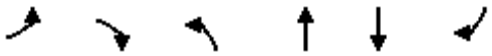
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	3	79	824	1052
Volume Left	0	0	0	0
Volume Right	3	79	45	71
cSH	266	384	1700	1700
Volume to Capacity	0.01	0.21	0.48	0.62
Queue Length 95th (m)	0.3	6.1	0.0	0.0
Control Delay (s)	18.7	16.8	0.0	0.0
Lane LOS	C	C		
Approach Delay (s)	18.7	16.8	0.0	0.0
Approach LOS	C	C		

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	69.0%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	23	747	10	0	753
Future Volume (Veh/h)	0	23	747	10	0	753
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	23	747	10	0	753
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1505	752			757	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1505	752			757	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	94			100	
cM capacity (veh/h)	133	410			854	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	23	757	753
Volume Left	0	0	0
Volume Right	23	10	0
cSH	410	1700	1700
Volume to Capacity	0.06	0.45	0.44
Queue Length 95th (m)	1.4	0.0	0.0
Control Delay (s)	14.3	0.0	0.0
Lane LOS	B		
Approach Delay (s)	14.3	0.0	0.0
Approach LOS	B		

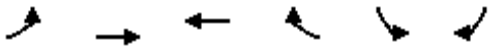
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	57	0	759	724	29
Future Volume (Veh/h)	0	57	0	759	724	29
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	57	0	759	724	29
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1498	738	753			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1498	738	753			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	86	100			
cM capacity (veh/h)	135	418	857			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	57	759	753
Volume Left	0	0	0
Volume Right	57	0	29
cSH	418	1700	1700
Volume to Capacity	0.14	0.45	0.44
Queue Length 95th (m)	3.8	0.0	0.0
Control Delay (s)	15.0	0.0	0.0
Lane LOS	B		
Approach Delay (s)	15.0	0.0	0.0
Approach LOS	B		

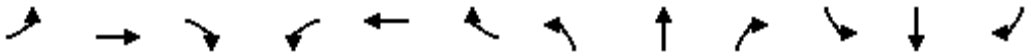
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	481	522	38	31	8
Future Volume (Veh/h)	3	481	522	38	31	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	481	522	38	31	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	560				1028	541
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	560				1028	541
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	99
cM capacity (veh/h)	1011				259	541

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	484	560	39
Volume Left	3	0	31
Volume Right	0	38	8
cSH	1011	1700	290
Volume to Capacity	0.00	0.33	0.13
Queue Length 95th (m)	0.1	0.0	3.7
Control Delay (s)	0.1	0.0	19.4
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	19.4
Approach LOS			C

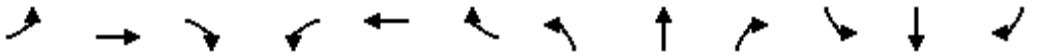
Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	14	5	45	14	29	62	677	30	185	705	94
Future Volume (Veh/h)	121	14	5	45	14	29	62	677	30	185	705	94
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	121	14	5	45	14	29	62	677	30	185	705	94
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1959	1953	752	1903	1985	692	799			707		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1959	1953	752	1903	1985	692	799			707		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	70	99	0	69	93	92			79		
cM capacity (veh/h)	27	47	410	32	45	444	824			891		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	140	88	62	707	185	799
Volume Left	121	45	62	0	185	0
Volume Right	5	29	0	30	0	94
cSH	29	49	824	1700	891	1700
Volume to Capacity	4.76	1.79	0.08	0.42	0.21	0.47
Queue Length 95th (m)	Err	69.2	1.9	0.0	6.2	0.0
Control Delay (s)	Err	555.3	9.7	0.0	10.1	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	Err	555.3	0.8		1.9	
Approach LOS	F	F				

Intersection Summary				
Average Delay	732.6			
Intersection Capacity Utilization	73.4%	ICU Level of Service	D	
Analysis Period (min)	15			



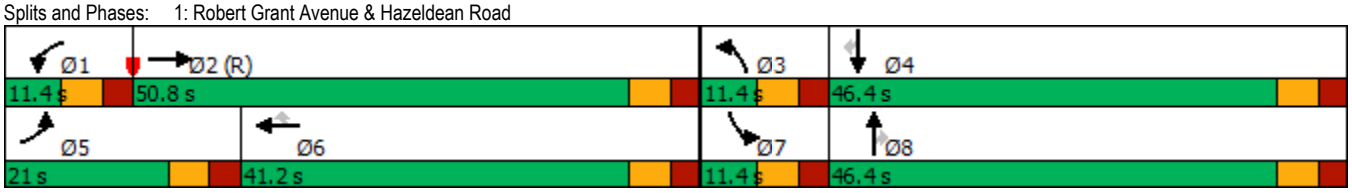
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	297	925	3	7	435	227	10	517	17	69	128	122
Future Volume (vph)	297	925	3	7	435	227	10	517	17	69	128	122
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt						0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3353	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3353	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						215			205			205
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			1570.7			152.9	
Travel Time (s)		9.1			17.6			94.2			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	297	925	3	7	435	227	10	517	17	69	128	122
Shared Lane Traffic (%)												
Lane Group Flow (vph)	297	928	0	7	435	227	10	517	17	69	128	122
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	0
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	0.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	0.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	43.4	43.4	11.4	43.4	43.4
Total Split (s)	21.0	50.8		11.4	41.2	41.2	11.4	46.4	46.4	11.4	46.4	46.4
Total Split (%)	17.5%	42.3%		9.5%	34.3%	34.3%	9.5%	38.7%	38.7%	9.5%	38.7%	38.7%
Maximum Green (s)	14.6	44.4		5.0	34.8	34.8	5.0	40.0	40.0	5.0	40.0	40.0
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

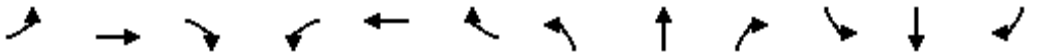
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	15.7	70.1		5.8	50.5	50.5	5.0	25.5	25.5	5.0	32.3	32.3
Actuated g/C Ratio	0.13	0.58		0.05	0.42	0.42	0.04	0.21	0.21	0.04	0.27	0.27
v/c Ratio	0.70	0.47		0.04	0.31	0.30	0.14	0.73	0.04	0.51	0.14	0.22
Control Delay	58.9	18.3		73.9	19.6	5.7	60.3	49.7	0.1	69.8	32.0	0.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	18.3		73.9	19.6	5.7	60.3	49.7	0.1	69.8	32.0	0.9
LOS	E	B		E	B	A	E	D	A	E	C	A
Approach Delay		28.1			15.5			48.3			28.3	
Approach LOS		C			B			D			C	
Queue Length 50th (m)	36.5	63.3		0.6	37.8	15.7	2.5	64.3	0.0	8.8	12.2	0.0
Queue Length 95th (m)	51.3	127.1		3.6	62.5	50.6	8.4	72.6	0.0	16.9	19.8	0.0
Internal Link Dist (m)		127.7			270.0			1546.7			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	439	1957		157	1410	755	69	1117	636	135	1117	636
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	0.68	0.47		0.04	0.31	0.30	0.14	0.46	0.03	0.51	0.11	0.19

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 7 (6%), Referenced to phase 2:EBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 29.0 Intersection LOS: C
Intersection Capacity Utilization 71.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Robert Grant Avenue & Hazeldean Road





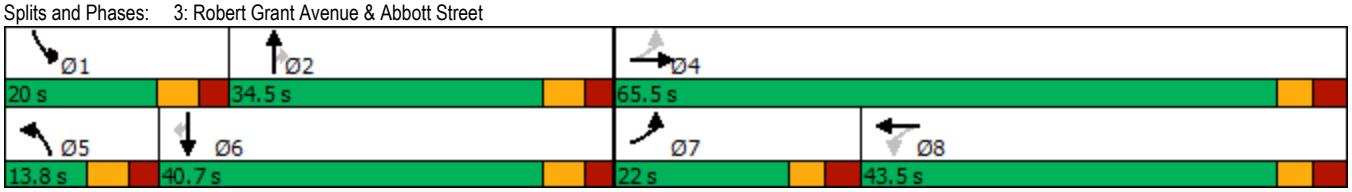
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	399	35	69	184	16	41	293	149	17	97	59
Future Volume (vph)	235	399	35	69	184	16	41	293	149	17	97	59
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		0.0	60.0		0.0	90.0		90.0	90.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	60.0			60.0			90.0			90.0		
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
Frt		0.988			0.988				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1744	0	1676	1744	0	1676	3353	1500	1676	3353	1500
Flt Permitted	0.377			0.510			0.950			0.950		
Satd. Flow (perm)	665	1744	0	900	1744	0	1676	3353	1500	1676	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			4				149			149
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		226.9			169.0			133.8			1570.7	
Travel Time (s)		16.3			12.2			8.0			94.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	399	35	69	184	16	41	293	149	17	97	59
Shared Lane Traffic (%)												
Lane Group Flow (vph)	235	434	0	69	200	0	41	293	149	17	97	59
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)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	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
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	7	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	43.5		43.5	43.5		11.4	33.4	33.4	11.4	33.4	33.4
Total Split (s)	22.0	65.5		43.5	43.5		13.8	34.5	34.5	20.0	40.7	40.7
Total Split (%)	18.3%	54.6%		36.3%	36.3%		11.5%	28.8%	28.8%	16.7%	33.9%	33.9%
Maximum Green (s)	15.5	59.0		37.0	37.0		7.4	28.1	28.1	13.6	34.3	34.3
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2		3.2	3.2		2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead			Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag

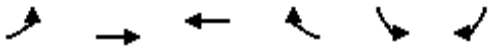
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max	Max	None	Max	Max
Walk Time (s)		7.0		7.0	7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		30.0		30.0	30.0			20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)		5		5	5			5	5		5	5
Act Effct Green (s)	39.4	39.4		18.3	18.3		7.0	37.8	37.8	6.7	35.3	35.3
Actuated g/C Ratio	0.41	0.41		0.19	0.19		0.07	0.40	0.40	0.07	0.37	0.37
v/c Ratio	0.55	0.60		0.40	0.59		0.34	0.22	0.22	0.15	0.08	0.09
Control Delay	24.6	25.8		41.9	42.5		55.7	23.3	6.0	50.9	24.8	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	25.8		41.9	42.5		55.7	23.3	6.0	50.9	24.8	0.3
LOS	C	C		D	D		E	C	A	D	C	A
Approach Delay		25.4			42.3			20.7			19.0	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	33.4	69.7		12.8	37.8		8.0	17.0	0.0	3.3	6.8	0.0
Queue Length 95th (m)	51.3	99.8		26.0	59.7		22.3	43.2	16.0	11.8	16.3	0.0
Internal Link Dist (m)		202.9			145.0			109.8			1546.7	
Turn Bay Length (m)	60.0			60.0			90.0		90.0	90.0		70.0
Base Capacity (vph)	443	1112		359	698		133	1328	684	245	1240	649
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.39		0.19	0.29		0.31	0.22	0.22	0.07	0.08	0.09

Intersection Summary

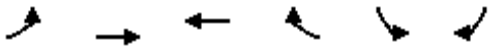
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 95.4
Natural Cycle: 100
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 26.1 — Intersection LOS: C
Intersection Capacity Utilization 63.8% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Robert Grant Avenue & Abbott Street





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	28	999	654	7	7	10
Future Volume (vph)	28	999	654	7	7	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0			170.0	0.0	0.0
Storage Lanes	1			1	2	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	3252	1500
Flt Permitted	0.371				0.950	
Satd. Flow (perm)	655	3353	3353	1500	3252	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				7		10
Link Speed (k/h)		60	60		40	
Link Distance (m)		294.0	278.5		148.0	
Travel Time (s)		17.6	16.7		13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	28	999	654	7	7	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	999	654	7	7	10
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		7.2	7.2		7.2	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2			6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	11.4	16.4	38.4	38.4	38.3	38.3
Total Split (s)	12.0	68.7	56.7	56.7	51.3	51.3
Total Split (%)	10.0%	57.3%	47.3%	47.3%	42.8%	42.8%
Maximum Green (s)	5.6	62.3	50.3	50.3	45.0	45.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.3	6.3
Lead/Lag	Lead		Lag	Lag		

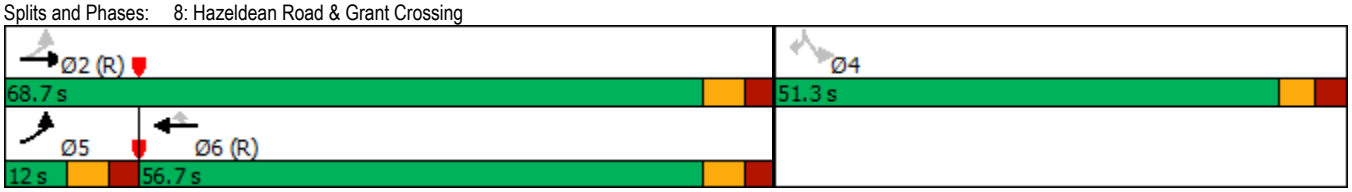


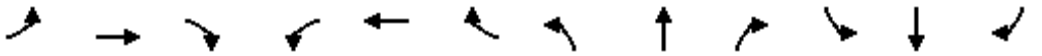
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			25.0	25.0	25.0	25.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	101.0	103.6	96.0	96.0	11.0	11.0
Actuated g/C Ratio	0.84	0.86	0.80	0.80	0.09	0.09
v/c Ratio	0.05	0.35	0.24	0.01	0.02	0.07
Control Delay	6.6	4.9	7.2	6.4	42.7	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.6	4.9	7.2	6.4	42.7	20.4
LOS	A	A	A	A	D	C
Approach Delay		4.9	7.2		29.6	
Approach LOS		A	A		C	
Queue Length 50th (m)	0.7	18.7	23.4	0.0	0.8	0.0
Queue Length 95th (m)	m5.9	61.7	64.0	2.5	2.6	4.5
Internal Link Dist (m)		270.0	254.5		124.0	
Turn Bay Length (m)	90.0			170.0		
Base Capacity (vph)	602	2894	2681	1201	1219	568
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.35	0.24	0.01	0.01	0.02

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.35
Intersection Signal Delay: 6.0 Intersection LOS: A
Intersection Capacity Utilization 43.9% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Hazeldean Road & Grant Crossing





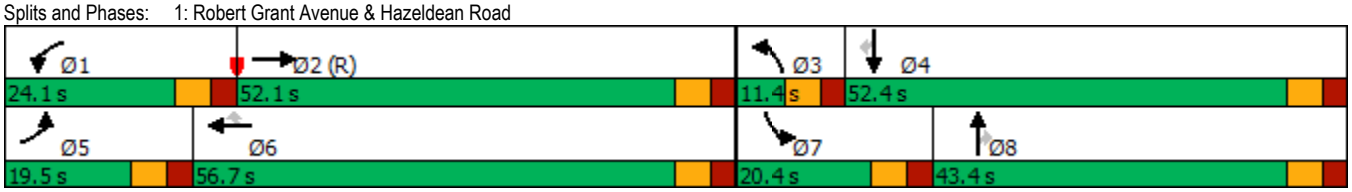
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	274	516	10	19	1067	174	6	488	12	286	554	357
Future Volume (vph)	274	516	10	19	1067	174	6	488	12	286	554	357
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3343	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3343	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				176			176			222
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			1576.6			152.9	
Travel Time (s)		9.1			17.6			94.6			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	274	516	10	19	1067	174	6	488	12	286	554	357
Shared Lane Traffic (%)												
Lane Group Flow (vph)	274	526	0	19	1067	174	6	488	12	286	554	357
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	0
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	0.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	0.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	43.4	43.4	11.4	43.4	43.4
Total Split (s)	19.5	52.1		24.1	56.7	56.7	11.4	43.4	43.4	20.4	52.4	52.4
Total Split (%)	13.9%	37.2%		17.2%	40.5%	40.5%	8.1%	31.0%	31.0%	14.6%	37.4%	37.4%
Maximum Green (s)	13.1	45.7		17.7	50.3	50.3	5.0	37.0	37.0	14.0	46.0	46.0
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

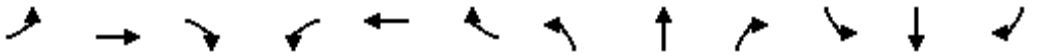
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	16.3	72.1		6.3	57.4	57.4	5.0	26.8	26.8	14.0	44.9	44.9
Actuated g/C Ratio	0.12	0.52		0.04	0.41	0.41	0.04	0.19	0.19	0.10	0.32	0.32
v/c Ratio	0.73	0.31		0.13	0.78	0.24	0.10	0.76	0.03	0.88	0.52	0.57
Control Delay	71.0	22.2		73.9	32.5	7.0	69.2	61.2	0.1	89.0	40.4	17.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.0	22.2		73.9	32.5	7.0	69.2	61.2	0.1	89.0	40.4	17.6
LOS	E	C		E	C	A	E	E	A	F	D	B
Approach Delay		38.9			29.6			59.8			45.2	
Approach LOS		D			C			E			D	
Queue Length 50th (m)	39.6	47.8		2.5	142.1	10.7	1.7	72.3	0.0	43.0	68.2	30.7
Queue Length 95th (m)	#68.2	72.7		m5.4	#184.8	19.4	6.7	83.7	0.0	#69.0	86.9	64.2
Internal Link Dist (m)		127.7			270.0			1552.6			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	377	1721		411	1373	718	59	886	525	325	1114	646
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	0.73	0.31		0.05	0.78	0.24	0.10	0.55	0.02	0.88	0.50	0.55

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 27 (19%), Referenced to phase 2:EBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 40.6 Intersection LOS: D
Intersection Capacity Utilization 83.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Robert Grant Avenue & Hazeldean Road



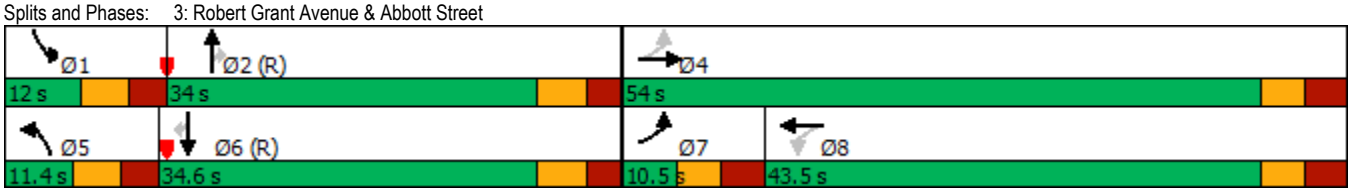


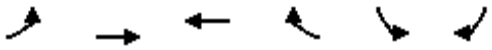
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	157	33	37	255	134	19	234	171	32	383	171
Future Volume (vph)	138	157	33	37	255	134	19	234	171	32	383	171
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		0.0	60.0		0.0	90.0		70.0	90.0		90.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	60.0			60.0			90.0			90.0		
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
Frt		0.974			0.948				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1719	0	1676	1673	0	1676	3353	1500	1676	3353	1500
Flt Permitted	0.219			0.638			0.950			0.950		
Satd. Flow (perm)	386	1719	0	1126	1673	0	1676	3353	1500	1676	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			30				179			179
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		209.4			198.2			228.8			1576.6	
Travel Time (s)		15.1			14.3			13.7			94.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	138	157	33	37	255	134	19	234	171	32	383	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	138	190	0	37	389	0	19	234	171	32	383	171
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)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	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
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	7	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.5	43.5		43.5	43.5		11.4	33.4	33.4	11.4	33.4	33.4
Total Split (s)	10.5	54.0		43.5	43.5		11.4	34.0	34.0	12.0	34.6	34.6
Total Split (%)	10.5%	54.0%		43.5%	43.5%		11.4%	34.0%	34.0%	12.0%	34.6%	34.6%
Maximum Green (s)	4.0	47.5		37.0	37.0		5.0	27.6	27.6	5.6	28.2	28.2
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2		3.2	3.2		2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead			Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		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
Flash Dont Walk (s)		30.0		30.0	30.0			20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)		5		5	5			5	5		5	5
Act Effct Green (s)	38.0	38.0		27.5	27.5		6.0	41.0	41.0	6.6	44.1	44.1
Actuated g/C Ratio	0.38	0.38		0.28	0.28		0.06	0.41	0.41	0.07	0.44	0.44
v/c Ratio	0.70	0.29		0.12	0.81		0.19	0.17	0.24	0.29	0.26	0.22
Control Delay	40.3	19.7		25.1	43.9		49.4	22.6	4.8	51.5	21.3	4.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	19.7		25.1	43.9		49.4	22.6	4.8	51.5	21.3	4.6
LOS	D	B		C	D		D	C	A	D	C	A
Approach Delay		28.4			42.2			16.6			18.1	
Approach LOS		C			D			B			B	
Queue Length 50th (m)	18.7	24.4		5.7	68.6		3.7	17.2	0.0	6.3	22.6	0.0
Queue Length 95th (m)	27.5	34.5		11.9	91.1		11.5	30.0	14.3	16.3	47.1	14.2
Internal Link Dist (m)		185.4			174.2			204.8			1552.6	
Turn Bay Length (m)	60.0			60.0			90.0		70.0	90.0		90.0
Base Capacity (vph)	198	823		416	637		100	1375	720	110	1477	761
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.23		0.09	0.61		0.19	0.17	0.24	0.29	0.26	0.22

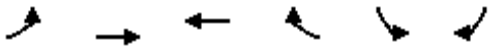
Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 25.5		Intersection LOS: C	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: Robert Grant Avenue & Abbott Street





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	93	751	1201	51	62	46
Future Volume (vph)	93	751	1201	51	62	46
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0			170.0	0.0	0.0
Storage Lanes	1			1	2	1
Taper Length (m)	60.0				0.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	3353	3353	1500	3252	1500
Flt Permitted	0.190				0.950	
Satd. Flow (perm)	335	3353	3353	1500	3252	1500
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				51		46
Link Speed (k/h)		60	60		40	
Link Distance (m)		294.0	278.5		148.0	
Travel Time (s)		17.6	16.7		13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	93	751	1201	51	62	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	751	1201	51	62	46
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		7.2	7.2		7.2	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0
Trailing Detector (m)	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
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0
Detector 1 Type	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
Detector 1 Queue (s)	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
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2			6	4	4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	11.4	16.4	38.4	38.4	38.3	38.3
Total Split (s)	12.2	80.7	68.5	68.5	59.3	59.3
Total Split (%)	8.7%	57.6%	48.9%	48.9%	42.4%	42.4%
Maximum Green (s)	5.8	74.3	62.1	62.1	53.0	53.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.3	6.3
Lead/Lag	Lead		Lag	Lag		

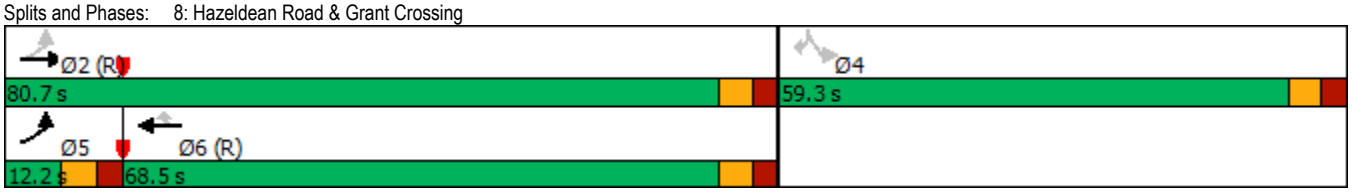


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			25.0	25.0	25.0	25.0
Pedestrian Calls (#/hr)			5	5	5	5
Act Effct Green (s)	117.3	118.6	103.6	103.6	12.4	12.4
Actuated g/C Ratio	0.84	0.85	0.74	0.74	0.09	0.09
v/c Ratio	0.27	0.26	0.48	0.05	0.21	0.26
Control Delay	7.0	3.3	10.4	2.9	57.6	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	3.3	10.4	2.9	57.6	16.7
LOS	A	A	B	A	E	B
Approach Delay		3.7	10.1		40.2	
Approach LOS		A	B		D	
Queue Length 50th (m)	2.1	10.1	61.6	0.0	9.1	0.0
Queue Length 95th (m)	m15.7	m68.8	144.0	6.2	13.9	11.0
Internal Link Dist (m)		270.0	254.5		124.0	
Turn Bay Length (m)	90.0			170.0		
Base Capacity (vph)	350	2840	2482	1123	1231	596
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.26	0.48	0.05	0.05	0.08

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 9.1		Intersection LOS: A	
Intersection Capacity Utilization 60.6%		ICU Level of Service B	
Analysis Period (min) 15			

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

Splits and Phases: 8: Hazeldean Road & Grant Crossing



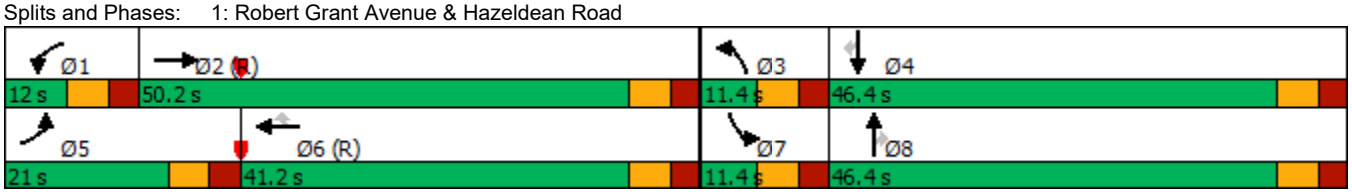
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	297	982	17	88	446	241	33	759	214	74	234	122
Future Volume (vph)	297	982	17	88	446	241	33	759	214	74	234	122
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3343	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3343	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				205			205			205
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			251.8			152.9	
Travel Time (s)		9.1			17.6			15.1			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	297	982	17	88	446	241	33	759	214	74	234	122
Shared Lane Traffic (%)												
Lane Group Flow (vph)	297	999	0	88	446	241	33	759	214	74	234	122
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	2.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	2.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	46.4	46.4	11.4	46.4	46.4
Total Split (s)	21.0	50.2		12.0	41.2	41.2	11.4	46.4	46.4	11.4	46.4	46.4
Total Split (%)	17.5%	41.8%		10.0%	34.3%	34.3%	9.5%	38.7%	38.7%	9.5%	38.7%	38.7%
Maximum Green (s)	14.6	43.8		5.6	34.8	34.8	5.0	40.0	40.0	5.0	40.0	40.0
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

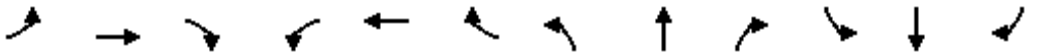
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	Max	Max
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	14.1	43.8		5.6	35.3	35.3	5.0	42.3	42.3	5.0	44.6	44.6
Actuated g/C Ratio	0.12	0.36		0.05	0.29	0.29	0.04	0.35	0.35	0.04	0.37	0.37
v/c Ratio	0.78	0.82		0.58	0.45	0.41	0.48	0.64	0.32	0.55	0.19	0.18
Control Delay	66.2	41.1		80.7	30.0	7.6	78.8	36.3	5.9	71.8	27.2	0.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.2	41.1		80.7	30.0	7.6	78.8	36.3	5.9	71.8	27.2	0.6
LOS	E	D		F	C	A	E	D	A	E	C	A
Approach Delay		46.8			28.8			31.2			27.3	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	37.2	116.8		8.1	48.8	18.4	8.2	85.0	1.5	9.4	21.7	0.0
Queue Length 95th (m)	#55.6	144.9		#22.0	28.8	14.4	#21.7	107.5	18.8	#18.0	32.2	0.0
Internal Link Dist (m)		127.7			270.0			227.8			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	395	1221		151	987	586	69	1181	661	135	1245	685
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	0.75	0.82		0.58	0.45	0.41	0.48	0.64	0.32	0.55	0.19	0.18

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 5 (4%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 36.0 Intersection LOS: D
Intersection Capacity Utilization 81.0% 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: 1: Robert Grant Avenue & Hazeldean Road





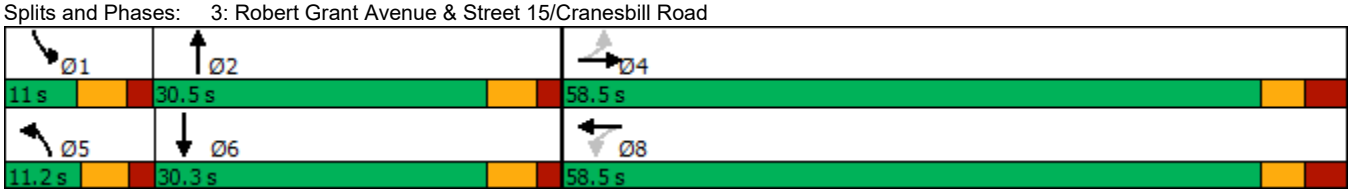
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	54	5	27	46	46	29	693	12	90	208	41
Future Volume (vph)	163	54	5	27	46	46	29	693	12	90	208	41
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	55.0		0.0	55.0		0.0	70.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	30.0			30.0			90.0			90.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.987			0.925			0.997			0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1742	0	1676	1632	0	1676	3343	0	1676	3269	0
Flt Permitted	0.697			0.719			0.950			0.950		
Satd. Flow (perm)	1230	1742	0	1269	1632	0	1676	3343	0	1676	3269	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			46			2			22	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		176.0			162.4			229.6			365.6	
Travel Time (s)		12.7			11.7			13.8			21.9	
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)	163	54	5	27	46	46	29	693	12	90	208	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	163	59	0	27	92	0	29	705	0	90	249	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	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	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	58.5	58.5		58.5	58.5		10.6	28.6		10.6	28.6	
Total Split (s)	58.5	58.5		58.5	58.5		11.2	30.5		11.0	30.3	
Total Split (%)	58.5%	58.5%		58.5%	58.5%		11.2%	30.5%		11.0%	30.3%	
Maximum Green (s)	52.0	52.0		52.0	52.0		5.6	24.9		5.4	24.7	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2		1.9	1.9		1.9	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5		6.5	6.5		5.6	5.6		5.6	5.6	
Lead/Lag							Lead	Lag		Lead	Lag	

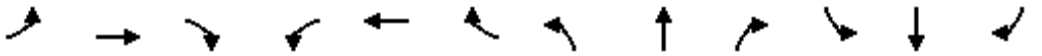
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	45.0	45.0		45.0	45.0			16.0			16.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	13.7	13.7		13.7	13.7		5.6	25.4		5.4	32.1	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.09	0.41		0.09	0.52	
v/c Ratio	0.60	0.15		0.10	0.23		0.19	0.52		0.62	0.15	
Control Delay	31.6	18.5		19.3	12.8		30.8	16.1		50.0	9.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.6	18.5		19.3	12.8		30.8	16.1		50.0	9.7	
LOS	C	B		B	B		C	B		D	A	
Approach Delay		28.1			14.2			16.6			20.4	
Approach LOS		C			B			B			C	
Queue Length 50th (m)	17.6	5.2		2.6	4.4		3.3	31.5		10.5	5.5	
Queue Length 95th (m)	34.6	13.3		8.1	14.4		11.0	53.8		#32.7	17.9	
Internal Link Dist (m)		152.0			138.4			205.6			341.6	
Turn Bay Length (m)	55.0			55.0			70.0			70.0		
Base Capacity (vph)	1030	1460		1063	1375		151	1365		145	1700	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.04		0.03	0.07		0.19	0.52		0.62	0.15	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 62.2
Natural Cycle: 100
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 56.8% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Robert Grant Avenue & Street 15/Cranesbill Road





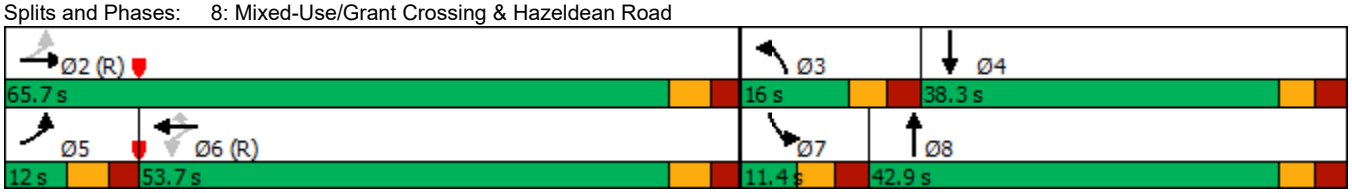
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	1113	71	26	712	7	48	0	42	7	0	10
Future Volume (vph)	28	1113	71	26	712	7	48	0	42	7	0	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0		30.0	0.0		170.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	1		0	2		0
Taper Length (m)	60.0			0.0			0.0			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.991				0.850		0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3323	0	1676	3353	1500	1676	1500	0	3252	1500	0
Flt Permitted	0.323			0.229			0.950			0.950		
Satd. Flow (perm)	570	3323	0	404	3353	1500	1676	1500	0	3252	1500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				145		146			231	
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		294.0			278.5			153.0			148.0	
Travel Time (s)		17.6			16.7			13.8			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	28	1113	71	26	712	7	48	0	42	7	0	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1184	0	26	712	7	48	42	0	7	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	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	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	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	
Detector 1 Queue (s)	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	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	38.4		38.4	38.4	38.4	11.3	38.3		11.3	38.3	
Total Split (s)	12.0	65.7		53.7	53.7	53.7	16.0	42.9		11.4	38.3	
Total Split (%)	10.0%	54.8%		44.8%	44.8%	44.8%	13.3%	35.8%		9.5%	31.9%	
Maximum Green (s)	5.6	59.3		47.3	47.3	47.3	9.7	36.6		5.1	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.3	6.3		6.3	6.3	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag		Lead	Lag	

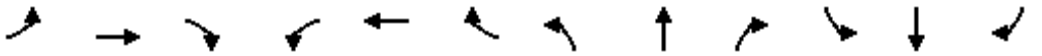
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0		7.0	7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		25.0		25.0	25.0	25.0		25.0			25.0	
Pedestrian Calls (#/hr)		5		5	5	5		5			5	
Act Effct Green (s)	89.8	91.0		83.6	83.6	83.6	9.0	18.5		5.1	14.4	
Actuated g/C Ratio	0.75	0.76		0.70	0.70	0.70	0.08	0.15		0.04	0.12	
v/c Ratio	0.06	0.47		0.09	0.30	0.01	0.38	0.12		0.05	0.03	
Control Delay	9.4	7.4		17.0	12.9	0.0	61.6	0.7		56.0	0.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	9.4	7.4		17.0	12.9	0.0	61.6	0.7		56.0	0.1	
LOS	A	A		B	B	A	E	A		E	A	
Approach Delay		7.4			12.9			33.2			23.1	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	0.8	25.6		1.8	30.6	0.0	11.4	0.0		0.8	0.0	
Queue Length 95th (m)	m3.6	67.7		11.5	89.8	0.0	24.4	0.0		3.5	0.0	
Internal Link Dist (m)		270.0			254.5			129.0			124.0	
Turn Bay Length (m)	90.0					170.0						
Base Capacity (vph)	480	2522		281	2336	1089	137	558		138	569	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.06	0.47		0.09	0.30	0.01	0.35	0.08		0.05	0.02	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 10.7 Intersection LOS: B
Intersection Capacity Utilization 54.9% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Mixed-Use/Grant Crossing & Hazeldean Road





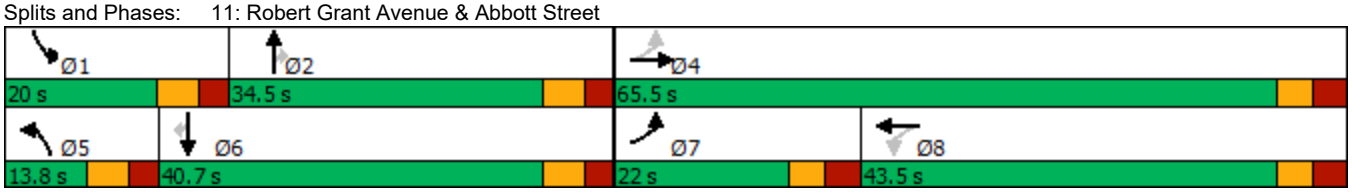
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	266	402	35	77	192	63	41	375	152	103	141	66
Future Volume (vph)	266	402	35	77	192	63	41	375	152	103	141	66
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		0.0	60.0		0.0	90.0		90.0	90.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	60.0			60.0			90.0			90.0		
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
Frt		0.988			0.963				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1744	0	1676	1699	0	1676	3353	1500	1676	3353	1500
Flt Permitted	0.305			0.509			0.950			0.950		
Satd. Flow (perm)	538	1744	0	898	1699	0	1676	3353	1500	1676	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			14				152			149
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		280.2			163.5			203.2			612.8	
Travel Time (s)		20.2			11.8			12.2			36.8	
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)	266	402	35	77	192	63	41	375	152	103	141	66
Shared Lane Traffic (%)												
Lane Group Flow (vph)	266	437	0	77	255	0	41	375	152	103	141	66
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)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	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
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	7	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	43.5		43.5	43.5		11.4	33.4	33.4	11.4	33.4	33.4
Total Split (s)	22.0	65.5		43.5	43.5		13.8	34.5	34.5	20.0	40.7	40.7
Total Split (%)	18.3%	54.6%		36.3%	36.3%		11.5%	28.8%	28.8%	16.7%	33.9%	33.9%
Maximum Green (s)	15.5	59.0		37.0	37.0		7.4	28.1	28.1	13.6	34.3	34.3
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2		3.2	3.2		2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead			Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag

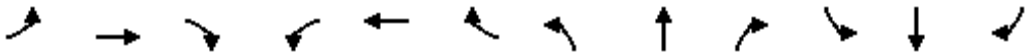
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max	Max	None	Max	Max
Walk Time (s)		7.0		7.0	7.0			7.0	7.0		7.0	7.0
Flash Dont Walk (s)		30.0		30.0	30.0			20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)		5		5	5			5	5		5	5
Act Effct Green (s)	42.5	42.5		20.9	20.9		6.9	30.7	30.7	10.9	37.1	37.1
Actuated g/C Ratio	0.42	0.42		0.21	0.21		0.07	0.31	0.31	0.11	0.37	0.37
v/c Ratio	0.67	0.59		0.41	0.70		0.36	0.37	0.27	0.57	0.11	0.10
Control Delay	29.1	25.8		42.0	45.7		58.2	32.1	7.1	58.1	25.3	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.1	25.8		42.0	45.7		58.2	32.1	7.1	58.1	25.3	0.3
LOS	C	C		D	D		E	C	A	E	C	A
Approach Delay		27.0			44.8			27.3			30.9	
Approach LOS		C			D			C			C	
Queue Length 50th (m)	38.7	70.4		14.4	48.3		8.4	32.8	0.0	20.8	10.7	0.0
Queue Length 95th (m)	58.5	100.7		28.4	74.6		22.3	58.2	17.2	43.6	22.3	0.0
Internal Link Dist (m)		256.2			139.5			179.2			588.8	
Turn Bay Length (m)	60.0			60.0			90.0		90.0	90.0		70.0
Base Capacity (vph)	407	1048		337	648		126	1025	564	231	1238	648
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.42		0.23	0.39		0.33	0.37	0.27	0.45	0.11	0.10

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 100.4
Natural Cycle: 100
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 30.8 — Intersection LOS: C
Intersection Capacity Utilization 71.4% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 11: Robert Grant Avenue & Abbott Street





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	3	0	0	138	0	866	37	0	338	32
Future Volume (Veh/h)	0	0	3	0	0	138	0	866	37	0	338	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	3	0	0	138	0	866	37	0	338	32
Pedestrians					3							
Lane Width (m)					3.6							
Walking Speed (m/s)					1.2							
Percent Blockage					0							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								365			252	
pX, platoon unblocked	0.91	0.91	0.98	0.91	0.91	0.90	0.98			0.90		
vC, conflicting volume	925	1260	185	1060	1258	454	370			906		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	620	987	122	767	984	179	311			679		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	82	100			100		
cM capacity (veh/h)	277	224	886	264	225	750	1219			818		

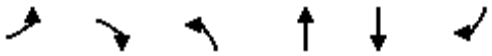
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	3	138	577	326	225	145
Volume Left	0	0	0	0	0	0
Volume Right	3	138	0	37	0	32
cSH	886	750	1700	1700	1700	1700
Volume to Capacity	0.00	0.18	0.34	0.19	0.13	0.09
Queue Length 95th (m)	0.1	5.4	0.0	0.0	0.0	0.0
Control Delay (s)	9.1	10.9	0.0	0.0	0.0	0.0
Lane LOS	A	B				
Approach Delay (s)	9.1	10.9	0.0		0.0	
Approach LOS	A	B				

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	42.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	31	700	5	0	241
Future Volume (Veh/h)	0	31	700	5	0	241
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	31	700	5	0	241
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						230
pX, platoon unblocked						
vC, conflicting volume	823	352			705	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	823	352			705	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	95			100	
cM capacity (veh/h)	312	644			889	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	31	467	238	120	120
Volume Left	0	0	0	0	0
Volume Right	31	0	5	0	0
cSH	644	1700	1700	1700	1700
Volume to Capacity	0.05	0.27	0.14	0.07	0.07
Queue Length 95th (m)	1.2	0.0	0.0	0.0	0.0
Control Delay (s)	10.9	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	10.9	0.0		0.0	
Approach LOS	B				

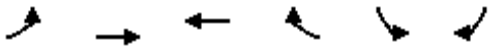
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	76	0	704	230	13
Future Volume (Veh/h)	0	76	0	704	230	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	76	0	704	230	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					348	
pX, platoon unblocked						
vC, conflicting volume	588	122	243			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	588	122	243			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	100			
cM capacity (veh/h)	440	907	1320			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	76	352	352	153	90
Volume Left	0	0	0	0	0
Volume Right	76	0	0	0	13
cSH	907	1700	1700	1700	1700
Volume to Capacity	0.08	0.21	0.21	0.09	0.05
Queue Length 95th (m)	2.2	0.0	0.0	0.0	0.0
Control Delay (s)	9.3	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	9.3	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	693	303	15	42	8
Future Volume (Veh/h)	0	693	303	15	42	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	693	303	15	42	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	318				1004	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	318				1004	310
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				84	99
cM capacity (veh/h)	1242				268	730

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	693	318	50
Volume Left	0	0	42
Volume Right	0	15	8
cSH	1242	1700	298
Volume to Capacity	0.00	0.19	0.17
Queue Length 95th (m)	0.0	0.0	4.7
Control Delay (s)	0.0	0.0	19.5
Lane LOS			C
Approach Delay (s)	0.0	0.0	19.5
Approach LOS			C

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

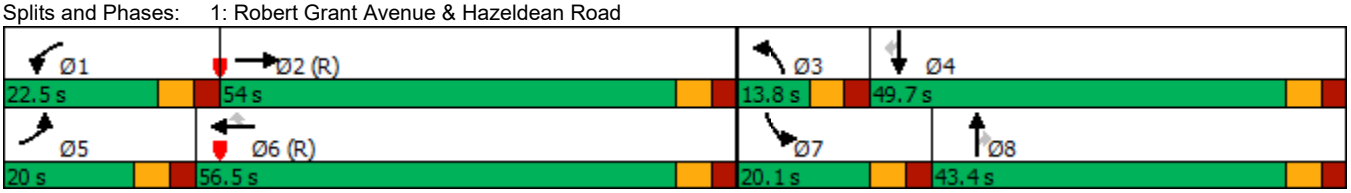
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	274	590	43	227	1118	181	36	630	187	295	761	357
Future Volume (vph)	274	590	43	227	1118	181	36	630	187	295	761	357
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	70.0		0.0	70.0		170.0	30.0		30.0	30.0		30.0
Storage Lanes	2		0	2		1	1		1	2		1
Taper Length (m)	60.0			60.0			60.0			60.0		
Lane Util. Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		0.990				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3319	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3319	0	3252	3353	1500	1676	3353	1500	3252	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				173			126			157
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		151.7			294.0			255.8			152.9	
Travel Time (s)		9.1			17.6			15.3			9.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	274	590	43	227	1118	181	36	630	187	295	761	357
Shared Lane Traffic (%)												
Lane Group Flow (vph)	274	633	0	227	1118	181	36	630	187	295	761	357
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)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	0	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	0.0	2.0	10.0	2.0
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)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	0.0	2.0	0.6	2.0
Detector 1 Type	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)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			4
Detector Phase	5	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.4	40.4		11.4	40.4	40.4	11.4	43.4	43.4	11.4	46.4	46.4
Total Split (s)	20.0	54.0		22.5	56.5	56.5	13.8	43.4	43.4	20.1	49.7	49.7
Total Split (%)	14.3%	38.6%		16.1%	40.4%	40.4%	9.9%	31.0%	31.0%	14.4%	35.5%	35.5%
Maximum Green (s)	13.6	47.6		16.1	50.1	50.1	7.4	37.0	37.0	13.7	43.3	43.3
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag

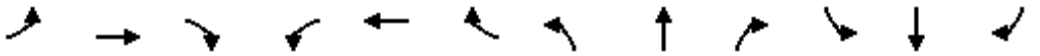
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	Max	Max
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		27.0			27.0	27.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		5			5	5		5	5		5	5
Act Effct Green (s)	13.6	49.4		14.3	50.1	50.1	7.0	37.0	37.0	13.7	46.1	46.1
Actuated g/C Ratio	0.10	0.35		0.10	0.36	0.36	0.05	0.26	0.26	0.10	0.33	0.33
v/c Ratio	0.87	0.54		0.69	0.93	0.28	0.43	0.71	0.38	0.93	0.69	0.60
Control Delay	88.7	38.2		84.2	42.3	3.4	80.8	51.9	16.9	97.2	45.4	26.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.7	38.2		84.2	42.3	3.4	80.8	51.9	16.9	97.2	45.4	26.7
LOS	F	D		F	D	A	F	D	B	F	D	C
Approach Delay		53.5			43.9			45.4			51.5	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	41.2	77.2		28.7	168.0	8.7	10.4	88.0	13.7	44.6	104.4	50.2
Queue Length 95th (m)	#66.3	98.5		m49.7	m#203.7	m5.4	22.7	110.6	36.1	#73.1	129.0	86.5
Internal Link Dist (m)		127.7			270.0			231.8			128.9	
Turn Bay Length (m)	70.0			70.0		170.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	315	1175		373	1200	647	88	886	489	318	1104	599
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	0.87	0.54		0.61	0.93	0.28	0.41	0.71	0.38	0.93	0.69	0.60

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 24 (17%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 48.3 Intersection LOS: D
Intersection Capacity Utilization 89.5% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Robert Grant Avenue & Hazeldean Road





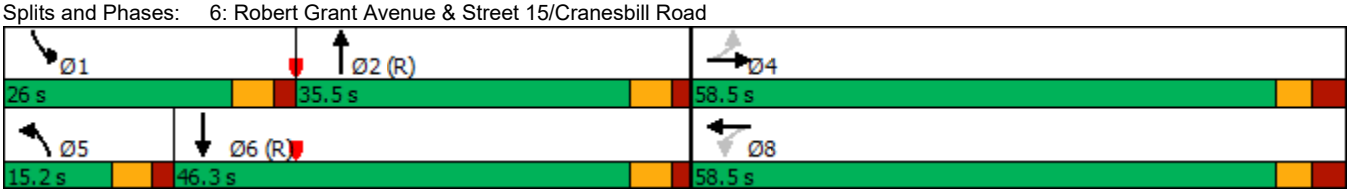
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	16	2	90	16	26	53	701	28	219	659	80
Future Volume (vph)	106	16	2	90	16	26	53	701	28	219	659	80
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	55.0		0.0	55.0		0.0	70.0		0.0	70.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	30.0			30.0			90.0			90.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.983			0.907			0.994			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1735	0	1676	1601	0	1676	3333	0	1676	3299	0
Flt Permitted	0.730			0.746			0.950			0.950		
Satd. Flow (perm)	1288	1735	0	1316	1601	0	1676	3333	0	1676	3299	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			26			3			12	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		143.9			181.7			230.8			360.9	
Travel Time (s)		10.4			13.1			13.8			21.7	
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)	106	16	2	90	16	26	53	701	28	219	659	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	106	18	0	90	42	0	53	729	0	219	739	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	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	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	58.5	58.5		58.5	58.5		10.6	28.6		10.6	28.6	
Total Split (s)	58.5	58.5		58.5	58.5		15.2	35.5		26.0	46.3	
Total Split (%)	48.8%	48.8%		48.8%	48.8%		12.7%	29.6%		21.7%	38.6%	
Maximum Green (s)	52.0	52.0		52.0	52.0		9.6	29.9		20.4	40.7	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2		1.9	1.9		1.9	1.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5		6.5	6.5		5.6	5.6		5.6	5.6	
Lead/Lag							Lead	Lag		Lead	Lag	

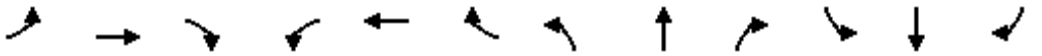
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	45.0	45.0		45.0	45.0			16.0			16.0	
Pedestrian Calls (#/hr)	5	5		5	5			5			5	
Act Effct Green (s)	21.6	21.6		21.6	21.6		8.5	60.9		19.8	74.4	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.07	0.51		0.16	0.62	
v/c Ratio	0.46	0.06		0.38	0.14		0.45	0.43		0.80	0.36	
Control Delay	46.8	30.4		44.0	17.4		62.7	17.7		68.9	15.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	46.8	30.4		44.0	17.4		62.7	17.7		68.9	15.7	
LOS	D	C		D	B		E	B		E	B	
Approach Delay		44.4			35.5			20.8			27.8	
Approach LOS		D			D			C			C	
Queue Length 50th (m)	25.3	3.6		21.2	3.5		13.5	45.7		51.9	39.7	
Queue Length 95th (m)	28.7	6.8		24.7	9.2		m23.4	#120.8		#90.0	102.3	
Internal Link Dist (m)		119.9			157.7			206.8			336.9	
Turn Bay Length (m)	55.0			55.0			70.0			70.0		
Base Capacity (vph)	558	752		570	708		137	1692		298	2048	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.02		0.16	0.06		0.39	0.43		0.73	0.36	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 68 (57%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 26.6 Intersection LOS: C
Intersection Capacity Utilization 61.8% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Robert Grant Avenue & Street 15/Cranesbill Road





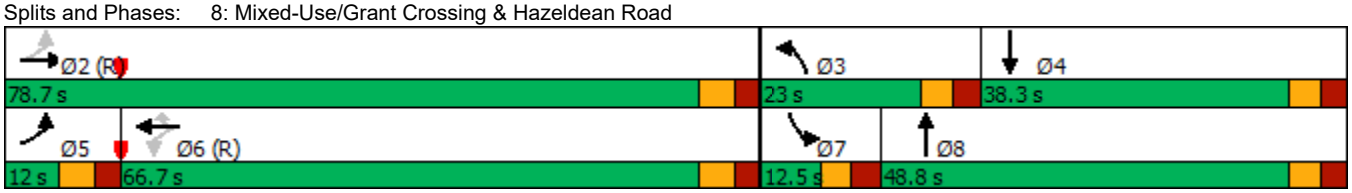
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	899	186	92	1287	51	180	0	64	62	0	46
Future Volume (vph)	93	899	186	92	1287	51	180	0	64	62	0	46
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	90.0		30.0	0.0		170.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	1		0	2		0
Taper Length (m)	60.0			0.0			0.0			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.974				0.850		0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3266	0	1676	3353	1500	1676	1500	0	3252	1500	0
Flt Permitted	0.118			0.259			0.950			0.950		
Satd. Flow (perm)	208	3266	0	457	3353	1500	1676	1500	0	3252	1500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				174		125			175	
Link Speed (k/h)		60			60			40			40	
Link Distance (m)		294.0			278.5			153.0			148.0	
Travel Time (s)		17.6			16.7			13.8			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	93	899	186	92	1287	51	180	0	64	62	0	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	1085	0	92	1287	51	180	64	0	62	46	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.2			7.2			7.2			7.2	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	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	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	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	
Detector 1 Queue (s)	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	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	38.4		38.4	38.4	38.4	11.3	38.3		11.3	38.3	
Total Split (s)	12.0	78.7		66.7	66.7	66.7	23.0	48.8		12.5	38.3	
Total Split (%)	8.6%	56.2%		47.6%	47.6%	47.6%	16.4%	34.9%		8.9%	27.4%	
Maximum Green (s)	5.6	72.3		60.3	60.3	60.3	16.7	42.5		6.2	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.7	2.7		2.7	2.7	2.7	3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4	6.4	6.3	6.3		6.3	6.3	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag		Lead	Lag	

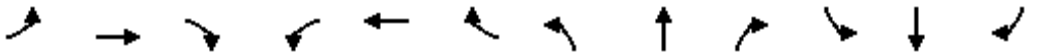
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0		7.0	7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		25.0		25.0	25.0	25.0		25.0			25.0	
Pedestrian Calls (#/hr)		5		5	5	5		5			5	
Act Effct Green (s)	93.3	93.3		78.7	78.7	78.7	16.5	24.0		6.1	14.4	
Actuated g/C Ratio	0.67	0.67		0.56	0.56	0.56	0.12	0.17		0.04	0.10	
v/c Ratio	0.42	0.50		0.36	0.68	0.06	0.91	0.18		0.43	0.15	
Control Delay	26.2	15.7		26.2	26.4	0.1	105.5	1.1		75.0	1.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	26.2	15.7		26.2	26.4	0.1	105.5	1.1		75.0	1.0	
LOS	C	B		C	C	A	F	A		E	A	
Approach Delay		16.6			25.5			78.1			43.5	
Approach LOS		B			C			E			D	
Queue Length 50th (m)	12.6	83.2		14.2	135.4	0.0	52.6	0.0		9.2	0.0	
Queue Length 95th (m)	m31.6	m124.3		38.4	214.2	0.0	#98.6	0.0		17.4	0.0	
Internal Link Dist (m)		270.0			254.5			129.0			124.0	
Turn Bay Length (m)	90.0					170.0						
Base Capacity (vph)	224	2186		256	1885	920	199	542		144	477	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.42	0.50		0.36	0.68	0.06	0.90	0.12		0.43	0.10	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 2 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 26.9 Intersection LOS: C
Intersection Capacity Utilization 76.1% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Mixed-Use/Grant Crossing & Hazeldean Road



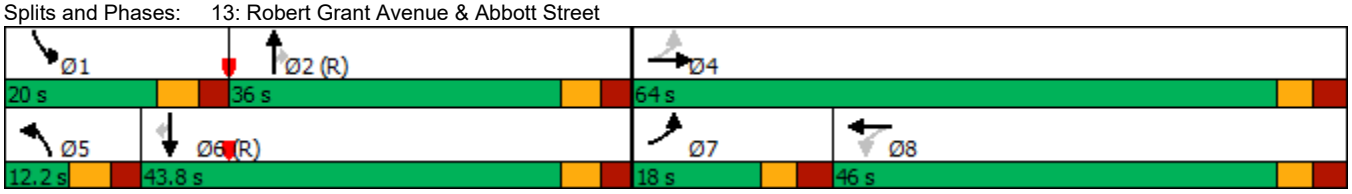


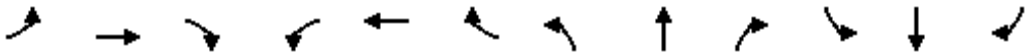
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	163	33	43	261	162	19	432	176	109	492	190
Future Volume (vph)	174	163	33	43	261	162	19	432	176	109	492	190
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	60.0		0.0	60.0		0.0	90.0		70.0	90.0		90.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	60.0			60.0			90.0			90.0		
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
Frt		0.975			0.943				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1721	0	1676	1664	0	1676	3353	1500	1676	3353	1500
Flt Permitted	0.169			0.634			0.950			0.950		
Satd. Flow (perm)	298	1721	0	1119	1664	0	1676	3353	1500	1676	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			28				207			190
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		223.7			155.2			182.6			602.9	
Travel Time (s)		16.1			11.2			11.0			36.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	174	163	33	43	261	162	19	432	176	109	492	190
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	196	0	43	423	0	19	432	176	109	492	190
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)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	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
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
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	pm+pt	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	7	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.5	43.5		43.5	43.5		11.4	33.4	33.4	11.4	33.4	33.4
Total Split (s)	18.0	64.0		46.0	46.0		12.2	36.0	36.0	20.0	43.8	43.8
Total Split (%)	15.0%	53.3%		38.3%	38.3%		10.2%	30.0%	30.0%	16.7%	36.5%	36.5%
Maximum Green (s)	11.5	57.5		39.5	39.5		5.8	29.6	29.6	13.6	37.4	37.4
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2		3.2	3.2		2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag	Lead			Lag	Lag		Lead	Lag	Lag	Lead	Lag	Lag

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		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
Flash Dont Walk (s)		30.0		30.0	30.0			20.0	20.0		20.0	20.0
Pedestrian Calls (#/hr)		5		5	5			5	5		5	5
Act Effct Green (s)	51.1	51.1		33.2	33.2		6.2	37.4	37.4	12.1	50.8	50.8
Actuated g/C Ratio	0.43	0.43		0.28	0.28		0.05	0.31	0.31	0.10	0.42	0.42
v/c Ratio	0.68	0.26		0.14	0.88		0.22	0.41	0.29	0.64	0.35	0.26
Control Delay	34.5	20.8		31.3	58.2		60.7	36.0	4.0	64.6	21.1	9.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.5	20.8		31.3	58.2		60.7	36.0	4.0	64.6	21.1	9.1
LOS	C	C		C	E		E	D	A	E	C	A
Approach Delay		27.2			55.7			27.7			24.2	
Approach LOS		C			E			C			C	
Queue Length 50th (m)	26.6	28.3		7.9	93.3		4.6	45.6	0.0	26.4	43.0	10.3
Queue Length 95th (m)	39.4	41.8		16.6	127.5		12.9	65.9	11.5	37.0	74.1	32.9
Internal Link Dist (m)		199.7			131.2			158.6			578.9	
Turn Bay Length (m)	60.0			60.0			90.0		70.0	90.0		90.0
Base Capacity (vph)	258	830		368	566		87	1046	610	193	1420	744
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.24		0.12	0.75		0.22	0.41	0.29	0.56	0.35	0.26

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 32.2		Intersection LOS: C	
Intersection Capacity Utilization 75.6%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 13: Robert Grant Avenue & Abbott Street





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	2	0	0	115	0	737	95	0	957	61
Future Volume (Veh/h)	0	0	2	0	0	115	0	737	95	0	957	61
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	2	0	0	115	0	737	95	0	957	61
Pedestrians		10										
Lane Width (m)		3.6										
Walking Speed (m/s)		1.2										
Percent Blockage		1										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								361			256	
pX, platoon unblocked	0.87	0.87	0.81	0.87	0.87	0.88	0.81			0.88		
vC, conflicting volume	1481	1830	519	1265	1812	416	1028			832		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	645	1047	0	397	1027	75	565			545		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	87	100			100		
cM capacity (veh/h)	264	195	871	463	201	858	805			901		

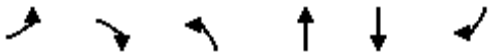
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	2	115	491	341	638	380
Volume Left	0	0	0	0	0	0
Volume Right	2	115	0	95	0	61
cSH	871	858	1700	1700	1700	1700
Volume to Capacity	0.00	0.13	0.29	0.20	0.38	0.22
Queue Length 95th (m)	0.1	3.7	0.0	0.0	0.0	0.0
Control Delay (s)	9.1	9.8	0.0	0.0	0.0	0.0
Lane LOS	A	A				
Approach Delay (s)	9.1	9.8	0.0		0.0	
Approach LOS	A	A				

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	40.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	31	758	10	0	753
Future Volume (Veh/h)	0	31	758	10	0	753
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	31	758	10	0	753
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						231
pX, platoon unblocked	0.91					
vC, conflicting volume	1140	384			768	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	955	384			768	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	95			100	
cM capacity (veh/h)	233	614			842	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	31	505	263	376	376
Volume Left	0	0	0	0	0
Volume Right	31	0	10	0	0
cSH	614	1700	1700	1700	1700
Volume to Capacity	0.05	0.30	0.15	0.22	0.22
Queue Length 95th (m)	1.3	0.0	0.0	0.0	0.0
Control Delay (s)	11.2	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	11.2	0.0		0.0	
Approach LOS	B				

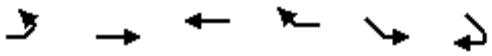
Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	32.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	49	0	768	728	25
Future Volume (Veh/h)	0	49	0	768	728	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	49	0	768	728	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					349	
pX, platoon unblocked	0.92	0.92	0.92			
vC, conflicting volume	1124	376	753			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	971	162	569			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	94	100			
cM capacity (veh/h)	231	790	924			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	49	384	384	485	268
Volume Left	0	0	0	0	0
Volume Right	49	0	0	0	25
cSH	790	1700	1700	1700	1700
Volume to Capacity	0.06	0.23	0.23	0.29	0.16
Queue Length 95th (m)	1.6	0.0	0.0	0.0	0.0
Control Delay (s)	9.9	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	9.9	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (veh/h)	3	440	481	32	27	4
Future Volume (Veh/h)	3	440	481	32	27	4
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)	3	440	481	32	27	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	513				943	497
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	513				943	497
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				91	99
cM capacity (veh/h)	1052				291	573

Direction, Lane #	EB 1	WB 1	SE 1
Volume Total	443	513	31
Volume Left	3	0	27
Volume Right	0	32	4
cSH	1052	1700	310
Volume to Capacity	0.00	0.30	0.10
Queue Length 95th (m)	0.1	0.0	2.6
Control Delay (s)	0.1	0.0	17.9
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	17.9
Approach LOS			C

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		