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Transportation Impact Study Update

BROWLANDS RESIDENTIAL DEVELOPMENT

801, 820, 855, 865 and 870 Scenic Drive
HAMILTON, ONTARIO

May 2022
Project No: NT-18-048

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NextEng Consulting Group Inc.

May 4, 2022

Attn: Laura Drennan

c/o Paul Valeri
Valery (Chedoke Browlands) Development Inc.
Hamilton, ON L8K 1W6

Re: Transportation Impact Study Update
Proposed Browlands Residential Development
801, 820, 855, 865 and 870 Scenic Drive
City of Hamilton, Ontario
Our Project No. NT-18-048

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Impact Study Update to support Official Plan Amendment and Zoning By-law Amendment Applications. The purposes of this Study Update are to address the City of Hamilton comments on the first submission and the latest proposed design changes that reflect these comments.

The subject site is an assemble of the lands located at 801, 820, 855, 865 and 870 Scenic Drive, which is bounded by Scenic Drive to the south and the wood lot to the north, in the City of Hamilton. The subject site is mostly vacant, with the exception of the existing Chedoke Hospital Long & Bisby Building located at the north part of the site. The proposed development consists of 641 residential dwelling units (40 townhouses and 601 condominium dwelling units). A total of 1,026 vehicle parking spaces, including visitor spaces and barrier-free spaces are provided for the proposed development.

The Transportation Impact Study Update, which is consistent with the City of Hamilton's Guidelines for the Preparation of Transportation Impact Studies and the study scope has been consulted with the City of Hamilton staff, concludes that the proposed development can adequately be accommodated by the existing transportation network, existing Hamilton Transit services, as well as the Transportation Demand Management measures and incentives recommended in this report. No improvements to the existing or future road network, as well as the existing future transit network are required to accommodate the proposed development.

We trust the enclosed sufficiently addresses your needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Nextrans Consulting Engineers
A Division of NextEng Consulting Group Inc.

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Report Submission Record

Identification	Date	Description of issued and/or revision
Final Report	May 4, 2022	For Final Submission

CITY OF HAMILTON COMMENTS

The following comments have been received from the City of Hamilton dated March 18, 2021 (**Appendix A**), related to the transportation component of the of the project. Appropriate responses are also provided for each comment below:

Transit Planning

1. Two bus routes (#33 and #41A) presently serve the site, both utilizing the portion of Sanatorium Road that exists north of Scenic Drive. One of the routes (#41A) makes use of the abandoned Brow Building parking lot as a turnaround & recovery point. At present there are no plans to adjust transit service levels.

   Response: Noted. However, it is suggested that in the City should review the ridership once the proposed developments in the area are completed.

2. With the closure of San Rd. north of Scenic Dr., both routes will be required to utilize the proposed roundabout at San Rd./Scenic Dr. Route #33 will require use of the roundabout to connect to/from Goulding Av., using Scenic Dr. in both directions. Route #41A will use the roundabout to make a 360 degree turn in order to change direction from Northbound to Southbound.

   Response: Noted.

3. The roundabout must be capable of accommodating these bus movements. The bus stop on San Rd. @ Scenic Dr., NW corner will be eliminated. The bus stop on San Rd. @ Scenic Dr., SE corner will require repositioning to ensure proper Northbound traffic flow into the roundabout. A new bus stop on Scenic Dr., south side, west of the roundabout may be required.

   Response: Noted. The roundabout will be designed to accommodate garbage trucks (TAC - HSU), therefore, it will accommodate buses as well.

4. Good pedestrian connections thru the site and out to Scenic Dr. will help to encourage transit use. HSR notes the TIS & TDM report recommendation related to transit shelter (and accompanying landing pad) installation and will work with the proponent in this regard, where appropriate.

   Response: Noted. Sidewalk connections will be provided to connect with the facilities on Scenic Drive.

Transportation Impact Study

5. A large disparity exists between the number of trips projected in AM and PM peak hours (217 and 272 respectively) and the total number of parking spaces which is proposed at 1114. While Transportation Planning concurs that the trip generation follows the appropriate ITE land use codes, either a reduction in parking (TIS concluded only 630 parking spaces required based on By-law 05-200) or a more conservative estimation of traffic volumes should be undertaken.

   Response: Noted. It should be noted that based on the current Zoning By-law requirement, the proposed development is required to provide a minimum of 812 parking spaces. The proposed development provides the following:

   - East Block – total 370 units with 463 parking spaces, inclusive of visitor parking (including 13 barrier-free spaces and 20 spaces for office use)
   - West Block – total 271 units with 563 parking spaces, inclusive of visitor parking (including 8 barrier-free spaces)

Therefore, the proposed development provides a total of 1,026 vehicle parking spaces (563 spaces on the west parcel and 463 spaces on the east parcel), which is only about 25% above the minimum Zoning By-law requirement. It should be noted that any unused parking spaces can be converted to more bicycle parking spaces, EV spaces or carshare spaces in the future, if appropriate.

6. Transportation Planning has concerns with the trip assignment. The resubmission should investigate whether a higher percentage of trips should be shown travelling east on Scenic Drive towards Garth Street, which would be consistent with existing travel patterns in the area.

   Response: Noted. The site trip assignment has been adjusted to account for trips that will be using Scenic Drive towards Garth Street. The analysis indicates that the development site traffic can be accommodated by the existing road network.

7. Previously Transportation Planning asked for analysis for the Sanatorium Road at Rice Avenue intersection. Nextrans has noted that "the City only has the September 11, 2006 traffic count available for this intersection. Ideally, traffic turning movement counts will be undertaken by Nextrans for the study area intersections to capture the most up-to-date turning movement counts in the area today. However, given the COVID-19 situation which requires business and school lockdown, any traffic turning movement counts to be undertaken at this time will not provide a meaningful assessment and snapshot of the existing conditions. These turning movement counts cannot be undertaken until such time that schools and businesses are resumed to normal operation. In addition, given that this is an unsignalized intersection with stop-controlled on the minor approach and it has more than one way of getting to Sanatorium Road, it is not expected to have major operational issues and therefore it is not required to include in the intersection operational capacity analysis." Transportation Planning directs the Consultant to undertake a turning movement count at this intersection after February 16, 2021. The count will be used to measure the degradation of level of service with added background and development generates traffic.

   Response: Noted. Nextrans has obtained the traffic turning movement counts for this intersection and analyzed the intersection as requested by the City. The analysis indicates that the development site traffic can be accommodated and not physical improvements are required at this intersection for the horizon year considered.

8. Transportation Planning does not support a site access at the Scenic Drive and San Pedro intersection since the Stormwater Management Block precludes the access from being properly aligned with San Pedro Drive. Furthermore, Transportation Planning finds this access redundant and requires the east and west blocks to be connected via an internal road network. This intersection shall be removed from future analysis. The site generated trips shall be reassigned accordingly to the other accesses, and a left-turn lane warrant for the northerly access shall be reinvestigated based on the changes in volume.

   Response: Noted. The current development proposal eliminated the proposed access at the Scenic Drive and San Pedro intersection. Only one access will be provided at the westerly limit of the site onto Scenic Drive. The analysis indicates that this proposed access is expected to operate at acceptable levels of service with minimum delays or queues.

9. Based on the comments above the study area shall be revised to eliminate 3 intersections and add 3 intersections to be analysed based on anticipated impacts of development generated traffic. The following intersections will be required in a future submission:

   a. Garth Street at Scenic Drive/ Fennell Avenue (City to provide TMC)
   b. Garth Street at Denlow Avenue (City to provide TMC)
   c. Sanatorium Road/ Rice Avenue at Sanitorium Road (TMC required)

   Response: Noted. These intersections have been added into the analysis. The analysis indicates that these intersections are expected to operate at acceptable levels of service and be able to accommodate the proposed development traffic without any physical improvements.

10. The TIS assumes that the full build out of the subject lands will occur by 2022, with a 5-year horizon year of 2027. Given the current status of the submission this timeline is not reasonable, and a more realistic horizon year shall be established.

    Response: Noted. It is assumed that the proposed development will be completed by 2025, therefore, a 5-year horizon (2030) will be reflected in the analysis.

11. Table 1 – Summary of the Existing Road Network has several corrections needed as follows:

    a. San Pedro Drive is a local road with a 2-lane cross-section and two-way operations, not 3-lanes southbound one-way only.

    b. Angela Avenue is a local road with a 2-lane cross-section and two-way operations, not one lane and one-way westbound only.

    c. Lincoln M. Alexander Parkway is a Parkway with two lanes in each direction and divided with a centre medium, not one lane and one-way westbound only.

    Response: Noted. These comments have been addressed in this Study Update.

12. The background volume shall include 555-559 Sanatorium Road, which is a townhouse development with 211 units that generates approximately 97 a.m. trips and 118 p.m. trips.

    Response: Noted. It has been reflected in the analysis.

13. The report concludes that "under the existing conditions, the Downtown area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit because the proposed development is located approximately 1-5 minute-walk to the bus stops and Hamilton GO Centre. The area is currently well served by a complete network of sidewalks. The sidewalks are generally in good condition and reasonably maintained on the public streets." Transportation Planning notes that the above text likely refers to a different development.

    Response: Noted. It has been corrected in this Study Update.

14. Transportation Planning concurs with the appropriateness of a single lane roundabout at the intersection of Scenic Drive at Sanatorium Road/ Site Access both for traffic control and to promote traffic calming. Transportation Planning notes that the internal site design shall promote the use of the roundabout as the primary access to the site.

    Response: Noted. The current development proposal reflected this comment in the site design.

Traffic Calming Report – Approved, Funds Required

15. Transportation Planning approves of the recommendations contained within the Neighborhood Traffic Calming Report. As a result of more than 200 new peak hour trips being added to the surrounding road network the Applicant shall:

    a. The Applicant shall contribute $24,000 ($6,000 per speed cushion x 4) to the City of Hamilton for the future placement of traffic calming measures along Scenic Drive as recommended within the Traffic Calming Report.

    b. Design and construct a single lane roundabout at the Scenic Drive at Sanatorium/Site access driveway as a means of both traffic control and traffic calming. The roundabout shall have Pedestrian Crossovers on all legs All to the satisfaction of the Manger, Transportation Operations and Maintenance.

Response: Noted.

16. The Applicant should be aware that this development is in Ward 14 not Ward 4 and is not near Parkdale Avenue/Queenston Road/Red Hill Valley Parkway and Roxborough Avenue, as the report mentions.

    Response: Noted. The typo has been corrected in this Study Update.

Transportation Demand Management – Approved, Revisions Required to Future Site Plan

17. The TIS/TDM report has indicated that 477 long-term bicycle parking spaces are provided underground. Transportation Planning also recommends installing above ground bicycle racks in amenity areas, or near visitor parking lots.

    Response: Noted. The proposed development will consider above ground bicycle parking spaces in the amenity areas or near visitor parking lots as part of the site plan submission.

18. The TIS/TDM report suggests that the proposed parking supply be reduced to be more in-line with the 630 requires parking spaces to meet By-law 05-200. It is also recommended to unbundle parking from the cost of a mid-rise unit as well as implementing car/bikeshare options. This is not demonstrated on the site plan.

    Response: Noted. The current development requires to provide a total of 812 vehicle parking spaces to meet the minimum Zoning By-law requirement. The proposed development will provide a total of 1,026 vehicle parking spaces, inclusive of 166 visitor parking, barrier-free and office spaces, which is only about 25% above the minimum Zoning By-law requirement. It should be noted that any unused parking spaces can be converted to more bicycle parking spaces, EV spaces or carshare spaces in the future, if appropriate.

19. The TIS/TDM report suggests providing direct shared pedestrian and cycling connections from the proposed development to Scenic Drive and Sanatorium Road. This is not demonstrated on the site plan however.

    Response: The proposed development provides sidewalks in front of all buildings and connect to Scenic Drive. All main building entrances will be fronting onto these sidewalks.

EXECUTIVE SUMMARY

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by Valery (Chedoke Browlands) Development Inc. (the Client) to undertake the original Transportation Impact Study to support Official Plan Amendment and Zoning By-law Amendment Applications dated September, 2020.

The purposes of this Study Update are to address the City of Hamilton comments on the first submission and the latest proposed development plan and design that reflect the changes.

The subject site is an assemble of the lands located at 801, 820, 855, 865 and 870 Scenic Drive, which is bounded by Scenic Drive to the south and the wood lot to the north, in the City of Hamilton. The subject site is mostly vacant, with the exception of the existing Chedoke Hospital Long & Bisby Building located at the north part of the site.

Current Development Proposal

The proposed development consists of 641 residential dwelling units (40 townhouses and 601 condominium dwelling units). The proposed development will be separated by the west side and east side and connected by a private condominium road, to accommodate the flood lands park of approximate 3.5 acres.

For the purposes of this assessment, it is assumed that the proposed development will be fully built-out by 2025. A five-year horizon (2030) has been carried out for the study analysis, which is consistent with the City of Hamilton's *Guidelines for the Preparation of Transportation Impact Studies*.

Proposed Development Accesses

The proposed access to the east part of the development will be located opposite Sanatorium Road and will be integrated as part of the proposed roundabout. The analysis indicates that single-lane entry roundabout at the Scenic Drive/Sanatorium Road intersection is sufficient to accommodated the proposed development site generated traffic and background traffic to 2030 horizon.

The proposed access for the west part of the development will be located to the northerly limit of the site on Scenic Drive. Based on the intersection capacity analysis, the proposed west access is expected to operate at excellent levels of service with minimum delays or queues. The left turn warrant analysis for this proposed access also indicates that no exclusive turning lanes are required on Scenic Drive to accommodated the proposed development site generated traffic.

Previously, a site access is proposed opposite San Pedro Drive, however, the City has indicated that this proposed access location is not permitted for various reasons. As the current development proposal eliminates this access, therefore, the current proposed access arrangement noted above meets the City's requirements and comments.

Transportation and Land Use Planning Context

Based on Nextrans comprehensive review of the study area, it is evident that there is a wide range of different types of land uses and housing types currently exist in the study such as

- Existing residential (low-rise) to the east and west of the site;
- Rental apartments (mid to high-rise) along Mohawk Road W;
- Institutions to the south of the site;
- Community centre (Chedoke Twin Pad Arena) south-west of the site; and
- Retail/commercial along Mohawk Road W

The existing amenities are located within cycling, walking or transit distance to the proposed development. From s transportation planning perspective, it is Nextrans' opinion that the proposed development fits in well with the existing community and utilize the existing transportation network that are available in the area.

Transportation Capacity Analysis

The proposed development is expected to generate 218 two-way auto trips (56 inbound and 162 outbound) and 274 two-way auto trips (167 inbound and 107 outbound) during the morning and afternoon peak hours, respectively.

The analysis indicates that under the existing conditions, all signalized intersections are currently operating at acceptable levels of service during the morning and afternoon peak periods, with the exception of the westbound left turn at the Garth Street/Fennell Avenue W intersection due to the heavy left turn movements during both the morning and afternoon peak hours. Nextrans has tested the signal timing optimization and it shows that the westbound left turn movement will improve with acceptable levels of service and v/c ratios during both the morning and afternoon peak hours. It should be noted that these suggested signal timing optimization plan will be carried into the future background and future total conditions. All unsignalized intersections are currently operating at acceptable levels of service based on both delay and v/c ratio. No critical movement or significant queues are observed at this time.

It should be noted that regardless of Nextrans suggestions for the signal timing plan optimization, it is the City's discretion to review and optimize the signal timing plans as required to serve the City's best interests and objectives. Given that the traffic conditions will change in the next 5 to 10 years, it intuitive that the signal timing plan should be periodically checked to ensure that intersections are operating at their optimum conditions.

The analysis indicates that under the future background conditions, all signalized and unsignalized intersections are generally expected to operate at acceptable levels of service during the morning and afternoon peak periods. Some movements are expected to operate with slightly higher delay. The suggested signal timing plan optimization provided under the existing conditions for the Garth Street/Fennell Avenue W/Scenic Drive intersection for both the morning and afternoon peak hours are applied to this horizon as well

The analysis indicates that similar to the existing and future background conditions, under the future total traffic conditions, all signalized and unsignalized intersections are generally expected to operate at acceptable levels of service during the morning and afternoon peak periods. The suggested signal timing plan optimization provided under the existing conditions for the Garth Street/Fennell Avenue W/Scenic Drive intersection for both the morning and afternoon peak hours are applied to this horizon as well

Based on the analysis findings, it is expected that the proposed development contributes minimal delay to overall intersection operations (at most 2 seconds), for all the signalized and unsignalized intersections considered. As such, it is Nextrans' opinion that the proposed development has negligible impact on the existing transportation network and therefore no physical improvements are required to accommodate the proposed development.

In addition, Nextrans identified a comprehensive Transportation Demand Management (TDM) plan for the proposed development so that the TDM measures and incentives provided will encourage the future residents from the proposed development to travel by alternative modes of transportation such as walking, cycling and transit instead of driving single-occupant-vehicles.

Transit and Active Transportation Mode Assessment

Walking

The area is currently well served by a complete network of sidewalks with sidewalks are generally available on both sides of the street. The sidewalks are generally in good condition and reasonably maintained on the public streets.

The current development proposal provides a comprehensive sidewalk network within the proposed development and connect to Scenic Drive and Sanatorium Road. This internal network is illustrated in **Figure 15** of this Study.

Cycling

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated two-way bicycle lanes on Upper Paradise Road and Rice Avenue. There is also a dedicated bicycle lane on Mohawk Road W west of Lincoln M. Alexander Parkway.

It is Nextrans' opinion that better and more connected bicycle network should be implemented as part of future City's capital projects and a more complete bicycle network will help increase cycling trips and reduce the numbers of single-occupant-vehicle trips to and from the area. Given that the internal road network is very complete and connected at every corner of the proposed development, as well as the internal road network is narrow with low speed, it is Nextrans' opinion that separate cycling facility such as dedicated bicycle lane or multi-use trail is not required for the internal road network.

It is Nextrans understanding that there are no current requirements for bicycle parking in the DE-H/S-1600 and E-H/S-1600 Zones. However, the proposed development will provide a total of 477 long-term bicycle parking spaces underground. It is Nextrans' opinion that this provision will encourage residents to cycle more to work, school and discretionary trips. This provision will also support the required TDM plan and requirements by the City of Hamilton.

Transit

The area is currently well serviced by the existing Hamilton transit network. The proposed development is located adjacent to Bus Routes 33 and 41A stops located at the Sanatorium Road/Scenic Drive intersection.

The Study has not assumed any transit modal split in the analysis. However, if 13% of the existing modal split is applied to the site trip generation, the proposed development could potentially generate 28 two-way transit trips (7 inbound and 21 outbound) and 36 two-way transit trips (22 inbound and 14 outbound) during the morning and afternoon peak hours, respectively.

The expected transit ridership from the proposed development can be accommodated by the existing HSR Bus Route 33 and 41A. No improvements are required on these routes under the horizon year considered.

Transportation Demand Management Measures and Incentives

The Report identifies and recommends appropriate Transportation Demand Management measures and incentives to support active transportation and transit, to meet the objectives and requirements in the City of Hamilton's TDM for Development Report (June, 2015).

Vehicle Parking Review

Based on the City's By-Law No. 05-200, the proposed development requires to provide a total of 812 vehicle parking spaces to meet the minimum Zoning By-law requirement. The proposed development will provide a total of 1,026 vehicle parking spaces, inclusive of 166 visitor parking, barrier-free and office spaces, which only about 25% above the minimum Zoning By-law requirement. It should be noted that any unused parking spaces can be converted to more bicycle parking spaces, EV spaces or carshare spaces in the future, if appropriate.

Bicycle Parking Review

It is Nextrans understanding that there are no current requirements for bicycle parking in the DE-H/S-1600 and E-H/S-1600 Zones. However, the proposed development will provide a total of 477 long-term bicycle parking spaces underground. It is Nextrans' opinion that this provision will encourage residents to cycle more to work, school and discretionary trips. This provision will also support the required TDM plan and requirements by the City of Hamilton.

Loading Requirement

The proposed development will provide one loading space on the west side with the following dimensions: 3.6 m width and 10.56 m length. The AutoTURN analysis has been provided in this Study to demonstrate garbage truck maneuverability within the site at on-site loading space.

Study Recommendations

The following are the recommended mitigation measures that are relevant and can be implemented within the proposed development capability:

- The proposed development to implement the Transportation Demand Management (TDM) measures and incentives identified in Section 9 of this report to support active transportation and public transit, to meet the objectives and requirements by the City of Hamilton;
- The proposed development provides 477 long-term bicycle parking spaces underground to encourage future residents to take alternative modes of transportation to and from the proposed development;
- No exclusive turning lanes are required on Scenic Drive or on the proposed site west access to accommodate the proposed development site generated traffic. Single inbound and outbound lanes are sufficient; and
- Single-lane entry roundabout at the Scenic Drive/Sanatorium Road intersection is sufficient to accommodate the background traffic and the proposed development traffic.

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APPENDICES

1.0 INTRODUCTION

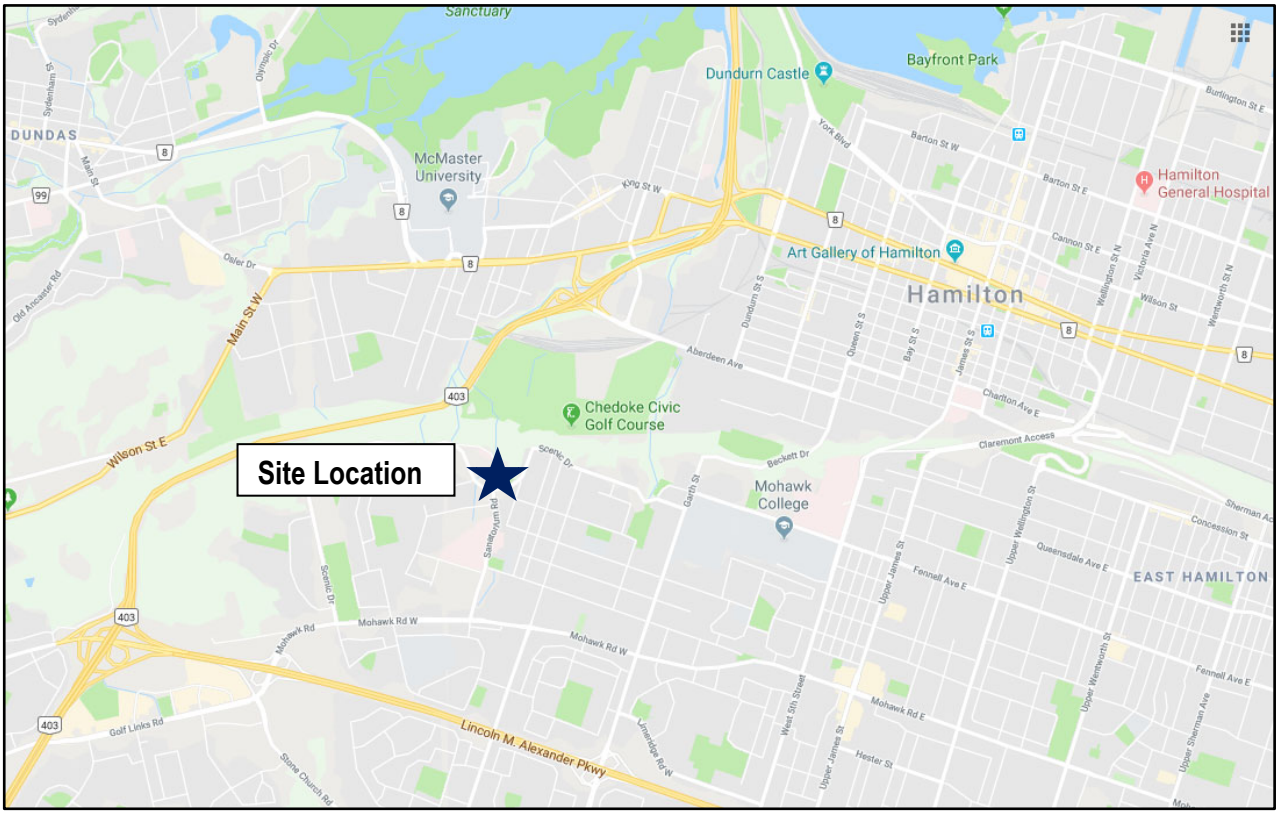
Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by Valery (Chedoke Browlands) Development Inc. (the Client) to undertake the original Transportation Impact Study to support Official Plan Amendment and Zoning By-law Amendment Applications dated September, 2020.

The purposes of this Study Update are to address the City of Hamilton comments (**Appendix A**) on the first submission and the latest proposed development plan and design that reflect the changes.

The subject site is an assemble of the lands located at 801, 820, 855, 865 and 870 Scenic Drive, which is bounded by Scenic Drive to the south and the wood lot to the north, in the City of Hamilton. The subject site is mostly vacant, with the exception of the existing Chedoke Hospital Long & Bisby Building located at the north part of the site.

The location of the proposed development is illustrated in **Figure 1**.

Figure 1 – Proposed Development Location



Source: Google Map

The current development proposal consists of 641 residential dwelling units (40 townhouses and 601 condominium dwelling units). It should be noted that there are no changes to the numbers of units and unit distribution from the previous assessment. The proposed development will be separated by the west side and east side and connected by a private condominium road, to accommodate the flood lands park of approximate 3.5 acres.

For the purposes of this assessment, it is assumed that the proposed development will be fully built-out by 2025. A five-year horizon (2030) has been carried out for the study analysis, which is consistent with the City of Hamilton's *Guidelines for the Preparation of Transportation Impact Studies*.

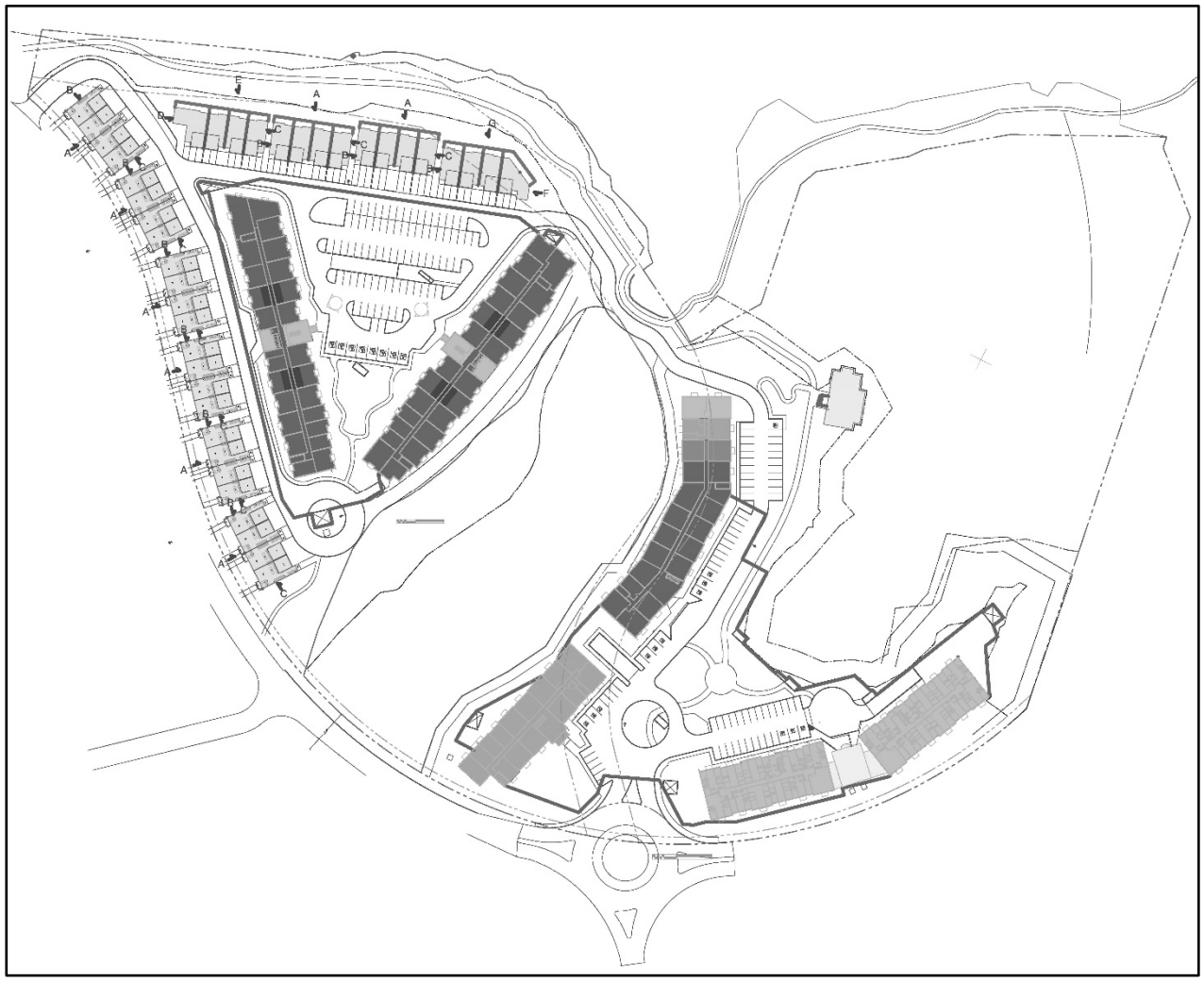
The proposed access to the east part of the proposed development will be located opposite Sanatorium Road and will be integrated as part of the proposed roundabout. The analysis indicates that single-lane entry roundabout at the Scenic

Drive/Sanatorium Road intersection is sufficient to accommodated the proposed development site generated traffic and background traffic to 2030 horizon.

The proposed accesses to the west part of the proposed development will be located at the westerly limit of the site. Based on the intersection capacity analysis, these accesses are expected to operate at excellent levels of service with minimum delays or queues. The left turn warrant analysis also indicates that no exclusive turning lanes are required on Scenic Drive or on the proposed accesses to accommodated the proposed development site generated traffic.

Figure 2 illustrates the proposed site plan.

Figure 2 – Proposed Development Site Plan



2.0 EXISTING TRANSPORTATION CONDITIONS

2.1. Existing Road Network

The existing road network, lane configuration and existing traffic control devices for the intersections in the study area are shown in **Figure 4**. The description of the existing road network in the study area is summarizes in **Table 1** below.

Table 1 – Summary of the Existing Road Network

Road Name	Jurisdiction	Number of Lanes	Sidewalk	Speed
Scenic Drive	City of Hamilton	2-lane cross-section with two-way operations (Collector Road)	On the south side Bike lanes and short multiuse path on the north side east of W 35th St No sidewalks or bike lanes/multiuse paths west of San Pedro Dr	posted 40 km/h
Mohawk Road W	City of Hamilton	4-lane cross-section with two-way operations (Major Arterial)	Sidewalks on both sides, No bike lanes east of Lincoln M. Alexander Pkwy Bike lanes on both sides west of Lincoln M. Alexander Pkwy	posted 50 km/h
Garth Street	City of Hamilton	4-lane cross-section with two-way operations (Minor Arterial)	Sidewalks on both sides of the street, no bike lanes	assumed 50 km/h
Sanatorium Road	City of Hamilton	2-lane cross-section with two-way operations (Collector Road)	Sidewalks on both sides south of Scenic Drive and sidewalk on the west side only north of Scenic Drive Bike lanes on both sides south of Redfern Avenue	posted 40 km/h
San Pedro Drive	City of Hamilton	2-lane cross-section with two-way operations (Local Road)	Sidewalks on both sides of the street, no bike lanes	assumed 40 km/h
Angela Avenue	City of Hamilton	2-lane cross-section with two-way operations (Local Road)	Sidewalks on both sides of the street, no bike lanes	assumed 40 km/h
Upper Paradise Road	City of Hamilton	2-lane cross-section with two-way operations, on-street parking lane on the east side (Collector Road)	Sidewalks on both sides, Bike lanes on both sides south of Scenic Drive	assumed 40 km/h
Rice Avenue	City of Hamilton	2-lane cross-section with two-way operations (Local Road)	Sidewalks and bike lanes on both sides of the street	assumed 40 km/h
Lincoln M. Alexander Pkwy	City of Hamilton	2 lanes in each direction and divided with a centre median (Parkway)	No sidewalks or bike lanes	posted 90 km/h

2.3. Existing Active Transportation Assessment

Sidewalks

The area is currently well served by a complete network of sidewalks with sidewalks are generally available on both sides of the street. The sidewalks are generally in good condition and reasonably maintained on the public streets. As such, no improvements are required at this time.

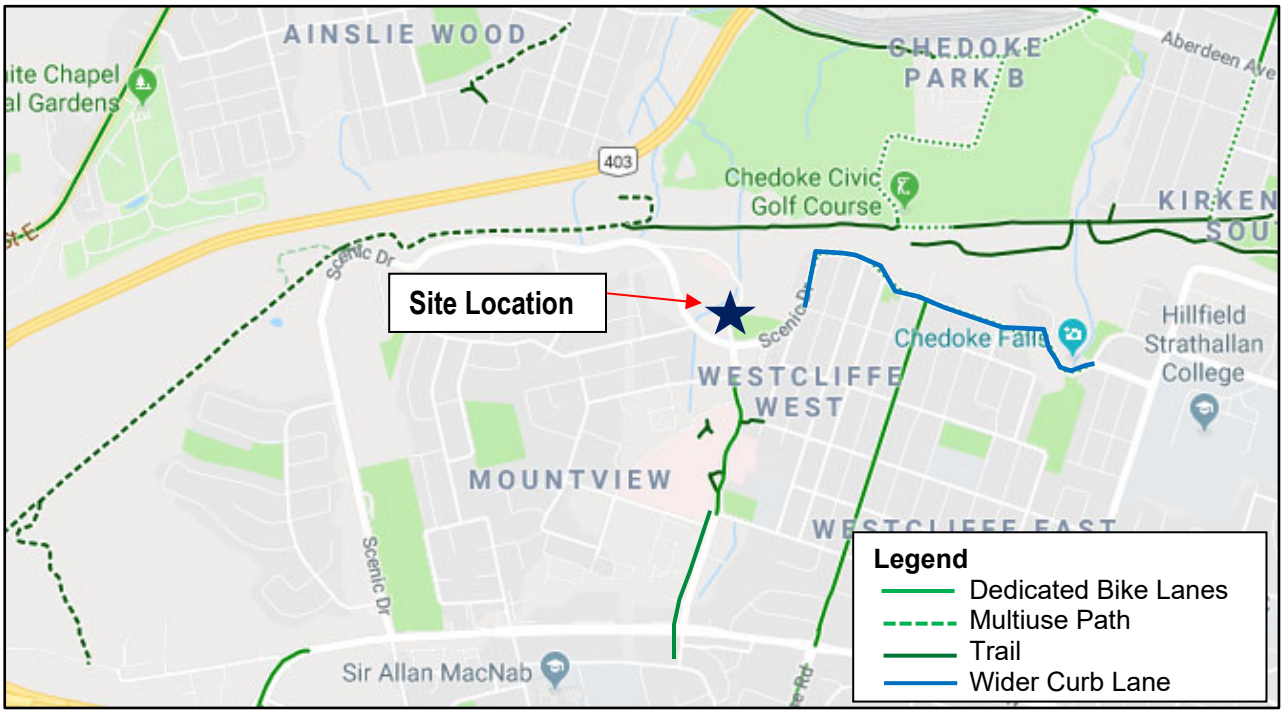
Cycling Facilities

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated two-way bicycle lanes on Upper Paradise Road and Rice Avenue. There is also a dedicated bicycle lane on Mohawk Road W west of Lincoln M. Alexander Parkway. It is Nextrans' opinion that better and more connected bicycle network should be implemented as part of future City's capital projects and a more complete bicycle network will help increase cycling trips and reduce the numbers of single-occupant-vehicle trips to and from the area.

2.4. Existing Transit Service

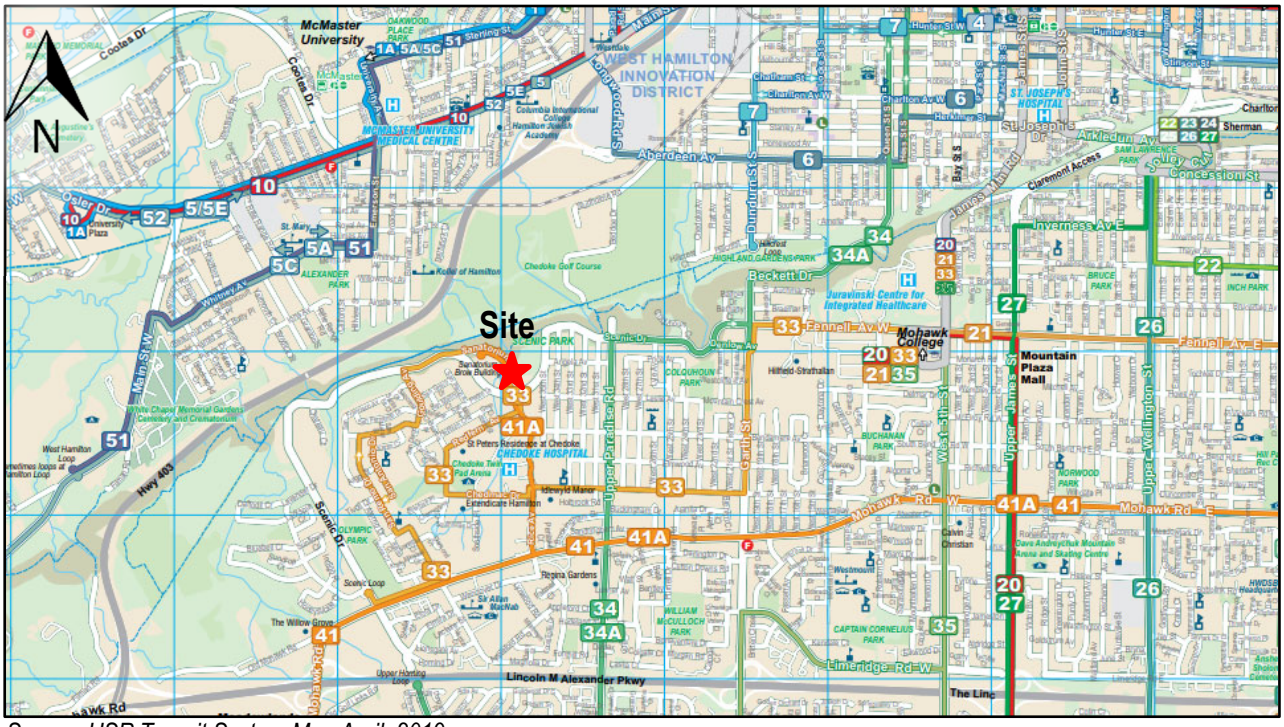
There are excellent existing Hamilton transit services in the study area. **Figure 5** illustrates the existing HSR Transit Bus Routes in the study area.

Figure 3 – Existing Cycling Network in the Study Area



Source: Hamilton Cycling/Google Map

Figure 5 – HSR Transit System Map for the Area



Source: HSR Transit System Map April, 2019

2.5. Existing Transit Assessment

As indicated in **Figure 5**, the area is currently well serviced by the existing Hamilton transit network. The proposed development is located adjacent to Bus Routes 33 and 41A stops located at the Sanatorium Road/Scenic Drive intersection. Below are Bus Routes 33 and 41A descriptions:

- Bus Route 33 (Sanatorium): The Sanatorium route travels generally in the north-south direction from the MacNab Terminal Platform #7 to the Scenic Loop. This service runs 7 days a week from the early morning until after midnight. The frequency is approximately 15-20 minutes during the weekday peak periods (6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM). The frequency during the weekend is approximately 30 minutes or greater.
- Bus Route 41 (Mohawk): The Mohawk route generally travels both east-west and north-south from downtown Hamilton at Gage/ Industrial to the Meadowlands Terminal. This service runs 7 days a week from the early morning until after midnight. The frequency is approximately 15 minutes or greater during the weekday peak periods (6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM). The frequency during the weekend is approximately 28 minutes or greater.

It is Nextrans' opinion that the proposed development will contribute a healthy transit ridership for the existing Hamilton transit system in the area.

2.6. Existing Traffic Volumes

Nextrans has order the traffic turning movement counts for this area in June, 2018, well before the pandemic. The traffic turning movement counts were conducted by Spectrum. In addition, existing traffic volumes at the study area intersections were also obtained from the City of Hamilton. Turning movement count summaries are provided in **Appendix B**.

- Mohawk Road W at Scenic Drive - Signalized intersection (February 15, 2018 – City of Hamilton)
- Mohawk Road W at Rice Avenue - Signalized intersection (February 15, 2018 – City of Hamilton)
- Mohawk Road W at Lincoln M. Alexander Pkwy - Signalized intersection (June 19, 2018 – Spectrum)
- Scenic Drive at Sanatorium Road – Unsignalized intersection (June 12, 2018 – Spectrum)
- Scenic Drive at Angela Avenue – Unsignalized intersection (June 12, 2018 – Spectrum)
- Scenic Drive at Upper Paradise Road – Unsignalized intersection (June 19, 2018 – Spectrum)
- Garth Street at Scenic Drive/Fennell Avenue – Signalized intersection (October 3, 2016 – City of Hamilton)
- Garth Street at Denlow Avenue – Unsignalized intersection (September 20, 2016 – City of Hamilton)
- Sanatorium Road/Rice Avenue at Sanitorium Road – Unsignalized intersection (November 6, 2018 – Spectrum)

It should be noted that the three last intersections on the list above are requested by the City of Hamilton to be included in the analysis. The existing traffic turning movement counts with adjustment are illustrated in **Figure 6**.

2.7. Existing Traffic Assessment

The existing volumes are illustrated in **Figure 6** and were analyzed using Synchro 10 software. The methodology of the software follows the procedures described and outlined in the Highway Capacity Manual, HCM 2000, published by the Transportation Research Board. It should be noted that the printouts for unsignalized intersections are based on HCM outputs and the results for signalized intersections are based on Synchro so that queues and more detailed information are provided. It should be noted that Synchro is more conservative than HCS in terms of delay. This information can be found in Synchro 10 Manual, Chapter 21, Page 21-14. The detailed results are provided in **Appendix C** and summarized in **Tables 2** and **3**.

Nextrans requested and received the existing traffic signal timing plans from the City of Hamilton for six signalized intersections considered in the analysis. The input parameters outlined in the signal timing plans such as cycle lengths, yellow and all-red intervals, minimum initials, extensions, walk and flash don't walk, offsets and maximum green times have been reflected in the analysis.

As requested by the City, several site visits and review of the traffic camera video were conducted for the intersections in the area so that it can be compared, validate and compliment the intersection operational capacity analysis.

Table 2 – Existing Levels of Service for Signalized Intersections

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Approx. Available Storage (m)
		LOS (v/c)	Delay (s)	95th Queue(m)	LOS (v/c)	Delay (s)	95th Queue(m)	
Upper Horning Rd/ Scenic Dr/ Mohawk Rd (signalized)	**Overall**	**B (0.54)**	**11**		**A (0.39)**	**9**		
	EB L	A (0.18)	6	13	A (0.35)	9	23	35
	EB TR	A (0.26)	6	31	A (0.31)	6	37	377
	WB L	A (0.13)	4	2	A (0.09)	4	1	50
	WB TR	A (0.25)	5	5	A (0.32)	6	19	795
	NB L	D (0.54)	53	35	D (0.35)	45	27	35
	NB TR	C (0.28)	29	29	B (0.12)	18	11	245
	SB L	D (0.27)	41	23	D (0.14)	39	15	45
	SB TR	B (0.45)	11	23	B (0.39)	11	21	973
Rice Ave/ Mohawk Rd W (signalized)	**Overall**	**B (0.81)**	**14**		**B (0.60)**	**11**		
	EB L	A (0.25)	5	16	A (0.25)	4	13	42
	EB TR	A (0.24)	5	30	A (0.20)	4	24	210
	WB L	A (0.16)	12	18	A (0.12)	9	13	30
	WB TR	B (0.29)	10	48	A (0.33)	9	56	456
	NB L	D (0.14)	37	11	D (0.20)	43	12	30
	NB TR	B (0.44)	14	24	B (0.22)	18	15	142
	SB L	E (0.81)	79	44	E (0.60)	56	41	30
	SB TR	B (0.42)	12	21	B (0.51)	14	24	715
Mohawk Rd W/ Lincoln M. A Pkwy Off-ramp (signalized)	**Overall**	**B (0.46)**	**10**		**B (0.65)**	**14**		
	WB L	C (0.46)	26	35	C (0.65)	28	55	350
	WB R	A (0.30)	7	13	B (0.29)	14	21	350
	NB T	A (0.28)	6	26	A (0.44)	9	58	247
	SB T	A (0.23)	6	21	A (0.32)	8	39	502
Garth Street/ Fennell Avenue W (signalized)	**Overall**	**D (1.08)**	**37**		**F (2.87)**	**222**		
	EB L	C (0.62)	23	87	B (0.13)	14	18	50
	EB TR	C (0.26)	23	29	C (0.12)	21	16	130
	WB L	F (1.08)	116	60	F (2.87)	868	178	300
	WB R	D (0.86)	48	111	F (1.05)	84	180	300
	NB T	C (0.65)	32	75	C (0.31)	427	35	115
	NB R	C (0.85)	25	108	A (0.47)	6	19	65
	SB L	D (0.87)	42	101	C (0.72)	26	72	35
	SB TR	C (0.96)	27	96	C (0.88)	31	143	500
Garth Street/ Fennell Avenue W (signalized) – with signal timing plan optimization	**Overall**	**C (0.87)**	**33**		**D (0.93)**	**45**		
	EB L	C (0.69)	28	85	B (0.20)	18	18	50
	EB TR	C (0.30)	28	31	D (0.20)	38	23	130
	WB L	D (0.72)	49	45	E (0.92)	57	142	300
	WB R	D (0.83)	45	100	D (0.89)	49	165	300
	NB T	D (0.70)	36	80	D (0.33)	37	47	115
	NB R	C (0.87)	27	110	A (0.48)	7	23	65
	SB L	D (0.84)	39	117	D (0.79)	43	143	35
	SB TR	C (0.91)	27	111	D (0.93)	48	236	500

Table 3 – Existing Levels of Service for Unsignalized Intersections

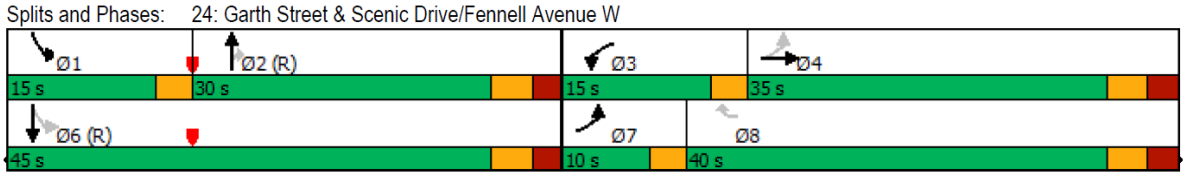
Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Approx. Available Storage (m)
		LOS (v/c)	Delay (s)	95th Queue(m)	LOS (v/c)	Delay (s)	95th Queue(m)	
Rice Ave/ Sanatorium Rd (unsignalized)	WB LR	A (0.14)	8	-	A (0.11)	8	-	157
	NB TR	A (0.23)	8	-	A (0.12)	8	-	62
	SB TL	A (0.14)	8	-	A (0.11)	8	-	102
Scenic Dr/ Angela Ave (unsignalized)	WB LR	B (0.01)	11	0	B (0.01)	11	0	237
	NB TR	B (0.15)	0	0	B (0.08)	0	0	79
	SB TL	A (0.00)	0	0	A (0.00)	0	0	172
Scenic Dr/ Upper Paradise Rd (unsignalized)	EB LTR	B (0.34)	11	-	A (0.15)	9	-	131
	WB L	A (0.06)	8	-	A (0.15)	8	-	30
	WB TR	A (0.04)	7	-	A (0.26)	9	-	415
	NB L	A (0.01)	8	-	A (0.03)	8	-	30
	NB TR	A (0.23)	8	-	A (0.16)	8	-	1,258
	SB LTR	A (0.04)	9	-	A (0.05)	9	-	88
Garth Street/ Denlow Avenue (signalized)	EB L	C (0.10)	25	3	E (0.13)	48	4	55
	EB R	B (0.03)	11	1	B (0.05)	10	1	55
	NB TL	A (0.02)	1	0	A (0.05)	2	1	200
	SB TR	A (0.20)	0	0	A (0.55)	0	0	115
Sanatorium Rd/ Scenic Dr (unsignalized)	EB LTR	A (0.27)	9	-	A (0.17)	8	-	86
	WB LTR	A (0.14)	8	-	A (0.27)	9	-	101
	NB LTR	A (0.17)	8	-	A (0.12)	8	-	262
	SB LTR	A (0.01)	8	-	A (0.02)	8	-	131

Based on the intersection operational capacity analysis, the following observations are made under the existing traffic conditions;

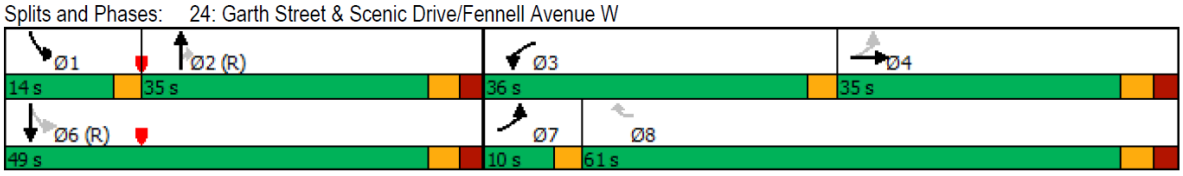
- Generally, all signalized intersections are currently operating at acceptable levels of service during the morning and afternoon peak periods, with the exception of the westbound left turn at the Garth Street/Fennell Avenue W intersection due to the heavy left turn movements during both the morning and afternoon peak hours;

- Nextrans has tested the signal timing optimization and it shows that the westbound left turn movement will improve with acceptable levels of service and v/c ratios during both the morning and afternoon peak hours. The potential signal timing optimization suggestions are illustrated below. It should be noted that these suggested signal timing optimization plan will be carried into the future background and future total conditions.

  AM Peak Hour Suggested Signal Timing Optimization:



  PM Peak Hour Suggested Signal Timing Optimization:



- Generally, all unsignalized intersections are currently operating at acceptable levels of service based on both delay and v/c ratio. No critical movement or significant queues are observed at this time.

Based on the intersection operational capacity analysis findings, site visits/observations and review of the traffic cameras, it is Nextrans' opinion that no improvements are required at this time as all the intersections considered in the analysis are currently operating within the parameters.

It should be noted that regardless of Nextrans suggestions for the signal timing plan optimization, it is the City's discretion to review and optimize the signal timing plans as required to serve the City's best interests and objectives. Given that the traffic conditions will change in the next 5 to 10 years, it intuitive that the signal timing plan should be periodically checked to ensure that intersections are operating at their optimum conditions.

3.0 TRANSPORTATION AND LAND USE PLANNING CONTEXT

Based on Nextrans comprehensive review of the study area, it is evident that there is a wide range of different types of land uses and housing types currently exist in the study such as

- Existing residential (low-rise) to the east and west of the site;
- Rental apartments (mid to high-rise) along Mohawk Road W;
- Institutions to the south of the site;
- Community centre (Chedoke Twin Pad Arena) south-west of the site; and
- Retail/commercial along Mohawk Road W

The existing amenities are located within cycling, walking or transit distance to the proposed development. From s transportation planning perspective, it is Nextrans' opinion that the proposed development fits in well with the existing community and utilize the existing transportation network that are available in the area.

4.0 FUTURE BACKGROUND CONDITIONS

4.1. Analysis Horizon

For the purposes of this assessment, it is assumed that the proposed development will be fully built-out by 2025. As such, a five-year horizon (2030) after the full built-out of the proposed development has been carried out for the study analysis.

4.2. Background Development Applications

Based on the review of the background development applications on the City of Hamilton Development Application website, there are a few background development applications in the study area that are under review/consideration. However, most of these applications are very small scale (reconstruction of existing single homes, small retail or office expansion and a new gas station close to Lincoln Alexander Parkway and Mohawk Road W). Given that these background developments generate insignificant numbers of trips during the peak periods, as well as pass-by trips, these trips will be captured as part of the background through corridor traffic growth of 2% per annum. The following background developments will be included in the analysis, including the 555-559 Sanatorium Road proposed background development as requested by the City:

- 1 Redfern Avenue (south-west corner of Sanatorium Road and Redfern Avenue that was approve - four-storey with 144 residential dwelling units and 215 parking spaces; and
- 555-559 Sanatorium Road – consists of 211 residential dwelling units, which is expected to generate approximately 97 total two-way auto trips (22 inbound and 75 outbound) and 118 total two-way auto trips (74 inbound and 44 outbound) during the morning and afternoon peak hours.

The background development traffic volumes are illustrated in **Figure 7**.

4.3. Future Background Corridor Growth

Based on Nextrans' consultation with the City staff, it is indicated that the City of Hamilton assumes 2% through background traffic growth per annum for the major public streets in the area. This is about 18% of the total growth to 2027 horizon year. For the purposes of this assessment, a 2% percent traffic growth per annum (compounded) will be applied to the through movements for all intersections considered for the study area, as per the approved terms of reference.

It should be noted that it is not reasonable to assume growth for all turning movements since most of the area is stable and some of the movements are already at capacity. In reality, drivers will try to find alternative routes instead of waiting for longer time at a particular movement. In addition, the background development traffic will be added to the turning movements, as indicated in Section 4.2. This approach is also consistent with other jurisdictions in the Greater Toronto Area. In addition, this study incorporates a significant number of intersections in the analysis, similar to the study area consider for a typical secondary plan. By arbitrary increase the growth for the turning movements, it will over estimate the traffic demand for that movement and therefore affect the pedestrian crossing time when these movements are prioritized. **Figure 8** illustrates the future background through corridor growth.

4.4. Future Background Traffic Assessment

The estimated future background traffic volumes are illustrated in **Figure 9** and were analyzed using Synchro 10 software. The detailed results are provided in **Appendix D** and summarized in **Tables 4** and **5**.

Table 4 – 2030 Future Background Levels of Service for Signalized Intersections

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Approx. Available Storage (m)
		LOS (v/c)	Delay (s)	95th Queue(m)	LOS (v/c)	Delay (s)	95th Queue(m)	
Upper Horning Rd/ Scenic Dr/ Mohawk Rd (signalized)	**Overall**	**B (0.55)**	**10**		**A (0.47)**	**9**		
	EB L	A (0.23)	7	14	B (0.47)	12	30	35
	EB TR	A (0.33)	6	43	A (0.41)	7	53	377
	WB L	A (0.16)	3	2	A (0.13)	3	1	50
	WB TR	A (0.33)	4	9	A (0.41)	6	8	795
	NB L	D (0.55)	54	35	D (0.36)	45	27	35
	NB TR	C (0.32)	33	35	B (0.12)	18	12	245
	SB L	D (0.29)	42	23	D (0.14)	39	15	45
	SB TR	B (0.46)	11	25	B (0.42)	17	30	973
Rice Ave/ Mohawk Rd W (signalized)	**Overall**	**B (0.83)**	**15**		**B (0.63)**	**12**		
	EB L	A (0.33)	7	20	A (0.42)	10	29	42
	EB TR	A (0.31)	7	44	A (0.26)	5	34	210
	WB L	B (0.20)	15	20	B (0.14)	11	15	30
	WB TR	B (0.37)	13	69	B (0.42)	11	81	456
	NB L	D (0.17)	36	11	D (0.26)	46	12	30
	NB TR	B (0.43)	15	26	B (0.22)	19	16	142
	SB L	E (0.83)	76	49	E (0.63)	56	45	30
	SB TR	B (0.50)	11	24	B (0.56)	13	27	715
Mohawk Rd W/ Lincoln M. A Pkwy Off-ramp (signalized)	**Overall**	**B (0.46)**	**10**		**B (0.65)**	**14**		
	WB L	C (0.46)	26	35	C (0.65)	28	55	350
	WB R	B (0.33)	12	19	C (0.33)	21	29	350
	NB T	A (0.37)	7	36	B (0.59)	11	85	247
	SB T	A (0.32)	6	30	A (0.42)	9	53	502
Garth Street/ Fennell Avenue W (signalized)	**Overall**	**D (0.93)**	**42**		**D (0.97)**	**53**		
	EB L	C (0.70)	29	87	C (0.26)	30	28	50
	EB TR	C (0.39)	29	40	D (0.31)	55	37	130
	WB L	D (0.72)	49	45	E (0.96)	77	172	300
	WB R	D (0.83)	45	100	E (0.93)	68	218	300
	NB T	D (0.92)	51	123	D (0.35)	44	75	115
	NB R	D (0.93)	38	127	A (0.43)	7	26	65
	SB L	E (0.93)	58	136	C (0.66)	30	102	35
	SB TR	D (0.92)	37	167	D (0.97)	52	332	500

Table 5 – 2030 Future Background Levels of Service for Unsignalized Intersections

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Approx. Available Storage (m)
		LOS (v/c)	Delay (s)	95th Queue(m)	LOS (v/c)	Delay (s)	95th Queue(m)	
Rice Ave/ Sanatorium Rd (unsignalized)	WB LR	A (0.16)	9	-	A (0.15)	8	-	157
	NB TR	A (0.31)	9	-	A (0.25)	9	-	62
	SB TL	A (0.29)	9	-	A (0.21)	9	-	102
Scenic Dr/ Angela Ave (unsignalized)	WB LR	B (0.02)	12	0	B (0.01)	11	0	237
	NB TR	B (0.19)	0	0	B (0.10)	0	0	79
	SB TL	A (0.00)	0	0	A (0.00)	0	0	172
Scenic Dr/ Upper Paradise Rd (unsignalized)	EB LTR	B (0.43)	11	-	A (0.20)	10	-	131
	WB L	A (0.06)	8	-	A (0.15)	8	-	30
	WB TR	A (0.06)	8	-	A (0.34)	10	-	415
	NB L	A (0.01)	8	-	A (0.03)	8	-	30
	NB TR	A (0.25)	8	-	A (0.17)	8	-	1,258
	SB LTR	A (0.05)	9	-	A (0.06)	9	-	88
Garth Street/ Denlow Avenue (signalized)	EB L	C (0.15)	39	4	F (0.32)	130	9	55
	EB R	B (0.03)	12	1	B (0.06)	11	2	55
	NB TL	A (0.02)	1	0	A (0.07)	3	2	200
	SB TR	A (0.23)	0	0	A (0.62)	0	0	115
Sanatorium Rd/ Scenic Dr (unsignalized)	EB LTR	A (0.34)	10	-	A (0.20)	8	-	86
	WB LTR	A (0.18)	9	-	B (0.37)	10	-	101
	NB LTR	A (0.19)	9	-	A (0.14)	9	-	262
	SB LTR	A (0.01)	8	-	A (0.01)	8	-	131

Based on the intersection operational capacity analysis, the following observations are made under the 2030 future background traffic conditions;

- Generally, all signalized intersections are expected to operate at acceptable levels of service during the morning and afternoon peak periods

  It should be noted that the suggested signal timing plan optimization provided under the existing conditions for the Garth Street/Fennell Avenue W/Scenic Drive intersection for both the morning and afternoon peak hours are applied to this horizon as well

- Generally, all unsignalized intersections are expected to operate at acceptable levels of service based on both delay and v/c ratio, with the exception of the eastbound movement at the Garth Street/Denlow Avenue intersection during the afternoon peak hour. This is due to the heavy through traffic along Garth Street in this area. However, the v/c ratio is very low (0.32), which means that the capacity for this movement is only 32% utilized

  It is Nextrans' opinion that it is acceptable as this is a typical condition for any movement from the side street onto a major arterial road such as Garth Street without an assistance of a traffic signal. Therefore, no improvements are required for this intersection under this horizon year

Based on the intersection operational capacity analysis findings, it is Nextrans' opinion that all intersections considered in the analysis are expected to operate at acceptable levels of service and no improvements are required under this horizon year.

5.0 PROPOSED DEVELOPMENT ASSESSMENT

5.1. Proposed Development

As indicated, the proposed development consists of 641 residential dwelling units (40 townhouses and 601 condominium dwelling units).

To be consistent with the previous assessment, the 2016 Transportation Tomorrow Survey (TTS) and the *Trip Generation Manual, 10th Edition* published by the Institute of Transportation Engineers (ITE) information was reviewed to estimate the modal split, trip distribution and trip generation for the proposed development.

5.2. Modes of Travel Assessment in the Area

Table 6 summarizes the travel mode split information based on the review of the 2016 Transportation Tomorrow Survey data for Traffic Zones 5139, 5140 and 5160. The detail data extraction is included in **Appendix E**.

Table 6 – Modes of Travel based on 2016 TTS for Traffic Zones 5139, 5140 and 5160

Land use	Peak Period	Auto Driver	Auto Passenger	Local Transit	Paid Rideshare	GO Transit	Cycle	Walk
Residential	AM Peak (6:00 - 9:00)	73%	14%	7%	0%	0%	1%	5%
	PM Peak (3:00 - 6:00)	72%	14%	7%	0%	0%	1%	6%

Based on the information outlines in **Table 6**, the predominant modes of travel for the residents in the area under the existing conditions are private automobile. Transit, walking and cycling modes account for approximately 13% and 14% for the morning and afternoon peak periods, respectively. For the purposes of this assessment, it is assumed that the non-auto modal split of 13% will be utilized in this study.

5.3. Site Trip Generation

To be consistent with the previous assessment, the trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 10th Edition* published by the Institute of Transportation Engineers (ITE). For the purposes of this assessment, the ITE Land Use Codes (LUC) 220 "Multifamily Housing Low-Rise General Urban/Suburban" and LUC 221 "Multifamily Mid-Rise General Urban/Suburban" fitted curve equations have been utilized for the proposed development. The summary of the vehicular trip generation is summarized in **Table 7**. Although the existing modal split in the area is currently 13% as indicated in Table 6 above**, to be conservative and to address the City's comments, NO modal split has been reflected in the trip generation estimate.**

Table 7 – Site Traffic Trip Generation

ITE Land Use	Magnitude (units)	Parameters	Morning Peak Hour			Afternoon Peak Hour		
			In	Out	Total	In	Out	Total
Multifamily Housing (Low-Rise) LUC 220 General Urban/Suburban	40	Trip Rates AM - Ln(T) = 0.95Ln(X) - 0.51 PM - Ln(T) = 0.89Ln(X) - 0.02	0.12	0.38	0.50	0.41	0.24	0.65
		Total Trips	5	15	20	16	10	26
Multifamily Housing (Mid-Rise) LUC 221 General Urban/Suburban	601	Trip Rates AM - Ln(T) = 0.98Ln(X) - 0.98 PM - Ln(T) = 0.96Ln(X) - 0.63	0.09	0.24	0.33	0.25	0.16	0.41
		Total Trips	51	147	198	151	97	248
Total New Auto Trips			***56***	***162***	***218***	***167***	***107***	***274***

The proposed development is expected to generate 218 two-way auto trips (56 inbound and 162 outbound) and 274 two-way auto trips (167 inbound and 107 outbound) during the morning and afternoon peak hours, respectively.

5.4. Site Trip Distribution and Assignment

The 2016 Transportation Tomorrow Survey (TTS) data was reviewed for Traffic Zones 5139, 5140 and 5160 in order to estimate the general trip distribution for the proposed development. **Table 8** summarizes the planning district/traffic zones distribution based on the 2016 TTS data for the proposed development.

Table 8 – Trip Distribution for Traffic Zones 5139, 5140 and 5160

Category	Toronto	Peel Region	Halton Region	Hamilton & Area	Niagara Region	Others
Auto	1%	4%	2%	86%	4%	3%
Transit	3%	0%	0%	97%	0%	0%

Tables 9 and 10 summarize the site trip distribution for auto and transit modes based on the 2016 TTS and existing transportation network in the area for the proposed development. The detail Hamilton traffic zone distribution analysis are included in **Appendix E**.

Table 9 – Site Trip Distribution for Auto Mode

Direction	Auto
South (via Sanatorium Road, Mohawk/Hwy 403 and Lincoln M. Alexander Pkwy)	55%
North (Scenic Drive, Garth St/Queen Street S)	25%
West (Scenic Drive, Mohawk Road)	9%
East (Mohawk Road, Lincoln M. Alexander Pkwy)	11%
Total	***100%***

Table 10 – Site Trip Distribution for Transit Mode

Direction	Transit
GO Transit toward Toronto (Route 33/41A to Routes 34/34A to Hamilton GO Station)	3%
South (Route 41A to Routes 20/27)	35%
North (Route 33/41A to Route 34/34A)	38%
East (Route 33 to Route 21, or Route 41A)	8%
West (Route 41A to Route 16)	16%
Total	***100%***

Figure 10 illustrates the site traffic volumes. It should be noted that the auto and transit site trip distribution and assignment have been taken into consideration existing traffic patterns and logical routes, where appropriate.

The City of Hamilton indicates that they have some concerns related to the trip assignment and would like to see more trips assigned to Scenic Drive toward Garth Street.

6.0 FUTURE TOTAL CONDITIONS

6.1. Future Total Traffic Assessment for Auto Mode

The estimated future total traffic volumes (future background traffic volumes plus site generated traffic volumes) are illustrated in **Figure 11** and were analyzed using Synchro 10 software. The detailed calculations are provided in **Appendix F** and summarized in **Tables 11** and **12**.

Table 11 – 2030 Future Total Levels of Service for Signalized Intersections

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Approx. Available Storage (m)
		LOS (v/c)	Delay (s)	95th Queue(m)	LOS (v/c)	Delay (s)	95th Queue(m)	
Upper Horning Rd/ Scenic Dr/ Mohawk Rd (signalized)	**Overall**	**B (0.67)**	**12**		**B (0.63)**	**10**		
	EB L	A (0.29)	9	18	B (0.63)	19	51	35
	EB TR	A (0.34)	7	48	A (0.44)	7	59	377
	WB L	A (0.17)	3	3	A (0.14)	3	1	50
	WB TR	A (0.37)	5	12	A (0.43)	6	9	795
	NB L	E (0.67)	67	39	D (0.41)	48	28	35
	NB TR	C (0.32)	33	34	B (0.12)	18	12	245
	SB L	D (0.28)	41	23	D (0.14)	39	15	45
	SB TR	C (0.58)	21	44	C (0.51)	24	42	973
Rice Ave/ Mohawk Rd W (signalized)	**Overall**	**B (0.82)**	**15**		**B (0.63)**	**14**		
	EB L	A (0.38)	9	28	B (0.54)	15	47	42
	EB TR	A (0.31)	7	45	A (0.26)	5	34	210
	WB L	B (0.20)	16	21	B (0.15)	13	17	30
	WB TR	B (0.37)	14	71	B (0.44)	13	93	456
	NB L	D (0.30)	44	11	D (0.34)	54	12	30
	NB TR	B (0.43)	15	26	B (0.22)	19	16	142
	SB L	E (0.82)	75	49	E (0.63)	56	45	30
	SB TR	B (0.59)	11	27	B (0.61)	13	30	715
Mohawk Rd W/ Lincoln M. A Pkwy Off-ramp (signalized)	**Overall**	**B (0.46)**	**10**		**B (0.65)**	**14**		
	WB L	C (0.46)	26	35	C (0.65)	28	55	350
	WB R	B (0.35)	14	21	C (0.36)	22	32	350
	NB T	A (0.38)	7	37	B (0.63)	11	95	247
	SB T	A (0.36)	7	34	A (0.45)	9	58	502
Garth Street/ Fennell Avenue W (signalized)	**Overall**	**D (0.95)**	**42**		**D (0.99)**	**55**		
	EB L	C (0.74)	30	92	C (0.29)	32	31	50
	EB TR	C (0.39)	29	40	D (0.31)	55	37	130
	WB L	D (0.72)	49	45	E (0.96)	77	172	300
	WB R	D (0.83)	45	100	E (0.93)	68	218	300
	NB T	D (0.92)	51	123	D (0.35)	44	75	115
	NB R	D (0.93)	38	127	A (0.43)	7	26	65
	SB L	E (0.95)	61	140	C (0.66)	30	102	35
	SB TR	D (0.92)	38	169	E (0.99)	57	344	500

Table 12 – 2030 Future Total Levels of Service for Unsignalized Intersections

Intersection	Key Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Approx. Available Storage (m)
		LOS (v/c)	Delay (s)	95th Queue(m)	LOS (v/c)	Delay (s)	95th Queue(m)	
Rice Ave/ Sanatorium Rd (unsignalized)	WB LR	A (0.17)	9	-	A (0.15)	9	-	157
	NB TR	A (0.35)	10	-	A (0.34)	10	-	62
	SB TL	B (0.39)	11	-	A (0.28)	9	-	102
Scenic Dr/ Angela Ave (unsignalized)	WB LR	B (0.02)	12	0	B (0.01)	12	0	237
	NB TR	B (0.23)	0	0	B (0.12)	0	0	79
	SB TL	A (0.00)	0	0	A (0.00)	0	0	172
Scenic Dr/ Upper Paradise Rd (unsignalized)	EB LTR	B (0.47)	13	-	A (0.22)	10	-	131
	WB L	A (0.06)	8	-	A (0.15)	9	-	30
	WB TR	A (0.11)	8	-	A (0.46)	11	-	415
	NB L	A (0.01)	8	-	A (0.03)	9	-	30
	NB TR	A (0.26)	9	-	A (0.18)	8	-	1,258
	SB LTR	A (0.05)	9	-	A (0.07)	10	-	88
Garth Street/ Denlow Avenue (signalized)	EB L	E (0.16)	42	5	F (0.47)	220	12	55
	EB R	B (0.10)	12	3	B (0.10)	12	3	55
	NB TL	A (0.04)	1	1	A (0.22)	9	6	200
	SB TR	A (0.24)	0	0	A (0.64)	0	0	115
Scenic Dr/ West Access (unsignalized)	WB LR	B (0.09)	11	3	B (0.07)	11	2	237
	NB TR	B (0.09)	0	0	B (0.18)	0	0	79
	SB TL	A (0.01)	0	0	A (0.03)	2	1	172
Sanatorium Rd/ Scenic Dr (Roundabout)	EB LTR	A (0.32)	7	-	A (0.19)	6	-	140
	WB LTR	A (0.15)	5	-	A (0.37)	7	-	90
	NB LTR	A (0.19)	6	-	A (0.17)	5	-	40
	SB LTR	A (0.12)	5	-	A (0.09)	6	-	15

Based on the intersection operational capacity analysis, the following observations are made under the 2030 future total traffic conditions;

- Generally, all signalized intersections are expected to operate at acceptable levels of service during the morning and afternoon peak periods

  Similar to the future background conditions, it should be noted that the suggested signal timing plan optimization provided under the existing conditions for the Garth Street/Fennell Avenue W/Scenic Drive intersection for both the morning and afternoon peak hours are applied to this horizon as well

- Generally, all unsignalized intersections are expected to operate at acceptable levels of service based on both delay and v/c ratio, with the exception of the eastbound movement at the Garth Street/Denlow Avenue intersection during the afternoon peak hour. This is due to the heavy through traffic along Garth Street in this area. However, the v/c ratio is very low (0.47), which means that the capacity for this movement is only 47% utilized

  It is Nextrans' opinion that it is acceptable as this is a typical condition for any movement from the side street onto a major arterial road such as Garth Street without an assistance of a traffic signal. Therefore, no improvements are required for this intersection under this horizon year

- It is expected that the proposed development contributes minimal delay (at most 2 seconds) to overall intersection operations, for all the signalized and unsignalized intersections considered. Therefore, it is Nextrans' opinion that the proposed development has negligible impact on the existing transportation network and no physical improvements are required to accommodate the proposed development.
- In addition, Nextrans identified a comprehensive Transportation Demand Management (TDM) plan for the proposed development so that the TDM measures and incentives provided will encourage the future residents from the proposed development to travel by alternative modes of transportation such as walking, cycling and transit instead of driving single-occupant-vehicles

Based on the intersection operational capacity analysis findings, it is Nextrans' opinion that all intersections considered in the analysis are expected to operate at acceptable levels of service and no improvements are required under this horizon year.

6.2. Access Assessment

As indicated, the proposed access to the east part of the development will be located opposite Sanatorium Road and will be integrated as part of the proposed roundabout. The analysis indicates that single-lane entry roundabout at the Scenic Drive/Sanatorium Road intersection is sufficient to accommodated the proposed development site generated traffic and background traffic to 2030 horizon.

The proposed access for the west part of the development will be located to the northerly limit of the site on Scenic Drive. Based on the intersection capacity analysis, the proposed west access is expected to operate at excellent levels of service with minimum delays or queues. The left turn warrant analysis for this proposed access also indicates that no exclusive turning lanes are required on Scenic Drive to accommodated the proposed development site generated traffic.

Previously, a site access is proposed opposite San Pedro Drive, however, the City has indicated that this proposed access location is not permitted for various reasons. As the current development proposal eliminates this access, therefore, the current proposed access arrangement noted above meets the City's requirements and comments.

6.3. Left Turn Warrant Analysis

The Ontario Ministry of Transportation (MTO) Left Turn Warrant analysis for at grade intersection was conducted to examine the need for an exclusive eastbound left turn from Scenic Drive to the west proposed development access.

Proposed West Access/Scenic Drive
AM Peak: 9 left turns x 100% / 266 advancing traffic volumes = 3%
PM Peak: 32 left turns x 100% / 164 advancing traffic volumes = 20%

Figures 12 and **13** illustrate the MTO warrant guidelines for each corresponding left turn percentage.

Figure 12 – MTO Left Turn Storage Warrant Analysis (5% Left Turn)

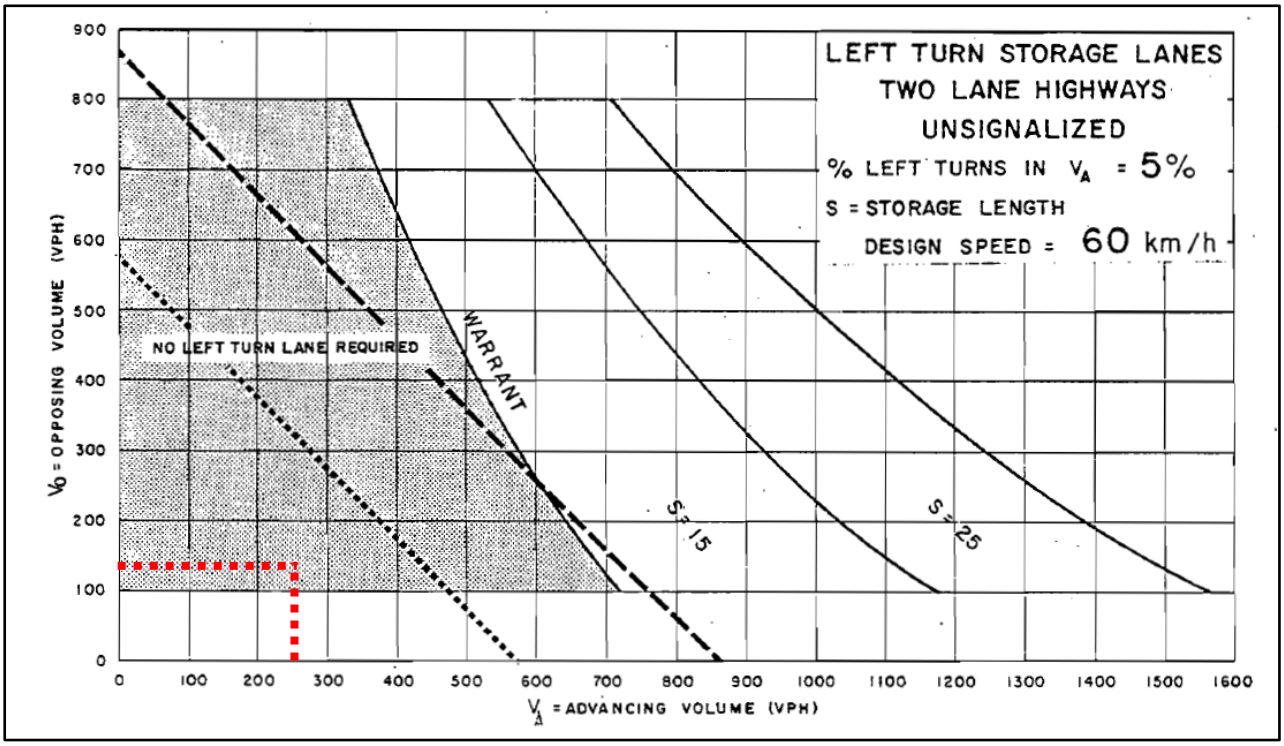
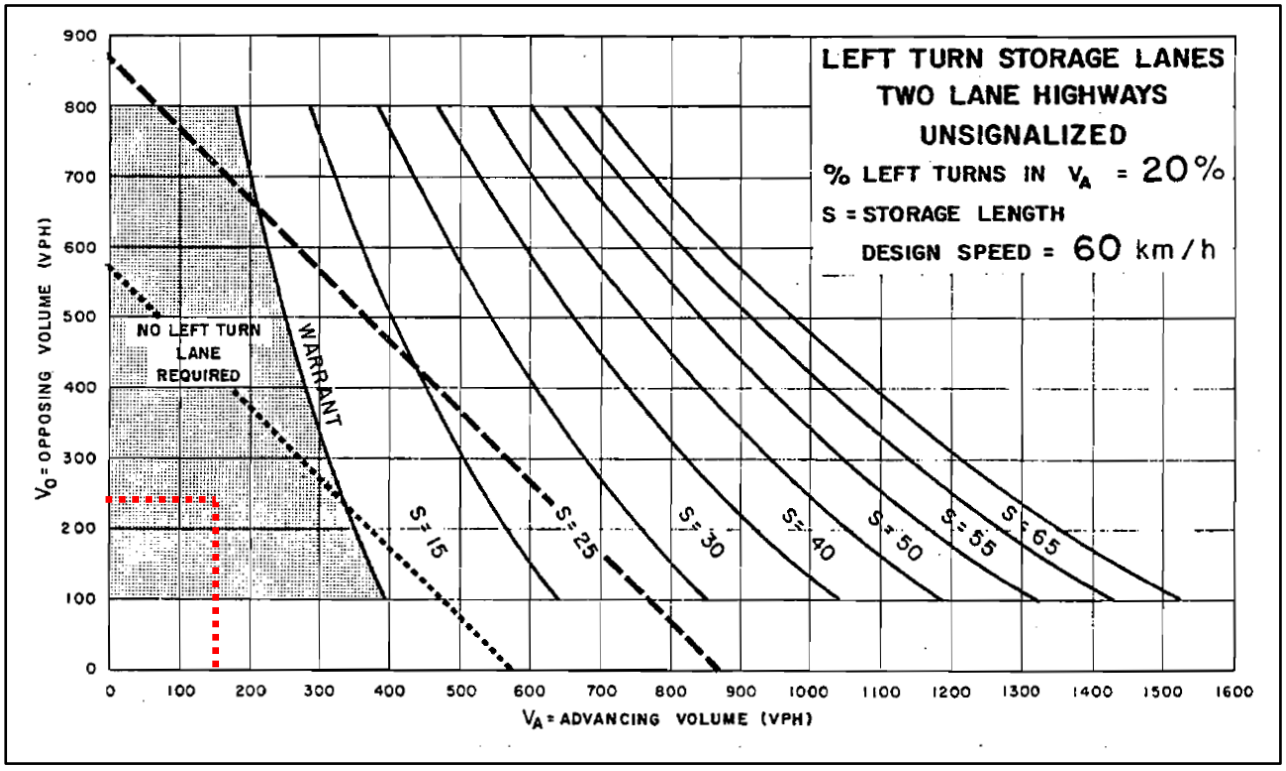


Figure 13 – MTO Left Turn Storage Warrant Analysis (20% Left Turn)



Based on the analysis, it is anticipated that exclusive eastbound left turn volumes onto the proposed development west access do not numerically meet the MTO warrant guidelines under the 2030 horizon.

6.4. Sightline Analysis for Proposed West Site Access

For the purpose of sight distance assessment and as requested by the City, a design speed of 60 km/h under stop-controlled will be utilized. Sight distance requirements will be considered both for passenger vehicles approaching and departing the stopped position at the proposed westerly site access via Scenic Drive. The criteria applied for vehicles approaching the intersection is stopping sight distance. Under the stopping sight distance assessment, the target height applied is 0.38m for vehicle taillights, and for intersection movements a top of car height of 1.3m is applied. A driver eye height of 1.05m is applied for all scenarios. A road grade of -0.65% has been applied from the westbound approach, and a road grade of 0.09% has been applied from the eastbound approach.

Required stopping distance, adjusted for effect of grade, is determined using the formula:

$d = V^2 / 254(f +/- G)$

Where:
V = design speed
f = Coefficient of friction (0.30) (TAC 1999, Table 1.2.5.2)

then: Stopping Sight Distance = 0.278tV + d

Where:
t = perception / reaction time = 2.5s (TAC 1999, Table 1.2.5.3)
G = the percent grade divided by 100

Average G for Westbound approach = -0.0065
Average G for Eastbound approach = 0.0009

Minimum sight distance for Westbound approach = $0.278 \times 2.5 \times 60 + 60^2 / 254 (0.30 - 0.0065)$
= 89.99 say **90m**
Minimum sight distance for Eastbound approach = $0.278 \times 2.5 \times 60 + 60^2 / 254 (0.30 + 0.0009)$
= 88.81 say **90m**

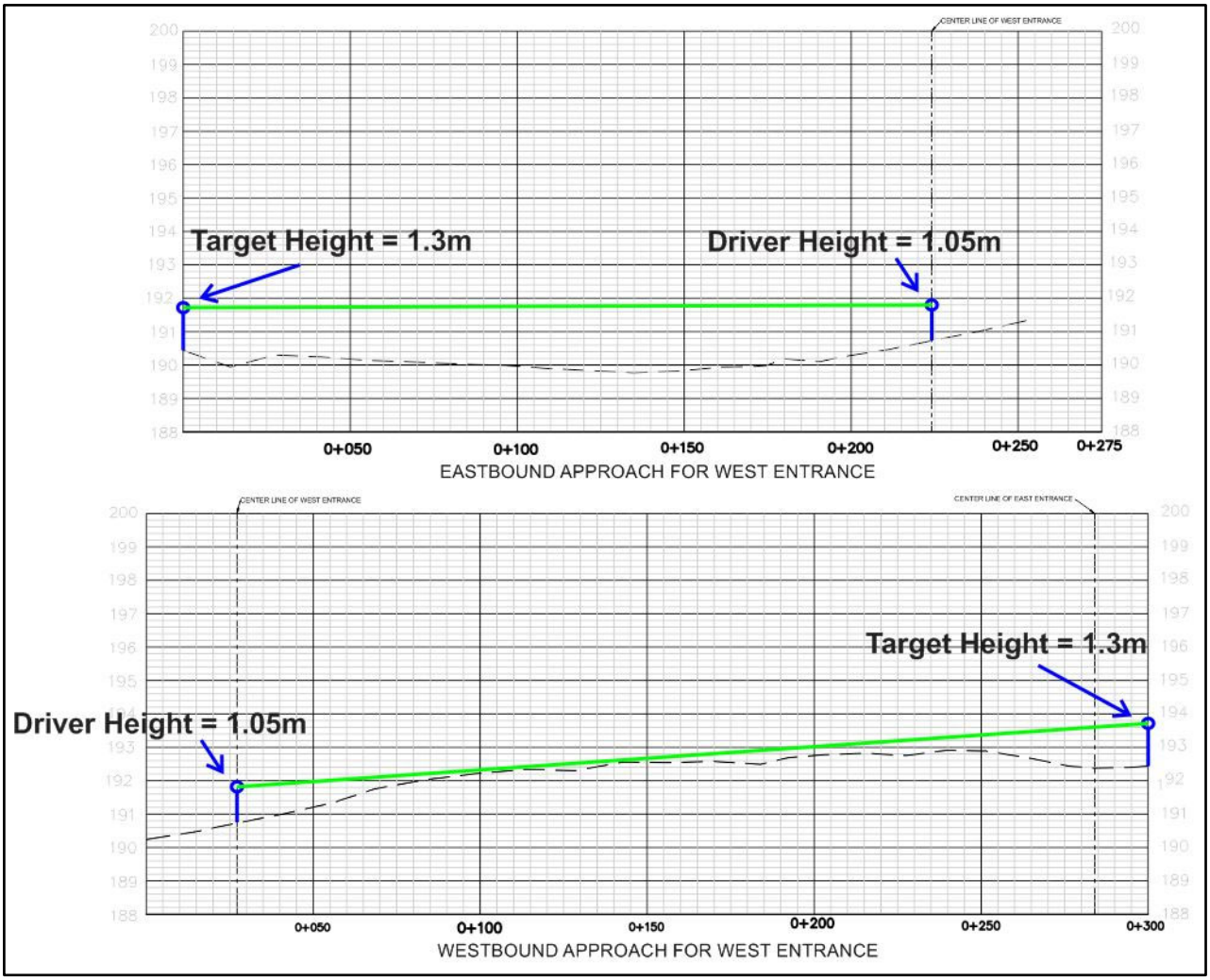
Actual sight distances approaching the proposed site access via Scenic Drive have been determined through computer modeling, using the existing road topography of Scenic Drive and the proposed road grades for the site entrance. The stopping sight distance at the Scenic Drive and proposed westerly site entrance is illustrated in **Figure 14** and the results are summarized in **Table 13**. **Appendix G** provides a larger scale version of the stopping sight distance analysis.

Table 13 – Stopping Sight Distance Assessment for Site West Access

Scenic Drive / Westerly Site Access	Movement	Stopping Sight Distance		
		Required	Achieved	Difference
Westbound Approach	Right-Turn	90 m	200+ m	+110 m
Eastbound Approach	Left-Turn	90 m	250+ m	+160 m

Table 13 indicates that the stopping sight distances achieve an excess of 130+ m and 180+ m in distance for the westbound and eastbound approaches, respectively. As a result, the sight distance analysis at the proposed site west access indicates there are sufficient sight line distances with the existing conditions.

Figure 14 – Sight Distance Analysis (Westerly Site Access)



6.5. Future Total Traffic Assessment for Transit Mode

As indicated in **Figure 5**, the area is currently well serviced by the existing Hamilton transit network. The proposed development is located adjacent to Bus Routes 33 and 41A stops located at the Sanatorium Road/Scenic Drive intersection. Below are Bus Routes 33 and 41A descriptions:

- Bus Route 33 (Sanatorium): The Sanatorium route travels generally in the north-south direction from the MacNab Terminal Platform #7 to the Scenic Loop. This service runs 7 days a week from the early morning until after midnight. The frequency is approximately 15-20 minutes during the weekday peak periods (6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM). The frequency during the weekend is approximately 30 minutes or greater.
- Bus Route 41 (Mohawk): The Mohawk route generally travels both east-west and north-south from downtown Hamilton at Gage/ Industrial to the Meadowlands Terminal. This service runs 7 days a week from the early morning until after midnight. The frequency is approximately 15 minutes or greater during the weekday peak periods (6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM). The frequency during the weekend is approximately 28 minutes or greater.

As indicated in Section 5.3 of the Study, to be conservative, no modal split has been included in the analysis. If 13% of the existing modal split is applied to the site trip generation, the proposed development could potentially generate 28 two-way transit trips (7 inbound and 21 outbound) and 36 two-way transit trips (22 inbound and 14 outbound) during the morning and afternoon peak hours, respectively.

It is Nextrans' opinion that the expected transit ridership from the proposed development can be accommodated by the existing HSR Bus Route 33 and 41A. No improvements are required on these routes under the horizon year considered.

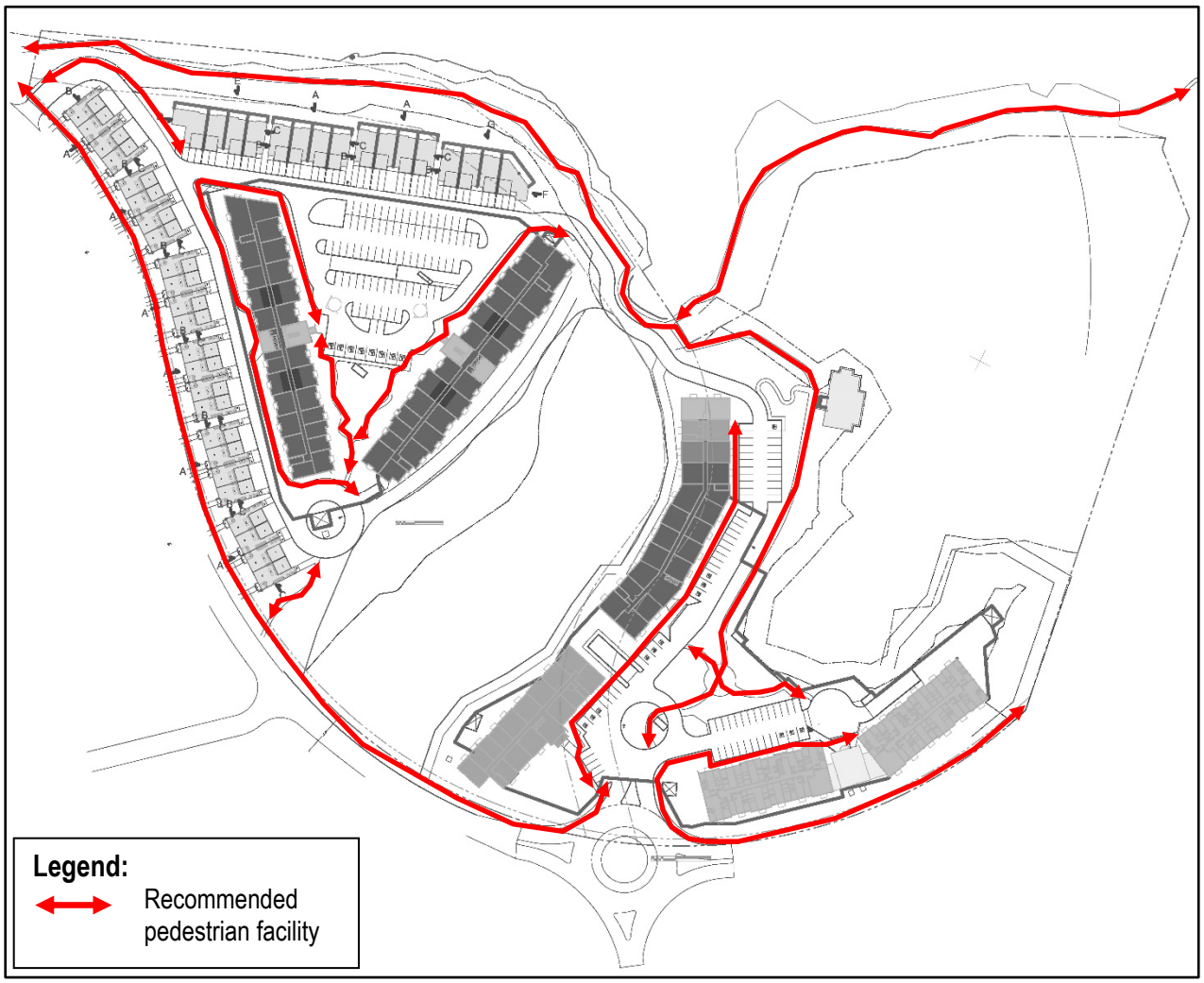
6.6. Future Active Transportation and Site Mobility Assessment

Walking

As indicated in Section 2.4 of the study, the area is currently well served by a complete network of sidewalks with sidewalks are generally available on both sides of the street. The sidewalks are generally in good condition and reasonably maintained on the public streets.

The current development proposal provides a comprehensive sidewalk network within the proposed development and connect to Scenic Drive and Sanatorium Road. **Figure 15** illustrates the internal pedestrian mobility network for proposed development.

Figure 15 – Recommended Internal Site Pedestrian Mobility Plan



Cycling

As indicated in Section 2.4 of the study, under the existing conditions, there are some bicycle facilities available in the area such as the dedicated two-way bicycle lanes on Upper Paradise Road and Rice Avenue. There is also a dedicated bicycle lane on Mohawk Road W west of Lincoln M. Alexander Parkway.

It is Nextrans' opinion that better and more connected bicycle network should be implemented as part of future City's capital projects and a more complete bicycle network will help increase cycling trips and reduce the numbers of single-occupant-vehicle trips to and from the area. Given that the internal road network is very complete and connected at every corner of the proposed development, as well as the internal road network is narrow with low speed, it is Nextrans' opinion that separate cycling facility such as dedicated bicycle lane or multi-use trail is not required for the internal road network.

It is Nextrans understanding that there are no current requirements for bicycle parking in the DE-H/S-1600 and E-H/S-1600 Zones. However, the proposed development will provide a total of 477 long-term bicycle parking spaces underground. It is Nextrans' opinion that this provision will encourage residents to cycle more to work, school and discretionary trips. This provision will also support the required TDM plan and requirements by the City of Hamilton.

6.7. Traffic Calming Measures

The City has approved of the recommendations contained within the Neighborhood Traffic Calming Report. In addition, the City indicates that:

- The Applicant shall contribute $24,000 ($6,000 per speed cushion x 4) to the City of Hamilton for the future placement of traffic calming measures along Scenic Drive as recommended within the Traffic Calming Report; and

- Design and construct a single lane roundabout at the Scenic Drive at Sanatorium/Site access driveway as a means of both traffic control and traffic calming. The roundabout shall have Pedestrian Crossovers on all legs All to the satisfaction of the Manger, Transportation Operations and Maintenance.

The proposed development will meet these requirements at the appropriate stage of the development application.

7.0 SITE PLAN REVIEW

7.1. Loading Requirement

The proposed development will provide one loading space on the west side with the following dimensions: 3.6 m width and 10.56 m length. The AutoTURN analysis has been provided in this Study to demonstrate garbage truck maneuverability within the site at on-site loading space**.** The detailed vehicle turning templates (using AutoTURN software) are provided in **Figure 16.**

7.2. Proposed Development Access Assessment

As indicated, the proposed access to the east part of the development will be located opposite Sanatorium Road and will be integrated as part of the proposed roundabout. The analysis indicates that single-lane entry roundabout at the Scenic Drive/Sanatorium Road intersection is sufficient to accommodated the proposed development site generated traffic and background traffic to 2030 horizon.

The proposed access for the west part of the development will be located to the northerly limit of the site on Scenic Drive. Based on the intersection capacity analysis, the proposed west access is expected to operate at excellent levels of service with minimum delays or queues. The left turn warrant analysis for this proposed access also indicates that no exclusive turning lanes are required on Scenic Drive to accommodated the proposed development site generated traffic.

Previously, a site access is proposed opposite San Pedro Drive, however, the City has indicated that this proposed access location is not permitted for various reasons. As the current development proposal eliminates this access, therefore, the current proposed access arrangement noted above meets the City's requirements and comments.

8.0 PARKING ASSESSMENT

8.1. Vehicle Parking

As indicated, the proposed development consists of 641 residential dwelling units (40 townhouses and 601 condominium dwelling units).

For the purpose of this assessment, Zoning By-law No. 05-200 Section 5.6 c) (Consolidated as of August 14, 2019) has been reviewed and applied in the analysis. As the City is replacing the Zoning By-laws of the former municipalities, it is anticipated that the new standards from Zoning By-law No. 05-200 will be applied to this area in the future. **Table 14** summarizes the proposed development parking requirements based on the City's Zoning By-law No. 05-200, Sections 5.6 c).

Table 14 – Zoning By-law No. 05-200 Vehicle Parking Requirement

Type	No. Unit	Ratio	Required
Mid-rise	609 units	1.0 space per unit	609 spaces
Townhouse	40 units	1.0 space per unit	40 spaces
Visitor	649 units	0.25 spaces per unit	163 spaces
Barrier Free	649 units	201 – 1,000 spaces (minimum 2 spaces + 2% of required spaces)	2 + 0.02*812 = 18 spaces
Total Parking Spaces Required			812 spaces

Based on the City's By-Law No. 05-200, a total of 812 parking spaces (including 18 barrier free spaces) are required for the proposed development.

Table 15 summarizes the parking supply for the proposed development.

Table 15 – Parking Supply for the Proposed Development

Type	East Side		West Side	
	No. of Units	Parking Supply	No. of Units	Parking Supply
Mid-rise	370 units	384 spaces	231 units	316 spaces
Townhouse	0 units	0 spaces	40 units	160 spaces
Visitor/barrier-free	370 units	79 spaces (including 20 spaces for Long & Bisby Building and 13 barrier free spaces)	271 units	87 spaces (including 8 barrier free spaces)
Total	370 units	463 parking spaces	271 units	563 parking spaces

As indicated in the table above, the proposed development will provide a total of 1,026 vehicle parking spaces, inclusive of 166 visitor parking, barrier-free parking and office spaces for Long & Bisby Building, which is only about 25% above the minimum Zoning By-law requirement. It should be noted that any unused parking spaces can be converted to more bicycle parking spaces, EV spaces or carshare spaces in the future, if appropriate.

8.2. Bicycle Parking

It is Nextrans understanding that there are no current requirements for bicycle parking in the DE-H/S-1600 and E-H/S-1600 Zones. However, the proposed development will provide a total of 477 long-term bicycle parking spaces underground. It is Nextrans' opinion that this provision will encourage residents to cycle more to work, school and discretionary trips. This provision will also support the required TDM plan and requirements by the City of Hamilton.

9.0 TRANSPORTATION DEMAND MANAGEMENT (TDM) OPTIONS

The City indicated that the previous TDM plan provided as part of the previous transportation impact study dated September 2020 was approved with the following comments to be addressed at the site plan stage:

1. The TIS/TDM report has indicated that 477 long-term bicycle parking spaces are provided underground. Transportation Planning also recommends installing above ground bicycle racks in amenity areas, or near visitor parking lots.

   Response: Noted. The proposed development will consider above ground bicycle parking spaces in the amenity areas or near visitor parking lots as part of the site plan submission.

2. The TIS/TDM report suggests that the proposed parking supply be reduced to be more in-line with the 630 requires parking spaces to meet By-law 05-200. It is also recommended to unbundle parking from the cost of a mid-rise unit as well as implementing car/bikeshare options. This is not demonstrated on the site plan.

   Response: Noted. The current development requires to provide a total of 812 vehicle parking spaces to meet the minimum Zoning By-law requirement. The proposed development provides a total of 1,026 vehicle parking spaces, inclusive of 166 visitor parking, barrier-free and office spaces, which is only about 25% above the minimum Zoning By-law requirement. It should be noted that any unused parking spaces can be converted to more bicycle parking spaces, EV spaces or carshare spaces in the future, if appropriate.

3. The TIS/TDM report suggests providing direct shared pedestrian and cycling connections from the proposed development to Scenic Drive and Sanatorium Road. This is not demonstrated on the site plan however.

   Response: The proposed development provides sidewalks in front of all buildings and connect to Scenic Drive. All main building entrances will be fronting onto these sidewalks with a direction connection.

10.0 CONCLUSIONS / RECOMMENDATIONS

10.1. Study Conclusions

The findings and conclusions of the analysis are as follows:

- The area is currently well served by a complete network of sidewalks. The sidewalks are generally in good condition and reasonably maintained on the public streets.

- The proposed development is expected to generate 218 two-way auto trips (56 inbound and 162 outbound) and 274 two-way auto trips (167 inbound and 107 outbound) during the morning and afternoon peak hours, respectively.

- The analysis indicates that under the existing conditions, all signalized and unsignalized intersections are currently operating at acceptable levels of service during the morning and afternoon peak periods. Based on the intersection operational capacity analysis findings, site visits/observations and review of the traffic cameras, it is Nextrans' opinion that no improvements are required at this time as all the intersections considered in the analysis are expected to operate within the parameters.

- The analysis indicates that under the future background conditions, all signalized and unsignalized intersections are generally expected to operate at acceptable levels of service during the morning and afternoon peak periods. Some movements are expected to operate with slightly higher delay. However, based on the intersection operational capacity analysis findings, it is Nextrans' opinion that no improvements are required at this horizon year as all the intersections considered in the analysis are expected to operate within the parameters.

- The analysis indicates that similar to the existing and future background conditions, under the future total traffic conditions, all signalized and unsignalized intersections are generally expected to operate at acceptable levels of service during the morning and afternoon peak periods. Some movements are expected to operate with slightly higher delay and queue may occasionally spillback as they are slightly exceeding existing available storage length.

- Based on the analysis findings, it is expected that the proposed development contributes minimal delay to overall intersection operations (at most 2 seconds), for all the signalized and unsignalized intersections considered. Therefore, it is Nextrans' opinion that the proposed development has negligible impact on the existing transportation network and therefore no physical improvements are required to accommodate the proposed development.

- Nextrans identified a comprehensive Transportation Demand Management (TDM) plan for the proposed development so that the TDM measures and incentives provided will encourage the future residents from the proposed development to travel by alternative modes of transportation such as walking, cycling and transit instead of driving single-occupant-vehicles. These recommendations have been accepted by the City, with only some minor comments that have been addressed in this Study and subsequent submission.

- The proposed access to the east part of the development will be located opposite Sanatorium Road and will be integrated as part of the proposed roundabout. The analysis indicates that single-lane entry roundabout at the Scenic Drive/Sanatorium Road intersection is sufficient to accommodated the proposed development site generated traffic and background traffic to 2030 horizon.

  The proposed access for the west part of the development will be located to the northerly limit of the site on Scenic Drive. Based on the intersection capacity analysis, the proposed west access is expected to operate at excellent levels of service with minimum delays or queues. The left turn warrant analysis for this proposed access also indicates that no exclusive turning lanes are required on Scenic Drive to accommodated the proposed development site generated traffic.

  Previously, a site access is proposed opposite San Pedro Drive, however, the City has indicated that this proposed access location is not permitted for various reasons. As the current development proposal eliminates this access, therefore, the current proposed access arrangement noted above meets the City's requirements and comments.

- The Study has not assumed any transit modal split in the analysis. However, if 13% of the existing modal split is applied to the site trip generation, the proposed development could potentially generate 28 two-way transit trips (7 inbound and 21 outbound) and 36 two-way transit trips (22 inbound and 14 outbound) during the morning and afternoon peak hours, respectively.

  The expected transit ridership from the proposed development can be accommodated by the existing HSR Bus Route 33 and 41A. No improvements are required on these routes under the horizon year considered.

- The active transportation analysis indicates that the area is currently well-serviced by the existing sidewalk network. There are some existing cycling facilities in the area, however, the cycling network could be improved through the City's future capital projects. The proposed development will provide complete network of sidewalk internal to the site and connect to Scenic Drive and Sanatorium Road.

- Based on the City's By-Law No. 05-200, a total of 812 parking spaces (including 18 barrier free spaces) are required for the proposed development. The proposed development provides a total of 1,026 vehicle parking spaces (563 spaces on the west parcel and 463 spaces on the east parcel), which is only about 25% above the minimum Zoning By-law requirement. It should be noted that any unused parking spaces can be converted to more bicycle parking spaces, EV spaces or carshare spaces in the future, if appropriate.

- It is Nextrans understanding that there are no current requirements for bicycle parking in the DE-H/S-1600 and E-H/S-1600 Zones. However, the proposed development will provide a total of 477 long-term bicycle parking spaces underground. It is Nextrans' opinion that this provision will encourage residents to cycle more to work, school and discretionary trips. This provision will also support the required TDM plan and requirements by the City of Hamilton.

- The proposed development will provide one loading space on the west side with the following dimensions: 3.6 m width and 10.56 m length. The AutoTURN analysis has been provided in this Study to demonstrate garbage truck maneuverability within the site at on-site loading space.

10.2. Study Recommendations

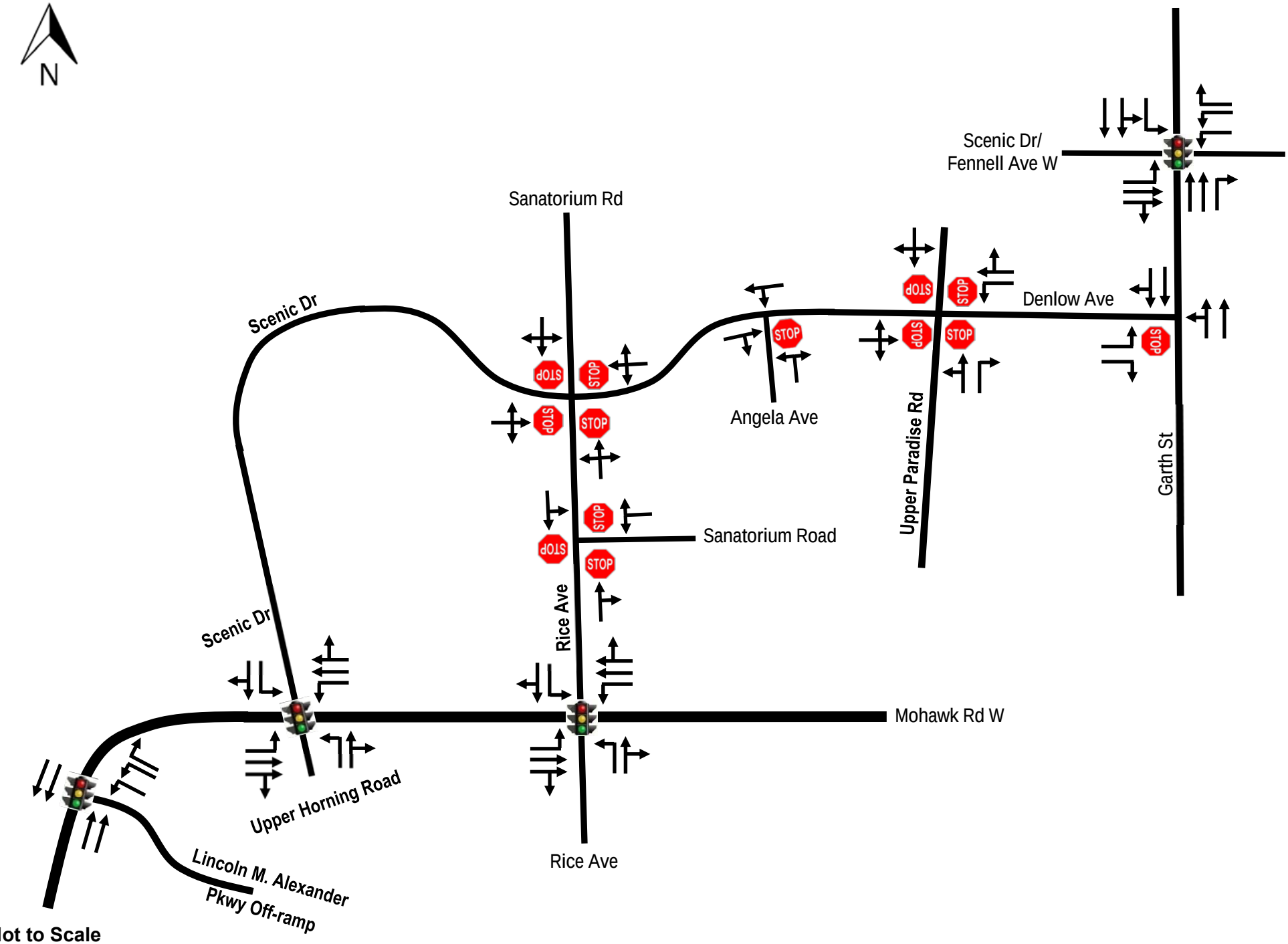
The following are the recommended mitigation measures that are relevant and can be implemented within the proposed development capability:

- The proposed development to implement the Transportation Demand Management (TDM) measures and incentives identified in Section 9 of this report to support active transportation and public transit, to meet the objectives and requirements by the City of Hamilton;

- The proposed development provides 477 long-term bicycle parking spaces underground to encourage future residents to take alternative modes of transportation to and from the proposed development;

- No exclusive turning lanes are required on Scenic Drive or on the proposed site west access to accommodate the proposed development site generated traffic. Single inbound and outbound lanes are sufficient; and

- Single-lane entry roundabout at the Scenic Drive/Sanatorium Road intersection is sufficient to accommodate the background traffic and the proposed development traffic.



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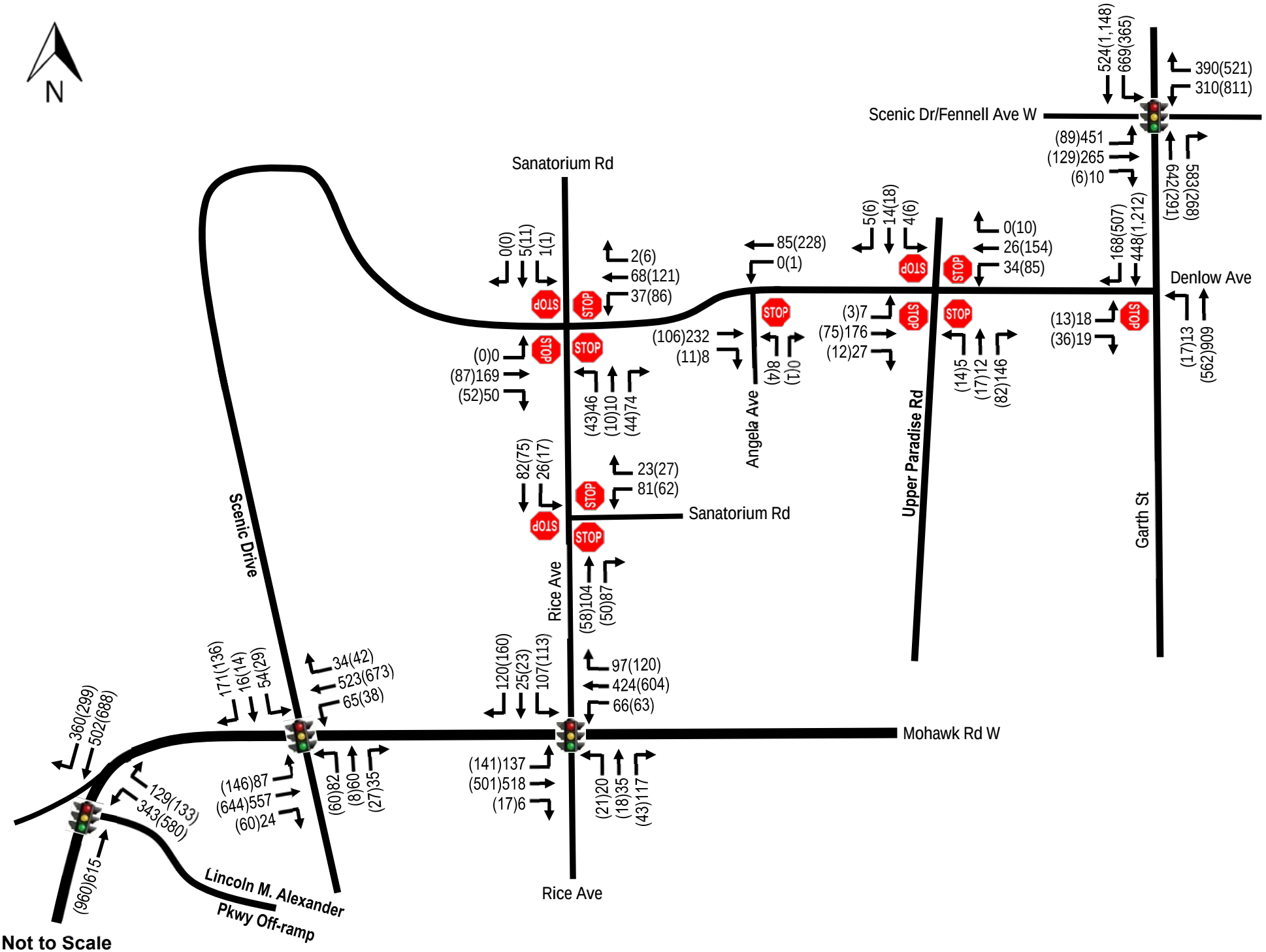
Legend — Existing Lane Configuration — Existing Stop Sign — Existing Signalized Intersection

Figure 3 - Existing Lane Configurations



Not to Scale

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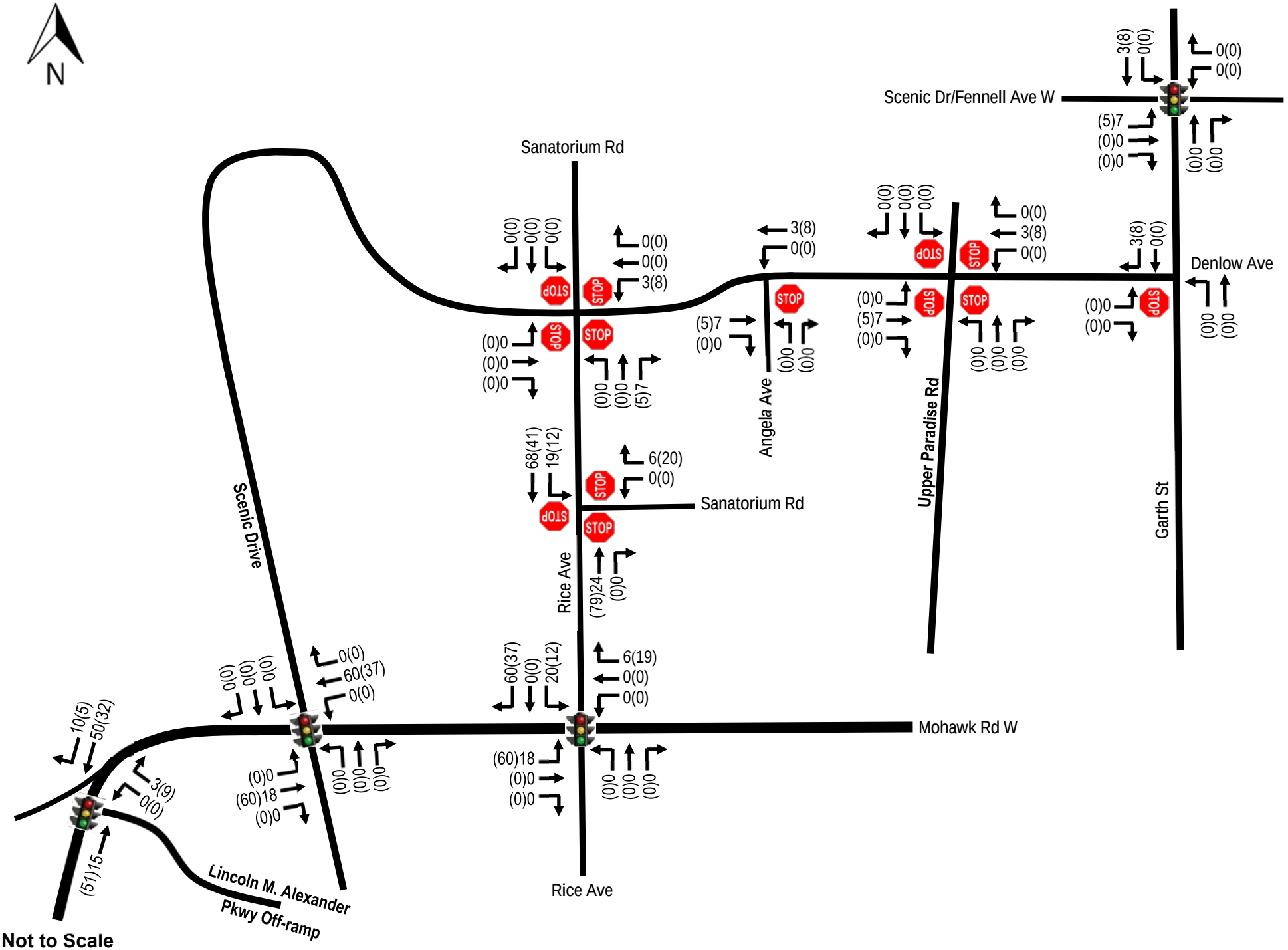
Legend

XX AM Peak Hour (XX) PM Peak Hour STOP Existing Stop Sign Existing Signalized Intersection

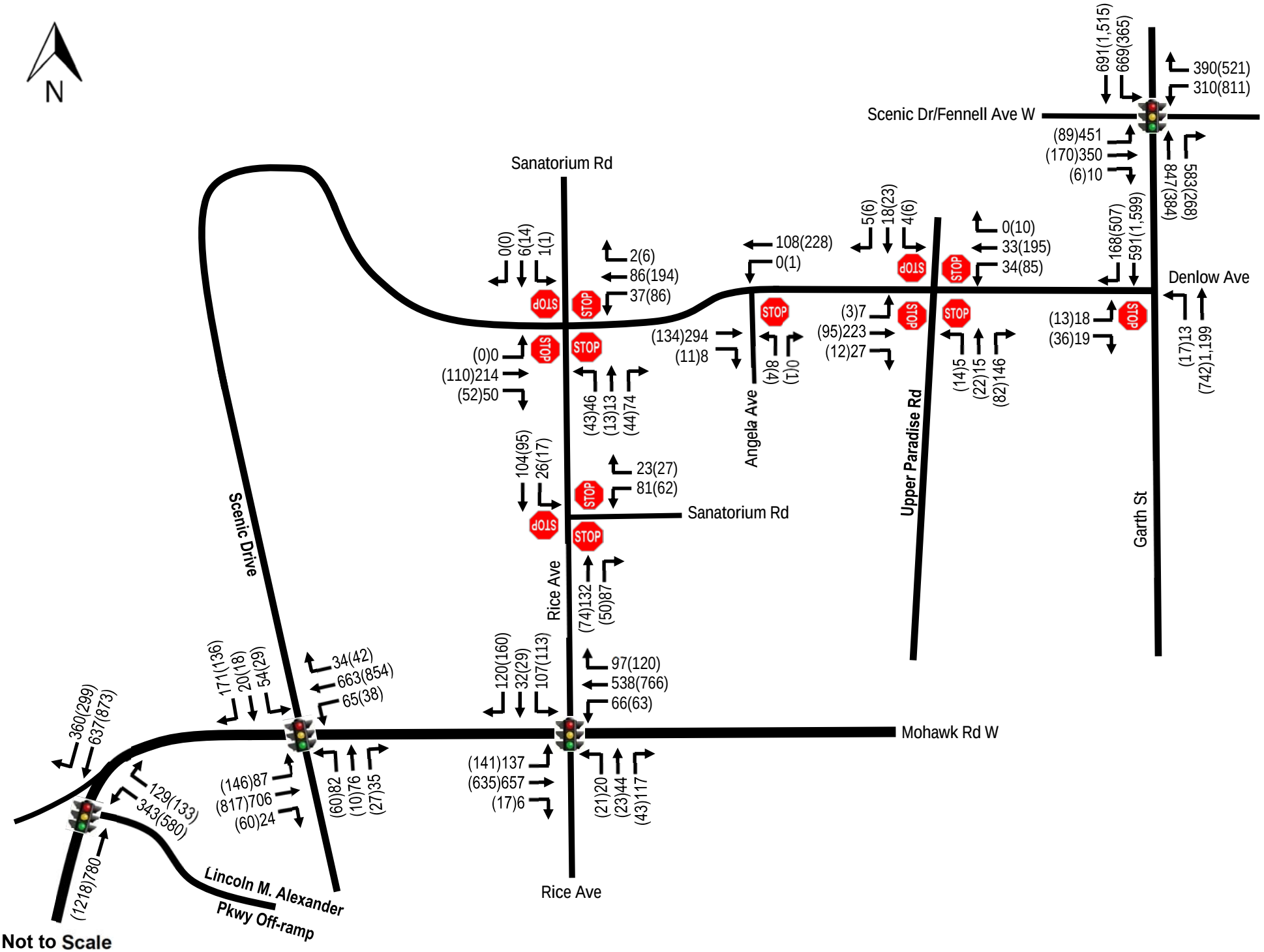
Figure 6 - Existing Traffic Volumes



Legend

XX AM Peak Hour (XX) PM Peak Hour STOP Stop Sign Signalized Intersection

Figure 7 – Background Development Traffic Volumes



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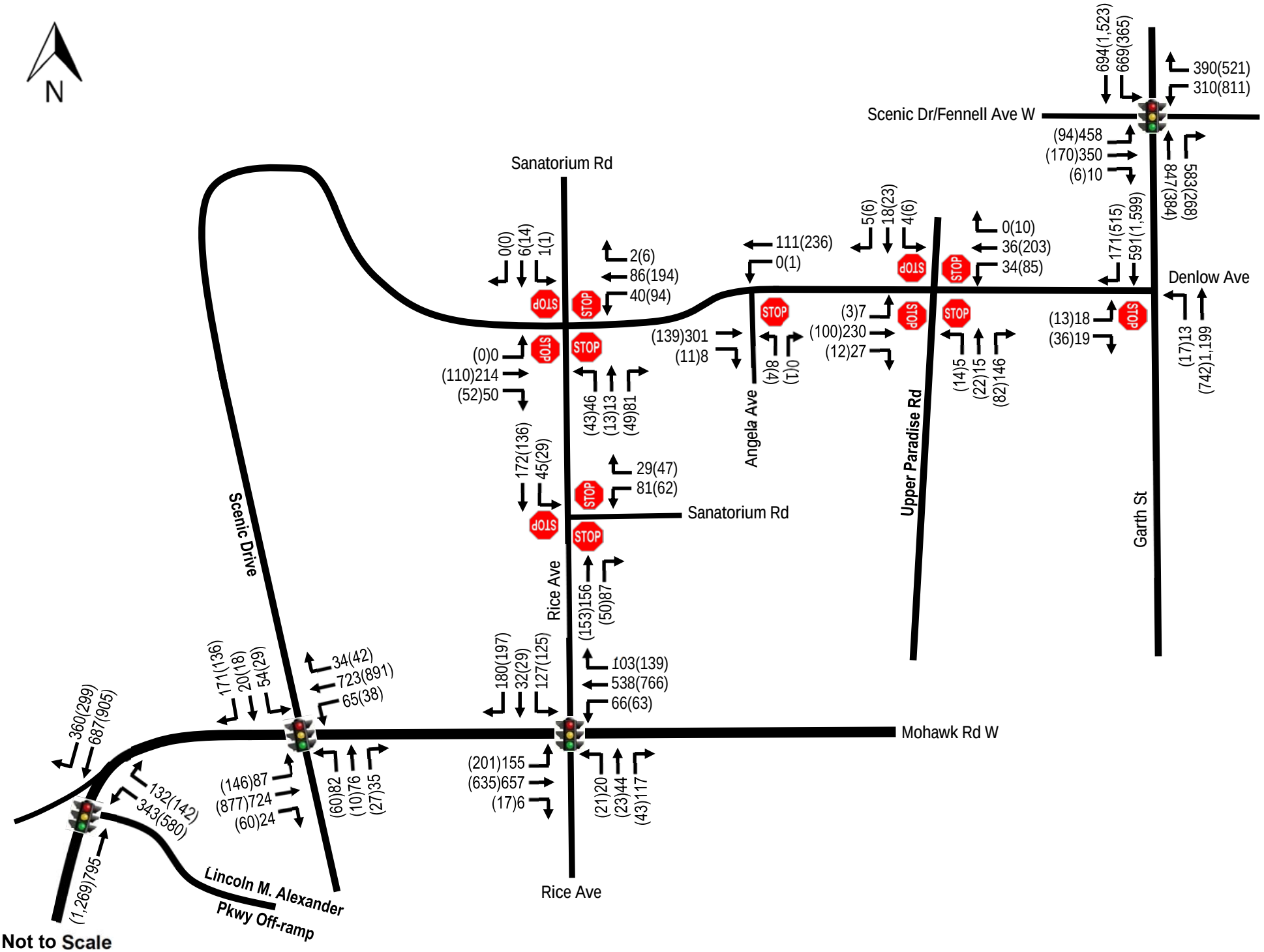
Legend
XX AM Peak Hour (XX) PM Peak Hour STOP Stop Sign Signalized Intersection

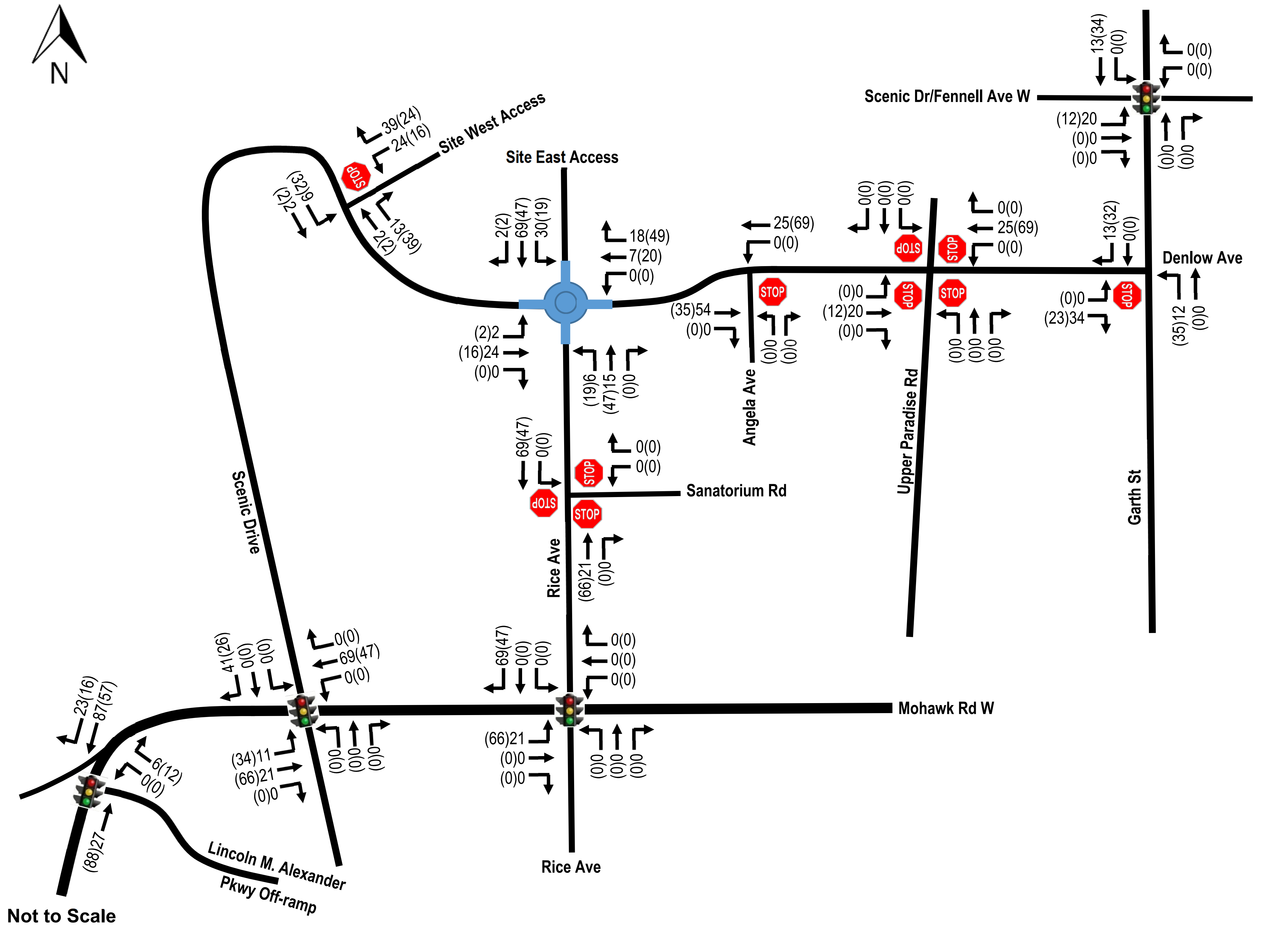
Figure 8 – 2030 Background Corridor Through Traffic Growth



Legend

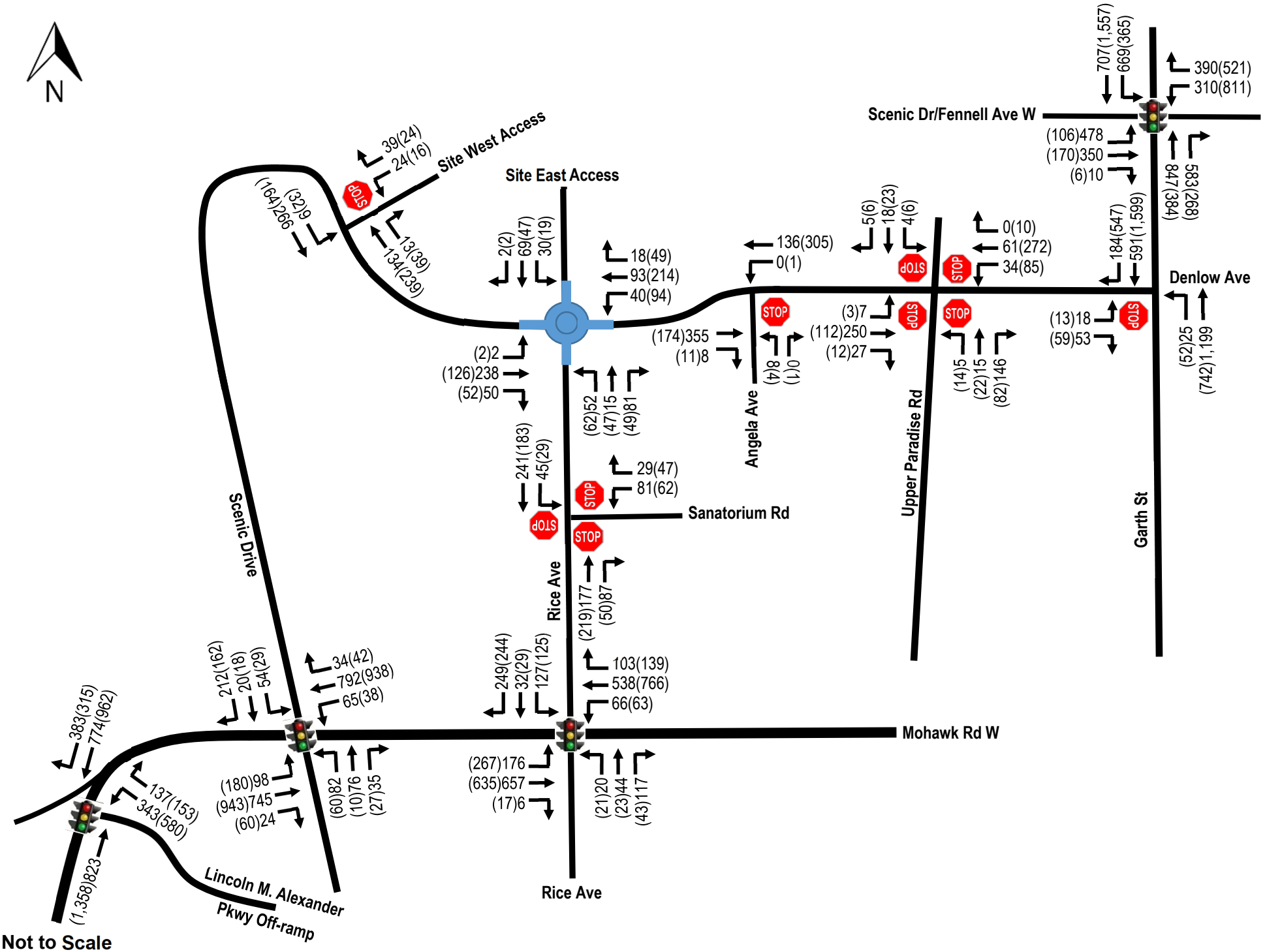
XX AM Peak Hour (XX) PM Peak Hour STOP Stop Sign Signalized Intersection

Figure 9 – 2030 Future Background Traffic Volumes



Legend
XX AM Peak Hour (XX) PM Peak Hour
Stop Sign
Signalized Intersection
Roundabout

Figure 10 – Site Traffic Volumes



nexTrans CONSULTING ENGINEERS

Figure 11 – 2030 Future Total Traffic Volumes

WEST BLOCK
231 CONDOMIMIUM UNITS
40 TOWNHOUSE UNITS
271 TOTAL UNITS

WEST BLOCK
APARTMENT
316 UNDERGROUND SPACES
86 SURFACE SPACES
402 TOTAL SPACES
1.48 SPACES PER UNIT

TOWNHOUSES
2.0 SPACES PER UNIT

EAST BLOCK
384 UNDERGROUND SPACES
79 SURFACE SPACES
463 TOTAL SPACES
1.25 SPACES PER UNIT

EAST BLOCK
152 UNITS - 8 STOREY
116 UNITS - 4 STOREY
100 UNITS - 6 STOREY
TOTAL = 370 UNITS

KEY PLAN

BENCHMARK

REVISONS

NO	REVISION	DATE	BY

STAMP

nexTrans
CONSULTING ENGINEERS
Suite 201, 520 Industrial Parkway South
Aurora ON L4G 6W8
Tel: 905-503-2563
Web: www.nextrans.ca

PROJECT NAME:
RESIDENTIAL DEVELOPMENT
801–870 Scenic Drive
(City of Hamilton)

DRAWING TITLE:
AutoTURN Analysis
(HSU TAC–2017)

DESIGN BY: K.A.	DATE: April 14, 2022
CHECKED BY: R.P.	PROJECT NO. NT-18-048
DRAWN BY: K.A.	DRAWING NO. Figure 16
SCALE: NTS	

Appendix A
City of Hamilton Comments

Hamilton

Mailing Address:
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Hamilton, Ontario
Canada L8P 4Y5
www.hamilton.ca

Planning and Economic Development Department
Development Planning, Heritage and Design
71 Main Street West, 5th Floor, Hamilton ON L8P 4Y5
Phone: 905-546-2424 Fax: 905-546-4202

March 18, 2021

File: 25T-202008
ZAC-20-041
UHOPA-20-026
Folder: 2020 190960 00 PLAN (1006203)

UrbanSolutions Planning & Land Development Consultants Inc.
c/o Sergio Manchia
105 Main St. E Suite 501
Hamilton ON L8N 1G6

Dear Mr. Manchia:

Re: Draft Plan of Subdivision, Zoning By-law Amendment and Official Plan Amendment Applications by by UrbanSolutions Planning & Land Development Consultants Inc. c/o Sergio Manchia for Lands Located at 870 Scenic Drive and 828 Sanatorium Road, Hamilton (Ward 14)

Your Official Plan Amendment, Zoning By-law Amendment, and Draft Plan of Subdivision applications have been considered by the City of Hamilton and external stakeholders.

The purpose and effect of this proposed **Urban Hamilton Official Plan Amendment** is to:

1. adjust the Core Area limits within the subject site (identified as a Significant Woodland and Locally Environmentally Significant Area), realign the Neighbourhoods and Open Space designations accordingly, and realign the stream traversing the site; and,
2. amend the Chedmac Secondary Plan by:
    - redesignating portions of the lands from “Medium Density Residential 3” to “Natural Open Space” and from “Natural Open Space” to “Medium Density Residential 3”, adjusting Site Specific Policy boundaries B-1 through B-4, and realigning the stream, to align to the proposed amendments to the Urban Hamilton Official Plan described above;
    - removing Old Sanatorium Road as a public road; and,
    - replacing the text of Area Specific Policies B-1 & B-2;

in order to enhance the extent of the natural heritage features and to permit the development of multiple dwellings with a maximum of 260 dwelling units in Area Specific Policy B-1, having a net residential density of 87 units per net residential hectare; 370 dwelling units in Area Specific Policy B-2, having a net residential density of 130 units per hectare; and, the adaptive reuse of the existing Long and Bisby building for commercial uses.

The purpose and effect of this proposed **Zoning By-law Amendment** is to change the zoning from:

- the "DE-H/S-1600" (Low Density Multiple Dwellings) District, Modified, Holding;
- the "E-H/S-1600" (Multiple Dwellings, Lodges, Clubs, Etc.) District, Modified, Holding;
- the "AA/S-1353" (Agricultural) District, Modified;
- the Conservation/Hazard Land (P5) Zone; and,
- the Conservation/Hazard Land (P5, 672, H69) Zone;

to "DE/S-___" (Low Density Multiple Dwellings) Districts, Modified and the Conservation/Hazard Land (P5) Zone, in order to permit the development of four to eight storey multiple dwellings (574 dwelling units) and 14 three storey block townhouse dwellings along a private condominium road (56 dwelling units) for a total of 630 dwelling units, with on-site surface and underground parking areas, open space, and amenity areas, with accesses from Scenic Drive. The existing "Long and Bisby" heritage building will be retained and is proposed to be reused for commercial / office uses.

The proposed **Draft Plan of Subdivision** consists of seven blocks, with two blocks for multiple dwellings (Blocks 2 & 5), two Open Space blocks (Blocks 1 & 4), one Stormwater Management block (Block 3), one Woodlot / ESA block (Block 6), and one block for road widening (Block 7).

Following the internal Plan of Subdivision Team Meeting held on January 28, 2021, the City of Hamilton and external stakeholders offer the following feedback:

Comment/Concern	Required Study/Report

Development Planning **Tim Vrooman**	
• The subject lands are identified as "Neighbourhoods" and "Major Open Space" on Schedule E – "Urban Structure" and designated "Neighbourhoods" and "Open Space" on Schedule E-1 – "Urban Land Use Designations" of the Urban Hamilton Official Plan (UHOP). • The subject lands are designated "Medium Density Residential 3" and "Natural Open Space" in the Chedmac Secondary Plan and located within "Site	**Required documentation:** • Planning Justification Report Addendum addressing general residential intensification and specific built form and scale policies.

Specific Policy B-1, B-2, B-3, B-4" areas. The subject lands are identified as a Cultural Heritage Landscape. • The west portion of the subject lands are designated "Medium Density Apartments" and "Open Space" in the Mountview Neighbourhood Plan. The remainder of the lands to the east are in the Westcliffe West Neighbourhood Planning Unit (no Neighbourhood Plan has been adopted for the Westcliffe West Neighbourhood).	• Revised Draft Official Plan Amendment and Draft Zoning By-law Amendment. • Revised Concept Plan / Architectural Drawing Package for consistency.

The following policies, amongst others, apply:

B.2.4.1.4 *Residential intensification* developments shall be evaluated based on the following criteria:

a) a balanced evaluation of the criteria in b) through g), as follows;

b) the relationship of the proposal to existing neighbourhood character so that it maintains, and where possible, enhances and builds upon desirable established patterns and built form;

c) the development's contribution to maintaining and achieving a range of dwelling types and tenures;

d) the compatible integration of the development with the surrounding area in terms of use, scale, form and character. In this regard, the City encourages the use of innovative and creative urban design techniques;

e) the development's contribution to achieving the planned urban structure as described in Section E.2.0 – Urban Structure;

f) infrastructure and transportation capacity; and,

g) the ability of the development to comply with all applicable policies.

B.2.4.2.1 *Residential intensification* within lands designated Neighbourhoods identified on Schedule E-1 - Urban Land Use Designations shall comply with Section E.3.0 – Neighbourhoods Designation.

B.2.4.2.2 When considering an application for a residential intensification development within the Neighbourhoods designation, the following matters shall be evaluated:

a) the matters listed in Policy B.2.4.1.4;

b) *compatibility* with adjacent land uses including matters such as shadowing, overlook, noise, lighting, traffic, and other nuisance effects;

c) the relationship of the proposed building(s) with the height, massing, and scale of nearby residential buildings;

d) the consideration of transitions in height and density to adjacent residential buildings;

e) the relationship of the proposed lot(s) with the lot pattern and configuration within the neighbourhood;

f) the provision of amenity space and the relationship to existing patterns of private and public amenity space;

g) the ability to respect and maintain or enhance the streetscape patterns including block lengths, setbacks and building separations;

h) the ability to complement the existing functions of the neighbourhood;

i) the conservation of *cultural heritage resources*; and,

j) infrastructure and transportation capacity and impacts.

E.3.2.4 The existing character of established Neighbourhoods designated areas shall be maintained. *Residential intensification* within these areas shall enhance and be compatible with the scale and character of the existing residential neighbourhood in accordance with Section B.2.4 – Residential Intensification and other applicable policies of this Plan.

E.3.5 **Medium Density Residential**

E.3.5.1 Medium density residential areas are characterized by *multiple dwelling* forms on the periphery of neighbourhoods in proximity to major or minor arterial roads, or within the interior of neighbourhoods fronting on collector roads.

E.3.5.2 Uses permitted in medium density residential areas include *multiple dwellings* except street townhouses.

E.3.5.5 Medium density residential uses shall be located within safe and convenient walking distance of existing or planned *community facilities*, public transit, schools, active or passive recreational facilities, and local or District Commercial uses.

E.3.5.6 Medium density residential built forms may function as transitions between high and low profile residential uses.

E.3.5.7 For medium density residential uses, the *net residential density* shall be greater than 60 units per hectare and not greater than 100 units per hectare.

E.3.5.8 For medium density residential uses, the maximum height shall be six storeys.

E.3.5.9 *Development* within the medium density residential category shall be evaluated on the basis of the following criteria:

a) Developments should have direct access to a collector or major or minor arterial road. If direct access to such a road is not possible, the development may gain access to the collector or major or minor arterial roads from a local road only if a small number of low density residential dwellings are located on that portion of the local road.

b) *Development* shall be integrated with other lands in the Neighbourhoods designation with respect to density, design, and physical and functional considerations.

c) *Development* shall be comprised of sites of suitable size and provide adequate landscaping, amenity features, on-site parking, and buffering if required. The height, massing, and arrangement of buildings and structures shall be compatible with existing and future uses in the surrounding area.

d) Access to the property shall be designed to minimize conflicts between traffic and pedestrians both on-site and on surrounding streets.

e) The City may require studies, in accordance with Chapter F – Implementation Policies, completed to the satisfaction of the City, to demonstrate that the height, orientation, design, and massing of a building or structure shall not unduly overshadow, block light, or result in the loss of privacy of adjacent residential uses.

VOL. 2 – Chedmac Secondary Plan:

- Medium Density Residential 3; Natural Open Space; Site Specific Policy Area B-1. B-2, B-3, B-4 **(Map B.6.3-1 – Land Use Plan)**
- Cultural Heritage Landscape **(Map B.6.3-2 – Cultural Heritage Landscapes)**

B.6.3.2 Residential Designations

The majority of the vacant lands within the Chedmac Planning Area shall be developed for low and medium density residential purposes. The residential policies shall define the location and scale of each type of residential use, and shall help ensure that a variety of residential types are provided to meet the needs of all area residents.

B.6.3.2.1 The residential areas are designated Low Density Residential 1, Low Density Residential 1a, Low Density Residential 2c, and Medium Density Residential 3 on Map B.6.3-1 – Chedmac - Land Use Plan. The following policies shall apply to each of these land use designations. **(OPA 109)**

B.6.3.2.2 General Residential Policies

In addition to Section E.3.0 – Neighbourhood Designation of Volume 1, the following general policies apply to all residential land use designations identified on Map B.6.3 -1 – Chedmac - Land Use Plan:

a) Within each residential density designation, the Zoning By-law shall restrict the use of any site to the dwelling unit types permitted within that designation. Such restrictions shall be implemented to preserve the character of the neighbourhood and compatibility of dwelling unit types with surrounding existing and proposed land uses.

b) Residential development shall be located to ensure a gradation of residential densities.

c) Residential development adjacent to existing institutional facilities may be subject to a noise study.

B.6.3.2.4 Medium Density Residential 3 Designation **(OPA 109)**

The following polices shall apply to the lands designated Medium Density Residential 3 on Map B.6.3 -1 – Chedmac - Land Use Plan:

a) In addition to Policies E.2.5.2 of Volume 1, lands designated Medium Density Residential 3 shall consist of block townhouses, stacked townhouses, and multiple dwellings.

b) Notwithstanding Policy E.3.5.7 of Volume 1, the net residential density shall be greater than 75 units per hectare and shall not exceed 100 units per hectare.

B.6.3.3 Parks and Open Space Designations

B.6.3.3.1 In addition to Sections B.3.5.3 – Parkland Policies and C.3.3 – Open Space Designations, the following policies shall apply to the lands designated Neighbourhood Park, Community Park, General Open Space, and Natural Open Space on Map B.6.3 - 1 - Chedmac - Land Use Plan: **(OPA 109)**

a) Three components make up the parks and open space system of the Chedmac community:

iv) Natural Open Space.

b) The expanded parkland shall provide an open space linkage from the existing neighbourhood to the recreational facilities located within the Chedmac Planning Area.

B.6.3.6 Transportation Policies

A safe and efficient road network shall be established in the Chedmac Secondary Plan area.

Site Specific Policy – Area B (OPA 109)

B.6.3.7.2 Chedoke Browlands

The Chedoke Browlands are located north of the intersection of Scenic Drive and Sanatorium Road, known municipally as 801-780 Scenic Drive, designated Medium Density Residential 3, General Open Space and Natural Open Space, and identified as Area Specific Policy Area B on Map B.6.3.1 – Chedmac Secondary Plan – Land Use Plan.

B.6.3.7.2.1 Objectives

a) In addition to Section B.6.3.1 of Volume 2, the following objectives shall apply to the Chedoke Browlands (Area B):

i) To provide for the opportunity of small scale commercial and business uses in close proximity to residential uses, live/work dwelling units are encouraged;

ii) To ensure that the development of the Chedoke Browlands (Area B) shall provide a safe, attractive and pedestrian-oriented residential environment with a high quality of design of buildings, public spaces and streets;

ii) To encourage energy conservation through community planning, site planning and urban design;

iv) To integrate natural and cultural heritage features into the design of the site with specific focus on the open space areas as well as providing a strong link to the Niagara Escarpment;

v) To integrate significant cultural heritage landscape features and characteristics such as the pavilion design, the curvilinear street pattern, as well as the sense of openness and park-like setting, into the development;

vi) To identify and protect historically or architecturally significant buildings and cultural heritage landscape features;

vii) To ensure compatibility with the existing residential area;

viii) To develop a land use pattern and transportation system that supports transit, cyclists and pedestrians and vehicular traffic;

ix) To provide public linkages to and through the site; and,

x) To provide and/or protect significant views and encourage sensitive development adjacent to the Niagara Escarpment.

B.6.3.7.2.2 Residential Policies

Areas B-1 and B-2

a) The following policies shall apply to those lands designated Medium Density Residential 3 - Land Use Plan and identified as Areas B-1 and B-2 in Area Specific Policy B on Map B.6.3-1 – Chedmac Secondary Plan – Land Use Plan:

i) In addition to Sections E.3.5.2 – Medium Density designation of Volume 1 and B.6.3.2.4 Medium Density Residential 3 Designation, a retirement home and amenity uses may be permitted.

ii) Notwithstanding Sections E.3.5.2 – Medium Density Residential designation of Volume 1 and B.6.3.2.3 Medium Density Residential 3 Designation, live/work units may be permitted in block townhouses only, except for lands fronting on Scenic Drive and shall be limited to only the following uses:

1. Artists' or photographers' studios;
2. Personal services;
3. Custom workshop; and,
4. Office

iii) Notwithstanding Sections E.3.5.4 – Medium Density Residential designation of Volume 1 and B.6.3.2.4 – Medium Density Residential 3 Designation, limited local commercial uses may be permitted within apartment buildings on the ground floor only and within the heritage buildings existing as of June 22, 2012 and in accordance with the Zoning By-law.

iv) Notwithstanding Sections E.3.5.7 – Medium Density designation (scale) of Volume 1 and B.6.3.2.4 - Medium Density 3 Residential Designation, the maximum net residential density shall not exceed 80 units per hectare.

v) Notwithstanding Policy B.6.3.7.2.2 a) iv), a maximum of 529 dwelling units shall be permitted. For the purposes of overall unit count and density:

1. Up to 100 of the permitted dwelling units may be allocated as retirement dwelling units and two retirement dwelling units shall be equivalent to one residential dwelling unit.

2. Should the land owner choose to implement the equivalency option in Policy B.6.3.7.2.2 a) v) 1, a maximum of 429 residential dwelling units and 200 retirement dwelling units shall be permitted within the Area Specific Policy Areas B-1 and B-2.

3. Notwithstanding the equivalency option in Policy B.6.3.7.2.2 a) v) 1, retirement dwelling units may also be permitted on a one to one basis exceeding the 200 equivalency units, provided the total number of dwelling units shall not exceed 629.

vi) The Long Bisby building, existing as of June 22, 2012, and shown on Map B.6.3-2 – Cultural Heritage Landscapes, shall be retained and conserved through sympathetic adaptive reuse, where structurally feasible.

vii) Notwithstanding Policies B.6.3.7.2.2 a) v), b) i) and c) i), uses contained within any existing heritage building shall not contribute to the overall unit count gross floor area or density.

viii) Direct vehicular access to individual buildings shall be prohibited from Scenic Drive. The site shall be developed on the premise of a private condominium road network.

ix) New buildings and structures shall be set back a minimum of 30 metres from the staked limit of the brow of the Niagara Escarpment. If enlarging any part of an existing building which is located closer than the 30 metres, no part of

the new construction shall be within the 30 setback to the staked limit of the Niagara Escarpment or closer to the brow than the existing building.

Area B-1

b) In addition to Section B.6.3.7.2.2 a), the following policies shall apply to the lands designated Medium Density Residential 3 and identified as Area specific B-1, on Map B.6.3-1 – Chedmac - Land Use Plan:

i) Notwithstanding Policy E.3.5.7 and B.6.3.2.4 b),

1. a maximum of 195 units; shall be permitted and,
2. the overall gross floor area for all residential units shall not exceed 20,000 square metres.

i) Notwithstanding Section E.3.5.8 – Medium Density Residential (scale), the maximum height of buildings shall not exceed

1. 4 storeys for buildings located in the interior of the site; and,
2. 3 storeys for buildings located on Scenic Drive.

iii) Notwithstanding Policy B.6.3.7.2.2 a) ix), a residential building shall be permitted in the vicinity of the former Brow Infirmary building provided:

1. it maintains the existing setbacks from the Escarpment brow; and,
2. the design of the building shall incorporate the recommendations of the Cultural Heritage Impact Assessment

Area B-2

c) In addition to Section B.6.3.7.2.2 a), the following policies shall apply to the lands designated Medium Density Residential 3 and identified as Area Specific B-2, on Map B.6.3-1 – Chedmac – Land Use Plan:

i) Notwithstanding Policy E.3.5.7 and B.6.3.2.4 b),

1. a maximum of 335 units shall be permitted; and,
2. the overall gross floor area for all residential units shall not exceed 34,000 square metres.

ii) Notwithstanding Section E.3.5.8 – Medium Density Residential (scale), the maximum height of buildings shall not exceed:

1. 3 storeys for block or stacked townhouses; and,
2. 4 storeys for apartment buildings

iii) In addition to Policy E.3.5.4 of Volume 1 and B.6.3.2.4 b) and notwithstanding Policy E.3.8.2 a) – Local Commercial Permitted Uses in Volume 1, only the following commercial and institutional uses shall be permitted in the existing "Long and Bisby" building:

1. Art Gallery;
2. Artist Studio;
3. Craftsperson Shop;
4. Office;
5. Personal Services;
6. Retail Store, excluding a Convenience Store, not to exceed 200 square metres;
7. Day Nursery;
8. Library;
9. Museum;
10. Community Centre;
11. Lecture Room; and,
12. Medical Clinic.

iv) The existing "Long and Bisby" building may also be converted to a maximum of 12 residential dwelling units provided the heritage character of the building is not altered significantly.

B.6.3.7.2.3 Natural Open Space

a) Lands designated "Natural Open Space" and identified as B-3 and B-4 on Map B.6.3-1 Chedmac Secondary Plan – Land Use Plan shall be preserved as natural open space and no development shall be permitted. Conservation, flood and erosion control, and passive recreation uses shall be permitted.

b) Notwithstanding Policy B.6.3.7.2.3 a), the existing heritage building may be converted to other uses in accordance with Policies B.6.3.7.2.2 c) iii) and iv); and,

c) A vegetative protection zone (buffer) will be provided along B-3, as identified through an approved Environmental Impact Statement, and revegetated in accordance with the recommendations of this study.

B.6.3.7.2.4 Urban Design

The Chedoke Browlands (Area B) shall be developed in accordance with the following urban design principles:

a) Prior to the approval of site plan and/or plan of condominium applications, the applicant is required to submit:

i) A Master Site Plan including, among other matters, a phasing plan, visual impact assessment and urban design guidelines, in accordance with Policies B.6.3.7.2.4 b) to f);

ii) A Precinct Plan, in accordance with Policies B.6.3.7.2.4 g) and h) below;

iii) Architectural Control Guidelines, in accordance with Policy B.6.3.7.2.4 i); and,

iv) An Urban Design Report, in accordance with Policy B.6.3.7.2.4 j).

Visual Impact Assessment/Viewshed Analysis

b) All new development proposals within Chedoke Browlands (Area B) shall conform to an approved Visual Impact Assessment prepared to the satisfaction of the City of Hamilton, in consultation with the Niagara Escarpment Commission. The Visual Impact Assessment shall:

i) determine the potential for adverse impacts on the Niagara Escarpment.

ii) recommend mitigation measures to assist in the visual integration of buildings into the landscape of the Niagara Escarpment, including but not limited to, landscaping, architectural treatment of buildings, building heights, roof details and fenestration, glazing of buildings and lighting;

c) An addendum to the Visual Impact Assessment will be required, prior to Site Plan Approval and the removal of “H” Holding provisions in the implementing Zoning By-law, detailing how the final building locations meet the Visual Assessment Guidelines and the requirements of the policies within Section B.6.3.7.2 – Chedoke Browlands (Area B).

d) All new developments shall be implemented in accordance with the Visual Impact Assessment, including the addendum, as appropriate.

Master Site Plan

e) A Master Site Plan shall be prepared prior to the removal of any “H” Holding Provision in the implementing Zoning By-law and prior to Site Plan Approval.

f) Master Site Plan shall provide a general site plan for all of the lands within Chedoke Browlands (Area B) and shall include:

i) Key neighbourhood design and built form elements, such as: the internal road system; pedestrian and cycling circulation and connectivity; buildings and associated parking areas; open space and recreational areas; cultural heritage buildings, structures and features that are to be preserved; locations of commercial and other non-residential uses; and other neighbourhood and site design elements (such as viewsheds identified in the Visual Impact Assessment as set out in Policy B.6.3.7.2.4 b) to d);

ii) General urban design guidelines to illustrate the intended character of buildings, streets and exterior spaces, and building relationships to streets and public spaces, to natural environment areas, to heritage buildings and structures to be preserved and to the surrounding neighbourhood. The guidelines shall address how the proposed development features such as new buildings, entry features, streetscape and landscape design are to be sympathetic in nature to the historical significant of the Chedoke Browlands (Area B), retained
natural heritage features (including the Niagara Escarpment) and, to the heritage architectural and cultural landscape features that will be conserved; and,

iii) A phasing plan for Chedoke Browlands (Area B);

Precinct Plans

g) Precinct Plans shall be prepared for each phase of development. The Precinct Plan shall illustrate the intended form of development for each block including the implementation of the overall neighbourhood design and built form elements (as set out in the Master Site Plan) and include: building footprints and heights; parking areas; landscaped areas; the manner in which cultural heritage buildings, structures and features are to be preserved and integrated into the project; and the locations of commercial and other non-residential uses.

h) The Master Site Plan and Precinct Plan(s) shall be used as a guide in the preparation and review of Site Plan and Plan of Condominium Applications. Deviations from the Master Site Plan may be permitted where required to reflect detailed building or infrastructure design, provided the change is consistent with the intent Urban Hamilton Official Plan and fundamental principles of the Master Site Plan are maintained, to the satisfaction of the City.

Architectural control guidelines

i) Architectural control guidelines shall be prepared prior to Site Plan Approval to provide design guidance necessary to achieve a high quality of architectural design and to ensure that new buildings are sympathetic to both the historical significance of the Chedoke Browlands (Area B) and to the heritage architecture and cultural landscape features that will be preserved. Architectural control is to be implemented through a third-party registered architect retained by the City.

Urban Design Report

j) The Urban Design Report shall include text, plans, details and/or elevations, as necessary, to demonstrate how the intent of the Chedmac Secondary Plan policies and the urban design policies contained in Section B.6.3.7.2.4 – Chedoke Browlands (Area B) have been met.

Other Policies

k) Significant views to and from the Escarpment Urban Area shall be maintained and enhanced, consistent with the cultural heritage landscape.

l) Surface parking shall be prohibited between Scenic Drive and the main wall of any building that faces Scenic Drive.

m) The majority of parking shall be accommodated either through underground structures or within buildings.

n) A minimum of 30% of landscaped open space shall be maintained for each of Areas B-1 and B-2. In order to preserve the open, park-like setting, the established groupings of trees shall be preserved, where possible.

o) Continuous building walls along Scenic Drive shall be prohibited. Buildings shall provide appropriate spacing based on building height to allow light, reduce shadow impacts and provide privacy between buildings. The spacing of the buildings will also promote views into and through the site.

p) All block townhouse units shall have the principal front door orientated towards Scenic Drive or an internal private condominium road or driveway. For townhouse units fronting both Scenic Drive and an internal public street, private condominium road or driveway, the principal entrance shall be orientated towards the public street.

q) All apartment buildings shall have a minimum podium height of 2 storeys and a maximum podium height of 4 storeys. Those portions of apartment buildings that abut Scenic Drive shall be setback above 4 storeys.

r) Green roofs shall be incorporated, where feasible, for all buildings that exceed 4 storeys in height.

s) Development of the Chedoke Browlands (Area B) shall incorporate sustainable site and building features and technologies to minimize energy consumption, conserve water, reduce waste, improve air quality and promote human health and wellbeing. All new development shall incorporate Leadership in Energy and Environmental Design (LEED) certification for new construction and neighbourhood development Low Impact Development (LID) approaches, where possible.

B.6.3.7.2.5 Transportation

In addition to Section C.4 – Integrated Transportation Network of Volume 1 and Policy B.6.3.6 of Volume 2, the following policies shall also apply:

a) The Chedoke Browlands (Area B) will be developed on the premise of a network of private driveways together with a private condominium road or public street, with a minimum of two driveway accesses to Scenic Drive.

b) New development shall support the use of public transit by creating a comfortable pedestrian environment with links to the public arterial road system where transit will be provided.

c) A pedestrian pathway network shall be established throughout the Chedoke Browlands (Area B) to connect to the Brow Trail. A public access easement shall be granted for pedestrian linkages within the north-south portion of the private road (as shown as a dashed line on Map B.6.3-1 Chedmac Secondary Plan – Land Use Plan).

d) A roundabout may be required at the southerly intersection of Scenic Drive and the private road (as shown as a dashed line on Map B.6.3-1 – Chedmac Secondary Plan – Land Use Plan) and any land required to accommodate the roundabout shall be dedicated to the City.

e) The Owner shall submit a streetscape plan for existing Sanatorium Road either as a private condominium road or as a public street.

f) A bicycle pathway, as identified in the City's Trails Master Plan, shall be provided and maintained through an easement along the north-south alignment of the Sanatorium Road either as a private condominium road or public street (as shown as a dashed line on Map B.6.3-1 – Chedmac Secondary Plan – Land Use Plan).

g) Any private condominium road shall be engineered and built to carry the load of fire apparatus to the satisfaction of the Fire Chief.

B.6.3.7.2.6 Cultural Heritage Resources

In addition to Section B.3.4 – Cultural Heritage Resources of Volume 1, the following policies shall also apply:

a) The lands contained within the Chedoke Browlands (Area B) have been included in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest, Appendix A: Inventory of Cultural Heritage Landscapes, as such, development and redevelopment within the Chedoke Browlands (Area B) shall be sympathetic to the cultural heritage landscape and shall ensure the conservation of significant built heritage and cultural heritage resources.

b) The Chedoke Browlands (Area B) shall be developed in accordance with the following built heritage conservation and planning principles and objectives:

i) The continuation of a pedestrian corridor along the brow of the Niagara Escarpment;

ii) The protection and retention of the "Long and Bisby" Building as shown as LB on Map B.6.3-2 – Chedmac Secondary Plan – Cultural Heritage Landscapes, in situ and through sympathetic adaptive reuse;

iii) A new building in the location of the former "Brow Infirmary" Building shall be designed to respect the heritage architecture of the original building shall be constructed in the same approximate building footprint to a maximum height of 4 storeys and be set back from the staked limit of the brow of the Niagara Escarpment no closer than the existing "Brow Infirmary" Building;

iv) The preservation and conservation of the pedestrian bridge over the Chedoke Creek and the stone vehicular bridge and associated stone wall/pillars; and,

v) The preservation and conservation of other heritage resources shall be encouraged. Where these resources cannot be retained, then the City will require the appropriate documentation of all buildings to be demolished be provided prior to removal.

Cultural Heritage Landscapes

c) The cultural heritage landscape consists of the curvilinear street pattern, open park-like setting, the undulating topography, the natural areas, the views through the site and the spatial organization of the buildings. In addition, the buildings themselves, the pedestrian bridge, the Cross of Lorraine, the stone pillars and stone wall, the stormwater management facility and Escarpment stairs are elements of the cultural heritage landscape.

d) Development within the Chedoke Browlands (Area B) shall have d to the following cultural heritage landscape requirements:

i) Development shall be compatible with the existing cultural heritage landscape, such that open spaces, plantings and the curvilinear street pattern are maintained and/or referenced in the new development and that the layout and scale of buildings reflect the existing site, where possible;

ii) The existing topography of the perimeter roads, woodlots and Chedoke Creek and stormwater management facility shall be maintained, where feasible.

iii) The existing trees and vegetation within the Chedoke Creek/stormwater management facility shall be maintained and enhanced.

iv) A tree preservation plan shall be submitted to determine the opportunities for the protection and preservation of individual trees and the recommendations shall be implemented to the satisfaction of the City. The plan shall be prepared in association with the Heritage Impact Assessment so that trees that contribute to the cultural heritage landscape can be identified and considered for preservation;

v) Significant view and view corridors to, through, and from Chedoke Browlands (Area B) shall be protected, as identified in the Master Site Plan, identified in Section B.6.3.7.2.4 – Urban Design of Volume 2.

vi) An open, park-like landscape setting shall be provided in front of the “Long and Bisby” Building. Limited parking may be permitted provided there are no other feasible alternative locations; and,

vii) The existing curvilinear road alignment of old Sanatorium Road shall be respected, where technically feasible.

Cultural Heritage Impact Assessment

e) A Cultural Heritage Impact Assessment or Assessments shall be undertaken prior to Site Plan Approval for any development within Chedoke Browlands (Area B) and shall contain the following matters:

i) Identification and evaluation of the following potentially affected cultural heritage resource(s): The “Long and Bisby” Building; including detailed site(s) history and cultural heritage resource inventory containing textual and graphic documentation;

ii) A descriptive of the proposed development or site alteration and alternative forms of the development or site alteration;

iii) A description of all cultural heritage resource(s) to be affected by the development and its alternative forms;

iv) A description of the effects on the cultural heritage resource(s) by the proposed development or site alteration and its alternative forms; and,

v) A description of the measures necessary to mitigate the adverse effects of the development or site alteration and its alternatives upon the cultural heritage resource(s).

f) The City may require that, as part of the development or redevelopment of the lands, heritage features be retained on site and incorporated, used for adaptively re-used as appropriate.

g) Where appropriate, the City may impose a condition on any development approval for the retention and conservation of the affected heritage features or the implementation of recommended mitigation measures through heritage easements pursuant to the Ontario Heritage Act and/or Development Agreements.

<u>Archaeology</u>

h) An Archaeological Assessment shall be undertaken by an Ontario licensed archaeologist for the entire site to the satisfaction of the Ministry of Culture and the City of Hamilton prior to any development or site alteration (including site grading, tree planting/removal and topsoil disturbance);

i) Where archaeological features are identified, the development proponent shall develop a plan, to protect, salvage or otherwise conserve the features within the

context of the proposed development as recommended by a licensed archaeologist and approved by the Province and the City of Hamilton.

B.6.3.7.2.7 Stormwater Management and Engineering

In accordance with Section C.5.4 – Storm Water Management of Volume 1, the following policies shall also apply:

a) Stormwater management facilities shall follow an integrated design process. The design of the facilities shall respect the recommendations of the Tree Preservation Plan and Heritage Impact Assessment.

b) Submission of engineering and grading plans for stormwater management facilities shall demonstrate a low impact design and how impact to the important heritage features identified will be minimized.

c) Due to the sensitive nature of the site a detailed engineering submission outlining how excavation for footings or underground parking on the subject lands can be achieve without adversely affecting the stability of the Niagara Escarpment. The report shall consider utilizing methods other than blasting, where possible.

B.6.3.7.2.8 Implementation

a) The “H” Holding provisions in the implementing Zoning By-law shall include the following requirements and maybe lifted for portions of the site to allow development to occur in phases:

i) The Master Site Plan and/or Master Plan for the relevant development phase has been prepared to the satisfaction of the City;

ii) Studies or updates/addenda to existing studies, as determined by the Director of Planning and Chief Planner, have been prepared which inform and support the master plan(s), and which may include:

1. Sustainability Strategy;
2. Detailed Cultural Heritage Impact Assessment(s);
3. Stormwater Management Report that considers Low Impact Development opportunities;
4. Tree Preservation/Protection Plan;
5. Traffic Impact Study;
6. Visual Impact Assessment or Update;
7. Archeological Assessments;,
8. Geotechnical/Engineering Study; and,

9. Detailed Servicing Strategy;

iii) The urban design guidelines have been prepared in accordance with Policy F.3.2.5.2 of Volume 1, to the satisfaction of the City;

iv) An Urban Design Report has been submitted to demonstrate, to the satisfaction of the Director of Planning, compliance with the urban design policies contained in Section B.3.3 – Urban Design Policies of Volume 1 and Section B.6.3.7.2.4 – Chedoke Browlands (Area B).

Planning staff have reviewed the submitted materials, and have the following comments:

1. Staff are concerned that the Planning Justification Report has not discussed residential intensification policies (including but not limited to B.2.4.1.4 and B.2.4.2.2) to demonstrate how the proposed development will maintain and enhance the character of the existing neighhourhood. Further, density and height policies of the Urban Hamilton Official Plan and Chedmac Secondary Plan have not been discussed. The subject lands are designated Medium Density. Volume 1 of the UHOP provides for a density range of 60-100 dwelling units per hectare (du/ha) with a maximum building height of six storeys, and the Chedmac Secondary Plan policies further refine the density range to 75-80 du/ha for the subject lands. The proposed development includes multiple dwellings with building heights of up to eight storeys, with densities of 87 du/ha in the western precinct (Block 2 / Area B-1) and 130 du/ha in the eastern precinct (Block 5 / Area B-2). The proposed increase in density (Area B-2 in particular) and height above the existing policies to ranges found in high density built form and scale has not been discussed.

   Staff have also noted that the proposed Official Plan Amendment is notwithstanding all of the existing UHOP and Secondary Plan medium density policies, and replacing the existing Area Specific Policies in their entirety, with generic density and height notwithstanding clauses. Staff is concerned that the existing special policy area framework has not been considered with the proposed amendments.

2. Staff have reviewed the submitted zoning by-law amendment and provides the following preliminary comments:

   a. A minimum 2.0 m setback for townhouses along Scenic Drive is proposed. Please confirm projecting yard encroachments (i.e. front porches and steps) would not encroach into the road right-of-way, and that an appropriate relationship and transition between the public and private realms is provided.

   b. A minimum 4.0 m setback for four storey multiple dwellings along Scenic Drive is proposed. Based on the Concept Plan, it appears this setback is only located at the triangular right-of-way for the proposed roundabout; otherwise the building is

consistent with the 5.5 m setback from five storey multiple dwellings. Staff recommend revisiting the proposed 4.0 m setback to maintain a consistent street wall along Scenic Drive.

c. Sections 2.1 (d) and 2.2 (d) of the amending by-law is notwithstanding Subsection 10A (5) Landscaped Area, and only 2.2 (d) is notwithstanding 10A (6). Clarification on these revisions and intent for required landscaped areas is required.

d. Section 2.2 (f) of the amending by-law is notwithstanding Table 1 of Section 18A. Staff note that Table 2 provides minimum required residential visitor parking. Please clarify.

e. Section 2.3 (a) of the amending by-law is notwithstanding Section 18A (8). Staff note that this is parallel parking space dimensions, and that other parking space dimensions are found in Section 18A (7). Please clarify.

f. Loading space requirements for multiple dwellings are proposed to be deleted. Please confirm how loading needs will be met on site, as the Transportation Impact Study implies that the proposed development will meet existing zoning by-law requirements.

3. Staff have reviewed the submitted Concept Plan and architectural drawings, and provide the following preliminary comments:

   a. West block parkade: The most westerly parking rows appear to have a long travel distance. It is recommended that the existing drive aisle from the ramp be extended the full extent of the parade. In addition, entering vehicles will be unable to navigate the turning radius entering the row adjacent to the ramp. Please review and revise.

The proposed zoning regulations appear to adopt current parking standards found in the comprehensive Hamilton Zoning By-law No 05-200. These standards also require where a wall, column, or any other obstruction is located abutting a parking space within an underground parking structure, the minimum width of a parking space shall be increased by 0.3 metres. The plans do not indicate additional width has been provided.

b. East block: A drop off area is shown in front of Building B; however, it has not been demonstrated how vehicles will be able to properly turn around to navigate around this area.

c. East block parkade: The extent of the underground parking appears to encroach into the proposed municipal road allowance of the proposed roundabout. In addition, the architectural drawings do not show the proposed lot boundary around

the roundabout consistent with the draft plan and concept plans. Please review and revise.

The proposed zoning regulations appear to adopt current parking standards found in the comprehensive Hamilton Zoning By-law No 05-200. These standards also require where a wall, column, or any other obstruction is located abutting a parking space within an underground parking structure, the minimum width of a parking space shall be increased by 0.3 metres. The plans do not indicate additional width has been provided.

4. With respect to Old Sanatorium Road traversing the property, given that the subject applications have been submitted it is expected that a road closure application will be submitted as noted in the Planning Justification Report. Staff request an update on the status of this application.

5. Please refer to the following comments which further speak in greater detail to the unique natural and cultural heritage features of the site.

Cultural Heritage
David Addington

Archaeology:

The subject property meets four (4) of the ten criteria used by the City of Hamilton and Ministry of Tourism, Culture and Sport for determining archaeological potential:

1) Within 250 metres of known archaeological sites;
2) Within 300 metres of a primary watercourse or permanent waterbody, 200 metres of a secondary watercourse or seasonal waterbody, or 300 metres of a prehistoric watercourse or permanent waterbody;
3) In an area of elevated topography; and
4) In the vicinity of distinctive or unusual landforms;

These criteria define the property as having archaeological potential. Accordingly, Section 2 (d) of the *Planning Act* and Section 2.6.2 of the Provincial Policy Statement apply. A Stage 1-2 archaeological report (PIF# P018-176-2006) was completed for the subject property and submitted to the City of Hamilton and the Ministry of Tourism, Culture and Sport (MTCS) in 2007. The study resulted in the identification of four archaeological sites including 18 positive test pits. As a result, Stage 3 testing was recommended for all four archaeological sites identified A Stage 3 archaeological report (PIF # P018-209-2007) was then completed for the subject application and submitted to the City of Hamilton and the MTCS in 2007. The study

recommended that both Chedoke 1 site (AhGx-637) and Chedoke 4 site be cleared of the requirement for further study. Chedoke 2 site (AhGx-638) and Chedoke 3 site (AhGx-644) were considered to contain significant cultural heritage value and required further Stage 4 excavation. Both sites were excavated thoroughly and areas were cleared of archaeological potential. As such, the City's concerns for the subject property related to archaeology have been satisfied.

Built Heritage & Cultural Heritage Landscapes:

The subject property comprises the majority of the lands that once made up the Brow complex of buildings within the former Mountain Sanatorium (later the Chedoke Hospital). The property is listed as a Cultural Heritage Landscape (Chedoke Brow Lands-Brow Campus Cultural Heritage Landscape).

Additionally, a Notice of Intention to Designate (NOID) has been issued on December 18, 2020 to designate the Long and Bisby building at 828 Sanatorium Road under Part IV of the *Ontario Heritage Act*. The issuance of the NOID and the anticipated Council approval of the designation by-law in February 2021 establishes the requirement for any alterations to the designated heritage attributes of the Long and Bisby building to be subject to the approval of a heritage permit application. The identified heritage attributes are located on the exterior of the Long & Bisby building.

Chedmac Secondary Plan:

The subject property is located within the Chemdac Secondary Plan area and is within the Chedoke Browlands 'Site Specific Policy Area B'. Accordingly, the following policies related to cultural heritage apply:

"B.6.3.7.2.1(iv) To integrate natural and cultural heritage features into the design of the site with specific focus on the open space areas as well as providing a strong link to the Niagara Escarpment;

B.6.3.7.2.1(v) To integrate significant cultural heritage landscape features and characteristics such as the pavilion design, the curvilinear street pattern, as well as the sense of openness and park-like setting, into the development;

B.6.3.7.2.1(vi) To identify and protect historically or architecturally significant buildings and cultural heritage landscape features;

B.6.3.7.2.1(ix) To provide public linkages to and through the site;

B.6.3.7.2.2(vi) The Long Bisby building, existing as of June 22, 2012, and shown on Map B.6.3-2 – Cultural Heritage Landscapes, shall be retained and conserved through sympathetic adaptive reuse, where structurally feasible;

B.6.3.7.2.4(i) Architectural control guidelines shall be prepared prior to Site Plan Approval to provide design guidance necessary to achieve a high quality of architectural design and to ensure that new buildings are sympathetic to both the historical significance of the Chedoke Browlands (Area B) and to the heritage architecture and cultural landscape features that will be preserved. Architectural control is to be implemented through a third-party registered architect retained by the City;

6.3.7.2.6(a) The lands contained within the Chedoke Browlands (Area B) have been included in the City of Hamilton's Inventory of Buildings of Architectural and/or Historical Interest, Appendix A: Inventory of Cultural Heritage Landscapes, as such, development and redevelopment within the Chedoke Browlands (Area B) shall be sympathetic to the cultural heritage landscape and shall ensure the conservation of significant built heritage and cultural heritage resources;

6.3.7.2.6(b) The Chedoke Browlands (Area B) shall be developed in accordance with the **following built heritage conservation and planning principles and objectives:**

6.3.7.2.6(b)(i) The continuation of a pedestrian corridor along the brow of the Niagara Escarpment;

6.3.7.2.6(b)(ii) The protection and retention of the "Long and Bisby" Building as shown as LB on Map B.6.3-2 – Chedmac Secondary Plan – Cultural Heritage Landscapes, in situ and through sympathetic adaptive reuse

6.3.7.2.6(b)(iii) A new building in the location of the former "Brow Infirmary" Building shall be designed to respect the heritage architecture of the original building shall be constructed in the same approximate building footprint to a maximum height of 4 storeys and be set back from the staked limit of the brow of the Niagara Escarpment no closer than the existing "Brow Infirmary" Building;

6.3.7.2.6(b)(iv) The preservation and conservation of the pedestrian bridge over the Chedoke Creek and the stone vehicular bridge and associated stone wall/pillars;

6.3.7.2.6(c) The cultural heritage landscape consists of the curvilinear street pattern, open park-like setting, the undulating topography, the natural areas, the views through the site and

the spatial organization of the buildings. In addition, the buildings themselves, the pedestrian bridge, the Cross of Lorraine, the stone pillars and stone wall, the stormwater management facility and Escarpment stairs are elements of the cultural heritage landscape.

6.3.7.2.6(d) Development within the Chedoke Browlands (Area B) shall have regard to the **following cultural heritage landscape requirements:**

6.3.7.2.6(i) Development shall be compatible with the existing cultural heritage landscape, such that open spaces, plantings and the curvilinear street pattern are maintained and/or referenced in the new development and that the layout and scale of buildings reflect the existing site, where possible;

6.3.7.2.6(ii) The existing topography of the perimeter roads, woodlots and Chedoke Creek and stormwater management facility shall be maintained, where feasible;

6.3.7.2.6(iii) The existing trees and vegetation within the Chedoke Creek/stormwater management facility shall be maintained and enhanced.

6.3.7.2.6(iv) A tree preservation plan shall be submitted to determine the opportunities for the protection and preservation of individual trees and the recommendations shall be implemented to the satisfaction of the City. The plan shall be prepared in association with the Heritage Impact Assessment so that trees that contribute to the cultural heritage landscape can be identified and considered for preservation;

6.3.7.2.6(v) Significant view and view corridors to, through, and from Chedoke Browlands (Area B) shall be protected, as identified in the Master Site Plan, identified in Section B.6.3.7.2.4 – Urban Design of Volume 2;

6.3.7.2.6(vi) An open, park-like landscape setting shall be provided in front of the “Long and Bisby” Building. Limited parking may be permitted provided there are no other feasible alternative locations;

6.3.7.2.6(vii) The existing curvilinear road alignment of old Sanatorium Road shall be respected, where technically feasible.

6.3.7.2.6(e) A **Cultural Heritage Impact Assessment** or Assessments shall be undertaken prior to Site Plan Approval for any development within Chedoke Browlands (Area B) and **shall contain the following matters:**

6.3.7.2.6(i) Identification and evaluation of the following potentially affected cultural heritage resource(s): The "Long and Bisby" Building; including detailed site(s) history and cultural heritage resource inventory containing textual and graphic documentation;

6.3.7.2.6(ii) A descriptive of the proposed development or site alteration and alternative forms of the development or site alteration;

6.3.7.2.6(iii) A description of all cultural heritage resource(s) to be affected by the development and its alternative forms;

6.3.7.2.6(iv) A description of the effects on the cultural heritage resource(s) by the proposed development or site alteration and its alternative forms; and,

6.3.7.2.6(v) A description of the measures necessary to mitigate the adverse effects of the development or site alteration and its alternatives upon the cultural heritage resource(s)."

Staff comments:

The retention, protection and proposed adaptive reuse of the existing Long and Bisby building in-situ is a significant and welcome component of the development proposal. Staff are of the opinion that the proposed adaptive reuse first as a sales office and followed by office uses and potentially combined with amenity space for the residents of the future development is an appropriate reuse of the building.

Staff have the following comments based on the application of the aforementioned Secondary Plan policies to the submitted proposal.

Integration of curvilinear street pattern:

The existing curvilinear form and siting of Sanatorium Road through the middle of the site has been identified as a feature of the Cultural Heritage Landscape (CHL) in the Chedmac Secondary Plan. The subject proposal includes the closure of the road.

Staff are concerned that the removal of the road will eliminate the key public access pathway in front front of the Long & Bisby building and will contribute to the building's isolation from the remainder of the site while constricting public visibility of the building and reducing circulation through to the west side of the site.

The Chedmac Secondary Plan notes that the curvilinear street pattern should be maintained and/or referenced in the new development and the existing curvilinear road alignment of old

Sanatorium Road shall be respected, where technically feasible. Should Sanatorium Road be closed, options should be considered to replace this pathway to provide public access stretching north of the proposed parking lot on the east side of the site and past the front yard of the Long & Bisby building towards the northwest section of the site and the Brow Trail. The public access function and curvilinear pattern of Sanatorium Road should be referenced in any new pathway and may include a pedestrianized connection that follows the same approximate route as the current road and links to different areas of the site while providing views and public access to the building.

Integration of Sense of Openness of Park-like Setting:

The conservation of the woodlot to the east of the Long & Bisby building as well as the open space in the middle of the site will assist in contributing to the sense of openness over the landscape.

The proposal also includes the removal of the trees on site, including those contributing to the existing park-like setting within the front and side yards of the Long & Bisby building.

The submitted Tree Preservation Plan indicates that there are a number of native, healthy and mature trees in the immediate vicinity of the Long and Bisby building that are proposed to be removed or injured. The mature trees are a key element of the CHL that signify the lasting heritage and longevity of the site and contribute to its park-like setting and their value cannot easily be replaced with new plantings. Every effort should be made to preserve the mature, healthy trees identified in the Tree Preservation Plan surrounding the Long & Bisby building to maintain the park-like setting both identified as a heritage attribute in the property's designation by-law and contributing to the value of the CHL. Consideration should be given towards a development alternative that reduces the extent of the northward siting of the eight-storey 'Building A' and its associated underground parking. This may prevent the removal of all the mature trees in the vicinity of the Long & Bisby building while also contributing to an enhanced sense of openness of the CHL through visual connectivity to the open space area in the middle of the site.

There are a number of memorial trees on-site that will be removed. A plan should be prepared to identify the significance of these trees and to mitigate the adverse impact resulting from their removal. This may be included as part of a revised Cultural Heritage Impact Assessment (CHIA) as noted below.

The Chedmac Secondary Plan notes that the undulating topography is a feature of the CHL. Every effort should be made to maintaining the existing topography and to design the new

development to be integrated within the existing topography and avoid extensive regrading wherever feasible.

Views through the site:

Public views towards key heritage features including the Long & Bisby building and Cross of Lorraine should be considered in the development.

While visibility towards the Long & Bisby building from the Brow Trail will be maintained from the Brow Trail, public views towards the building from the west and south will be obstructed from the construction of the new eight-storey building 'Building A' to the west and the five-storey condominium to the south. It is desirable to improve upon the public view towards the building where possible. Consideration should be given towards increasing the visibility to the Long & Bisby building from the mid-site open space area by reducing the northward extent of 'Building A'.

Furthermore, the view towards the Long & Bisby building from the trafficked areas within the site appear to be less than desirable. The roundabout immediately southwest of the building is proposed to incorporate a dedicated waste collection point directly to the south of building which will likely have an obtrusive impact on views towards the heritage building. Additionally, the proposed retaining wall adjacent to the proposed parking area to the southwest of the Long & Bisby building may also intrude on views towards the building. Staff are of the opinion that the view corridor towards the Long & Bisby building can be improved by relocating the waste collection area and potentially by incorporating landscaping treatments adjacent to the proposed retaining walls.

Consideration should also be given towards potentially providing views through the site towards the Cross of Lorraine on the edge of escarpment. While the Cross is not a towering structure and may not be easily visible, there may be an opportunity to establish a public view corridor towards the structure. Additionally, effort should be made to retain an open sightline between the Long & Bisby building and Cross of Lorraine as these structures have a historical relationship as being the surviving structures linked to the fight against tuberculosis.

Design of new buildings:

The Chedmac Secondary Plan requires that the design of new buildings are sympathetic to both the historical significance of the Chedoke Browlands and to the heritage architecture. While it is not desirable for new buildings to replicate the appearance of the heritage architecture, the new buildings should be designed in a contemporary style while taking design

cues from the heritage structures including the Long & Bisby building and those that have been demolished as shown in historical photos.

Additionally, the Chedmac Secondary Plan requires that a new building to be constructed in the same approximate building footprint of the demolished Brow Infirmary building on the northwest section of the site shall be designed to respect the heritage architecture of the original building to a maximum height of 4 storeys. It does not appear that any of the new buildings on the northwest section of the site reflects the previous siting of the demolished Infirmary building. Staff will require that a revised CHIA (or an addendum) is provided that includes a review of the design of the new buildings for compatibility with the heritage form and the above noted policy related to the Infirmary building.

Identification and Protection of Built Cultural Heritage Landscape Features:

It appears that a majority of the remaining built heritage structures including the stone wall and pillars located between Sanatorium Road and the Brow's edge, the Cross of Lorraine and Long & Bisby building will be preserved within the new development. The pedestrian bridge over the Chedoke Creek has been noted as having heritage value as part of the CHL within the Chedmac Secondary Plan and it is being proposed to be removed. More information regarding the heritage value of the bridge and whether there is a plan for its salvage and/or reuse should be provided. This information can be provided in a revised CHIA.

Cultural Heritage Impact Assessment (CHIA):

A CHIA authored by Megan Hobson (October 16, 2020) has been submitted with the subject application. The CHIA assesses impacts of the proposed development on the Chedoke Browlands Cultural Heritage Landscape and the Long & Bisby Building. Staff have reviewed the report and have provided comments below and also within a marked-up pdf copy of the report. The CHIA has also been reviewed by the Policy & Design working group of the Hamilton Municipal Heritage Committee (HMHC). The comments below should be addressed in a revised CHIA before it is considered complete.

Staff notes on the CHIA (please also see notes provided in the marked-up CHIA):

- Removal of the concrete bridge over the Chedoke creek (p. 9) – does the bridge retain heritage value, and if so, are there any recommended options for its on-site salvage and reuse?

- The report notes that there are non-native trees on site that will be removed, however, the Tree Preservation Plan indicates that there are also many native trees that are in good health and this should be acknowledged in the report.

- Policy 6.3.7.2.6(iv) of the Chedmac Secondary Plan notes that the Tree Preservation Plan shall be prepared in association with the Heritage Impact Assessment so that trees that contribute to the cultural heritage landscape can be identified and considered for preservation. Mature trees that are important to the CHL, especially in the vicinity of the Long & Bisby building, should be identified in the CHIA and alternative development options be considered as necessary to avoid the removal of such trees.

- Some of the trees are memorial trees that commemorate patients who received treatment at the sanatorium. The report should indicate the value of these memorial trees and options for how adverse impacts can be mitigated.

- The curvilinear pattern and location of Sanatorium Road should be acknowledged as a feature of the Cultural Heritage Landscape in the report. There may also be significance to the road as the physical division that separated the site, with the west side being dedicated to patients and the east side for staff (p.17). Alternative development options should be considered so that the potential loss of this access route and its resulting impact to the Long & Bisby building is mitigated.

- An assessment of the value of retaining views towards the Long & Bisby building, the Cross of Lorraine and between these structures should be included as well as consideration for alterative development options to preserve such views.

- An assessment of the proposed building in the area of the former Brow Infirmary building should be included (see Chedmac Secondary Plan policy 6.3.7.2.6(b)(iii)) to evaluate its design and siting compatibility with the influence of the former Brow Infirmary building as per the indicated Secondary Plan policy.

- Once elevations for the proposed new buildings are available, their design should be reviewed for compatibility with the heritage influence of both the Long & Bisby building and the previously demolished buildings. This can be completed in an addendum to this CHIA.

The Heritage Impact Assessment has been reviewed by the Policy and Design Working Group of the Hamilton Municipal Heritage Committee at their meeting held on January 25, 2021. The Working Group provided the following comments that should be addressed in a revised CHIA:

- There appears to be additional items of design interest on the interior including the moulding on ceiling of the nurses lounge and the brick fireplace surround. Consideration should be given toward identifying if these and any other interior items can feasibly be restored and potentially recommended to be retained as part of the adaptive reuse of the building.

- The working group agreed with the recommendation (on page 27) that an engineer should confirm that any excavation or blasting into the bedrock to facilitate the underground parking will not have an adverse impact on the Long and Bisby building.

- The report should be specific in identifying the need for a plan for the ongoing securing and monitoring of the Long and Bisby building.

- It was suggested that the report should contain additional information on the Cross of Lorraine in terms of requirements for its restoration and further discussion about the estimated timing of its potential dedication to the City, if this is known.

- Consideration should be given towards retaining as many trees as possible especially given that many of the trees are memorial trees.

Staff are in agreement with the conclusions of the CHIA for the submission of a Conservation Plan and security deposit for the repair of heritage attributes and rehabilitation for a compatible use; the provision of a plan identifying protection measures for the Long & Bisby building from excavation and construction impacts and an updated landscape plan for the area surrounding the front and side yards of the Long & Bisby building.

Staff intend to require the following conditions:

1. That the applicant receive the approval of a Heritage Permit prior to the commencement of any alterations or work that may impact the designated heritage attributes of the Long & Bisby building;

2. That the applicant submit a Conservation Plan for the Long & Bisby building which details a strategy for the securing, protecting and ongoing monitoring and restoration of the exterior of the building prior to the commencement of any alterations to the

building's exterior, to the satisfaction and approval of the Manager of Development Planning, Heritage and Design;

3. That the recommendations of the Conservation Plan be implemented, to the satisfaction of the Director of Planning, Chief Planner, prior to the issuance of an Occupancy Permit;

4. That the applicant provide cost estimates for 100% of the total cost for securing, protecting and monitoring the Long & Bisby building over the period of construction and for the total cost of restoration of the exterior of the Long & Bisby building prior to the commencement of alterations to the exterior of the building. Such estimates shall be in a form satisfactory to the Director of Planning, Chief Planner;

5. That the applicant provide a Letter of Credit to the Director of Planning, Chief Planner for 100% of the total estimated cost, as per the cost estimates in a form satisfactory to the City's Finance Department to be held by the City as a security for securing, protecting and monitoring the Long & Bisby building over the period of construction and for the total cost of restoration of the exterior of the Long & Bisby building;

6. That the applicant submit a plan prepared by a qualified Professional Engineer which addresses the mitigation of potential excavation and impacts to the Long & Bisby building prior to excavation for the underground parking, to the satisfaction and approval of the Director of Planner and Chief Planner.

(DA 2020-01-27)

Natural Heritage
Melissa Kiddie

Introduction:
The subject properties are located within the boundaries of the Urban Hamilton Official Plan (UHOP) and have been identified within the Chedmac Secondary Plan. Based on mapping within the UHOP (Volume 1-Schedule B Natural Heritage System), Core Areas (Hamilton Escarpment Environmentally Significant Area, Significant Woodland and tributary of Chedoke Creek) have been identified within and adjacent to the subject properties. These features have been designated as "Natural Open Space" within the Chedmac Secondary Plan (Land Use Plan Map B.6.3-1). The watercourse is also regulated by the Hamilton Conservation Authority (HCA).

The following documents have been reviewed as part of this application.

- Valery Homes Chedoke Browlands 801, 820, 828, 855, 865 and 870 Scenic Drive Environmental Impact Study prepared by Dougan and Associates September 14, 2020
- Tree Management Plan Report Chedoke Browlands 801, 820, 828, 855, 865 and 870 Scenic Drive, Hamilton September 14, 2020
- Meander Belt Width Delineation Update Memorandum-Tributary Chedoke Creek (Scenic Drive and Sanatorium Road) City of Hamilton, Ontario prepared by Geo Morphix Ltd. July 23, 2020
- Technical Design Brief-Tributary of Chedoke Creek Realignment City of Hamilton prepared by Geo Morphix Ltd. July 24, 2020
- Functional Servicing and Stormwater Management Report prepared by Wood Environment & Infrastructure Solution September 18, 2020
- Concept Plan prepared by Urban Solutions Planning and Land Development and KNYMH Architecture Solutions August 24, 2020
- Planning Justification Report 801, 820, 828, 855, 865 and 870 Scenic Drive, Hamilton prepared by Urban Solutions Planning and Land Development October 2020
- Heritage Impact Assessment for Chedoke Browlands prepared by Megan Hobson October 26, 2020

Recommendations:

1. Environmental Impact Statement (EIS): It is the intent of policies within the UHOP that Core Areas are to be protected, preserved and enhanced (Volume 1 policy C.2.3). In addition, any development or site alteration within or adjacent to Core Areas shall not negatively impact their natural features or ecological functions (Volume 1 policy C.2.3). As per the Chedmac Secondary Plan, the natural features are to be integrated within the development.

   An EIS has been prepared by Dougan and Associates (Sept. 14, 2020). Based on the information provided, there is concern that the intent of policies within the Provincial Policy Statement and UHOP have not been met. Key issues have been outlined below.

   In addition, as per UHOP policy (Volume 1 F.3.3.1.1), the EIS is to be reviewed by the City's Environmentally Significant Areas Impact Evaluation Group (ESAIEG). Final comment on the EIS will be provided once this has occurred.

   At this time, the EIS has not been approved. The approval of the EIS is required prior to the approval of the Official Plan/Zoning By-law Amendment and Plan of Subdivision applications (UHOP Volume 1 policy F.3.2.1.6).

2. Tree Protection Plan (TPP): The City recognizes the importance of trees and woodlands to the health and quality of life in the community and encourages the protection and restoration of trees and forests (UHOP Volume 1 policy C.2.11.1). Trees within the Significant Woodland/ ESA are also regulated under the City's Urban Woodland Conservation By-law 14-212. In addition, through the previous Ontario Municipal Board (OMB) Order (PL100691; June 22, 2012 related to OPA-07-14; ZAC-07-053; 25T-200712) it was identified that trees were important to the character of the neighbourhood.

   As per the Chedmac Secondary Plan, the natural features and significant cultural heritage features (including the sense of openness and park-like setting) are to be integrated into the development (UHOP Volume 2 policy B.6.3.7.2.1 a) iv), v)). In addition, the development is to have regard for the cultural heritage landscape features (UHOP Volume 2 policy B.6.3.7.2.6 d) i), ii), iii) and iv)).

   A TPP has been prepared by Dougan and Associates (Sept. 14, 2020). Based on this Plan, of the 522 trees inventoried, 438 trees have been proposed to be removed. There is concern that this is not representative of the "design with nature" approach that has been identified within the above policies. It is advised that the site be re-designed to address the intent of the policies. As a result, the TPP has not been approved.

   A revised TPP is required to be submitted and approved prior to the approval of the UHOPA/ZBA/Plan of Subdivision applications. Key issues and technical comments have been provided below to aid in the revision of the TPP.
3. Urban Hamilton Official Plan Amendment (UHOPA): A draft UHOPA has been provided within the Planning Justification Report prepared by Urban Solutions Planning and Land Development (October 2020). This UHOPA includes:

   - Amendments to Volume 1 to adjust the limits of the Core Areas within the subject properties (identified as a Significant Woodland and Local Natural Area-Environmentally Significant Area); realignments to the Neighbourhoods and Open Space designations and realignment of Core Area (watercourse) that traverses the site.
   - Amendments to Volume 2 (Chedmac Secondary Plan) to re-designate portions of the lands from "Medium Density 3" to "Natural Open Space" and from "Natural Open Space" to "Medium Density 3"; adjustment to Site Specific Policy boundaries B-1 through B-4; and realignment of the watercourse to align with the proposed amendments to Volume 1.

   At this time, Natural Heritage Planning staff cannot support the amendments as presented because the EIS has not been approved and the "Order to Restore

Woodlands" as outlined within the Probation Order issued by the Ontario Court of Justice August 14, 2019 (in response to charges under the City's Urban Woodland By-law 14-212) has not been considered. It is recommended that the UHOPA be DENIED.

4. Zoning By-law Amendment (ZBA): A draft ZBA has been provided within the Planning Justification Report prepared by Urban Solutions Planning and Land Development (October 2020). Amendments are proposed to the "P5" (Conservation/Hazard Land) zone within the City's 05-200 Zoning By-law.

   At this time, Natural Heritage Planning staff cannot support the amendments as presented because the EIS has not been approved and the "Order to Restore Woodlands" as outlined within the Probation Order issued by the Ontario Court of Justice August 14, 2019 (in response to charges under the City's Urban Woodland By-law 14-212) has not been considered. It is recommended that the ZBA be DENIED.
5. Plan of Subdivision: A Draft Plan of Subdivision has been prepared by Urban Solutions Planning and Land Development (October 2020). The natural heritage features are associated within Block 1, Block 4 and Block 6. Since the EIS and TPP have not been approved, at this time, Natural Heritage Planning staff cannot support the Draft Plan of Subdivision and conditions cannot be provided.

Key Issues/Comments:

1. EIS:
   a) ESAIEG Review: As per UHOP policy F.3.3.1.1, the EIS is to be reviewed by the City's ESAIEG. ESAIEG provides objective, technical advice to City staff on the impacts of the proposed land use changes within and adjacent to natural areas. While ESAIEG is being scheduled during COVID-19, a specific date has not yet been identified. An ESAIEG review fee is required to be provided at the time of the review (2021 review fee is $390.00).
   b) "No Negative Impact" Test:
      i. Within the Draft Plan of Subdivision, Block 1 has been identified as "Brow Trail Park Open Space Block". Discussions on the trail have not been included within the EIS making it difficult to determine if this development will have any impacts on the Core Areas and their functions.
      ii. Impact Analysis and Mitigation Measures: It has been identified within the EIS that the development will have no impact on the Core Areas or their functions. There is concern with this statement since development is proposed within a reduced vegetation protection zone (VPZ) and wholesale removal of riparian vegetation is to occur. The cumulative impact assessment that has been provided does not address the impacts of previous development on the environmental features and functions (i.e. trails, dumping, tree removal, introduced plants).

In addition, details on specific mitigation measures such as planting of the VPZ, fencing, invasive species management have not been provided (it has been identified that these details will be provided at detail design). Further information is required (at a high-level) to understand how the impacts of the development will be mitigated.

c) VPZ: As per UHOP Volume 1 policy C.2.3.3, an appropriate VPZ shall be applied to all Core Areas. The VPZ is to be of sufficient size to protect the features and functions of the Core Areas from the impacts of the development that will occur before, during and after construction. Minimum VPZs have been identified within the UHOP and are to be evaluated and addressed within the EIS (UHOP Volume 1 policy C.2.5.10).

i. Significant Woodland/ESA: A 10 metre VPZ has been proposed to protect the Significant Woodland/ESA. There are concerns with this approach and at this time, this VPZ cannot be supported.

- Habitat: Within the EIS, it has been identified that the Significant Woodland/ESA supports: 1) mature trees and generally good quality native forest community; 2) Significant Wildlife Habitat (Seasonal Concentration Areas-bat maternity colonies; Habitat for Species of Conservation Concern-Eastern Wood Pewee and Virginia Bluebells); and 3) locally uncommon species (White Goldenrod). It is unclear why a larger VPZ has not been identified to protect these features and their functions.
- Minimum VPZ: The minimum VPZ for Significant Woodlands (as outlined within the UHOP) is 15 metres. An evaluation of this width has not been undertaken.
- Previous Studies: On page 48 of the EIS, it has been identified that the 10 metre VPZ was supported by the previous development application. It is important to note that policies have changed since the previous application. In addition, to clarify, within the OMB Order (PL100691) Exhibit 20, policy A.6.1.3.3 b) it is stated "*a vegetation protection zone (buffer) will be provided along Area C, as identified through an approved Environmental Impact Statement, and revegetated in accordance with the recommendations of this study*".
- Development: Based on the Concept Plan and Site Plans that have been prepared; there are many areas where the 10 metre VPZ has not been provided (e.g. widths of 6.48 m, 7.90 m and 8.98 m). In addition, the proposed development

(underground parking, surface parking, retaining walls) are proposed to encroach into the reduced VPZ. This has not been considered.

- Stormwater Management: Based on the Functional Servicing Report/Stormwater Management Report prepared by Wood (Sept. 18, 2020), a bioswale has been proposed within the reduced VPZ. The impacts of this feature on the VPZ has not been discussed.
- Treatment: It has been identified that the VPZ will be enhanced with trees and shrubs. A high-level discussion on the location and types of species is missing from the EIS. It is unclear if the VPZ is an appropriate width to accommodate the proposed plantings.
- Restoration Order: A portion of the Significant Woodland/ESA is to be planted as a result of a Court Order replanting program. Since this area is to be protected, the VPZ is to include this area. This has not been clearly identified/discussed.

ii. Tributary of Chedoke Creek: Watercourses have been identified as Core Areas within the City's Natural Heritage System. There is concern that this has not been recognized within the EIS.

On page 34, it has been identified that this watercourse is not classified as fish habitat. This is contradictory to the Tributary Realignment Brief prepared by Geo Morphix (July 2020). While fish may not be directly using this watercourse, it is providing an indirect function and is to be considered fish habitat. In addition, on page 38, it has been noted "*as the entire creek corridor is affected by this realignment, no VPZ is proposed as no vegetation will be preserved*".

As mentioned above, VPZs are to protect features and their functions before, during and after construction. As a result, a VPZ is required. A minimum VPZ of 15 metres on each side of the watercourse has been identified within the UHOP. This width is to be evaluated within the EIS.

d) Watercourse Realignment: Within the Chedmac Secondary Plan (policy B.6.3.7.2.6 d) ii), iii)), existing topography and vegetation within the Chedoke Creek shall be maintained and enhanced. There is concern that the intent of this policy has not been considered since the realignment of the watercourse will require grading and the removal of all vegetation within this corridor. While there may be enhancement, through the planting of new trees/shrubs/perennials, the existing mature vegetation

provides many benefits that will be lost with the wholesale removal. The impacts of the loss of vegetation and grading has not been clearly discussed.

e) Court Ordered Restoration: On page 48 of the EIS, a mitigation measure of "re-establish forest edge within Polygon 3" has been identified. While it has been noted that a Restoration Plan has been developed in consultation with the City, there is concern that reasons for this restoration plan have not been fully discussed.

   In March 2017, the applicant removed trees from the Significant Woodland/ESA without permission and was charged under the City's Urban Woodland Conservation By-law 14-212. Within the Probation Order issued by the Ontario Court of Justice August 14, 2019, an "Order to Restore Woodlands" was required. The trees were originally to be planted between the fall of 2019 and the spring of 2020. An extension was granted by the courts to replant by August 2021. The planting of these trees has not yet occurred.

   Based on the proposed Site Plan, these trees may be impacted by the proposed development (underground parking). The impacts of the proposed development on this requirement has not been fully discussed within the EIS. It is also important to note that the limit of tree planting provided on the Concept Plan may not be reflective of the on-ground requirements since this line has not been surveyed. The VPZ is to be extended within this area to protect these trees.

f) Ownership of Open Space Blocks: Based on the Concept Plan blocks have been created for the watercourse (Open Space Block), woodlot (Woodlot/ESA Block) and trail (Brow Trail Park Block). Will these areas be publicly or privately owned? This discussion has not been provided within the EIS.

2. TPP:

a) Policy Compliance: Based on the TPP, a total of 522 trees have been inventoried. Of these trees, 438 have been proposed to be removed. This is representative of over 83 % of trees on site. There is concern that the removal of these trees does not address policies within the Provincial Policy Statement (PPS) or the UHOP. To meet the intent of these policies, a redesign of the development is required. This redesign is to consider the vigour, condition, aesthetics, age and species of trees as well as their importance within the cultural heritage landscape.

   i. PPS: Trees provide a variety of functions to the overall community (i.e. canopy cover, energy conservation, mental health benefits, wildlife habitat) and are integral in minimizing the impacts of air pollution and climate change (policies 1.1.1 h, l; 1.3.2 c, d; and 1.8.1 f, g). With the removal of such a large number of trees, the mitigating effects of vegetation on climate change and the other benefits that trees provide have not been considered.

ii. UHOP: As per Chedmac Secondary Plan policies B.6.3.7.2.1 a) iv); v), and B.6.3.7.2.6 d) i), ii), iii) and iv), trees are to be integrated into the design of the development.

While the TPP notes that this site has an interesting and unique natural and cultural history, the proposed design does not take this into consideration. The replacement of trees (at 1 for 1) has been used as a rationale within both the TPP and the Heritage Impact Assessment for the removal of trees.

This rationale does not represent the "design with nature" approach that is highlighted within the Chedmac Secondary Plan and it represents a loss of the open park-like setting that is an important characteristic of the area. It also does not consider that the many of the trees proposed to be removed are in good condition and are large (e.g. Northern Red Oaks-54, 57, 58, 82, 89 cm DBH; Bur Oaks-37, 41, 54, 68 cm DBH; Pin Oak-75 cm DBH; Shagbark Hickory-37, 57, 58 cm DBH). The loss of these trees on the character of the neighbourhood has not been recognized (replacement of canopy cover provided by these trees cannot be accomplished through 1 for 1 compensation).

b) Further Removal of Trees: On page 9 of the TPP, it has been stated "*the exact number of trees to be removed and/or injured will be reassessed at the detailed design phase of this project*". There is concern with this approach because it suggests that further tree removals may be required, and the intent of the policies will not be met. The number of trees to be removed need to be identified at this stage of the process.

3. Draft UHOPA:

a) As per Volume 1 policy C.2.2.2, the boundaries of Core Areas are general in nature. Minor refinements to the boundaries can occur through appropriate studies (i.e. EIS) without an amendment to the UHOP. Major changes to boundaries, the removal or addition of Core Areas require an amendment.

- Realignment of the Watercourse: While the watercourse is proposed to be realigned, it appears that it will be located within the general footprint of the existing feature. It is unclear why Schedule B (Natural Heritage System) and Schedule B-8 (Detailed Natural Heritage Feature Streams) need to be revised. Further clarification is required.

b) As per Volume 1 policy C.2.3.3, an appropriate vegetation protection zone (VPZ) shall be applied to all Core Areas. There is concern that the proposed changes to Schedule E-1 (Urban Land Use Designations), Schedule B (Natural Heritage System), Schedule B-2 (Detailed Natural Heritage Features Key Natural Heritage Feature Significant Woodlands) and B-6 (Detailed Natural

Heritage Features Local Natural Area Environmentally Significant Areas) does not consider the requirement for VPZs.

c) In March 2017, the applicant removed a portion of the Significant Woodland/ESA and was charged under the City's Urban Woodland Conservation By-law 14-212. As a result of a Probation Order issued by the Ontario Court of Justice August 14, 2019, the applicant is responsible for restoring this area. There is concern that the proposed revisions to Schedule E-1, B, B-2 and B-6 does not consider this requirement. This area is to be protected and should not be removed from the Schedules.

It is important to note that this area was not included within the Significant Woodland/ESA boundary staking that occurred on October 28, 2019 because the trees had not yet been planted. In addition, the location of the proposed planting (as outlined on the Concept Plan) has not been delineated in the field or surveyed.

d) Changes to the Chedmac Secondary Plan do not take into consideration the required VPZ associated with the Core Areas or the Court Order restoration.

4. Draft ZBA:
    a) As per UHOP Volume 1 policy C.2.2.8, all natural features, required VPZs and enhancement or restoration areas are to be placed in appropriate zoning. There is concern that the proposed changes do not consider the intent of this policy. The evaluation and determination of VPZs is completed within the EIS. Since the EIS has not yet been approved, the changes to the zoning by-law cannot be supported.
    b) The amendments do not consider the requirements of the "Order to Restore Woodlands" as outlined within the Probation Order issued by the Ontario Court of Justice August 14, 2019.
5. Plan of Subdivision:
    a) The limits of the Significant Woodland/ESA were delineated in consultation with the City of Hamilton and the HCA on October 28, 2019. The surveyed limits have not been clearly labelled on the Plan.
    b) An appropriate VPZ shall be provided for all Core Areas. It is unclear if the VPZs are intended to be separate blocks on the Plan.
    c) The woodland restoration area identified through the Probation Order issued by the Ontario Court of Justice August 14, 2019 has not been considered as part of the Draft Plan.

Technical Comments:

1. TPP:

a) A TPP review fee is to be provided to the City. It is unclear if this fee has been provided. Further clarification is required. The 2021 fee is $610.00.

a) Trees provide a variety of functions to the overall community (i.e. canopy cover, energy conservation, mental health benefits). The decision to retain trees is to be based on vigour, condition, aesthetics, age and species. In addition, the contribution to the cultural heritage landscape is to be considered. There is concern that this has not been contemplated since many trees proposed to be removed are in good condition. For example, trees #12-Red Maple, 13-Northern Red Oak, 14-Northern Red Oak, 15-Shagbark Hickory, 16-Shagbark Hickory, 22-Shagbark Hickory, 24-Northern Red Oak, 25-Northern Red Oak, 29-Black Walnut, 34-White Oak, 37-Bur Oak, 40-Northern Red Oak, 62-Sugar Maple, 66-Sugar Maple, 129-Northern Red Oak, 133-Norway Maple, 154-Pin Oak, 221-Shagbark Hickory, 227-Northern Red Oak, 532-Bur Oak, 535-Bur Oak. 549-Bur Oak, 561-Sugar Maple, 572-Shagbark Hickory and 583-Northern Red Oak. Opportunities to retain more trees on site are to be explored.

b) Tree Inventory Table:

   i. On page 8 of the TPP, it has been identified that the structural condition, biological health and preservation priority was ranked as “high, medium and low”. Further clarification is required on how these criteria were developed and how it relates to the tree condition rankings outlined within the City’s Council adopted Tree Protection Guidelines (revised October 2010).

   ii. As per the City’s Council adopted Tree Protection Guidelines (revised October 2010), the tree inventory is to be included on mapping associated with the TPP. There is concern that the inventory is missing from all the maps provided. As a result, all maps are to be revised to include this information.

   iii. The tree inventory is to comprise of trees that are 10 cm DBH or greater. There are several trees included within the inventory less than this size (e.g. tree #23-Shagbark Hickory (5 cm); 28-White Spruce (3 cm); 32-Paper Birch (4 cm); 95-Norway Maple (2 cm); 113-Norway Maple (4 cm); 141-Bur Oak (5 cm); 153-Pin Oak (7 cm); 222-American Beech (5 cm); 536-Bur Oak (4 cm); and 534-Green Ash (1 cm)). Further clarification is required.

   iv. A “tree action” column has been included within the tree inventory table. There is concern that specific rationale (i.e. grading within the root zone) for removal and injury of trees has not been clearly identified. As a result, this column is to be revised.

v. There are missing numbers within the tree inventory table. Is this a function of different tree tags or are there trees missing? Further clarification is required.

c) Trees #707, 708, 709, 727 and 769 have been identified as Hawthorn species. There is concern that these trees have only been identified to genus and not to species. Since there are several locally rare and uncommon Hawthorns within the City, hawthorns are to be identified to species.

d) Trees #146(Norway Maple), 1001 (White Ash), 1002 (Black Pine), 1003 (Norway Maple), 1004 (Norway Maple), 1005 (Sugar Maple), 1007 (Sugar Maple), 1008 (American Basswood), 1009 (Norway Maple), 1010 (Scots Pine), 1011 (Eastern Hop Hornbeam), 1012 (Black Pine), 1013 (Sugar Maple), 1014 (Hawthorn), 1015 (American Basswood), 1016 (Scots Pine), 1017 (Sugar Maple), 1018 (Sugar Maple), 1019 (American Basswood), 1020 (American Basswood), 1025 (American Basswood), 1026 (Sugar Maple), 1027 (Black Walnut), 2022 (American Basswood), 2023 (Sugar Maple), 2024 (Sugar Maple) have been identified within the Significant Woodland/ ESA.

In addition, trees #147.1 (Norway Maple), 149.1 (Norway Maple), 150.1 (Norway Maple), 153.1 (Freeman Maple), 154.1 (Northern Red Oak), 1028 (Norway Maple), 1029 (Norway Maple), 1030 (Norway Maple), 1031 (Norway Maple), 1032 (Sugar Maple), 1033 (Norway Maple), 1034 (Norway Maple), 1035 (Norway Maple), 1036 (Norway Maple), and 1037 (Norway Maple) are located within the area where previous tree cutting occurred (area had been identified as part of the Significant Woodland/ESA).

Based on page 5 of the TPP, it was identified that trees within the ESA were not tagged. Further clarification is required.

e) Tree Protection Fencing: Trees that are proposed to be retained are to be protected with tree protection measures (i.e. fencing). These measures prevent injuries to trees (and their roots) from construction activities.

i. Tree protection fencing has been identified along the vegetation protection zone (VPZ) associated with the Significant Woodland/ESA. There is concern that development is proposed within this area. Development is to be removed from the VPZ and the fencing is to be located at the limit of the VPZ. As a result, the drawings are to be revised.

ii. As per the City's Council adopted Tree Protection Guidelines (revised October 2010), the tree management professional (i.e. certified arborist, registered professional forester or landscape architect) is to prepare a Verification of Tree Protection Letter to

the satisfaction of the Director of Planning. This is to ensure that tree protection fencing has been installed as per the approved Tree Protection Plan. There is concern that this has not been identified within the TPP. As a result, the TPP needs to be revised. f) Specific notations on plan i. Birds may be using the trees on site for nesting. It is advised that the owner be aware of the Migratory Birds Convention Act, 1994. This Act is implemented by Environment Canada and protects birds and their nests. It is advised that the removal of vegetation should be avoided during the period of March 31st to August 31st. The drawings are to be revised to include the following notation: "*the Owner is to be aware of the Migratory Birds Convention Act, 1994. The removal of vegetation is to be avoided during March 31st to August 31st*". ii. As identified above, a Verification of Tree Protection Letter is to be prepared by a recognized tree management professional. A notation is missing from the drawings. The drawings are to be revised to include the following: "*a Verification of Tree Protection is to be prepared by a tree management professional to confirm that all tree protection measures have been installed. This Letter is to be provided to the Director of Planning prior to undertaking any onsite activities*". iii. Mitigation measures have been outlined on page 11 of the TPP. These measures are missing from the drawings. As a result, the drawings are to be revised to include these notations.	
Urban Design **Ana Cruceru**	
Please see the following Urban Design staff comments regarding the application above. The comments are based on the Architectural Drawings package (dated Sep 1st, 2020), Urban Design Brief (dated Sep 27, 2020), and Visual Impact Assessment (dated September 2020) submitted for review. **Comments** Architectural Drawings package & Urban Design Brief Site layout / Community Design Streetscapes – internal roads	• Revisions or an addendum to the Urban Design Brief should be provided to: ○ (In the Site Design section) ▪ Reconsider the Site Plan design in

• One of the primary objectives for this special policy area is to "provide a safe, attractive and pedestrian-oriented residential development with a high quality of design of buildings, public spaces and streets" (6.3.7.2.1(a)(ii)). Expectations for a streetscaped internal road are also noted in the Transportation and Cultural Heritage policies for this site (6.3.7.2.5(e) and 6.3.7.2.6 (b)(i)). As proposed, internal roads are designed primarily for parking, whereas they should provide quality streetscapes and public realm amenity on site, creating inviting connections between the contextual public sidewalks, new building entrances and trails as well as a green interface between the new residential buildings. o Please consider opportunities to relocate and consolidate the majority of surface parking in designated parking areas, at less conspicuous locations on site. Ensure roads incorporate traditional streetscape elements such as tree planted boulevards and continuous sidewalks. o If feasible, please consider opportunities to eliminate one of the large internal roundabouts in Block 2 by providing emergency access from Scenic Rd in the form of decorative paver surfaced pads between the 5 storey buildings, closed to vehicular traffic by removable bollards. o For the townhouse (or low-rise residential T Building) component in Block 1, the townhouse design should be reconsidered to avoid long rows of garages and parking at the rear (i.e. on the 'lane'), which impacts the quality of the adjacent streetscape and the interface with the proposed mid-rise buildings. They should be designed to achieve a true dual-frontage aspect, by minimizing the garage width (from double to single car width) at the rear and allowing for tree planted landscaped areas between individual driveways. Sidewalks should be introduced on both sides of the road on this block. o Sidewalks should be provided on both sides of the road on Block 1, in response to the proposed residential densities and expected need for public realm and pedestrian movement. They should not be	respect to vehicular and pedestrian circulation systems on site ▪ Indicate optimal landscaped setbacks/interface between buildings and adjacent sidewalks or parking areas ▪ A streetscaping section should be added to include information about the proposed internal and external streetscaping (with street sections) ▪ Direction regarding optimization of parking areas and garage ramps location to minimize impacts onto pedestrian circulation and internal views. o (In the Landscape Design section)

encumbered by parking areas or garage ramps. Garage ramps should be internalized in buildings at inconspicuous locations on site, as much as possible away from primary pedestrian routes on site or views to adjacent open spaces. ○ Please provide illustrations indicating the proposed streetscape design objectives for internal roads. Streetscapes – external (Scenic) • Continuous building walls along Scenic Dr are strongly discouraged through the secondary plan (Section 6.3.7.2.4.o). Clear breaks are required between buildings to promote views into and through the site. Best practices are also generally encouraging fine grained street walls within residential areas, recommending maximum 60m long building slabs. Please provide adequate clear separation between the two 5 storey building proposed along Scenic Rd, at the eastern end of the property (Block 2). • A proposed street section illustrating the proposed streetscape treatment along Scenic Rd, along the edge of the property, should be included in the report, to guide future public realm development on this site. Staff recommends tree planted boulevards at the curb, to buffer pedestrians from traffic and provide shade. • A round-about, as proposed, should only be provided if no other solutions (such as medians and control signals) are acceptable, due to impacts on pedestrian movement along Scenic Rd (east-west) and Sanatorium Rd (north-south). Direct, attractive, and comfortable pedestrian movement on both of these roads is essential to providing trail access, easy movement to community facilities for new residents, etc. If a round-about is required, pedestrian crossings should be designed to be landscaped and welcoming. Pedestrian connections • Midblock pedestrian connections should generally be provided on blocks longer than 120m. The UD Brief provides direction (on p.32) to provide a midblock pathway between buildings T1 and T6 in Block 1; however, the site plan does not include the mid-block connection. The Site Plan should be revised for this purpose and include a landscaped pedestrian connection as illustrated on p.34.	▪ Conceptual landscape plans for principal open spaces on site. ▪ Planting on slab direction ▪ Design direction for critical interfaces between residential buildings and the open space blocks. ○ (In the Built Form/Architectural Design Objectives) ▪ Illustrate an improved dual-frontage townhouse model able to support the development of full streetscapes along the internal roads • A revised Site Plan and conceptual Building Elevations should be added to the Architectural Drawings package and provided for review.

- A direct, seamless, inviting pedestrian connection should be provided between the public sidewalk on Scenic Rd and the escarpment trail, unencumbered by parking, and avoiding indirect detours, as proposed near the heritage building site. It should be associated with a ramp, to facilitate barrier-free access at the proposed change in grade near the Long & Bigsby building.
- Please provide graphic support illustrating the location of the proposed SWM pond /creek pathways on the Site Plan, as well as direction regarding path dimensions and appropriate street furniture such as pedestrian-oriented lighting and benches. Please also provide information on the plan clarifying what is the proposed interface between residential units facing the SWM pond/creek and these pedestrian facilities. Connections should be provided between primary building access points and the common pathways.

Integration of the Long and Bisby building and associated landscape

- The treatment of the internal roads are detrimental to establishing a continuous public realm route to the existing building, which would be essential to integrating it functionally and visually in the proposed community layout.

Landscaped areas/buffers

- Blocks 1 & 2: Minimum 3m wide landscape buffers should be provided between the multi-unit residential buildings and adjacent sidewalks or parking areas, to frame the building in context and provide quality privacy buffers for units at grade.

Built Form

Sustainability objectives

- The report does not provide a clear commitment for environmentally sustainable building design solutions. As directed through the Secondary Plan, green roofs shall be incorporated, where feasible, for all buildings higher than 4 storeys. There should be a clear minimum planned green roof target set at the rezoning stage, to direct implementation at the Site Plan stage to respond to this policy.
- Similarly required through the Secondary Plan, LEED certification is to be sought for new construction where

possible. There should be commitment at the rezoning stage to plan for LEED design and certification at least for those buildings above 3 storeys in height.

Massing – Step-backs and podium definition

- Conceptual building elevations will be required for review to fully evaluate the proposed massing. Staff recommends the contemporary design approach roughly illustrated in the report.
- Please consider opportunities to reduce the perceived podium definition for the 8 storey buildings at 5-6 storeys, to scale them down visually and establish a pedestrian-scaled public realm in the interior of the blocks.
- The report notes objectives for angular plane compliance; however, staff will need clarification regarding the source of the noted angular plane requirements as they are not outlined in site-specific policies or guidelines.

Building orientation

- As proposed, the orientation of the two 8 storey Buildings D (in Block 1) will generate significant shadow projection on the internal courtyard. Please consider re-orienting these buildings to maximize sun access to the internal courtyard between these two buildings, to the effect of facilitating its use and sun access to internal building facades.

Building slab length

- As noted in the UD Brief, building length should be limited to 70m, 50m on Scenic Dr. The proposed design introduces common entrance pavilions which are closing in gaps between the proposed 8 storey buildings in the interior of Blocks 1 and 2 and the 5 storey buildings facing Scenic Dr on Block 2. A recessed articulating connection, as proposed, may be supported on an interior road although it is not preferred (to allow for more block porosity, views, and pedestrian movement on site). However, staff recommends a clear break between the 5 storey buildings facing Scenic Rd (Buildings C) to allow for views between buildings to the interior of the lot and the Bigsby building, as well as additional mid-block pedestrian connections.

Landscaping

• Please provide conceptual design direction for common amenity areas and for the proposed interface between built form on site and adjacent open space (woodlots and the SWM pond). • Please ensure any required permanent landscaping or tree planting areas are not encumbered by the underground garage. Planting on slab requires additional structural consideration and maintenance; it is also temporary in nature, due to period maintenance work. ○ The Brief should incorporate direction for planting-on-slab conditions (i.e. required soil depths and other required substrates), to ensure future site plans will take into consideration necessary load and grading requirements to achieve sufficient soil volumes. <u>Visual Impact Assessment</u> • The report notes minimal visual impacts onto escarpment views from designated view points outside the site. Staff has no further comments; however, approval should be confirmed by the NEC staff.	
Noise Study Review **Melanie Schneider**	
In response to your circulation, I have reviewed the Environmental Noise Study titled “Browlands Development” prepared by SLR Canada, dated September 4, 2020. Based on the results of the study, all noise levels appear to be less than 60 dBA. The following policies from the UHOP apply to this proposal: “B.3.6.3.8 Proponents of development proposals for which noise studies are submitted shall satisfy all of the following requirements and conditions to the satisfaction of the City and in accordance with provincial guidelines: a) Proponents shall provide evidence that predicted noise levels in outdoor living areas meet the daytime objective of 55 dBA.	**Prior to Approvals:** • Revised Environmental Noise Study **Future Site Plan Stage:** • Detailed Noise Study

b) If predicted noise levels in outdoor living areas exceed 55 dBA but are less than or equal to 60 dBA, noise mitigation measures may be required. c) If predicted noise levels in outdoor living areas exceed 60 dBA, noise mitigation measures shall be required. d) Every effort should be made to reduce noise levels in the outdoor living area to as close to 55 dBA as technically, economically, and administratively feasible. If noise levels will not be reduced to 55 dBA, the proponent shall demonstrate with options and cost estimates why it is not feasible or practical to achieve 55 dBA, or shall provide justification as to why it may not be aesthetically appropriate or desired to mitigate noise levels to 55 dBA. If noise levels will not be mitigated to 55 dBA, appropriate warning clauses shall be included in lease or rental agreements, agreements of purchase and sale, and within required development agreements. e) Provide evidence that provincial indoor sound level criteria are met. If sound levels exceed provincial guidelines for either daytime or nighttime hours, appropriate mitigation measures shall be incorporated into the development, according to provincial guidelines, and appropriate warning clauses shall be included in lease or rental agreements, agreements of purchase and sale, and within development agreements." In addition to the provincial documents that were used to prepare the report and its recommendation, the applicant is also required to address Municipal requirements, including and not limited to the above noted policy. Additional rationale is required to demonstrate	

that no noise barriers and noise levels above 55dBA is appropriate for this development proposal and is required to be addressed prior to the finalization of a staff recommendation. Staff have no concerns otherwise with the proposal as detailed review will occur through the Site Plan Control stage to evaluate noise impacts of any required HVAC equipment on the development itself and existing surrounding land uses. If you have any further questions or concerns, please feel free to contact me.	

Building Zoning and Engineering
Victoria Brito

1. The proposed rezoning application (ZAC-20-041) will facilitate the zoning of the subject lands the from:
   - the “DE-H/S-1600” (Low Density Multiple Dwellings) District, Modified, Holding;
   - the “E-H/S-1600” (Multiple Dwellings, Lodges, Clubs, Etc.) District, Modified, Holding;
   - the “AA/S-1353” (Agricultural) District, Modified;
   - the Conservation/Hazard Land (P5) Zone; and,
   - the Conservation/Hazard Land (P5, 672, H69) Zone;

   to the modified “DE/S-___” (Low Density Multiple Dwellings) Districts and the Conservation/Hazard Land (P5) Zone, in order to permit the development of the lands for multiple dwellings and townhouse dwellings with a combined total of 630 dwelling units, on-site surface and underground parking areas, open space, and amenity areas, with accesses from Scenic Drive. The existing “Long and Bisby” heritage building will be retained and is proposed to be reused for commercial/office uses. The applicant is also proposing to permit limited commercial uses and multiple dwellings within said existing building.
2. The proposed Draft Plan of Subdivision consists of seven (7) blocks, with two blocks for multiple dwellings and townhouses (Blocks 2 & 5), two Open Space blocks (Blocks 1 & 4), one Stormwater Management block (Block 3), one Woodlot / ESA block (Block 6), and one block for road widening (Block 7).

3. A multiple dwelling and groups of multiple dwellings in accordance with Section 18(8) are permitted in the DE district. The proposed amended by-law shall specifically permit the proposed townhouse dwellings. The proposed amending By-law shall specifically permit the intended commercial uses and dwelling units within the existing building.
4. It is noted that the road between the west block and the east block (formerly known as Sanatorium Road) is intended to be closed off and merged with the subject lands.

   Therefore, the applicant shall ensure that the lands are merged in title or under same ownership for the proposed development.

   The applicant is proposing that through the amending By-law, the boundaries of the zone shall be deemed to be lot lines.

   Due to the configuration of the lands, it is recommended that the applicant deem which lots lines are considered the rear lot line and side lot lines for this development.
5. The proposed development has been reviewed and compared to the standards of the DE district; however, the applicant is proposing to amend the DE district by entirely replacing sections 10A (2), (3), (4) and (5) and the chart below.
6. Please note that if the concrete retaining wall surrounding the stairs from the underground Garage Ramps or Underground Garage Vents does not extend greater than 6” (0.15m) above grade then they can encroach into a required yard. NOTE: The 6” curbing/retaining wall can have a guard/fence surrounding the curbing/wall. If the wall extends greater than 6” above grade, then the minimum required yard setback must be taken from the surrounding the stair, ramp or vent.
7. All mechanical equipment including “transformers” shall comply with the requirements of Section 18 (4) (v) of the Hamilton Zoning By-law 6593.
8. A portion of this property is within an area regulated by Hamilton Conservation Authority.
9. No building or structure may be erected, used or occupied unless compliance with Section 4.4.1.1 ‘Adequate services’ has been achieved.
10. The proposed development is subject to the issuance of building permits from the Building Division.
11. All fencing proposed for this development must comply with the regulation contained within the Fence By-law 10-142.
12. All new signs proposed for this development must comply with the regulations contained within the Sign By-law 10-197.

13. The designer shall ensure that the fire access route conforms to the Ontario Building Code.

DE district (Section 10A)	Required By By-law - 6593	Provided	Conforming/Non-conforming
Zoning compliance Review for West Block #5 of Schedule A			
Maximum height *[per Section 10A (2) of the Hamilton Zoning By-law 6593)]*	Notwithstanding Subsections 10A(2) of Zoning By-law No. 6593, the following provisions shall apply to multiple dwelling units: i. The maximum building height is eight (8) storeys or 36.0 metres	No elevation plans provided. Site plan and "Site statistics chart" indicates a height of eight (8) storeys. No height dimension indicated.	***Unable to determine compliance.***
	Notwithstanding Subsections 10A(2) of Zoning By-law No. 6593, the following provisions shall apply to townhouse units: i. The maximum building height is three (3) storeys or 16.0 metres	No elevation plans provided. Site plan and "Site statistics chart" indicates a height of (2) storeys. No height dimension indicated.	***Unable to determine compliance***
Minimum yards *[per Section 10A (3) of the Hamilton Zoning By-law 6593)]* **Intensity of use Requirements – minimum lot area and lot width** *[per Section 10A (4) of the Hamilton Zoning By-law 6593)]* **Landscaped Area** *[per Section 10A (5) of the Hamilton Zoning By-law 6593)]*	Notwithstanding Subsections 10A (3), (4) and (5) of Zoning By-law No. 6593, the following provisions shall apply to multiple dwelling units: ii. The minimum setback to Scenic Drive shall be 39.0 metres; iii. The minimum setback to a Conservation/Hazard Lands (P5) Zone in City of Hamilton Zoning By-law No. 05-200 shall be 37.0 metres; iv. The minimum setback to a townhouse dwelling shall be 16.0 metres; and v. The maximum number of dwelling units shall be 204 units.	The site plan shows two (2) multiple dwelling buildings on the westerly block. ii. The buildings are located a distance of 40.0m and greater from Scenic Drive. iii. The buildings are located a distance of 37.57m from the southerly proposed P5 zone and a distance of 44.25m from the northerly P5 Zone. Not clearly shown on the submitted site plan; however, the Concept plan shows 15.07m (between building B and townhouse T8/east tower) and greater. A combined total of 204 dwelling units proposed between the west and east towers.	Conforms Conforms ***Non-conforming*** *Note: It is unclear why the setback requirement between the multiple dwellings and street townhouses is different in the proposed By-law.* Conforms

	Notwithstanding Subsections 10A (3), (4) and (5) of Zoning By-law No. 6593, the following provisions shall apply to townhouse units:	The submitted site plan shows fourteen (14) townhouse buildings within the westerly block.	
	ii. The minimum setback to Scenic Drive shall be 2.0 metres;	ii. The buildings are located a setback of 2.29m and greater is shown.	Conforms
	iii. The minimum setback to a Conservation/Hazard Lands (P5) Zone in City of Hamilton Zoning By-law No. 05-200 shall be 5.75 metres;	iii. The buildings are located a setback of 5.84m and greater.	Conforms
	iv. The maximum number of dwelling units shall be 56 units;	iv. The site plan shows fourteen (14) buildings x 4 units each. A total of 56 dwelling units.	Conforms
	v. The minimum setback to the multiple dwelling unit shall be 14.0 metres; and	v. The setbacks between the townhouse dwellings and the multiple dwelling buildings has not been clearly shown on the site plan. However, the Concept plan shows 15.07m (between building B and townhouse T8/east tower) and greater.	Conforms *Note: It is unclear why the setback requirement between the multiple dwellings and street townhouses is different in the proposed By-law.*
	vi. That a minimum setback of 1.75 metres shall be provided between end wall to end wall of townhouse dwelling units.	A setback of 1.95m and greater is shown.	Conforms
	Notwithstanding Subsections 10A (4) and (5) of Zoning By-law No. 6593, the following provisions shall apply to the lands zoned DE/S-xxx:		
	i. The minimum lot frontage shall not apply;	i. No details	N/A
	ii. The minimum lot area shall be 2.95 hectares;	ii. 30,006.6m² (Greater than 3.0hectares)	Conforms Conforms

	iii. The minimum setback from any lot line to the underground parking area shall be 17.25 metres;	iii. A setback 17.69m and greater is shown from the underground parking area to a lot line.	
Parking Section 18A for West block			
Minimum Number of Parking Spaces *[Per Section 18A(1)(a) and Table 1]*	Notwithstanding Subsections 18(A) Table 1 of Zoning By-law No. 6593, the following provisions shall apply to the lands zone DE/S-xxx: i. Minimum visitor parking shall be 0.2 spaces per unit. Therefore, based on a total of 260 dwelling units x 0.2, a minimum of 52 parking spaces are required for visitors parking. *Note: The amending By-law proposed to entirely delete Table 1. Therefore, only visitors parking is required. It is unclear if this is the intent.*	The plans indicate 64 surface parking spaces plus 271 underground parking spaces. Visitors parking has not been clearly labeled on the plans.	***Unable to determine compliance***
Minimum Number of visitor parking spaces *[per Sections 18A(1)(b) Table 2]*	65 spaces ***Requirement for multiple dwellings*** *0.25 of a space per Class A dwelling unit.* *Therefore, based on 260 units x 0.25 = 65 spaces for visitors* *Note: The amending has not amended/removed this section.*		***Unable to determine compliance***
Minimum Number of Loading Spaces for Multiple Dwellings *[per Sections 18A (c) (1)Table 3]*	A minimum of two (2) loading spaces required; one having a minimum size of 9.0m (l) x 3.7m (w) x 4.3 (h) and one having a minimum size of 18.0m (l) x 3.7m (w) x 4.3m (h).	One surface uncovered loading space having a minimum size of 11.99m (l) x 3.60m (w) is shown.	***Non-conforming***
Minimum Manoeuvring Space Aisle Width *[per Section 18A(1)(f) and Table 6]*	6.0m width ***Requirement:*** *manoeuvring space abutting upon and accessory to each required parking space, having an aisle width mentioned in column 2 of Table 6 for each parking*	It appears parking spaces are proposed in front of each townhouse dwelling. A manoeuvring access driveway having a width of 5.9m (between "Building D and	***Partly non-conforming***

	space having a parking angle mentioned in column 1,	Townhouse dwellings T8 to T10) is shown. A 6.0m manoeuvring aisle widths shown for all other spaces within all levels	
Minimum Parking Space Size *[per Section 18A(7)]*	Notwithstanding Section 18A (8), a minimum parking space shall be 3.0 metres in width by 5.8 metres in length, 2.8 metres in width by 5.8 metres for underground parking and 4.40 metres in width by 5.8 metres in length for a barrier free parking space; and, *Note: Section 18A (7) should also be included as it contains regulations for all other parking spaces other than parallel spaces.*	3.0m x 5.8m and 3.0m x 5.79m (typical parking spaces shown for surface parking). 2.8m x 5.8m (typical parking spaces shown for underground parking). 4.4m x 5.79m (typical parking space shown for barrier free spaces) .	***Non-conforming*** Conforms ***Non-conforming***
Location of parking loading and manoeuvring spaces *[per Sections 18A(9)]*	The required parking, loading and manoeuvring spaces shall be provided and maintained only on the lot on which the principal building is located.	Not all required parking, manoeuvring spaces and loading are provided on the lot.	***Partly non-conforming***
Parking Space Accessibility *[per Sections 18A(10)]*	Sufficient space additional to required parking space shall be provided and maintained on the same lot on which the parking space is located, in such a manner as to enable each and every parking space to be unobstructed and freely and readily accessible from within the lot, without moving any vehicle on the lot or encroaching on any designated parking or loading space.	Parking spaces are unobstructed and freely and readily accessible. It appears that a parking space is proposed in front of each street townhouse dwelling.	Conforms
Parking area adjoining a residential district containing five (5) or more parking spaces *[per Sections 18A(11) & (12)]*	The boundary of the parking area: -shall be not less than 1.5m from the adjoining residential districts and shall be landscaped with a planting strip	Not adjacent to residential district.	N/A

	- Shall be maintained with a minimum 1.2m – 2.0m high visual barrier along all lot lines abutting a residential district. -shall not be closer to the street line than the minimum depth of the front yard required to be provided in the adjoining residential district for that portion of the parking area within 3.0m of a residential district.		Conforms
Lighting of Parking Area *[Per Section 18A(13)]*	Lighting shall be directed towards or on the lot and away from adjacent uses and any highway	Lighting details have not been provided;	***Unable to determine compliance*** *Note: Applicant shall ensure that any lighting shall be directed away from adjacent uses and highway.*
Location of parking as it relates to a required front yard. *[per Section 18A(14g)]*	No part of the required parking area in a residential district shall be located in a required front yard.	No part of the required parking area is located within the required front yard.	Conforms
Requirement for visitor parking *[per Section 18A(16)]*	Shall be maintained for the exclusive use of visitors Shall have a sign appurtenant thereto legibly marked that the parking space is for the exclusive use of visitors; and Be maintained readily accessible to visitors and free and clear of all obstructions.	No visitors parking spaces have been exclusive designated or labelled as visitors parking.	***Unable to determine compliance*** Note: applicant shall ensure proper signage is installed.
Location of Access Driveways *[per Section 18A(21)]*	All required parking spaces and manoeuvring spaces shall have access by means of one or more access driveways located on the lot or located partly on the lot in the case of a mutual driveway or by means of a right of way.	Access to the parking spaces and manoeuvring spaces is via access driveways located on the lot.	Conforms
Manoeuvring Spaces *[per Section 18A(22)]*	All manoeuvring spaces shall be maintained free and clear of all obstructions to permit unobstructed access to and	Manoeuvring spaces for both surface and parking spaces within the underground garage are shown to be unobstructed.	Conforms

	egress from required parking spaces.		
Parking area where there are more than 5 parking spaces *[per Section 18A(24)(b)]*	(i) Not less than one access driveway or mutual access driveway, having a width of at least 5.5m, or (ii) a separate ingress/egress driveway shall have a minimum width of 3.0m (iii) marking on the surface of the parking area delineating the separate parking spaces; and (iv) bumpers or wheel barriers to prevent physical encroachment beyond the parking area (except at the entrance/exit from the parking area)	5.99m and greater mutual access driveway shown (iii) Markings on the surface are shown (iv) no bumpers or wheel barriers are not shown for surface parking; however, a concrete curb is shown which would prevent vehicles from encroaching beyond the parking area for the surface spaces. All other spaces proposed within underground parking garage.	***Non-conforming*** Conforms Conforms
Location of an access driveway *[per Section 18A(25) and (26)]*	Where a townhouse dwelling, maisonette dwelling, multiple dwelling or a use other than a residential use is adjacent to a residential district that does not permit such uses, every access driveway to the multiple dwelling and non-residential use shall be located not less than 3.0m from the common boundary. The adjacent northerly/westerly zone is an "AA and AA/S-1353" district which does not permit a multiple dwelling.	Access driveway is located a distance less than the minimum required 3.0m from said residential boundary.	***Non-conforming***
Surface materials for Parking Area, manoeuvring space, loading space and access driveway *[per Section 18A(30)]*	A permanent durable and dustless surface that is graded, drained and paved with concrete or asphalt or a combination of concrete and asphalt shall be provided and maintained for every parking area, manoeuvring space,	Heavy Duty asphalt shown to be proposed. Grading or drainage details not provided.	Conforms Compliance to be determined by Development Planning

	loading spaces and access driveway.		
Loading Space Requirements *[per Section 18A(32) & (33)]*	Sufficient space additional to required loading space shall be provided and maintained on the same lot on which the loading space is located, in such a manner as to enable each and every loading space to be unobstructed and freely and readily accessible from within the lot, without moving any vehicle on the lot or encroaching on any designated parking or loading space. Every loading space shall be provided and maintained to permit commercial motor vehicles to move readily and without hindrance between the loading space and an access driveway.	Loading space appear is shown to be unobstructed and freely and readily accessible from within the lot.	Conforms
Encroachments Section 18			
Eaves or gutter projection *[per Section 18 (3)(vi)(b)]*	(i) into a required front yard not more than 1.5 m provided that no such projection shall be closer to a street line than 1.5m (ii) into a required rear yard not more than 1.5m; therefore, shall maintain a setback of 4.5m from the rear lot line. (iii) into a required side yard not more than one half of its width, or 1.0m whichever is the lesser;	No details provided	***Unable to determine compliance***
Balcony projection *[per Section 18 (3)(vi)(cc)]*	(i) into a required front yard not more than 1.0m provided that no such projection shall be closer to a street line than 1.5 metres. (ii) into a required rear yard not more than 1.0 metre The zoning By-law requires 5.75m setback from the P5	No balconies shown in the front yard adjacent to a street line. Townhouse Balconies are shown as close as 4.59m from a rear lot line.	N/A ***Non-conforming***

	zone boundary (considered a property lot line as intended). Therefore, balconies shall maintain a setback of 4.75m from the rear lot line. (iii) into a required side yard not more than one-third of its width, or 1.0m whichever is the lesser, The zoning By-law requires 5.75m setback from the P5 zone boundary (considered property lot line as intended). Therefore, balconies shall maintain a setback of 4.75m from all side lot lines.	Townhouse Balconies are shown as close as 4.08m from a side lot line.	***Non-conforming***
Uncovered porch *[per Section 18 (3)(vi)(e)]*	A terrace, uncovered porch, platform or ornamental feature which does not extend more than 1.0 metre above the floor level of the first storey, may project into a required yard, if distant at least 0.5 metres from the nearest side lot line and at least 1.5 metres from the nearest street line;	The porches are shown to be located closer than 1.5m from the Scenic Drive street line.	***Non-conforming***
A roofed-over unenclosed porch projection *[per Section 18 (3)(vi)(d)]* *Definition: "**Storey, First"** shall mean the storey with its floor closest to grade and its ceiling more than 1.8 metres (5.91 feet) above grade*	A roofed-over or screened but otherwise unenclosed one-storey porch at the first storey level, including eaves and gutters, may project into a required front yard or rear yard to a distance of not more than 3.0m, and every such projecting porch shall be distant at least 1.5m from the front lot line, and the enclosure of such a porch to the following extent shall not be deemed enclosure for the purpose of this Section; (i) the porch may have a solid guard around the perimeter of the porch not more than 1.0 metres in height measured from the floor of the porch;	It does not appear that the front porches along Scenic drive are roofed over unenclosed.	N/A

	(ii) the roof may be supported on columns or piers having a maximum width of 0.5m (iii) the beam, lintel or crown of an arch shall be no more than 0.3m in depth (iv) the minimum distance between piers or columns shall be 1.0m and in the case of arches, the arches shall have a minimum clear width of 1.0m		
Zoning Compliance Review for East Block #3 of Schedule A			
Maximum height *[per Section 10A (2) of the Hamilton Zoning By-law 6593)]*	Notwithstanding Subsections 10A(2) of Zoning By-law No. 6593, the following provisions shall apply to multiple dwelling units: i. The maximum building height is eight (8) storeys or 36.0 metres	No elevation plans provided. Site plan and "Site statistics chart" indicates a height ranging from four (4) to eight (8) storeys. No height dimension indicated	***Unable to determine compliance***
	Notwithstanding Subsections 10A(2) of Zoning By-law No. 6593, the following provisions shall apply to townhouse units: i. The maximum building height is three (3) storeys or 16.0 metres	No townhouse dwellings shown	N/A
Minimum yards *[per Section 10A (3) of the Hamilton Zoning By-law 6593)]* **Intensity of use Requirements – minimum lot area and lot width** *[per Section 10A (4) of the Hamilton Zoning By-law 6593)]* **Landscaped Area** *[per Section 10A (5) of the Hamilton Zoning By-law 6593)]*	Notwithstanding Subsections 10A (3), (4) and (5) of Zoning By-law No. 6593, the following provisions shall apply to multiple dwelling units: ii. The minimum setback to Scenic Drive shall be 3.75 metres for a four (4) storey multiple dwelling, 5.5 metres for a five (5) storey multiple dwelling and thirty-five (35) metres to an 8 storey multiple dwelling and 0.0 metres to underground parking;	ii. The four storey multiple dwelling is located a distance of 6.16m from the Scenic Drive. The five storey multiple dwellings are located a distance of 5.95m from the Scenic Drive. A setback from the 8 storey multiple dwelling to the Scenic Drive lot line has not been provided.	Conforms Conforms ***Unable to determine compliance***

	Notwithstanding Subsections 10A (3), (4) and (5) of Zoning By-law No. 6593, the following provisions shall apply to townhouse units: ii. The minimum setback to Scenic Drive shall be 2.0 metres; iii. The minimum setback to a Conservation/Hazard Lands (P5) Zone in City of Hamilton Zoning By-law No. 05-200 shall be 5.75 metres; iv. The minimum setback to the multiple dwelling unit shall be 14.0 metres; and v. That a minimum setback of 1.75 metres shall be provided between end wall to end wall of townhouse dwelling units.	No townhouse units shown to be proposed at this time.	N/A
	Notwithstanding Subsections 10A (4) and (5) of Zoning By-law No. 6593, the following provisions shall apply to the lands zoned DE/S-xxx: i. The minimum lot frontage shall not apply; ii. The minimum lot area shall be 2.75 hectares;	i. No details. ii. 24,130.1m² (2.41hectares)	N/A ***Non-conforming***

The maximum number of dwelling units	The maximum number of dwelling units shall exclude any dwelling units that may be contained in the buildings existing on the date of the passing of this by-law.	Insufficient details provided to confirm compliance.	Unable to determine compliance
Parking Section 18A			
Minimum Number of Parking Spaces *[Per Section 18A(1)(a) and Table 1]*	Notwithstanding Subsections 18(A) Table 1 of Zoning By-law No. 6593, the following provisions shall apply to the lands zone DE/S-xxx: i. Minimum visitor parking shall be 0.2 spaces per unit. *Note: The amending By-law proposed to entirely delete Table 1. Therefore, only visitors parking is required. It is unclear if this is the intent.*	A total of 555 parking spaces are proposed for the East Block. The plans indicate 102 surface parking spaces plus 453 underground parking spaces. Visitors parking has not been clearly labeled on the plans.	***Unable to determine compliance***
	20 parking spaces shall be required for the buildings existing on the date of the passing of this by-law.	The required 20 parking spaces have not been clearly labelled or shown on the plan.	***Unable to determine compliance***
Minimum Number of visitor parking spaces *[per Sections 18A(1)(b) Table 2]*	93 spaces ***Requirement for multiple dwellings*** *0.25 of a space per Class A dwelling unit.* *Therefore, based on 370 units x 0.25 = 93 spaces for visitors* *Note: The amending has not amended/removed this section.*	A total of 555 parking spaces are proposed for the East Block. The plans indicate 102 surface parking spaces plus 453 underground parking spaces. Visitors parking has not been clearly labeled on the plans	***Unable to determine compliance***
Minimum Number of Loading Spaces *[per Sections 18A (c) (1)Table 3]*	*Multiple Dwellings:* A minimum of two (2) loading spaces required; one having a minimum size of 9.0m (l) x 3.7m (w) x 4.3 (h) and one having a minimum size of 18.0m (l) x 3.7m (w) x 4.3m (h). *Existing Heritage building:* The Gross floor area has not been provided. Therefore,	The site plan shows several "load move" areas; however, no specific loading spaces have been clearly designated.	***Non-conforming***

	loading could not be determined.		
Minimum Manoeuvring Space Aisle Width *[per Section 18A(1)(f) and Table 6]*	6.0m width ***Requirement:*** *manoeuvring space abutting upon and accessory to each required parking space, having an aisle width mentioned in column 2 of Table 6 for each parking space having a parking angle mentioned in column 1,*	Several manoeuvring areas are shown having a width of 5.9m. All other spaces show a manoeuvring aisle widths of 6.0m.	***Partly Non-conforming***
Minimum Parking Space Size *[per Section 18A(7)]*	Notwithstanding Section 18A (8), a minimum parking space shall be 3.0 metres in width by 5.8 metres in length, 2.8 metres in width by 5.8 metres for underground parking and 4.40 metres in width by 5.8 metres in length for a barrier free parking space; and, *Note: Section 18A (7) should also be included as it contains regulations for all other parking spaces other than parallel spaces.*	3.0m x 5.8m (typical parking spaces shown for surface parking). 2.8m x 5.8m and 2.8m x 5.79(typical parking spaces shown for underground parking). 4.4m x 6.0m and 4.4m x 5.8m(typical parking space shown for barrier free spaces)	Conforms ***Non-conforming*** Conforms
Location of parking loading and manoeuvring spaces *[per Sections 18A(9)]*	The required parking, loading and manoeuvring spaces shall be provided and maintained only on the lot on which the principal building is located	Not all required parking, manoeuvring spaces and loading are provided on the lot	***Partly non-conforming***
Parking Space Accessibility *[per Sections 18A(10)]*	Sufficient space additional to required parking space shall be provided and maintained on the same lot on which the parking space is located, in such a manner as to enable each and every parking space to be unobstructed and freely and readily accessible from within the lot, without moving any vehicle on the lot or encroaching on any designated parking or loading space.	Parking spaces are unobstructed and freely and readily accessible.	Conforms
Parking area adjoining a residential district containing five (5) or more parking spaces	The boundary of the parking area:	Not adjacent to a residential district.	N/A

[per Sections 18A(11) & (12)]	-shall be not less than 1.5m from the adjoining residential districts and shall be landscaped with a planting strip - Shall be maintained with a minimum 1.2m – 2.0m high visual barrier along all lot lines abutting a residential district. -shall not be closer to the street line than the minimum depth of the front yard required to be provided in the adjoining residential district for that portion of the parking area within 3.0m of a residential district.		
Lighting of Parking Area *[Per Section 18A(13)]*	Lighting shall be directed towards or on the lot and away from adjacent uses and any highway	Lighting details have not been provided;	***Unable to determine Compliance*** *Note: Applicant shall ensure that any lighting shall be directed away from adjacent uses and highway.*
Location of parking as it relates to a required front yard. *[per Section 18A(14g)]*	No part of the required parking area in a residential district shall be located in a required front yard.	No part of the required parking area is located within the required front yard.	Conforms
Requirement for visitor parking *[per Section 18A(16)]*	Shall be maintained for the exclusive use of visitors Shall have a sign appurtenant thereto legibly marked that the parking space is for the exclusive use of visitors; and Be maintained readily accessible to visitors and free and clear of all obstructions.	No parking spaces have been exclusive designated or labelled as visitors parking.	***Unable to determine compliance*** *Note: applicant shall ensure proper signage is installed.*
Location of Access Driveways *[per Section 18A(21)]*	All required parking spaces and manoeuvring spaces shall have access by means of one or more access driveways located on the lot or located partly on the lot in the case of a mutual driveway or by means of a right of way.	Access to the parking spaces and manoeuvring spaces is via access driveways located on the lot.	Conforms
Manoeuvring Spaces *[per Section 18A(22)]*	All manoeuvring spaces shall be maintained free and clear of	Manoeuvring spaces for parking spaces within the	Conforms

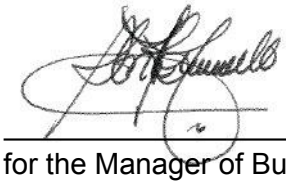
	all obstructions to permit unobstructed access to and egress from required parking spaces.	garage are shown to be obstructed by another vehicle in the driveway. All other manoeuvring spaces are free of obstructions	
Parking area where there are more than 5 parking spaces *[per Section 18A(24)(b)]*	(i) Not less than one access driveway or mutual access driveway, having a width of at least 5.5m, or (ii) a separate ingress/egress driveway shall have a minimum width of 3.0m (iii) marking on the surface of the parking area delineating the separate parking spaces; and (iv) bumpers or wheel barriers to prevent physical encroachment beyond the parking area (except at the entrance/exit from the parking area)	5.99m and greater mutual access driveway shown (iii) Markings on the surface are shown (iv) no bumpers or wheel barriers are not shown for surface parking; however, a concrete curb is shown which would prevent vehicles from encroaching beyond the parking area. All other spaces proposed within underground parking garage structure.	***Non-conforming*** Conforms Conforms
Location of an access driveway *[per Section 18A(25) and (26)]*	Where a townhouse dwelling, maisonette dwelling, multiple dwelling or a use other than a residential use is adjacent to a residential district that does not permit such uses, every access driveway to the multiple dwelling and non-residential use shall be located not less than 3.0m from the common boundary. Note: The adjacent northerly/westerly zone is an "B-1/S-1788" district which does not permit a multiple dwelling.	Access driveway is located a distance of significantly greater than 3.0m from the residential boundary.	Conforms
Surface materials for Parking Area, manoeuvring space, loading space and access driveway *[per Section 18A(30)]*	A permanent durable and dustless surface that is graded, drained and paved with concrete or asphalt or a combination of concrete and	Heavy duty asphalt shown to be proposed.	Conforms

	asphalt shall be provided and maintained for every parking area, manoeuvring space, loading spaces and access driveway.	Grading or drainage details not provided.	Compliance to be determined by Development Planning
Loading Space Requirements *[per Section 18A(32) & (33)]*	Sufficient space additional to required loading space shall be provided and maintained on the same lot on which the loading space is located, in such a manner as to enable each and every loading space to be unobstructed and freely and readily accessible from within the lot, without moving any vehicle on the lot or encroaching on any designated parking or loading space. Every loading space shall be provided and maintained to permit commercial motor vehicles to move readily and without hindrance between the loading space and an access driveway.	No loading spaces are not shown to be proposed.	N/A
Encroachments Section 18			
Eaves or gutter projection *[per Section 18 (3)(vi)(b)]*	(i) into a required front yard not more than 1.5 m provided that no such projection shall be closer to a street line than 1.5m (ii) into a required rear yard not more than 1.5m; therefore, shall maintain a setback of 4.5m from the rear lot line. (iii) into a required side yard not more than one half of its width, or 1.0m whichever is the lesser	No details provided.	***Unable to determine compliance***
Balcony projection *[per Section 18 (3)(vi)(cc)]*	(i) into a required front yard not more than 1.0m provided that no such projection shall be closer to a street line than 1.5 metres.	The balconies for a four storey multiple dwelling are located a distance of 5.02m and greater from the scenic street lot line. The balconies for a five storey multiple dwelling are located a	Conforms

	Therefore, shall maintain the following setbacks from Scenic Drive: 2.75m for a four storey multiple dwelling 4.5m for a five storey multiple dwelling (ii) into a required rear yard not more than 1.0 metre (iii) into a required side yard not more than one-third of its width, or 1.0m whichever is the lesser, The zoning By-law requires 5.65m setback from the P5 zone boundary (considered property lot line as intended). Therefore, balconies shall maintain a setback of 4.65m from all side lot lines.	distance of 5.15m and greater from the scenic street lot line. No balconies are shown into the rear yard. Balconies are shown as close as 4.29m from the side lot lines.	N/A ***Non-Conforming***
A roofed-over unenclosed porch projection *[per Section 18 (3)(vi)(d)]* *Definition: "**Storey, First"** shall mean the storey with its floor closest to grade and its ceiling more than 1.8 metres (5.91 feet) above grade*	A roofed-over or screened but otherwise unenclosed one-storey porch at the first storey level, including eaves and gutters, may project into a required front yard or rear yard to a distance of not more than 3.0m, and every such projecting porch shall be distant at least 1.5m from the front lot line, and the enclosure of such a porch to the following extent shall not be deemed enclosure for the purpose of this Section; <u>therefore shall not project into a required side yard and shall maintain the principle building setbacks.</u> (i) the porch may have a solid guard around the perimeter of the porch not more than 1.0 metres in height measured from the floor of the porch;	Not shown to be proposed	N/A

	(ii) the roof may be supported on columns or piers having a maximum width of 0.5m (iii) the beam, lintel or crown of an arch shall be no more than 0.3m in depth (iv) the minimum distance between piers or columns shall be 1.0m and in the case of arches, the arches shall have a minimum clear width of 1.0m		
Uncovered porch *[per Section 18 (3)(vi)(e)]*	A terrace, uncovered porch, platform or ornamental feature which does not extend more than 1.0 metre above the floor level of the first storey, may project into a required yard, if distant at least 0.5 metres from the nearest side lot line and at least 1.5 metres from the nearest street line;	Not shown to be proposed	N/A

Yours truly



for the Manager of Building Engineering and Zoning

VB/vb

Development Engineering
Zivko Panovski

We have reviewed the following documents submitted in support of the above noted applications for the draft plan lands:

- Functional Servicing, and Stormwater Management (FSR & SWM) prepared by Wood, dated September 18, 2020.

- Civil Engineering Drawing Set, prepared by Wood, dated July, 2020.
- Draft Plan, prepared by Urban Solutions, dated October 22nd, 2020.
- Slope Assessment, prepared by Landtek Limited, dated September 4, 2020

Information

- There is an existing 375mm sanitary sewer along Scenic Drive from the intersection with San Pedro Drive that flows westerly.
- There is an existing storm sewer system along Scenic Drive beginning at San Pedro Drive continuing to the western limits of the site range from 375mm to 1350mm.
- There is an existing 200mm watermain from San Pedro Drive, to the western limit of the site.
- There is an existing 300mm watermain along Scenic Drive Between Sanatorium Road and San Pedro Drive.
- There is an existing 300mm watermain along the south side of Scenic Drive 90m to the east of Sanatorium Road.
- Scenic Drive currently has a road allowance right-of-way of approximately 20.0m width (65.617 feet). The Urban Hamilton Official Plan classifies Scenic Drive as a major collector Road with an ultimate right-of-way width of 26.213m (86 feet) wide. Therefore, a road widening of 3.05m (10 feet) block will be required.
- There is no sidewalk along the north side of Scenic Drive fronting the proposed site, as well as there is no curb along the north side of the pavement to the east of the intersection with Sanatorium Road.
- There is an existing creek that bisects the site and provide outlet for the existing stormwater management facility at the south side of Scenic Drive.

Comments:

We offer the following comments on the above noted documents:

1. Section 2.1 of the FSR & SWM indicates that there is an existing private sanitary drain that was conveying flows from the property to the north through the Escarpment. Due to the age, unknow conditions, maintenance and environmental issues this sewer is considered as not suitable to service the proposed development. Therefore, the proponent will be required to include in the engineering design and cost estimate schedule provision to abandon the existing sewer at the owner's cost. Our office agrees with the Consultant's recommendation to redirect the sanitary flows from the existing heritage building on the site to the sanitary sewer on Scenic Drive.

2. The Consultant has identified constructability issues in Section 2.1.2.2 of the FSR & SWM related to the future sanitary sewer extension to service the east portion of the site that will be reviewed at the detailed design stage. We note that all works related to the extension of the existing sanitary sewer on Scenic Drive to service the proposed development are at 100% owner's cost.

3. The Consultant has identified in Section 2.1.2.3 of the FSR & SWM that there are existing capacity constrains in the existing sanitary sewer downstream of the site that preclude development of the property until upgrades on the existing sewer are completed.

   3.1 We would like to advise that section of the existing 375 mm dia. sanitary sewer from the existing manhole #HD14A063 at the west limit of the property, to HC14A033 at Goulding Avenue is going to be replaced with a 525mm dia sanitary sewer to address the existing capacity constrains and to provide for development of the subject property. The Consultant will be required to update the FSR & SWM to demonstrate that the future 525mm dia. sanitary sewer has sufficient capacity to support the proposed density within the draft plan lands. Furthermore, the proponent will be required to provide a cash payment for their share of the costs to upsize the existing sewer.

4. It appears that the total equivalent population of 898 persons identified in Appendix D of the FSR & SWM, as per Part 8 of the OBC, is underestimated based on the number and type of the residential units for the future development. We advise that the MOECP design criteria governs the design of the municipal infrastructure. Therefore, we recommend that the capacity of the future 525mm dia. sanitary sewer be assessed by the Consultant based on the following assumptions: 3.5ppu for townhouse units, 2.0ppu for 1-bedroom, 2.7ppu for 2-bedroom for the multi storey building at 360l/day/capita and appropriate infiltration in accordance with the current City's development criteria.

5. The Consultant's proposal for twining of the existing municipal watermains on Scenic Drive discussed in Section 2.2 of the FSR & SWM is going to be further evaluated at the detailed design stage with objective to ensure that no extra municipal infrastructure is installed due to the long-term maintenance and capital cost issues. The Consultant will be required to run the water modeling servicing scenario to consider upsizing the existing 200mm municipal watermain on Scenic Drive to the west of San Pedro Drive to 300mm dia, watermain first. We would like to advise that any upgrades on the existing municipal system that are driven by the proposed development shall be paid for by the proponent as a condition of draft plan of subdivision approval.

6. The Consultant has identified need of a municipal storm sewer to pick up the runoff collected by the existing catchbasins within Scenic Drive ROW that discharge onto the subject lands and to divert the runoff to the existing 750mm storm sewer in Section 2.3.1 of the FSR & SWM and preliminary Engineering plans. The existing 750mm storm sewer performs as the outlet for the existing SWM facility and is not sized to pick up additional flows to our understanding. Consultant shall provide additional discussion to clarify this issue.

   6.1 We note that the proposed low flow channel should pick up flows from the existing 750mm storm sewer to our understanding. Consultant to clarify.

7. We would like to advise that at the detailed Engineering design stage, the Consultant will be required to revise the proposal to have the proposed storm outlets from the underground storage structures at MH17 to match the spring line of the existing outlet pipe, as a minimum, in accordance with the City's servicing criteria.

8. It appears that the preliminary grading proposal for the site to the east of the proposed roundabout conflicts with the existing drainage pattern. Refer to Figure 4 in the Engineering set. Consultant shall provide additional info to address this issue.
9. The preliminary grading proposal shown on Figure 4 suggests that the major flows and emergency flow route from the proposed development on the east side of the creek are directed to Scenic Drive. We note that at the detailed design stage the Consultant will be required to demonstrate that the post-development runoff is self-contained within the private lands and directed to an adequate outlet being proposed realigned creek.

10. The Consultant objective to keep the footings of future underground parking structure at or above the existing bedrock elevation requires high retaining walls in proximity to the existing heritage building that may not be supported by the City's staff.

10.1 We would like to note that if significant rock excavation is required to facilitate sitting of the future multi-storey buildings our office will require a study prepared by a qualified professional to address vibration impact on the Escarpment c/w adequate monitoring protocol due to the proximity to the brow of the escarpment. We note that if a such study is required it will be subject to a peer review at the proponent's cost.

11. We have no clear understanding of the impact of the Consultant's proposal to raise the emergency spill way elevation at the brow from approximately 191.35m based on the existing topo to 191.60m. We note that the existing low-laying area within the subject lands performs as a SWM storage facility for the upstream catchment. Therefore, the Consultant should provide additional info to demonstrate that the post-development storage within the site and emergency spillway elevation are matching the pre-development conditions. We advise that an easement in the City favour over the creek block will be required as a condition of the draft plan approval.

12. Detailed comments on Section 4, Stormwater Management, of the FSR & SWM provided by the Infrastructure Planning staff are included in this document.

13. Development Engineering staff offers the following info that may impact the timing of the City's approvals for consideration by the proponent and further discussions with the City staff.

13.1 As noted above there is a capital project initiated by the City to upsize the existing 375mm sanitary sewer on Scenic Drive, from the west limit of the subject lands to Goulding Avenue, including the road improvements works from Chateau Crescent to Upper Paradise Road. The works within the municipal right-of-way that are driven by the proposed development are expected to be paid for by the proponent including but not limited to upgrades of the existing watermain, extension of the sanitary sewer, installation of roundabout, curbing, storm sewer, sidewalk c/w street lighting, multi-use trail etc. could be included as a part of the City contract. However, it is expected that the proponent retain services of qualified Consultants and obtain Form 1 watermain approval by the City, the MOECP approval for the proposed municipal sewers and the detailed design of the proposed roundabout and street light design at 100% their cost and prior to tendering of the capital project works by the City.

13.2 The Development Engineering staff may recommend 'H' provision to be placed over the subject lands under the proposed Zoning By-law amendment to ensure that the required upgrades on the municipal infrastructure to support the proposed

development are completed and proponent has provided payment to the City for their share of the works prior to issuance of the building permits.

14. We would like to advise that our office has no objection on the proponent's proposal to close off and purchase the lands of Sanatorium Road right-of-way to the north of Scenic Drive subject to providing a 5.0m wide Block on the proposed draft plan of subdivision to facilitate public access to the brow. The said block is to provide for installation of a 3.0m wide walkway from Scenic Drive to the brow of the Niagara Escarpment within the creek block. In addition, we note that the proponent will be required to install walkway within the open space block at 100% their cost and to the City satisfaction.

Infrastructure Planning Comments (FSR and SWM Report prepared by Wood, dated, September 18, 2020)

1. Table 4.4.4 and 4.4.5: Please provide supporting model files/outputs in support of the post development flows from the subject site.

2. Paragraph 2, Page 24: It is mentioned that impermeable liner for the wet pond may be required. Please provide supporting design details of the proposed pond liner including groundwater table information.

   Please verify and conform the depth of the pond as per Geotechncal study recommendations.

3. OGS design calculations should be stamped by a Professional Engineer. Additional design measures should be considered in addition to the proposed OGS to achieve required TSS removal ('Leve 1' /80% TSS removal).

4. Page 8 and page 28: Cost sharing for the proposed storm sewer on Scenic Drive (east of Sanatroium Road) -
   The existing overland drainages from Scenic Drive (east of Sanatorium Road) drains overland through existing Sanatorium road to the Creek.

   However, the proposed development proposes to eliminate the existing Sanatorium road (north of Scenic Drive) which currently provides the overland conveyance for flows from Scenic Drive (east of Sanatorium road); in absence of Sanatorium road/overland flow route, storm drainage from Scenic Drive is proposed to be captured and conveyed to the Creek through storm sewer on Scenic Drive. Therefore, proposed storm sewers on Scenic Drive should be constructed to accommodate entire drainages at

proponent's cost; There will not be any City share for any cost for proposed storm sewer on Scenic Drive (east of Sanatoirum Road)

5. Page 10 (paragraph 1): Creek block slide slope 3:1 proposed; however, we recommend a flatter slope (4:1)

6. Page 10 (paragraph1), Page 11 (last paragraph) Page 17 (paragraph 1): meander belt width 30 m (determined by Geo Morphix) mentioned; please show/label the meander belt width/ creek block width on the grading plan.

   Please provide cross sections through the Creek showing water levels for low flow (to be determined based on erosive event) and high flow (to be determined based on design storm events: 2-100 year storm and regional storm) channel.

   Please provide a 4m wide creek maintenance access road on both sides of the proposed realigned creek. These access roads should be set at a minimum of 0.3 m above the emergency spillway elevation (191.60 m) near downstream culvert at Sanatorium road.
   The cross section should show maintenance access road.

7. Please submit functional design of the realigned creek which should show low and high flow channel considering the existing soil (bed rock) and groundwater condition.

8. Table 4.4.5 shows post and predevelopment flow comparison to the Creek from the subject site. However, the report did not provide any discussions related to downstream erosion assessment in the Creek. Please review.

   In this connection, the report should demonstrate that the predevelopment water balance and erosion below escarpment is maintained in the post development such that the predevelopment hydrology is maintained in the downstream as much as possible in the post development conditions.

9. Please provide existing and proposed conditions stage-storage-discharge table for the Creek to demonstrate water level, corresponding volume and discharge for all storm events (2-100 year) including regional storm event.

10. Section 4.3.2/section 4.4.2: Please discuss where is the existing conditions drainage outlet for the woodlots (where the flows drain to from the wood lots). Also, please confirm if the drainage outlet for the woodlots remains the same in the post development conditions.

11. Table 4.4.5: Tabulated results suggests that 2 year and 5 year post development flows are increased towards wood lots. Please confirm that there will not be any erosion impact in the downstream of the woodlot (below escarpment).

12. By the comparing existing conditions drainage area plan prepared by AJ Clarke (digital page 59 of 292) with proposed grading and storm servicing plans (Figure 3 to 6) it appears that drainage from existing sub-catchment 230 is diverted from woodlot to the creek. However, the report did not discuss how the predevelopment water balance/hydrologic regime for the woodlots will be maintained.

13. Section 4.4.2.4: Servicing plan shows there are two outlets proposed to the woodlots; however, stormwater quality treatment through bioswale is proposed for only at one outlet location. Please clarify how the stormwater quality treatment will be provided at other outlet location.

    Report should provide functional design of the bioswale.

14. Culvert outlet at Sanatorium road at downstream of the Creek: Digital Page 219 (appendix F) of 292 shows the existing and proposed culvert rating curve based on current Wood study; however, it is not clarified whether the stage-storage-discharge information presented are based on hydrologic/ hydraulic model. Please provide model files with the report.

15. Sub-catchment names on Table 4.4.2 should be consistent with Figure 11 (Table 4.4.2 mentions S02 but Figure 11 shows S02A for the same 1.09 ha area).

16. Please show sub-catchment S08 (1.39 ha) on Figure 11 as per Table 4.4.2.

17. Stage-storage-discharge Tables – Appendix F (digital page 221 of 292): Please show stages in terms of elevations on the stage-storage-discharge tables for the proposed wet pond, underground storage tanks to confirm the facility footprints and backwater conditions.

18. Please provide stage-storage-discharge rating table for the proposed wet pond at 0.1 m incremental height by identifying the stage/storage/discharge for different storm events (2 to 100 year and regional storm events).

19. Please review and confirm an ECA requirement from MECP for the proposed wet pond and underground storage tank.

20. We recommend the proponent will be responsible to maintain the Creek including downstream the culvert at Sanatorium Road; however, an easement should be provided in favour of the City.

21. A 4 m maintenance access Road around the Creek should be provided and to be shown on the cross section on the drawing as per comment **no. 6** above.

Figure 3 (Functional site grading plan)

22. Please provide cross section through the pond (across the entire creek block up to the east bank) in both directions (north-south; east-west) showing side slopes, inlets, outlets and water level for different storm events.

23. Units parallel to Scenic Drive: current grading plan suggests proposed rear elevation of the townhouse house units are lower than the front. Please demonstrate how the drainages from the rear of townhouse units will be captured.

    We do not support any uncontrolled flows from the rear of townhouse units to Scenic Drive.

    Please review and confirm that the emergency spillway for the internal roads on both condo sites towards the creek, not towards Scenic Drive. Please verify and confirm that overland drainages from Scenic Drive east of Sanatorium Road does not drain through Condo site at roundabout location.

24. The proposed grade along the development limit to the west should be set at a minimum of 0.3 m above the emergency spillway elevation 191.6 m near the downstream culvert (on existing Sanatorium Road).

Figure 5 (Functional Site Servicing Plan- West)

25. Wet pond: Permanent pool elevation mentioned is 190 m which does not appear to be correct. Please review and confirm. The bottom invert of the pond should be set above the 100 year creek operating elevation. The pond emergency spillway invert elevation should be set at a minimum of 0.3 m above the spillway elevation 191.6 m at culvert location on Sanatorium road. The pond and perimeter berm should not be located within the emergency spillway elevation 191.6 m on Sanatorium Rd at the culvert outlet location.

26. Please consider erosion protection at the end of Headwalls HW1, HW2 and HW 4, HW21.

27. Please provide the following information regarding SWM detention unit #2, #3, #4:
    Please confirm and mention the proposed model of the underground storage (i.e ADS Stormtech Chamber as per Page 22 of the report); Please confirm on the drawing: foot print of the storage chamber based on stage-storage-discharge rating table; and top/bottom elevation considering Creek elevation to confirm the volume.

    The storage tank inverts should be set at 0.3 m above the 100 year creek operating elevation. All pipes inverts from the below ground parking lot to the storage systems/pond/creek should be set at a minimum of 0.3 m above the emergency spillway elevation 191.6 m on Sanatorium road.
    Please mention that proposed underground chamber will have impermeable liner at the bottom.

28. Please provide flow control details at MH 16 (for underground SWM detention unit #2) and at MH35 (for underground SWM detention unit #3) and
    Control structure details to confirm stage-storage-discharge rating and back water condition for 100 year level in the creek.

29. Wet pond: please provide flow control details at MH18 to justify footprint of the pond and adequacy of pond volume and outlet configuration considering backwater condition for 100 year water level in the creek

30. Please mention the proposed OGS model (EF 6) at OGS 1 and OGS 21 on the drawing (Figure 6)
    OGS design calculations should be stamped by a Professional Engineer.

    All OGS should be designed using treatment train design principle. Please note that City will give credit upto the maximum TSS removal efficiency obtained by the ETV test for the chosen OGS model. The design should consider additional measures to achieve the required TSS removal rate (Level 1).

31. Downstream culvert at the creek: Proposed 1500 culvert is proposed to be placed at an angle south of the front portion of the existing culvert.

    Please confirm stage-storage-discharge table for the Creek at 0.1 m incremental elevation under pre and post development conditions.

Please provide a table showing the outlet velocity (leaving the culvert) comparisons at different stages under pre and post development considerations.
As the southern portion (south of proposed MH 17) existing culvert (1.63 m W× 1.12 m H) will be replaced by the proposed 1500 mm culvert (19 m @0.5 % slope) to replicate the online flood control storage in the realigned creek, therefore the remaining portion of the existing culvert should be replaced at owners cost and be maintained by the condo Corporation.

Figure 6 (Functional Site Servicing Plan- East)

32. Wood Block: Please show erosion protection at end of the Internal storm service on the east side out letting to the Woodlot and on the west out letting to bioswale
All outlet to the woodlot should be labelled properly including end of treatment control/erosion protection.

33. Please show functional design of the proposed bioswale on the drawing

34. Please use a different line style for the storm sewer vs. underground storage outline.

35. Storm outlet for storm sewers on Scenic Drive: Instead of connecting to the 750 mm culvert, proposed storm sewer on Scenic Drive should have a separate outlet to the Creek.

    Please show emergency flooding extent on Scenic drive west of Sanatorium road to convey the greater of uncontrolled 100-year post development flow or Regional event flow from the upstream drainages south of Scenic Drive. Please confirm any negative impacts on the proposed access across San Pedro Drive. Please confirm if spillway extent on Scenic Drive is in line with the proposed creek width north of Scenic Drive.

Figure 12 (Post Development Floodplain Mapping Plan)

36. Regional Flood line: please provide the relevant hydrologic and hydraulic model files/output.

37. Please show a cross section on the emergency spillway above the downstream culvert on Sanatorium Rd to demonstrate flooding extent, depth and flow velocity on the spillway.

Information Provided by Public Works:

Water Servicing Review

Regarding the memo of November 27, 2020 requesting comments on the proposal to permit the development of the lands at 801, 820, 828, 865 and 870 Scenic Drive in Hamilton:

- The following document was reviewed as part of the submission:
  - Watermain Hydraulic Report (Wood., September 18, 2020)

From the water servicing perspective, we have the following comments:

1. Water Demands:
   - Section 2.2 discusses populations but does not provide the actual flows. Please include the Average Day, max Day, and Peak Hour Flows for both the West side and the East side.
2. Required Fire Flow:
   - The required fire flow for the development has been determined to be 150 L/s. This is acceptable.
3. Hydraulic Analysis:
   - The boundary conditions do not discuss the pump conditions at the Kenilworth and Greenhill Pumping Stations. Typical operation is to have PMP-4 at Greenhill Ave. on all the time. If needed, PMP-1 at Greenhill will also turn on. In general, pumps at Kenilworth are off.
   - All pumps at Woodward should be off.
   - Pumps in PD 6 should be on (up to firm capacity) in order to maintain pressures in PD 6 while supplying the required flow and pressure in PD 5.
   - Please use the 2021 scenario as existing and the 2031 scenario as future.
   - If you would like to further discuss the boundary conditions/model, please contact Udo Ehrenberg (Udo.Ehrenberg@hamilton.ca)
   - A detailed review of the hydraulic analysis has not been completed at this time, and will be completed after the boundary conditions have been coordinated.

Sanitary Servicing

The following sanitary services are available:

- 375 mm sanitary sewer on the West side of the site on Scenic Dr

1. There is a capital project scheduled for construction in the future to replace the existing 375 mm sanitary sewer on Scenic Dr with a 525 mm sanitary sewer from manhole HD14A063 at the west limit of the property, to HC14A033 at Goulding Avenue.

Completion of the 525 mm sewer project is required prior to approval of this application in order to prevent capacity constraints.

Minor Storm Drainage System

1. There is an outfall to Chedoke Creek at the north end of the site, at Sanatorium Rd and the border of Chedoke Golf Course via a 900 mm storm sewer, as well as a dry pond through the middle of the site which collects flows from upstream of the site.

2. The applicant is suggesting that for the East site a City-owned storm sewer be constructed along Scenic Dr between the creek and Sanatorium Rd in order to capture flows from external areas and provide road drainage.

3. Clarification is required on the proposed City access and easements, as well as proposed ownership of existing storm assets, including the existing SWM facilities and culvert outlet to Chedoke Golf Course at Sanatorium.

Source Water Protection

1. Both PED and Hamilton Water would not support permanent dewatering to sanitary or combined sewer infrastructure. The applicant shall present options or geotechnical designs that remove the need for permanent dewatering wherever possible. Discharges to storm sewerage would likely require amendments to the applicant's SWM design as well as an Environmental Compliance Approval from MECP. Issues related to permanent dewatering will need to be resolved prior to OPA/rezoning approval.

2. Within the report, the following is stated: "Once construction dewatering is initiated it will be difficult to stop pumping or significantly reduce the rate of pumping without disrupting construction activities." Given the potential for karstic conditions within the bedrock aquifer, the applicant shall comment on how karstic conditions could impact dewatering volumes and provide mitigating factors in case discharge rates are higher than expected to achieve target dewatering levels.

3. Landtek cites the following in their last item in their summary section: Once the proposed construction excavation depths have been finalized, a dewatering plan should be prepared and anticipated dewatering flows estimated based (sic)." The applicant shall clarify/complete this statement, as dewatering parameters and calculations appeared to be known throughout this report.

4. Closer to site plan application for temporary construction dewatering, the applicant shall present peak dewatering rates, discharge location (manhole ID), and representative groundwater quality in order to comply with City of Hamilton Sewer Use Bylaw standards and Temporary Sewer Discharge Permit requirements. It is recommended to consult with the Superintendent of Environmental Monitoring and Enforcement Group within Hamilton Water as early as possible in the approval process, given that additional review may be required by Hamilton Water to verify the wastewater system could accept the quantity and/or quality of the discharge. Email sewerusebylaw@hamilton.ca to better understand water discharges to City infrastructure.

5. Closer to site plan application for temporary construction dewatering, a future condition of approval will be a demonstration that EASR registration will be executed.

Should you have any questions please contact me at 905-546-2424 x2435.

Environmental Services
Rūta Morkunas

This application has been reviewed for municipal waste collection service. As currently designed the development is not serviceable for the following reasons:

- truck movement is not illustrated on the site plan,
- intended waste collection method, storage locations, and staging is not illustrated on the site plan,
- required details (noted below) are not illustrated on the site plan.

The following requirements must be shown on the site plan for the single unit townhomes to receive municipal waste collection:

1. A storage area in each unit separate from the living space, identified for waste material with adequate space for recycling boxes, an organics cart, garbage container and leaf and yard bags/containers. The minimum required size for the waste storage area is 2.5 square metres.
2. A curbside set out area within the property line that is a minimum of 2.5 square metres to accommodate two recycling boxes, an organics cart, a garbage container and leaf and yard waste. Waste containers must not be set out on sidewalks.
3. The anticipated movement of the waste collection vehicle must be shown on the site plan using AutoTURN or other similar software.

The following requirements must be shown on the site plan for the multi-residential buildings to receive municipal waste collection:

4. An internal storage room that is ventilated, rodent-proof and separate from the living space with adequate space to hold a front-end bin container for garbage and the

appropriate number of carts. The storage room must comply with the Ontario Building Code. Recycling carts, organics carts, and garbage containers must be placed near one another in a clean and well-lit location which is accessible for residents. A Multi-residential building requires a minimum of one recycling cart for every ten units and one organics cart for every fifteen units. Each recycling cart has a footprint of 1.0 metre x 0.8 metres, and each organics cart has a footprint of 0.6 m x 0.5 m. Additional space requirements for front-end bin containers can be found in the Solid Waste Collection Design Guidelines for Developments.

5. A curbside set out area within the property line for recycling carts and organics carts with adequate space to hold all carts on the waste collection day. Carts must not be set out on sidewalks.
6. If a garbage compactor is used, public and resident access must be prohibited to any waste storage rooms equipped with a compactor, or appropriate measures must be taken to ensure that the compactor is not accessible to the public and residents.
7. A garbage enclosure for all garbage stored externally with the following requirements:
    - enclosure for a single front-end garbage bin – clearance width of 4.25 metres
    - enclosure with 2 gates for two front-end garbage bins – clearance width of 8.5 metres
    - the outside gates of the garbage enclosure shall swing open 135 degrees
    - the garbage enclosure shall have free and clear overhead access with a minimum of 9.5 metres of overhead clearance.
8. Internal roads must have a minimum width of 6 metres and have a 13 metre turning radii from the centre line. The road base when over a supported structure must support of minimum of 35,000 kilograms.
9. Road layout must be designed to allow continuous forward movement of the collection vehicles exclusive of parking spaces and/or stored snow. The anticipated movement of the waste collection vehicle must be shown on the site plan using AutoTURN or other similar software.
10. An external waste collection area accessible with a minimum 18 metres straight head-on approach. If the 18-metre head-on approach is not possible, the collection area must be designed to allow a waste collection vehicle with dimensions of 10.5 metres long by 2.6 metres wide to drive forward onto the site, collect the waste, and exit without the need to back up onto a municipal road. The internal roadway towards the collection area must be level (i.e. +/-2%), and the same width as the collection area at minimum.
11. No parking signage must be posted along the access route.

Revised drawings must include:

12. Illustration of the anticipated movement of the waste collection vehicle using AutoTURN or other similar software.

13. Demonstration of the multi-residential buildings (including townhomes) intended waste collection system, i.e. how will waste be managed – collected and stored on the property. External storage, and / or staging area of front-end bin garbage.
14. A curbside collection set out area within the property line for recycling carts and organics carts, must be illustrated. Carts must not be set out on sidewalks.

The following notations must be included on the Draft Plan Approval:

15. The developer is responsible for all waste removal up until the time that an "Agreement for On-site Collection of Solid Waste" is finalized, and municipal collection services are initiated.
16. The developer must provide a signed letter from a professional engineer certifying that the road base along the access route can support at least 35,000 kilograms.
17. If the development is not designed according to specifications identified herein, the developer must:
    a. Arrange a private waste hauler for the removal of all waste materials.
    b. As part of the Purchase and Sale Agreement the developer, owner, property manager or agent for the development must disclose in writing to a prospective buyer of a unit within the development that the property is not serviceable for municipal waste collection.

Additional Information

Information concerning the City's requirements for waste management services for new developments is available in the "City of Hamilton Waste Collection Design Standards for New Developments and Redevelopments". Each user of this document is responsible for ensuring they are referencing the current version. This document is available as Appendix 21 at the following link:
https://www.hamilton.ca/develop-property/policies-guidelines/site-plan-guidelines

***Please note**, Block 3 does "appear" to be serviceable; however, truck movement will need to be illustrated to evidence such (as well as the other requirements stated above). Block 5 "appears" problematic: truck movement and staging will need to be illustrated, etc. City of Hamilton Waste Collections will not service Block 5 with three reversal points. Staging areas will need to be illustrated.

Please contact the undersigned if further information regarding City waste management service is required.

Forestry & Horticulture
Sam Brush

PREAMBLE

In response to your Memorandum of November 27, 2020, regarding the subject area under discussion, the Forestry & Horticulture Section has reviewed the Application for this site and provides the following opinion:

Forestry does not approve the Tree Management plan Report conducted by Dougan and Associates Dated September 14, 2020 requiring the amendments and additional information as addressed below.

Forestry has reviewed approximately 50% of the report and confirms mis information requiring changes prior to a full review. Trees #5 and #6, have been incorrectly identified, as well there are trees within the right of way that have not been included on plan. Tree #68 is no longer on site and removed prior to September 2020. Tree #69 requires ownership identification and condition appraisal reviewed. Additional trees within proximity to this area have not been identified.

All trees within public land need to be identified correctly. The threshold for including tree data within the public realm is not >10cm rather all trees shall be identified.

The table shall also clearly identify tree ownership and other items addressed in bullet format below.

Where ownership of trees in proximity to the boundary between public and private land is un-certain, the subject trees must be surveyed by the applicant to confirm ownership. Ownership is as per By-law 15-125. Ownership must be clearly identified on the Tree Management Plan as either municipal or private.

A **Landscape Plan** is required by the Forestry and Horticulture Section, depicting the street tree planting scheme for the proposed development.

Conditions of the Forestry and Horticulture Section will be cleared only after receipt of all applicable fees and payments.

TREE MANAGEMENT

Tree Protection is a measure of efforts to preserve existing trees during the Planning of New Developments, Infrastructure Enhancements, Utility Upgrades & Residential Improvements.

The Forestry & Horticulture Section requires that a **Tree Management Plan** be prepared by a **Registered Landscape Architect**. All trees within this proposed development area must be

surveyed, identified and accurately plotted on the plan to determine ownership, including intensions regarding retention or removal.

It is compulsory that all proposed surface treatment changes within individual tree driplines as well as property lines, building footprints, driveways, utility construction corridors and temporary access roads be accurately depicted on the submission.

The Tree Inventory Analysis Table on the Tree Management Plan shall not be considered complete without the following data and recommended action for each tree.

- Species by Botanical and common name
- Diameter at breast height in centimeters or millimeters
- Ownership {> 50% @ ground level = ownership}
- Biological health
- Structural condition
- Proposed grade changes within individual driplines {compulsory}
- Proposed utility construction within individual driplines {compulsory}
- Proposed removals or relocations
- Proposed trees to be protected

If it is determined and verified that existing trees can remain, a Tree Protection Zone Detail with notes showing Tree Preservation Techniques shall be included on the submission as per the **Public Tree Preservation and Sustainability Policy.**

The determination of ownership of all trees is the responsibility of the applicant and any civil issues which may exist or arise between property owners with respect to trees, must be resolved by the applicant. The ownership of each individual tree inventoried must be clearly stated as municipal or private.

All Healthy trees on municipal property which are found to be in conflict with this proposed development and do not meet our criteria for removal are subject to a replacement fee as outlined in the **Public Tree Preservation and Sustainability Policy** in conjunction with **By-Law 15-125**.

A $278.80 plus HST permit fee, payable to the City of Hamilton is required prior to the permit issuance.

A <u>permit</u> will be issued upon approval of the Tree Management Plan and applicable fees.

LANDSCAPE PLAN

The Forestry & Horticulture Section requires that a detailed Landscape Planting Plan prepared by a **Registered Landscape Architect**, showing the placement of trees on internal/external City property be provided.

The City of Hamilton's Public Tree Preservation and Sustainability Policy in conjunction with the Tree By-Law 15-125 requires new developments to provide payment of $657.80 plus HST per tree for road allowance street trees. All street tree plantings shall be planted by the City of Hamilton, as approved through the review of a proposed street tree planting scheme. All trees shown on municipal road allowance shall be identified as 'Trees to be planted by City of Hamilton Forestry Section.

Urban Forest Health Technician from the Forestry Section shall be notified post construction, when final grade has been achieved, to facilitate the scheduling of the street tree planting(s). Otherwise, all sites will be monitored annually by Forestry to determine when site is suitable for the following planting season.

The Landscape Plan should specifically outline 50mm caliper size and the species of trees to be planted as well as identify hard surface and soft surface areas on the site. Individually planted trees in new sidewalk installations shall include a detail showing 21 m3 of soil, and a grouping of 2 or more trees in a soil bed shall include 16m3 of soil per tree. New sidewalks, paving or asphalting shall allow 1.5m2 of breathing space for tree roots.

An option to allow forestry to determine tree species is permitted and plan shall reflect that decision by denoting on plan 'City of Hamilton forestry department to determine species'. Please note; all private trees on plan shall have species denoted.

Tree species selection should take into account cultivars {fruitless etc.} salt and heat tolerance, mature tree size, public visibility and daylight triangles, as well as potential pest concerns. Spacing guidelines for trees are 8-10 metres on centre for larger species and 6-7 metres on centre for smaller species.

Guidelines for species diversity shall ensure no single species shall make up more than 20% of the total street tree population. No coniferous trees will be permitted on City of Hamilton road allowance. Any identified street tree species on plan will be subject to change at time of planting due to but limited to; on site conditions, in stock availability and compatibility with approved species by City of Hamilton. Although utility conflicts may change specific planting locations, every opportunity will be made to keep with the intent of the design. Trees planted on the road allowance will have a minimum approximate caliper of 50 mm.

Forestry's mission to increase urban canopy through new development encourages any opportunity for planting locations. The City's goal is to plant trees for many reasons including replacement of canopy loss due to development. Forestry's mandate is to increase canopy coverage across the City to promote a robust green infrastructure, and therefore, a healthy community for all residents of Hamilton.

SUBDIVISION AGREEMENT

In accordance with the New Developments Tree Planting Policy, the city of Hamilton collects cash in lieu of Trees for residential subdivisions; the Forestry & Horticulture Section will provide clearance of a Street Tree Planting condition upon receipt of a plan depicting new trees and a cash payment as shown in item 2.8 of the completed Subdivision Agreement. The remittance is to be made payable directly to the Forestry & Horticulture Section.

The City of Hamilton's Public Tree Preservation and Sustainability Policy in conjunction with the Tree By-Law 15-125 requires new developments to provide payment of $657.80 plus HST per tree for road allowance street trees. All street tree plantings shall be planted by the City of Hamilton. All trees shown on municipal road allowance shall be identified as 'Trees to be planted by City of Hamilton Forestry Section.

Street tree requirements for all blocks identified within the subdivision will be addressed at site plan stage.

Forestry's mission to increase urban canopy through new development encourages any opportunity for planting locations.

SUMMARY

- Tree Management Plan is not approved.
- Landscape Plan required.
- **A permit will be issued upon approval of the Tree Management Plan and applicable fees.**
- The Forestry & Horticulture Section requires that a detailed Landscape Planting Plan prepared by a **Registered Landscape Architect**, showing the placement of trees on internal/external City property be provided.

- The City of Hamilton's Public Tree Preservation and Sustainability Policy in conjunction with the Tree By-Law 15-125 requires new developments to provide payment of $657.80 plus HST per tree for road allowance street trees. All street tree plantings shall be planted by the City of Hamilton, as approved through the review of a proposed street tree planting scheme. All trees shown on municipal road allowance shall be identified as 'Trees to be planted by City of Hamilton Forestry Section.

We encourage you to forward a complete copy of our comments to the applicant and should you or the Applicant require clarification or technical assistance, please do not hesitate to contact me at (905) 546-2424 Ext. 7375.

Growth Planning
David Tsai

The following comments are provided by the Growth Planning Section with respect to the Official Plan Amendment and Zoning By-law Amendment applications:

- It should be noted that a PIN abstract will be required for a Draft Plan of Subdivision and / or Draft Plan of Condominium application;
- It should be determined if the existing Draft Plan of Subdivision 25T200712 will be closed or if a major revision will be required. Staff defer to Development Planning for further comment;
- Has there been any indication that the subject proposal will be Condominium tenure?; If Condominium tenure, will it be phased and / or have multi-corporations? If phased, note that Schedules "G" and "K" per the *Condominium Act* will be required for future phases;
- It should be determined if the proposed Valery Office, the 'Long and Bisby' building per MDA-20-106, will be part of the future Condominium Corporation within Block 5;
- It should be noted that the existing Sanatorium Road address assigned to the 'Long and Bisby' building will eventually be retired upon closure of the road. The owner / applicant should contact Growth Planning staff prior to the closure and reassign a Scenic Drive address to the building;
- It should be determined if the proposed residential developments will require rear yard easements for access and maintenance. Staff defer to Development Planning and / or Development Engineering for further comment;
- It should be noted that the valid municipal addresses for the subject lands are 870 Scenic Drive and 828 Sanatorium Road; and,
- It should be noted that municipal addressing for the proposed residential developments will be determined when future Site Plan applications have been submitted.

The following comments are provided by the Growth Planning Section with respect to the Draft Plan of Subdivision and are required to be addressed prior to or following Draft Approval:

- As required under Section 51(17)(b) of the *Planning Act*, the widths of the existing highways on which the proposed subdivision abuts shall be identified;
- Section 51(17)(g) of the *Planning Act,* natural and artificial features within or adjacent to the land proposed to be subdivided shall be identified;
- Section 51(17)(i) of the *Planning Act,* the nature and porosity of the soil for the lands to be subdivided shall be identified;
- It should be determined if Parts 1 to 11 on Registered Plan 62R-17555 should be part of the legal description; and,
- While reviewing the submitted Draft Plan of Subdivision, we wish to confirm that municipal addresses for the proposed Blocks will be determined after the plan has received Draft Approval.

The following note is required to be added as a Note to the Draft Approval Conditions:

NOTE: Pursuant to Section 51(32) of the *Planning Act*, draft approval shall lapse if the plan is not given final approval within 3 years. However, extensions will be considered if a written request is received 2 months before the draft approval lapses.

Hamilton Conservation Authority
Mike Stone

HCA staff have reviewed the information and studies provided in support of the noted planning applications in accordance with HCA's responsibilities under the *Conservation Authorities Act*, the Memorandum of Understanding between the Ontario Ministry of Natural Resources (MNR), the Ontario Ministry of Municipal Affairs and Housing (MMAH) and Conservation Authorities (CA) relating to provincial interests for natural hazards, and the Memorandum of Agreement between the HCA and the City of Hamilton for planning and technical review services and provide the following comments.

Proposal

The proposed development is comprised of 630 residential units in townhouses and multiple unit dwellings, including 390 surface and 724 underground parking spaces, a stormwater management facility, as well as open space and natural heritage areas associated with the Niagara Escarpment brow, Chedoke Creek through the central portion

of the site and the Significant Woodland and ESA in the east/northeast. Commercial uses are proposed for the retained Long and Bisby heritage building.

The proposed Draft Plan of Subdivision consists of seven blocks, with two blocks for multiple dwellings (Blocks 2 & 5), two Open Space blocks (Blocks 1 & 4), one Stormwater Management block (Block 3), one Woodlot / ESA block (Block 6), and one block for road widening (Block 7).

Amendments to the existing land use designations and zoning are required to accommodate the proposal. This includes adjustments to the Natural Heritage System and Core Area limits, and Conservation/Hazard Land zone. The required designation and zoning changes are described more specifically in the Planning Justification Report (PJR, Urban Solutions, October 2020) and City application circulation memo dated November 27, 2020.

HCA understands future Site Plan and Draft Plan of Condominium applications will be required to implement the proposal.

HCA has provided earlier comments regarding the proposed redevelopment of the site as part of Formal Consultation (FC-18-004) in letters dated February 2, 2018 and August 5, 2020. HCA staff also participated in a site visit with City staff on October 28, 2019 to stake the woodland/ESA boundary. HCA also reviewed the previous planning applications for the site (25T-2007-12) between 2008-10, which were ultimately referred to the Ontario Municipal Board, with a Board decision dated June 22, 2012.

Memorandum of Agreement Hamilton Conservation Authority and City of Hamilton

The subject property is approximately 11ha and is located within the Chedoke Creek Subwatershed on the brow of the Niagara Escarpment. The site is designated Urban Area within the Niagara Escarpment Plan. The property contains areas of the Hamilton Escarpment Environmentally Significant Area (ESA) and Significant Woodland. A headwater tributary of Chedoke Creek bisects the middle of the property, draining north over the Escarpment brow. These natural features are identified as Core Areas and part of the Natural Heritage System within the Urban Hamilton Official Plan (UHOP).

Natural Heritage

An Environmental Impact Study (EIS) and Tree Management Plan (TMP) have been prepared to evaluate the potential impacts of the proposed development (Dougan & Associates, September 14, 2020). The EIS also includes a Restoration Planting Plan in

Appendix J, prepared by adesso design inc. (August 17, 2020). In reviewing the environmental studies prepared HCA notes the following.

Section 5.1.1.1 of the EIS indicates there is a minimum 10m VPZ established for the Significant Woodland and ESA. In reviewing the figures provided in the EIS, PJR, and Functional Servicing and Stormwater Management Report (FSR), it is evident the VPZ for these natural areas is less than 10m in a number of locations. This is noted in particular in the west block, at the north end of the site adjacent to the Escarpment, when the extent of proposed grading is considered. The reductions in the VPZ from the proposed 10m minimum are generally not well described or rationalized in the EIS or PJR. HCA also notes that the VPZ in some places would appear not to meet the minimum 7.5m setback required from the Conservation/Hazard Land (P5) zone, which is to be applied to the natural and open space areas. HCA suggests the development plan should be revised to provide for a minimum 10m VPZ throughout the site.

Further to the above, HCA suggests additional details are required in regards to the VPZ along ELC Polygon 7. Section 5.1.1.1 indicates that this area will have a wider VPZ due to the significance of the Niagara Escarpment. However, as noted, with the proposed grading the development limit appears to encroach up to the ESA boundary in places. HCA staff also note it is not clear if the VPZ in this area is proposed for restoration/planting. Much of this area is currently a road and will be compacted, making planting difficult without prior site preparation.

It is also indicated a trail is to be built through the VPZ at this location. HCA suggest trails should generally be located outside of the buffers that are established for natural feature protection. The setbacks and proposed mitigation for this area should be clarified in the EIS, TMP and Restoration Planting Plan.

The EIS notes there will be a 10 m VPZ where ELC Polygon 2 wraps around the Long and Bisby building. The EIS indicates that the 10 m buffer can be achieved through fencing or additional plantings. HCA staff suggest additional details are required, as plantings do not seem to be included in the Restoration Planting Plan currently. Staff also note there is a road between the building and the Significant Woodland/ESA. In order to restore and establish a planted VPZ the road would need to be removed. Map 6 shows the buffer zone actually covering the building. As this building will remain, this figure should be revised to indicate the true location of the buffer and the EIS revised to clarify the proposed setback and any planting/mitigation.

The Functional Site Servicing Plan (East), Figure 6, from the FSR indicates a small drainage bioswale is proposed into the Significant Woodland, near the location of the Virginia Bluebells, a provincially rare species. HCA is concerned with the addition of a parking lot and

road runoff to this species and the trees in this location. This will increase salt into the woodlot from the road drainage. As this is indicated in the EIS as a method to retain the hydrology in this polygon, HCA suggests further discussion should be included to describe how the impact of salt and other road runoff will be mitigated.

The ELC for Polygon 1 as well as the TMP does not identify Hawthorns to species. According to the Natural Areas Inventory Database, of the identified Hawthorn species in Hamilton just under 25% are provincially rare (Srank 2 or 3). Many are also locally rare and uncommon. The five that are proposed for removal in the TMP should be identified to species so that proper mitigation measures can be designed and followed.

In reviewing the Restoration Planting Plan, HCA notes the trees and shrubs as well as the woodland seed mix proposed are generally acceptable. However, HCA does not support the use of Annual ryegrass as a nurse crop. The other two species proposed are acceptable.

HCA staff note that the edge restoration area shown in the Restoration Planting Plan is smaller than that shown on Map 6: Mitigation Opportunities Browlands. Further, as noted above, it is not clear what restoration/planting is proposed at the Long and Bisby building, or between the development and Escarpment brow. The descriptions and figures/plans included in the EIS should be reviewed and the proposed mitigation and restoration measures clarified.

The method of invasive species removal for Common Buckthorn is acceptable if all stems can be removed without the use of heavy equipment. The Common Buckthorn is located in the same area as the Virginia Bluebells and care would need to be taken not to damage this species as the Common Buckthorn are being removed. It is also likely that there are Common buckthorn trees too large for removal with hand tools. Basal bark treatment with Garlon RTU is recommended. This can be applied in early spring or late fall once other vegetation has senesced. This should be completed by a registered pesticide applicator. Alternatively, the restoration plan should be consistent with the EIS which states that removal methods should be sourced from the Ontario Invasive Plant Council document on Common Buckthorn control.

HCA suggests Section 5.1.6 requires further clarification. The plant list for ELC Polygon 1 appears to include a number of aggressive invasive species. Transplanting or rescuing plants from this corridor (as this section implies) may not be appropriate. It is likely any native plant that is rescued will also have the seeds of or parts of the invasive species located in this corridor. To ensure a stable restoration site, it is recommended that the aggressive invasive species located in this corridor be controlled prior to any removal and reconstruction of the channel. Without this, these invasive species will re-establish and likely degrade attempts to establish native self-sustaining vegetation in the creek corridor.

From the TMP, trees 153 and 154 are identified as Pin Oak, a provincially rare species (S3), and tree 710 is a Cucumber Magnolia, also a provincially rare species (S2). Some discussion around these trees should occur in the EIS as has been done for Honey Locust. In addition, the 2009 report by Aboud & Associates indicates that the two Pin Oak should be preserved. In 2009 these trees were considered high quality with diameters of 60 and 65 cm. The current TMP indicates that these two trees are now 75 and 7 cm in diameter, and still in good condition. HCA assumes that the 7 cm maybe a typographical error, and suggest the plan should be reviewed to see if these species can be preserved, and any change in recommendation rationalized given their mature and healthy condition.

HCA suggests consideration could been given to the removal of all Norway Maple, Black Locust and White Mulberry from those trees identified in the TMP. These species threaten the Niagara Escarpment ESA as they are aggressive invasive species. These specimens may have been established for a number of years, but the redevelopment of this site presents the opportunity to remove these invasive species and re-plant both the restoration areas and the landscape/streetscape with non-invasive species. It is likely that with the planting of the VPZ and the Chedoke creek corridor that the 1:1 tree replacement ratio will be meet even with the removal of all the invasive tree species identified in the TMP.

HCA suggests Section 5.1.5.1 should be reviewed and clarified as the paragraphs seem to repeat themselves and the dates noted for breeding birds are different from the first to the second paragraph.

The EIS notes that six Garter snakes observed in early May was the location searched for hibernacula. Please clarify if this observation indicated potential hibernacula where the snakes were observed.

In Section 3.5.1. Watercourse Characterization, it is concluded the on-site reach does not seem suitable to support fish directly. While staff agree with this conclusion, there should be recognition that there is fish habitat downstream of the escarpment and that this reach likely plays a small contributory role to the downstream habitat. Specifically, through allochthonous and autochthonous resource generation. This is important since the proposal is to realign the creek which will disturb this function and needs to be accounted for in the impacts and mitigation sections.

Staff note the Legislation & Policies section (p.30) is missing the *Fisheries Act* and should be updated to include it. Given the findings of the fieldwork it is expected the Act will have limited effect on the project, but should still should be discussed here.

HCA suggests Table 5: Direct Impact Summary Matrix, the Anticipated Magnitude / Extent of Impact cell for the Chedoke Creek tributary corridor should be updated to reflect there is no direct fish habitat to be impacted on site but that the proposed realignment will have the potential to have impacts downstream through the disruption of the system temporarily. Furthermore, with the plans for the new channel to be improved ecologically there is the potential for the future impacts to have a positive effect downstream, which could be identified as indirect effects in Table 6.

HCA suggests the Impacts and Cumulative Impacts sections should include discussion related to the impacts of bringing more people on the site and how this could impact the creek corridor into the future. Examples include: garbage, invasive plant introduction through illegal dumping of garden waste, impact of pets (cats and dogs especially), channel alterations such as constructed dams, etc. The potential for such impacts are especially problematic when lands remain privately held but are not monitored or managed once the development is constructed.

Table 7, Mitigation and Restoration Measures, and Section 5.1.6 should be updated to reflect the additional items discussed above.

Chedoke Creek Realignment

The development concept for the property includes the proposed realignment of Chedoke Creek, which runs through the central portion of the property. A Technical Design Brief for the proposed realignment was submitted in support of the planning applications (TDB, GEO Morphix Ltd., July 24, 2020). HCA staff note creek realignment was not proposed at the time of original Formal Consultation for the current applications, or through the earlier concepts and discussions that have occurred regarding the property. There has been no prior consultation with HCA regarding the proposed realignment, which is concerning given the watercourse is regulated by HCA and any alteration of a watercourse requires HCA approval. Neither the TDB or PJR identify this, or discuss HCA's policy framework as it relates to watercourse alterations.

After the planning applications had been circulated to HCA for review, HCA requested through the applicant's planning consultant the opportunity for a site visit to inspect the creek and discuss the proposed realignment. There has been no response to this request to date. Given HCA has not had the opportunity to inspect the creek, staff have undertaken only a preliminary review of the TDB, noting it characterizes the watercourse as degraded, and suggests the proposed realignment will improve both form and function of the channel. Neither the TDB or PJR offer a rationale for the proposed realignment, other than it is necessary to accommodate the proposed development.

As a general comment, HCA suggests development proposals are more typically designed around existing site constraints and to protect natural features such as watercourses, rather than altering such features to suit the desired development form. While there may be merit in the proposed realignment and opportunity for improvement, as noted, HCA staff will want an opportunity to inspect the existing creek conditions and review rationale for the proposed realignment. HCA will provide further comments on this aspect of the proposal once a site inspection has been completed.

Stormwater Management and Servicing

The subject property is part of the Chedoke Creek Subwatershed and drains to Hamilton Harbour, which has a Remedial Action Plan to restore the health of the harbour by reducing the amount of sediment entering the harbour and Lake Ontario and by improving stormwater quality. As the subject property drains to Hamilton Harbour, in accordance with the recommendations of the Remedial Action Plan and City of Hamilton development guidelines, stormwater quantity and quality to the Enhanced Level will be required for the development proposal.

A Functional Servicing and Stormwater Management Report was submitted in support of the proposed development (FSR, Wood, September 18, 2020). Given HCA's interest in undertaking a site visit, staff have completed only a cursory review of the FSR and offer the following preliminary comments.

Section 4.4.2.3 outlines that the HEC-HSM modeling determined that increased erosion is not an issue at the Escarpment. At the same time, the report outlines that the flood storage volume is expected to be increased (Section 4.4.1). Considering the flood volume will increase and, respectively, the storm water discharge time from the site will be extended, it is recommended that a qualified fluvial geomorphologist assess the proposed long-term erosion extent at the waterfall located immediately downstream of the road crossing and compare it to the existing long-term erosion potential.

If it is determined the proposed creek realignment will proceed, HCA notes further study will be required to demonstrate that the combination of the realigned channel and reconstructed Scenic Drive crossing is not a source of erosion at the Escarpment brow.

If it is determined the erosion potential at the Escarpment brow will increase and have potential to encroach on the development, a geotechnical consultant would be required to assess the slope stability setback along the creek.

HCA staff note the plans and drawings included do not identify the existing or proposed flood or erosion hazards, or indicate the width of the proposed creek block. A plan delineating the existing flood and erosion hazards in relation to the proposed development should be included with the submission.

The ultimate design should demonstrate that all new outfalls to the regulated watercourse are located above the bankfull elevation and away from the 100-year erosion hazard limit.

If filtration/infiltration quality control measures are proposed to achieve the required level of TSS removal, it should be demonstrated that storm water is not a potential source of shallow aquifer contamination.

HCA staff note the Hydrogeologic Investigation (Landtek Ltd., September 8, 2020), indicates the potential for a significant change in site water balance. In Section 7.4.1, Maintenance of Groundwater Recharge, it is recommended the development maintain pre-development water balance and recharge at the site through storm water management design techniques. In reviewing the submission it is not clear how this has been addressed, and HCA suggests this should be addressed/clarified in the FSR.

Ontario Regulation 161/06 under the *Conservation Authorities Act*

The central portion of the subject property is regulated by the HCA pursuant to *Ontario Regulation 161/06* (HCA's Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses) made under the *Conservation Authorities Act, R.S.O. 1990.* The regulated area is associated with a tributary of Chedoke Creek and associated flood and erosion hazards.

The development includes the proposed realignment of Chedoke Creek through the central portion of the property. As noted, this proposal has not been previously reviewed with HCA and the studies submitted in support of the application have not addressed HCA policies as they relate to proposed watercourse alterations. A site visit with HCA staff and further rational and assessment of the proposal is required.

Given the proposed creek realignment and development within the regulated area a permit(s) will be required for site development.

MNR/MMAH/CA Memorandum of Understanding – PPS Natural Hazards

Provincial natural hazard policies generally direct development to areas outside of hazardous lands. A plan to illustrate the flood and erosion hazards under existing and proposed

conditions in relation to the proposed development should be submitted. All development will be required to be located outside of hazard limits, as they are ultimately determined. Given hazard limits have not been confirmed HCA staff suggest the natural hazard policies of the PPS have not been addressed.

Based on the above comments, HCA staff suggest additional work and assessment is required before the applications should be considered for approval. HCA staff are available to review these comments in more detail as necessary.

Hamilton Water
Sarah Primmer (GMBP) / Lindsay Currie / Mike Christie

Water Servicing Review
Regarding the memo of November 27, 2020 requesting comments on the proposal to permit the development of the lands at 801, 820, 828, 865 and 870 Scenic Drive in Hamilton:

- The following document was reviewed as part of the submission:
  - Watermain Hydraulic Report (Wood., September 18, 2020)

From the water servicing perspective, we have the following comments:

4. Water Demands:
   - Section 2.2 discusses populations but does not provide the actual flows. Please include the Average Day, max Day, and Peak Hour Flows for both the West side and the East side.
5. Required Fire Flow:
   - The required fire flow for the development has been determined to be 150 L/s. This is acceptable.
6. Hydraulic Analysis:
   - The boundary conditions do not discuss the pump conditions at the Kenilworth and Greenhill Pumping Stations. Typical operation is to have PMP-4 at Greenhill Ave. on all the time. If needed, PMP-1 at Greenhill will also turn on. In general, pumps at Kenilworth are off.
   - All pumps at Woodward should be off.
   - Pumps in PD 6 should be on (up to firm capacity) in order to maintain pressures in PD 6 while supplying the required flow and pressure in PD 5.
   - Please use the 2021 scenario as existing and the 2031 scenario as future.
   - If you would like to further discuss the boundary conditions/model, please contact Udo Ehrenberg (Udo.Ehrenberg@hamilton.ca)

- A detailed review of the hydraulic analysis has not been completed at this time, and will be completed after the boundary conditions have been coordinated.

Sanitary Servicing

The following sanitary services are available:

- 375 mm sanitary sewer on the West side of the site on Scenic Dr
- 250 mm sanitary sewer on the East side of the site on Scenic Dr

The site is located in a catchment with a population density of 125 ppHa.
There is a capital project (ID# 11270) scheduled for construction in 2024 to replace the 375 mm sanitary sewer on Scenic Dr with a 525 mm sanitary sewer from Chateau Crt to Upper Paradise Rd. Completion of the 525 mm sewer project is required prior to approval of this application in order to prevent capacity constraints.

Minor Storm Drainage System

There is an outfall to Chedoke Creek at the north end of the site, at Sanatorium Rd and the border of Chedoke Golf Course via a 900 mm storm sewer, as well as a dry pond through the middle of the site which collects flows from upstream of the site.
The applicant is suggesting that for the East site a City-owned storm sewer be constructed along Scenic Dr between the creek and Sanatorium Rd in order to capture flows from external areas and provide road drainage, ultimately directing flows to the West.
Clarification is required on the proposed City access and easements, as well as proposed ownership of existing storm assets, including the existing SWM facilities and culvert outlet to Chedoke Golf Course at Sanatorium.

Source Protection Planning

Source Protection Planning has reviewed the applicant's hydrogeological report. Our comments are as follows:

6. Both PED and Hamilton Water would not support permanent dewatering to sanitary or combined sewer infrastructure. The applicant shall present options or geotechnical designs that remove the need for permanent dewatering wherever possible. Discharges to storm sewerage would likely require amendments to the applicant's SWM design as well as an Environmental Compliance Approval from MECP. Issues related to permanent dewatering will need to be resolved prior to OPA/rezoning approval.

7. Within the report, the following is stated: "*Once construction dewatering is initiated it will be difficult to stop pumping or significantly reduce the rate of pumping without disrupting construction activities*." Given the potential for karstic conditions within the bedrock aquifer, the applicant shall comment on how karstic conditions could impact dewatering

volumes and provide mitigating factors in case discharge rates are higher than expected to achieve target dewatering levels.

8. Landtek cites the following in their last item in their summary section: *Once the proposed construction excavation depths have been finalized, a dewatering plan should be prepared and anticipated dewatering flows estimated based* (sic)." The applicant shall clarify/complete this statement, as dewatering parameters and calculations appeared to be known throughout this report.

9. Closer to site plan application for temporary construction dewatering, the applicant shall present peak dewatering rates, discharge location (manhole ID), and representative groundwater quality in order to comply with City of Hamilton Sewer Use Bylaw standards and Temporary Sewer Discharge Permit requirements. It is recommended to consult with the Superintendent of Environmental Monitoring and Enforcement Group within Hamilton Water as early as possible in the approval process, given that additional review may be required by Hamilton Water to verify the wastewater system could accept the quantity and/or quality of the discharge. Email sewerusebylaw@hamilton.ca to better understand water discharges to City infrastructure.

10. Closer to site plan application for temporary construction dewatering, a future condition of approval will be a demonstration that EASR registration will be executed.

Infrastructure Planning
Monir Moniruzzaman / Suman Saha

Infrastructure Planning Staffs have reviewed Functional Servicing and Stormwater Management Report prepared by Wood, dated: September 18, 2020 and would like to provide following comments from stormwater management perspective:

FSR & SWM Report

38. Table 4.4.4 and 4.4.5: Please provide supporting model files/outputs in support of the post development flows from the subject site.

39. Paragraph 2, Page 24: It is mentioned that impermeable liner for the wet pond may be required. Please provide supporting design details of the proposed pond liner including groundwater table information.

    Please verify and conform the depth of the pond as per Geotechncal study recommendations.

40. OGS design calculations should be stamped by a Professional Engineer. Additional design measures should be considered in addition to the proposed OGS to achieve required TSS removal ('Leve 1' /80% TSS removal).

41. Page 8 and page 28: Cost sharing for the proposed storm sewer on scenic drive (east of Sanatroium Road) -
The existing overland drainages from Scenic Drive (east of Sanatorium Road) drains overland through existing Sanatorium road to the Creek.

However, the proposed development proposes to eliminate the existing Sanatorium road (north of Scenic Drive) which currently provides the overland conveyance for flows from Scenic Drive (east of Sanatorium road); in absence of Sanatorium road/overland flow route, storm drainage from Scenic Drive is proposed to be captured and conveyed to the Creek through storm sewer on Scenic Drive. Therefore, proposed storm sewers on Scenic Drive should be constructed to accommodate entire scenic drainages at proponent's cost; There will not be any City share for any cost for proposed storm sewer on Scenic Drive (east of Sanatoirum Road)

42. Page 10 (paragraph 1): Creek block slide slope 3:1 proposed; however, we recommend a flatter slope (4:1)

43. Page 10 (paragraph1), Page 11 (last paragraph) Page 17 (paragraph 1): meander belt width 30 m (determined by Geo Morphix) mentioned; please show/label the meander belt width/ creek block width on the grading plan.

Please provide cross sections through the Creek showing water levels for low flow (to be determined based on erosive event) and high flow (to be determined based on design storm events: 2-100 year storm and regional storm) channel.

Please provide a 4m wide creek maintenance access road on both sides of the proposed realigned creek. These access roads should be set at a minimum of 0.3 m above the emergency spillway elevation (191.60 m) near downstream culvert at Sanatorium road. The cross section should show maintenance access road.

44. Please submit functional design of the realigned creek which should show low and high flow channel considering the existing soil (bed rock) and groundwater condition.

45. Table 4.4.5 shows post and predevelopment flow comparison to the Creek from the subject site. However, the report did not provide any discussions related to downstream erosion assessment in the Creek. Please review.

    In this connection, the report should demonstrate that the predevelopment water balance and erosion below escarpment is maintained in the post development such that the predevelopment hydrology is maintained in the downstream as much as possible in the post development conditions.

46. Please provide existing and proposed conditions stage-storage-discharge table for the Creek to demonstrate water level, corresponding volume and discharge for all storm events (2-100 year) including regional storm event.

47. Section 4.3.2/section 4.4.2: Please discuss where is the existing conditions drainage outlet for the woodlots (where the flows drain to from the wood lots). Also, please confirm if the drainage outlet for the woodlots remains the same in the post development conditions.

48. Table 4.4.5: Tabulated results suggests that 2 year and 5 year post development flows are increased towards wood lots. Please confirm that there will not be any erosion impact in the downstream of the woodlot (below escarpment).

49. By the comparing existing conditions drainage area plan prepared by AJ Clarke (digital page 59 of 292) with proposed grading and storm servicing plans (Figure 3 to 6) it appears that drainage from existing sub-catchment 230 is diverted from woodlot to the creek. However, the report did not discuss how the predevelopment water balance/hydrologic regime for the woodlots will be maintained.

50. Section 4.4.2.4: Servicing plan shows there are two outlets proposed to the woodlots; however, stormwater quality treatment through bioswale is proposed for only at one outlet location. Please clarify how the stormwater quality treatment will be provided at other outlet location.

    Report should provide functional design of the bioswale.

51. Culvert outlet at Sanatorium road at downstream of the Creek: Digital Page 219 (appendix F) of 292 shows the existing and proposed culvert rating curve based on current Wood study; however, it is not clarified whether the stage-storage-discharge information presented are based on hydrologic/ hydraulic model. Please provide model files with the report.

52. Sub-catchment names on Table 4.4.2 should be consistent with Figure 11 (Table 4.4.2 mentions S02 but Figure 11 shows S02A for the same 1.09 ha area).

53. Please show sub-catchment S08 (1.39 ha) on Figure 11 as per Table 4.4.2.

54. Stage-storage-discharge Tables – Appendix F (digital page 221 of 292): Please show stages in terms of elevations on the stage-storage-discharge tables for the proposed wet pond, underground storage tanks to confirm the facility footprints and backwater conditions.

55. Please provide stage-storage-discharge rating table for the proposed wet pond @ 0.1 m incremental height by identifying the stage/storage/discharge for different storm events (2 to 100 year and regional storm events).

56. Please review and confirm an ECA requirement from MECP for the proposed wet pond and underground storage tank.

57. We recommend the proponent will be responsible to maintain the Creek including downstream the culvert at Sanatorium Road; however, an easement should be provided in favour of the City. Development Engineering staff should confirm this requirements.

58. A 4 m maintenance access Road around the Creek should be provided and to be shown on the cross section on the drawing as per comment **no. 6** above.

Figure 3 (Functional site grading plan)

59. Please provide cross section through the pond (across the entire creek block upto the east bank) in both directions (north-south; east-west) showing side slopes, inlets, outlets and water level for different storm events.

60. Units parallel to Scenic Drive: current grading plan suggests proposed rear elevation of the townhouse house units are lower than the front. Please demonstrate how the drainages from the rear of townhouse units will be captured.

    We do not support any uncontrolled flows from the rear of townhouse units to Scenic Drive.

    Please review and confirm that the emergency spillway for the internal roads on both condo sites towards the creek, not towards Scenic Drive. Please verify and confirm that

overland drainages from Scenic Drive east of Sanatorium Road does not drain through Condo site at roundabout location.

61. The proposed grade along the development limit to the west should be set at a minimum of 0.3 m above the emergency spillway elevation 191.6 m near the downstream culvert (on existing Sanatorium Road).

Figure 5 (Functional Site Servicing Plan- West)

62. Wet pond: Permanent pool elevation mentioned is 190 m which does not appear to be correct. Please review and confirm. The bottom invert of the pond should be set above the 100 year creek operating elevation. The pond emergency spillway invert elevation should be set at a minimum of 0.3 m above the spillway elevation 191.6 m at culvert location on Sanatorium road. The pond and perimeter berm should not be located within the emergency spillway elevation 191.6 m on Sanatorium Rd at the culvert outlet location.

63. Please consider erosion protection at the end of Headwalls HW1, HW2 and HW 4, HW21.

64. Please provide the following information regarding SWM detention unit #2, #3, #4: Please confirm and mention the proposed model of the underground storage (i.e ADS Stormtech Chamber as per Page 22 of the report); Please confirm on the drawing: foot print of the storage chamber based on stage-storage-discharge rating table; and top/bottom elevation considering Creek elevation to confirm the volume.

    The storage tank inverts should be set at 0.3 m above the 100 year creek operating elevation. All pipes inverts from the below ground parking lot to the storage systems/pond/creek should be set at a minimum of 0.3 m above the emergency spillway elevation 191.6 m on Sanatorium road.
    Please mention that proposed underground chamber will have impermeable liner at the bottom.

65. Please provide flow control details at MH 16 (for underground SWM detention unit #2) and at MH35 (for underground SWM detention unit #3) and
    Control structure details to confirm stage-storage-discharge rating and back water condition for 100 year level in the creek.

66. Wet pond: please provide flow control details at MH18 to justify footprint of the pond and adequacy of pond volume and outlet configuration considering backwater condition for 100 year water level in the creek

67. Please mention the proposed OGS model (EF 6) at OGS 1 and OGS 21 on the drawing (Figure 6)

    OGS design calculations should be stamped by a Professional Engineer.

    All OGS should be designed using treatment train design principle. Please note that City will give credit upto the maximum TSS removal efficiency obtained by the ETV test for the chosen OGS model. The design should consider additional measures to achieve the required TSS removal rate (Level 1).

68. Downstream culvert at the creek: Proposed 1500 culvert is proposed to be placed at an angle south of the front portion of the existing culvert.

    Please confirm stage-storage-discharge table for the Creek @ 0.1 m incremental elevation under pre and post development conditions.

    Please provide a table showing the outlet velocity (leaving the culvert) comparisons at different stages under pre and post development considerations.
    As the southern portion (south of proposed MH 17) existing culvert (1.63 m W× 1.12 m H) will be replaced by the proposed 1500 mm culvert (19 m @0.5 % slope) to replicate the online flood control storage in the realigned creek, therefore the remaining portion of the existing culvert should be replaced at owners cost and be maintained by the condo Corporation.

Figure 6 (Functional Site Servicing Plan- East)

69. Wood Block: Please show erosion protection at end of the Internal storm service on the east side out letting to the Woodlot and on the west out letting to bioswale
    All outlet to the woodlot should be labelled properly including end of treatment control/erosion protection.

70. Please show functional design of the proposed bioswale on the drawing

71. Please use a different line style for the storm sewer vs. underground storage outline.

72. Storm outlet for storm sewers on Scenic Drive: Instead of connecting to the 750 mm culvert, proposed storm sewer on Scenic Drive should have a separate outlet to the Creek.

Please show emergency flooding extent on Scenic drive west of Sanatorium road to convey the greater of uncontrolled 100 year post development flow or Regional event flow from the upstream drainages south of Scenic Drive. Please confirm any negative impacts on the proposed access across San Pedro Drive. Please confirm if spillway extent on Scenic Drive is in line with the proposed creek width north of Scenic Drive.

Figure 12 (Post Development Floodplain Mapping Plan)

73. Regional Flood line: please provide the relevant hydrologic and hydraulic model files/output.

74. Please show a cross section on the emergency spillway above the downstream culvert on Sanatorium Rd to demonstrate flooding extent, depth and flow velocity on the spillway.

Landscape Architectural Services / Asset Management
Cynthia Graham / Erika Waite

- Per the Mountainbrow Trail Masterplan there is a trail connection required to link the future multi-use path along scenic drive to the existing woodlot trail. Would the developer be interested in entering into an Open Space Financing Agreement (OSFA) with the City to construct the 3m wide asphalt trail on the City's behalf? Can the trail be zoned P4 and not P5? Please submit the grading plans for LAS to review to ensure that a trail can be accommodated.
- A seating area and interpretive area is planned adjacent to the cross of lorraine along the future trail and will include relighting the cross. Would the developer be interested in constructing this on the City's behalf as part of the OSFA? What would be the developer's timeline from completing this work?
- Will there be an access road provided to stormwater management facility? Will there be a trail connection through the stormwater open space block to connect Scenic to the future brow trail?
- We request cash-in-lieu of parkland dedication.

- NP - No concerns. ES is aware of upcoming development, as we have reconstruction projects planned along Scenic from Mohawk to Upper Paradise

Transit Planning
Andy McLaughlin

Two bus routes (#33 and #41A) presently serve the site, both utilizing the portion of Sanatorium Road that exists north of Scenic Drive. One of the routes (#41A) makes use of

the abandoned Brow Building parking lot as a turnaround & recovery point. At present there are no plans to adjust transit service levels.

With the closure of San Rd. north of Scenic Dr., both routes will be required to utilize the proposed roundabout at San Rd./Scenic Dr. Route #33 will require use of the roundabout to connect to/from Goulding Av., using Scenic Dr. in both directions. Route #41A will use the roundabout to make a 360 degree turn in order to change direction from Northbound to Southbound.

The roundabout must be capable of accommodating these bus movements. The bus stop on San Rd. @ Scenic Dr., NW corner will be eliminated. The bus stop on San Rd. @ Scenic Dr., SE corner will require repositioning to ensure proper Northbound traffic flow into the roundabout. A new bus stop on Scenic Dr., south side, west of the roundabout may be required.

Good pedestrian connections thru the site and out to Scenic Dr. will help to encourage transit use. HSR notes the TIS & TDM report recommendation related to transit shelter (and accompanying landing pad) installation and will work with the proponent in this regard, where appropriate.

Transportation Planning
Sandra Lucas / Jeff Cornwell

- Official Plan Amendment - **DO NOT SUPPORT**
- Zoning By-law Amendment - **DO NOT SUPPORT**
- Draft Plan of Subdivision – **CONDITIONS**
- Transportation Impact Study – **RESUBMISSION REQUIRED**
- Traffic Calming Report –**APPROVED, FUNDS REQUIRED**
- Transportation Demand Management – **APPROVED, REVISIONS REQUIRED TO FUTURE SITE PLAN**
- Right-of-Way - **DEDICATIONS REQUIRED, REVISIONS TO SITE PLAN REQUIRED**
- Infrastructure Improvements – **REQUIRED**
- Future Site Plan – **REVISIONS REQUIRED**

Synopsis of Transportation Planning Comments for Planning Report

4.0 PRIOR TO SERVICING

- As a condition of Draft Plan Approval, prior to servicing, the Applicant shall be required to contribute $18,000 ($6000 per speed cushion x 3) to the City of Hamilton for the future placement of traffic calming measures along Scenic Drive.
- As a condition of Draft Plan Approval, prior to servicing, the Applicant shall be responsible for the design and construction of a multi-use trail, in lieu of a sidewalk constructed along the north

• Transportation Planning does not support the proposed site development as shown since there are access and site maneuverability issues, some which will affect both the underground parking and building envelopes. • Transportation Planning cannot approve the Transportation Impact Study and requires a resubmission as noted below in this document • To protect the existing and future pedestrian realm, cycling infrastructure and road network, Transportation Planning shall require the following: ▪ An appropriate right-of-way and daylighting triangle dedication to accommodate the proposed roundabout; ▪ Sanatorium Road is currently a municipal roadway. While Transportation Planning does not object to the conversion of the road to private ownership, or realignment if necessary, to support the development, we do require a continuous internal roadway throughout the site, and the number of accesses to Scenic Drive be reduced to only two accesses as detailed below ▪ The construction of a proposed multi-use trail may be required along the frontage of Scenic Drive, in lieu of a sidewalk, to be determined by City staff ▪ Additional internal sidewalk connections to improve walkability within the site and connect to the existing and planned municipal trail/sidewalk network ***Documents Reviewed*** Transportation Planning has reviewed the subject file. The following comments and recommendations refer to:	side of Scenic Drive to provide accommodation for pedestrians and cyclists. The Mountain Brow Trail study provides trail width details. This work shall be coordinated through the construction of facilities or provide securities to facilitate the construction as part of future Public Works along Scenic Drive and Sanatorium Road. Reference the Mountain Brow Study - https://www.hamilton.ca/parks-recreation/creating-new-parks/mountain-brow-multi-use-pathway-feasibility-study, fully at the expense of the Applicant and to the satisfaction of the Manager, Transportation Planning and Manager, Transportation Operations and Maintenance. • As a condition of Draft Plan Approval, prior to servicing, the Applicant shall be responsible for the design and construction of a single lane roundabout at the Scenic Drive at Sanatorium/Site access driveway as a means of both traffic control and traffic calming. The roundabout shall feature pedestrian crossovers on all legs and may need to accommodate a planned

• The Browlands Concept Plan, dated August 24, 2020, • Chedoke Browlands- East and West Blocks, dated September 1, 2020 • Transportation Impact Study, Browlands Residential Development, dated September 2020, prepared by NexTrans Consulting Engineers. • Neighbourhood Traffic Calming Study, Browlands Residential Development, dated September 25, 2020, prepared by NexTrans Consulting Engineers ***Background Information*** The original site plans through ZAC-07-053 & OPA-07-014 & 25T-200712; PSR-13-187; FC-18-004 were circulated and separate comments provided by Corridor Management, Public Works and Transportation Management, Public Works. As of January 2018, Development Application related duties of those sections of Public Works have been combined under Transportation Planning and Parking, Planning and Economic Development. **<u>Official Plan Amendment – Do Not Support</u>** 1. Transportation Planning do not support the Official Plan Amendment (UHOPA-20-026) since the full extent of transportation impacts on the surrounding road network has not been adequately addressed in the Transportation Impact Study. 2. A large disparity exists between the number of trips projected in AM and PM peak hours (217 and 272 respectively) based on the Transportation Impact Study, and the 1114 parking spaces provided. **<u>Zoning By-law Amendment – Do Not Support</u>**	multi-use trail on the north side of Scenic Drive, fully at the expense of the Applicant and to the satisfaction of the Manager, Transportation Planning and Manager, Transportation Operations and Maintenance.

3. Transportation Planning do not support the Zoning By-law Amendment (ZAC-20-041) until key issues such as access, right-of-way and site maneuverability can be addressed.

4. Transportation Planning requires a TIS resubmission to address the study area, horizon build-out year, and access arrangement. It is noted that a large disparity exists between the number of trips projected in AM and PM peak hours (217 and 272 respectively) based on the Transportation Impact Study, and the 1114 parking spaces provided.

5. Sanatorium Road is currently a municipal roadway. While Transportation Planning does not object to the conversion of the road to private ownership, or realignment if necessary, to support the development, we do require a continuous internal roadway throughout the site, and the number of accesses to Scenic Drive to be reduced to two accesses.

Draft Plan of Subdivision – Conditions

Transportation Planning offers the following Conditions of Draft Plan Approval and reserves the right to provide additional conditions with future submissions:

6. As a condition of Draft Plan Approval, **prior to servicing,** the Applicant shall be required to contribute $18,000 ($6000 per speed cushion x 3) to the City of Hamilton for the future placement of traffic calming measures along Scenic Drive.

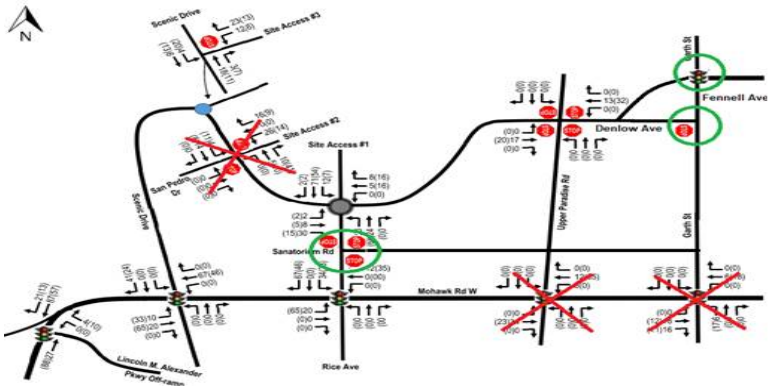
7. As a condition of Draft Plan Approval, **prior to servicing**, the Applicant shall be responsible for the

design and construction of a single lane roundabout at the Scenic Drive at Sanatorium/Site access driveway as a means of both traffic control and traffic calming. The roundabout shall feature pedestrian crossovers on all legs and may need to accommodate a planned multi-use trail on the north side of Scenic Drive, fully at the expense of the Applicant and to the satisfaction of the Manager, Transportation Planning and Manager, Transportation Operations and Maintenance. 8. As a condition of Draft Plan Approval, **prior to servicing,** the Applicant shall be responsible for the design and construction of a multi-use trail, in lieu of a sidewalk constructed along the north side of Scenic Drive to provide accommodation for pedestrians and cyclists. The Mountain Brow Trail study provides trail width details. This work shall be coordinated through the construction of facilities or provide securities to facilitate the construction as part of future Public Works along Scenic Drive and Sanatorium Road. Reference the Mountain Brow Study - https://www.hamilton.ca/parks-recreation/creating-new-parks/mountain-brow-multi-use-pathway-feasibility-study, fully at the expense of the Applicant and to the satisfaction of the Manager, Transportation Planning and Manager, Transportation Operations and Maintenance. **<u>Transportation Impact Study –Resubmission Required</u>** *A resubmission of the TIS is required to address the following:*	

9. A large disparity exists between the number of trips projected in AM and PM peak hours (217 and 272 respectively) and the total number of parking spaces which is proposed at 1114. While Transportation Planning concurs that the trip generation follows the appropriate ITE land use codes, either a reduction in parking (TIS concluded only 630 parking spaces required based on By-law 05-200) or a more conservative estimation of traffic volumes should be undertaken. 10. Transportation Planning has concerns with the trip assignment. The resubmission should investigate whether a higher percentage of trips should be shown travelling east on Scenic Drive towards Garth Street, which would be consistent with existing travel patterns in the area. 11. Previously Transportation Planning asked for analysis for the Sanatorium Road at Rice Avenue intersection. Nextrans has noted that *"the City only has the September 11, 2006 traffic count available for this intersection. Ideally, traffic turning movement counts will be undertaken by Nextrans for the study area intersections to capture the most up-to-date turning movement counts in the area today. However, given the COVID-19 situation which requires business and school lockdown, any traffic turning movement counts to be undertaken at this time will not provide a meaningful assessment and snapshot of the existing conditions. These turning movement counts cannot be undertaken until such time that schools and businesses are resumed to normal operation. In addition, given that this is an unsignalized intersection with stop-controlled on the minor approach and it has more than one way of*	

getting to Sanatorium Road, it is not expected to have major operational issues and therefore it is not required to include in the intersection operational capacity analysis." Transportation Planning directs the Consultant to undertake a turning movement count at this intersection after February 16, 2021. The count will be used to measure the degradation of level of service with added background and development generates traffic. 12. Transportation Planning does not support a site access at the Scenic Drive and San Pedro intersection since the Stormwater Management Block precludes the access from being properly aligned with San Pedro Drive. Furthermore, Transportation Planning finds this access redundant and requires the east and west blocks to be connected via an internal road network. This intersection shall be removed from future analysis. The site generated trips shall be reassigned accordingly to the other accesses, and a left-turn lane warrant for the northerly access shall be reinvestigated based on the changes in volume. 13. Based on the comments above the study area shall be revised to eliminate 3 intersections and add 3 intersections to be analysed based on anticipated impacts of development generated traffic. The following intersections will be required in a future submission: a. Garth Street at Scenic Drive/ Fennell Avenue (City to provide TMC) b. Garth Street at Denlow Avenue (City to provide TMC) c. Sanatorium Road/ Rice Avenue at Sanitorium Road (TMC required)	

The diagram below illustrates the revised study area for the resubmission, including the intersections no longer required in the analysis:



14. The TIS assumes that the full build out of the subject lands will occur by 2022, with a 5-year horizon year of 2027. Given the current status of the submission this timeline is not reasonable, and a more realistic horizon year shall be established.

15. Table 1 – Summary of the Existing Road Network has several corrections needed as follows:
    a. San Pedro Drive is a local road with a 2-lane cross-section and two-way operations, not 3-lanes southbound one-way only.
    b. Angela Avenue is a local road with a 2-lane cross-section and two-way operations, not one lane and one-way westbound only.
    c. Lincoln M. Alexander Parkway is a Parkway with two lanes in each direction and divided with a centre medium, not one lane and one-way westbound only.

16. The background volume shall include 555-559 Sanatorium Road, which is a townhouse development with 211 units that generates approximately 97 a.m. trips and 118 p.m. trips.

17. The report concludes that *"under the existing conditions, the Downtown area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit because the proposed development is located approximately 1-5 minute-walk to the bus stops and Hamilton GO Centre. The area is currently well served by a complete network of sidewalks. The sidewalks are generally in good condition and reasonably maintained on the public streets."* Transportation Planning notes that the above text likely refers to a different development.

18. Transportation Planning concurs with the appropriateness of a single lane roundabout at the intersection of Scenic Drive at Sanatorium Road/ Site Access both for traffic control and to promote traffic calming. Transportation Planning notes that the internal site design shall promote the use of the roundabout as the primary access to the site.

Traffic Calming Report – Approved, Funds Required

19. Transportation Planning approves of the recommendations contained within the Neighborhood Traffic Calming Report. As a result of more than 200 new peak hour trips being added to the surrounding road network the Applicant shall:
    a. The Applicant shall contribute $24,000 ($6,000 per speed cushion x 4) to the City of Hamilton for the future placement of traffic calming measures along Scenic Drive as recommended within the Traffic Calming Report.
    b. Design and construct a single lane roundabout at the Scenic Drive at Sanatorium/Site access driveway as a means of both traffic control and

traffic calming. The roundabout shall have Pedestrian Crossovers on all legs
All to the satisfaction of the Manger, Transportation Operations and Maintenance.

20. The Applicant should be aware that this development is in Ward 14 not Ward 4 and is not near Parkdale Avenue/Queenston Road/Red Hill Valley Parkway and Roxborough Avenue, as the report mentions.

Transportation Demand Management – Approved, Revisions Required to Future Site Plan

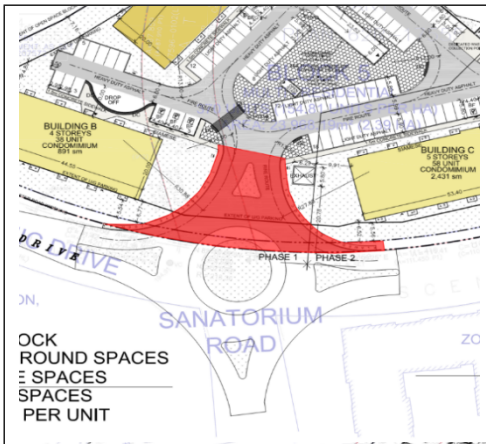
21. The TIS/TDM report has indicated that 477 long-term bicycle parking spaces are provided underground. Transportation Planning also recommends installing above ground bicycle racks in amenity areas, or near visitor parking lots.

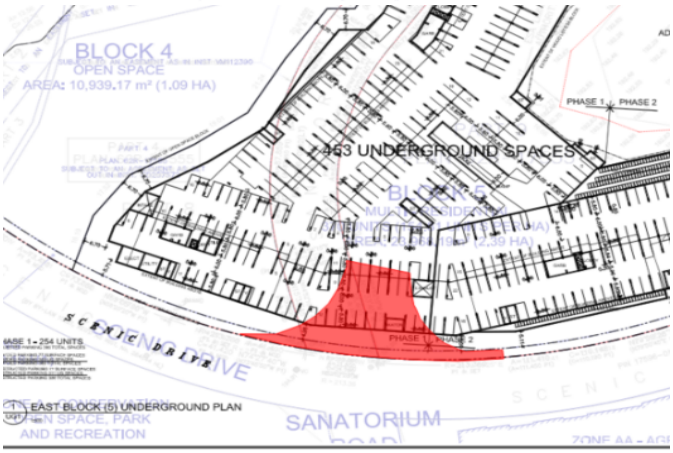
22. The TIS/TDM report suggests that the proposed parking supply be reduced to be more inline with the 630 requires parking spaces to meet By-law 05-200. It is also recommended to unbundle parking from the cost of a mid-rise unit as well as implementing car/bikeshare options. This is not demonstrated on the site plan.

23. The TIS/TDM report suggests providing direct shared pedestrian and cycling connections from the proposed development to Scenic Drive and Sanatorium Road. This is not demonstrated on the site plan however.

Right-of-Way – Dedications Required, Revisions Required to Site Plan

24. A detailed design of the roundabout at Scenic Drive at Sanatorium Road/ Site Access must be completed to the satisfaction of the Manager, Transportation Planning; Manager, Development Approvals, Planning and Economic Development and Director, Engineering Services, Public Works to determine the ultimate right-of-way dedication requirements. The roundabout may require right-of-way exceeding typical values. The design shall incorporate a planned 3.5 metre multi-use trail, planned to run on the north side of Scenic Drive. 25. As required, the right-of-way dedication of approximately 3.0 metres is shown on the site plan along Scenic Drive. The right-of-way for Scenic Drive is required to be 26.213 metres as per the Official Plan. 26. A detailed design of the roundabout at Scenic Drive at Sanatorium Road/ Site Access must be completed to the satisfaction of the Manager, Transportation Planning; Manager, Development Approvals, Planning and Economic Development and Director, Engineering Services, Public Works to determine the ultimate right-of-way dedication requirements. The roundabout may require daylighting triangles that exceed typical dedications for Collector Roads. Neither the parking garage, or any objects or structures cannot encroach into the municipal right-of-way. The encroachment is shown below in red.	





Infrastructure Improvements – Required

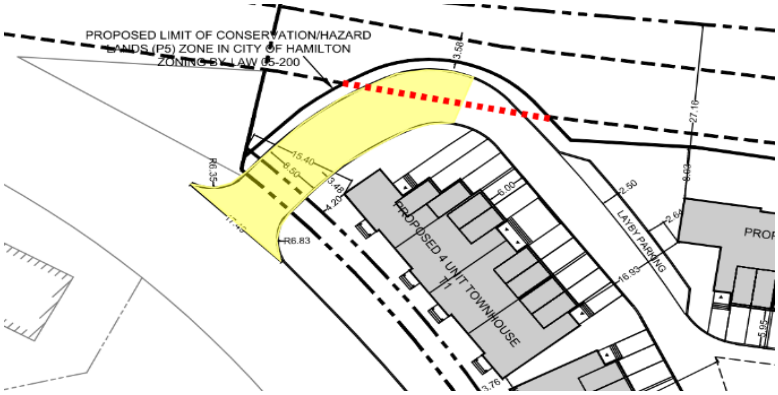
27. The Applicant shall be responsible for the design and construction of a single lane roundabout at the Scenic Drive at Sanatorium/Site access driveway as a means of both traffic control and traffic calming. The roundabout shall feature pedestrian crossovers on all legs and may need to accommodate a planned multi-use trail on the north side of Scenic Drive

28. The Applicant shall be responsible for the design and construction of multi-use trail, in lieu of a sidewalk constructed along the north side of Scenic Drive to provide accommodation for pedestrians and cyclists. The Mountain Brow Trail study provides trail width details. This work shall be coordinated through the

construction of facilities or provide securities to facilitate the construction as part of future Public Works along Scenic Drive and Sanatorium Road. Reference the Mountain Brow Study - https://www.hamilton.ca/parks-recreation/creating-new-parks/mountain-brow-multi-use-pathway-feasibility-study **<u>Future Site Plan – Revisions Required</u>** ***Driveway Location and Design*** *The Applicant is to complete the following revisions:* 29. Transportation Planning does not support the proposed access across from San Pedro Drive since the Stormwater Management Block precludes the access from being properly aligned with San Pedro Drive. Furthermore, Transportation Planning finds this access redundant and requires the east and west blocks to be connected via an internal road network. Transportation Planning does not object to the conversion of Sanatorium Road to private ownership, or realignment if necessary, to support the development, but do require a continuous internal roadway throughout the site. 30. 5.0 metres x 5.0 metres visibility triangles must be provided for each driveway accessing a municipal road. They must be illustrated, dimensioned and identified on the site plan. Visibility triangles are between the driveway limits and the ultimate property line (right-of-way limit). No object or mature vegetation can exceed a height of 0.6 metres above the corresponding perpendicular centreline elevation of the adjacent street.	

31. The TIS has determined the proposed accesses meet minimum sightline requirements as defined by the Transportation Association of Canada (TAC) based on a design speed of 50 km/h. The proposed northerly access shall ensure sufficient sightlines are afforded based on an operating speed of 60 km/h.

32. For two-way operation onto the municipal road, the driveway access width(s) must be 7.5 metres at the ultimate property line and curve radii of 6.0 metres. The internal road can be reduced to 6.0 metres on private property. The northerly access is overbuilt at 8.5 metres wide and encroaches onto the Brow Trail Open Space Block, preventing a planned trail connection from being constructed with appropriate grading and setback requirements, as shown below in yellow.



Internal Circulation

The Applicant is to complete the following revisions:

33. The underground parking area is not necessarily part of Transportation Planning's purview however, it should be noted it is poorly designed and is not intuitive to maneuver around. The underground parking ramp(s) requires a maximum grade of 5% for

the first 7.5 metres and a maximum grade of 10% thereafter. **<u>Pedestrian Facilities</u>** 34. The Applicant shall be responsible for the design and construction of multi-use trail, in lieu of a sidewalk constructed along the north side of Scenic Drive to provide accommodation for pedestrians and cyclists. The Mountain Brow Trail study provides trail width details. This work shall be coordinated through the construction of facilities or provide securities to facilitate the construction as part of future Public Works along Scenic Drive and Sanatorium Road. Reference the Mountain Brow Study - https://www.hamilton.ca/parks-recreation/creating-new-parks/mountain-brow-multi-use-pathway-feasibility-study 35. On behalf of the Landscape Architecture group, Transportation Planning notes that as per the Mountain Brow Trail Master Plan there is a trail connection required to link the future multi-use path along Scenic Drive to the existing wood lot trail. Landscape Architecture would be interested in working with the Applicant to enter into an Open Space Financing Agreement (OSFA) with the City to construct the 3.0 metre wide asphalt trail on the City's behalf, as part of the site works. A seating area and interpretive area is planned adjacent to the Cross of Lorraine along the future trail and will include relighting the cross. Should you have any questions, please email tplanning@hamilton.ca, referencing:	

801, 820, 828, 855, 865, and 870 Scenic Drive - 25T-202008, UHOPA-20-026 & ZAC-20-041 (Ward 14) Transportation Planning Response	

Bruce Trail Conservancy
Joel Swagerman

Thank you for providing the Bruce Trail Conservancy with the opportunity to review the development application for the above-noted property in the City of Hamilton.

The Bruce Trail Conservancy is a member-driven, volunteer-based charitable organization. It is both a trail association and one of Ontario's largest land trusts, committed to caring for the Bruce Trail and preserving land along its route on the Niagara Escarpment. It is our goal to secure the Optimum Route of the Trail within a permanently protected natural corridor, through receipt of land donations, purchase of land, easement agreements, or other arrangements with landowners.

The Robert MacLaren Side Trail follows the route of the Brow Trail from the Chedoke Stairs to the Hydro corridor in the west, where it re-joins the Bruce Trail Main Trail. The Bruce Trail Conservancy is satisfied that the Trail will be maintain and/or enhanced in its current location, on City of Hamilton property. We respectfully request to be included in all future circulations/notifications regarding the development and any construction activities, so that we can advise Trail users of any impacts accordingly.

We are aware that the OMB decision for the previous version of this development included an agreed statement of facts, in which the City and the applicant agreed that the development "should provide access to the Bruce Trail". As long as this commitment is met, the Bruce Trail Conservancy has no objection to the proposed development.

Canada Post Corporation
David E. Kyle

This Draft Plan of Subdivision Application will receive mail service to centralized mail facilities provided through our Community Mailbox program.

I will specify the conditions which I request to be added for Canada Post Corporation's purposes.

The owner shall complete to the satisfaction of the Director of Engineering of the City of Hamilton and Canada Post:

a) include on all offers of purchase and sale, a statement that advises the prospective purchaser:

   i) that the home/**business** mail delivery will be from a designated Centralized Mail Box.

   ii) that the developers/owners be responsible for officially notifying the purchasers of the exact Centralized Mail Box locations prior to the closing of any home sales.

b) the owner further agrees to:

   i) work with Canada Post to determine and provide temporary suitable Centralized Mail Box locations which may be utilized by Canada Post until the curbs, boulevards and sidewalks are in place in the remainder of the subdivision.

   ii) install a concrete pad in accordance with the requirements of and in locations to be approved by Canada Post to facilitate the placement of Community Mail Boxes

   iii) identify the pads above on the engineering servicing drawings. Said pads are to be poured at the time of the sidewalk and/or curb installation within each phase of the plan of subdivision.

   iv) determine the location of all centralized mail receiving facilities in co-operation with Canada Post and to indicate the location of the centralized mail facilities on appropriate maps, information boards and plans.

   v) Maps are also to be prominently displayed in the sales office(s) showing specific Centralized Mail Facility locations.

c) Canada Post's multi-unit policy, which requires that the owner/developer provide the centralized mail facility (Lock Box Assembly) at their own expense (less than 100 units will require a front loading Lock Box Assembly & more than 100 units will require a rear loading Lock Box Assembly which will require a mail room) will be in affect for buildings and complexes with a common lobby, common indoor or sheltered space.

Should the description of the project change, I would appreciate an update in order to assess the impact of the change on mail service.

If you have any questions or concerns regarding these conditions, I can be reached at 519-520-0795, fax at 519-457-5412 or the above noted address.

Horizon Utilities
Mark Jakubowski

In response to your correspondence dated November 27, 2020, please be advised that our Engineering Design Department has reviewed the information concerning the above noted Consent Application and our comments are as follows:

- For Residential/Commercial electrical service requirements, the Developer needs to contact our ICI and Layouts Department at 1-877-963-6900 ext: 25713 or visit our web site @ www.alectrautilities.com.
- Relocation, modification, or removal of any existing hydro facilities shall be at the owner's expense. Please contact Alectra Utilities to facilitate this.
- Developers shall be responsible for the cost of civil work associated with duct structures, transformer foundations, and all related distribution equipment.
- Developers to acquire an easement, if required.
- Developers to provide a grade level transformer and switching room/vault as per standard 19U-416. This standard is for REFERENCE PURPOSES ONLY and cannot be utilized for construction purposes. Alectra Standards Department is to be consulted on actual standard required for specific development application.
- In order for Alectra Utilities to prepare design and procure the materials required to service this site in a timely manner, a minimum of 6 months notification is required. It would be advantages for the developer if Alectra Utilities were contacted at thestage where the new site plan becomes available. Please note that it takes approximately 20 weeks to purchase a transformer.

We would also like to stipulate the following:

- Do not excavate within two metres of hydro poles and anchors.
- Excavation within one metre of underground hydro plant is not permitted unless approval is granted by an Alectra Utilities respresentative and is present to provide direct supervision. Cost associated with this task shall be at the owner's expense.
- Alectra Utilities must be contacted if the removal, isolation or relocation of existing plant is required, all cost associated with this work will be at the owners expense.

- CALL BEFORE YOU DIG, arrange for underground hydro cable locate(s) before beginning construction by contacting Ontario One Call @ 1-800-400-2255.
- Clearances from Overhead and Underground existing electrical distribution system must be maintained in accordance to:
  - Ontario Building Code (1997) Section 3.1 (3.1.18.1)
  - Electrical Safety Code Rule 75-312
  - Occupational Health and Safety Act (OH&SA) – Construction Projects (Electrical Hazards)
  - CAN/CSA-C22.3 No. 1-15, Overhead System
  - C22.3 No. 7-15 Underground Systems

We trust that you will find this information satisfactory and that the information contained within will be provided to the owner of this project. Should you have any questions regarding this response, please contact Charles Howell at 905-522-6611 ext: 4729 in our Engineering Design Department.

Niagara Escarpment Commission
Nancy Mott

Staff of the Niagara Escarpment Commission (NEC) have reviewed the above-noted applications and supporting documentation and offer the following comments.

The subject lands are outside the NEC Area of Development Control and so no Development Permit application is required. The lands are designated Urban Area and Escarpment Natural Area along the brow of the Niagara Escarpment. Part 1.3.2 sets out the designation criteria for the Escarpment Natural Area and indicate that “where woodlands abut the Escarpment, the designation includes the woodlands 300 metres back from the brow of the Escarpment slopes”.

NEC comments below are based on the policies of the Niagara Escarpment Plan 2017, as amended, in relation to this proposed development.

<u>Background</u>

NEC staff was a party to the Ontario Municipal Board hearing in connection with the previous development proposal for the site. The NEC settled based on a development for 271 units which included a built form with 6-storey building heights, setbacks from the Escarpment and the protection of views to and through the Plan Area in accordance with an accepted visual impact assessment.

The new proposal is for 630 units with maximum heights of 8 storeys and a 30-metre setback from the brow of the Escarpment.

Visual Impact

Mitigating the visual impact of development on the subject lands was one of the key considerations for the NEC with the previous proposal. The NEC settled on a development with buildings at a maximum of 6 storeys. Among the agreed facts in the OMB decision for the previous development was a commitment that "further visual impact assessments were required prior to site plan approval".[1]

Policies of the NEP were updated in 2017 as part of the Co-Ordinated Provincial Plan Review. Part 2.13 states that "development shall ensure the protection of the scenic resources of the Escarpment". A Visual Impact Assessment is required where visual impact is a concern.

NEC staff (Nancy Mott and Karen Bannister) have reviewed the Preliminary Visual Impact Assessment (September 2020) by MBTW-WAI.

Per NEC guidelines, visual impact assessment is an iterative process typically involving multiple submissions for the purposes of confirming methodology and scope of work, identifying baseline conditions and visual impacts, and proposing mitigation measures. The Visual Impact Assessment (VIA) dated September 2020 is a preliminary submission and no prior terms of reference was submitted for NEC review. As such, NEC staff review has been focused on the scope of work and the methodology only.

The five (5) long-range viewpoints studied were carried forward from the 2008 VIA which assessed the previous development proposal. NEC staff require minor changes to two of the camera positions for the purposes of obtaining a clear view to the Escarpment brow due to vegetation growth over time. NEC staff also require an assessment of the five (5) short-range viewpoints found in the Minutes of Settlement 2009 which were not included in this submission. In addition, NEC staff require the assessment of six (6) new viewpoints from various public locations with anticipated views of the proposed development. Leaf-off photos are required to demonstrate the worst-case scenario for visibility. Assessment of these views with baseline photos and photo simulations of the proposed development is required to fully evaluate impacts on the scenic resources of the Escarpment landscape.

NEC staff met with the consultant to review the preliminary submission on September 18, 2020. The consultant confirmed that the assessment was incomplete due to the lack of available detailed architectural and landscape design information potentially resulting in limited

[1] OMB decision, June 22, 2012, p. 6.

reliability for simulating proposed development at close range. NEC staff noted that there is sufficient information for conceptually modelling built form and evaluating visual impacts associated with building massing, layout and height and requested an updated and comprehensive VIA. Further details for signage, lighting, building materials and colours, and building details can be assessed in a subsequent submission as that information becomes available. Until this outstanding work has been provided, NEC staff deem the VIA to be incomplete therefore no conclusions on conformity with NEP policy can be derived from it.

Newly approved NEC Technical Criteria for Visual Impact Assessment are now available on the NEC website and will apply to subsequent submissions. (Ontario's Niagara Escarpment - Visual Impact Guidelines)

Cultural Heritage

NEC staff note that the plan is to restore the Long & Bisby building and find an adaptive re-use for the historic building. The Cultural Heritage Impact Assessment also notes that the cobblestone wall and steps down the Escarpment are also to be preserved. This is consistent with NEP policy in Part 2.10 which has the objective to conserve the Escarpment's cultural heritage resources including built heritage resources and their heritage attributes. Heritage attributes include not only the built form but also vegetation and visual setting. The density of the development proposal would result in the significant loss of mature trees that contribute to the heritage attributes around the Long & Bisby building. Part 2.10.2 of the NEP requires that the proponent of development demonstrate how heritage attributes will be conserved through implementation of proposed mitigative measures and/or alternative development approaches. NEC staff request further discussion regarding the development proposal from this perspective prior to a decision on the applications.

The Cross of Lorraine is also identified as a heritage feature on the subject lands. NEC staff has been involved in previous discussions with City staff and has received inquiries from the public with respect to opportunities to restore the Cross. If the lands where the Cross sits are dedicated to the City, NEC staff would appreciate continued consultation with the NEC to protect this important heritage resource.

Slope Assessment

Apparently based on one day of observation in June 2018, the report concludes that the slope of the Escarpment below the development site is stable due to the mature vegetation on the slope. Weather cycles that result in freeze/thaw conditions and significant storm events can contribute to instability in the face of the Escarpment over time. NEC staff is of the opinion that insufficient observation or testing of the Escarpment feature was undertaken to justify the

report's conclusion. Furthermore there are inconsistencies between the various reports with respect to the method of construction which could impact the slope stability. It was suggested in the Cultural Heritage report that blasting might be used in construction and concern was expressed for the integrity of the heritage building. The geotechnical report indicated however that blasting would not be used to construct the below-grade portions of the buildings.

Geotechnical Report

As stated in the preceding paragraph, NEC staff noted that this report indicated that below-grade construction could be undertaken without using blasting but there is no discussion with respect to possible impacts to the Escarpment as a result of construction. The authors of the report should be required to provide a professional opinion in this regard. The NEC stated in its comments on the previous development proposal for the site that blasting is not supported so it needs to be confirmed whether construction will require blasting and what monitoring or mitigation would be proposed to address unanticipated failure of the slope or brow of the Escarpment or negative impact to the heritage building.

Technical Design Brief – Chedoke Creek realignment

Permanent and intermittent streams are identified as key hydrologic features (KHF) in the NEP in Part 2.6. Development is not permitted in KHF with limited exceptions which may include conservation and flood or erosion control projects, after all alternatives have been considered. The Design Brief states that the on-site tributary of Chedoke Creek would be realigned and naturalized to improve channel form and function and improve and enhance aquatic habitat.

NEC staff notes however that Appendix E to the design brief, Meander Belt Width, states that the basis for the creek realignment is to "accommodate the development" and not for conservation and erosion control purposes primarily.

Provided that the stream realignment supports the restoration and enhancement of the feature and is properly designed to minimize erosion and sedimentation and control storm water exiting the site, the proposed creek realignment may be permitted in accordance with NEP policy. NEC staff support the recommendation to monitor the creek following restoration to ensure that the design is achieving the environmental objectives and conformity with NEP policy.

Environmental Impact Study (EIS)

The EIS (p. 34) confirms that no development is proposed within the Escarpment Natural Area consistent with the designation criteria for that designation and the Urban Area Development Objectives.

NEP policy with respect to development affecting natural heritage in Part 2.7 identifies key natural heritage features (KNHF) which include significant wildlife habitat, earth science areas of natural and scientific interest (ESA's) and habitat of endangered and threatened species. No development is permitted in KNHF with limited exceptions. Any development proposed in the habitat of an endangered or threatened species must be in accordance with the *Endangered Species Act.*

The EIS identified significant wildlife habitat for endangered bats on the subject lands and possible habitat for threatened birds. NEC staff notes from the EIS that MECP is being consulted on the proposal. If a response has been received from that Ministry with respect to compliance with the *Endangered Species Act,* we would appreciate receiving a copy of their correspondence in order that we can determine if NEP policy is met with respect to KNHF.

The EIS concludes that there will be some "net benefits" from the proposed development. The policies of the NEP 2017 are not based on this approach but rather seek to "protect and where possible enhance natural heritage features and functions". (NEP Part 2.7) Although there are many non-native species of vegetation on the subject lands, that does not diminish their value. The mature vegetation on the site contributes overall to the Escarpment environment, scenic resources, wildlife habitat and the natural heritage features present on the property. The density of development proposed for the site, according to the EIS may have negative impacts in terms of noise and light intrusion in addition to the loss of trees. Opportunities to further discuss and address all these impacts are warranted including increased tree and vegetation preservation/planting and the application of "dark sky friendly" development approaches.

Finally, NEC staff note some areas in the EIS where it appears that the document is not a final version (e.g. p. 14, 43, 44). NEC staff would appreciate receiving a corrected and final copy of the EIS.

<u>Tree Management Plan</u>

A significant number of mature trees (438) will be removed from the site. Re-planting is proposed at a 1:1 replacement ratio along the roadside and in the creek block. Aside from the loss of scenic and cultural heritage value of these trees, the tree removal represents a big natural heritage loss, and a 1:1 replacement ratio would be a minimum standard, especially if the trees are not of equivalent size.

Planting trees within the creek block may be acceptable so long as the species are appropriate to the growing conditions. While the replacement of trees with native species is appropriate, the policies of the NEP in Part 2.13 require that new development minimize the development footprint and changes to vegetation. We acknowledge that the development provides a 30-metre setback from the brow of the Escarpment. However, the form of development proposed on the site otherwise maximizes the development footprint at the expense of the trees on-site which is inconsistent with NEP policy with respect to the protection of the scenic resources of the Niagara Escarpment and the natural heritage features and functions in Urban Areas (NEP Part 1.7.9a).

We note that the existing Norway maple street trees lining Scenic Drive are to be preserved but may be injured since the limit of work extends virtually to their trunks. This would be unfortunate since they are mature, add value to the streetscape and scenic quality of Scenic Drive, and would provide some screening of the new development from the public roadway despite being non-native.

We note that the mature trees are indicated to be removed in front of the Long & Bisby building after it had been noted earlier in the report that this area is a cultural heritage landscape valued for its park-like setting and views towards Sanitorium Road. Further justification should be provided as to why this is an acceptable impact. This is not something that can be easily compensated for with new plantings, at least not without another 50-100 years of growing time.

Planning Justification (PJR)

The PJR states that the development will achieve a 30-metre setback from the brow of the Escarpment. The brow was surveyed during the previous development proposal. NEC staff was recently requested by the applicant to provide a copy of the survey. Confirmation should be provided that the 30-metre setback is from the surveyed brow not an observed brow.

The PJR refers to the VIA as if it were a completed document and makes policy conformity conclusions on that basis. As noted in the VIA section of this letter, the VIA is not complete and therefore the conclusion in the PJR with respect to the compatibility of the proposed development with the scenic resources of the Niagara Escarpment has not yet been demonstrated. We acknowledge that it is proposed to mitigate the visual impact of the development by limiting reflective surfaces and utilizing earth toned materials and colours. We would appreciate confirmation as to how these measures can be required by the City in its planning review process to achieve the policy direction in part 1.7.5.1 of the NEP. With the

previous development approval, based on Minutes of Settlement entered into by the NEC with the developer, guidelines for cladding of buildings were established.[2]

In the analysis of NEP policy, the PJR states that "the proposal intends to alter and expand an existing permitted use within the Urban Area designation".[3] The use is not existing as the site is vacant but for the heritage building. An existing use is defined in the NEP to generally mean uses that have been in place since 1985. Further, the designation of the property is Escarpment Natural Area not just Urban Area although the development, apart from the future trail, is concentrated in the urban portion of the site.

It is the objective of the Urban Area policies "to minimize the impact and prevent the encroachment of urban growth on the *Escarpment environment*". Proposed uses may be permitted subject to zoning by-laws that are not in conflict with the NEP. The existing zoning for the Escarpment Natural Area portion of the property is P5 – Conservation/Hazard Lands with a site-specific exception. NEC staff understand that this is not proposed to be changed as part of the zoning by-law amendment but for adjusting the extent of the lands subject to this zoning. However, NEC staff note that the holding exception do not contain a provision that was discussed in the OMB decision. At page 4 of the OMB decision it stated:

With regard to the fourth concern [visual access from the neighbourhood into the site], it was agreed that the lands would be subjected to a Holding provision (H symbol) under the zoning by-law. The development would require a full visual impact analysis to be done at the site planning stage for the removal of the holding zone.

Further discussion between the City, the applicant and the NEC needs to be undertaken with regard to the holding provision to determine if the City or the applicant are prepared to revise the holding provision to include a restriction relating to satisfactory visual assessment prior to development approval.

The DE zoning is proposed to be amended from allowing 3-storey buildings to allowing up to 8 storeys with a maximum height of 36 metres. NEC staff cannot comment at this time as to whether the zoning is in conflict with the NEP until the VIA is completed to our satisfaction. At the time we met with the consultant preparing the VIA, we were advised that he had insufficient information about the built form to complete the study and derive conclusions with respect to visual impact and its possible mitigation.

<u>Conclusion</u>

[2] Memorandum of Agreement with Deanlee Management, May 20, 2011.

[3] PJR, p. 29.

NEC staff appreciate the opportunity to comment on these applications but would appreciate further discussion with the City and the applicant to address our comments and the receipt of a completed VIA prior to a decision on the applications. Additional comments would be provided after those discussions and in response to any changes to the development proposal.

If there are any questions, I can be reached at 289-839-0106 or nancy.mott@ontario.ca.

WSP (obo Bell Canada)
Ryan Courville

We have reviewed the circulation regarding the above noted application and have no objections to the application as this time. However, we hereby advise the Owner to contact Bell Canada at planninganddevelopment@bell.ca during detailed design to confirm the provisioning of communication/telecommunication infrastructure needed to service the development. We would also ask that the following paragraph be included as a condition of approval:

“The Owner agrees that should any conflict arise with existing Bell Canada facilities where a current and valid easement exists within the subject area, the Owner shall be responsible for the relocation of any such facilities or easements at their own cost.”

It shall also be noted that it is the responsibility of the Owner to provide entrance/service duct(s) from Bell Canada’s existing network infrastructure to service this development. In the event that no such network infrastructure exists, in accordance with the Bell Canada Act, the Owner may be required to pay for the extension of such network infrastructure.

If the Owner elects not to pay for the above noted connection, Bell Canada may decide not to provide service to this development.

To ensure that we are able to continue to actively participate in the planning process and provide detailed provisioning comments, we note that we would be pleased to receive circulations on all applications received by the Municipality and/or recirculations.

Please note that WSP operates Bell’s development tracking system, which includes the intake of municipal circulations. WSP is mandated to notify Bell when a municipal request for comments or for information, such as a request for clearance, has been received. All responses to these municipal circulations are generated by Bell, but submitted by WSP on Bell’s behalf. WSP is not responsible for Bell’s responses and for any of the content herein.

If you believe that these comments have been sent to you in error or have questions regarding Bell's protocols for responding to municipal circulations and enquiries, please contact planninganddevelopment@bell.ca.

Should you have any questions, please contact the undersigned.

Responses advising of no comments were received from:

- Conseil Scolaire Viamonde; and,
- Enbridge Gas Inc. (o/a Union Gas).

For detailed instructions on the submission requirements listed above please refer to:

- Urban Hamilton Official Plan: https://www.hamilton.ca/city-planning/official-plan-zoning-by-law/urban-hamilton-official-plan
- Hamilton Zoning By-law 05-200: https://www.hamilton.ca/city-planning/official-plan-zoning-by-law/zoning-by-law-no-05-200
- Zoning By-laws for the Former Communities: https://www.hamilton.ca/city-planning/official-plan-zoning-by-law/zoning-by-laws-former-communities
- Policies and Guidelines (i.e. Environmental Impact Statements, Planning Justification Reports, Site Plan Guidelines, Traffic Impact Studies, Tree Protection Plans, Urban Design Reports, etc.): https://www.hamilton.ca/develop-property/policies-guidelines

If you have any questions or concerns with the comments outlined in this letter, please contact Tim Vrooman at 905.546.2424 ext. 5277 or by email at tim.vrooman@Hamilton.ca.

Yours truly,

Ohi Izirein, MURP, MCIP, RPP
Senior Project Manager
Development Planning, Heritage and Design - Suburban Team

OI:tv

Appendix B
Existing Traffic Data and Signal Timing Plans

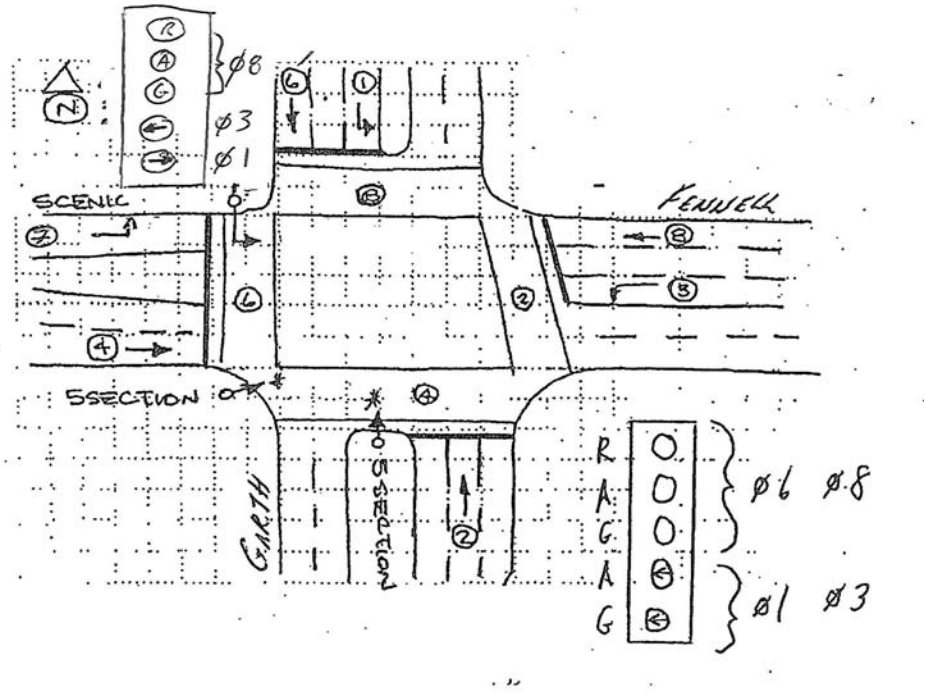
City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Fennell & Garth & Scenic**

Controller Type: **3000E** Page **1** of **15**

Programmed By: **RDG** Installed By:

Date: **Nov 8/13** Date:



ϕ1: Garth - SBLT
ϕ2: Garth - NB, East Xwalk
ϕ3: Fennell - WBLT
ϕ4: Scenic - EB, South Xwalk
ϕ5:
ϕ6: Garth SB, West Xwalk
ϕ7: Scenic - EBLT
ϕ8: Fennell - WB, North Xwalk

Flash Operation: **Red: Garth**
Red: Fennell / Scenic

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases				**X**				**X**								
	Interval	**0**	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	**10**	(0-255 seconds start-up flash time)														
	Red	**5.0**	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	**3**	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1	**X**	**X**	**X**	**X**												
	Ring 2						**X**	**X**	**X**								
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1	**X**	**X**				**X**										
	CO PH 2			**X**	**X**			**X**	**X**								
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL	X		X				X									
	PED RCL																
	SOFT REC																
	NON-LOCK																
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL	X		X				X									
	PED RCL																
	SOFT REC																
	NON-LOCK																
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL	X		X				X									
	PED RCL																
	SOFT REC																
	NON-LOCK																
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK																
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X				X										
	CNA 2				X				X								
	CNA 3																
	CNA 4																
	WRM		X		X		X		X								
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	5	10	5	10		10	5	10								
	Passage																
	Yellow	3.0	3.3	3.0	3.3		3.3	3.0	3.3								
	Red	0.0	2.5	0.0	2.7		2.5	0.0	2.7								
	Walk		7		7		15		7								
	Ped Clr		16		21		16		21								
	Max 1	10	30	10	35		40	10	35								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

PHASE TIMES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial	**5**	**10**	**5**	**10**		**10**	**5**	**10**								
Passage																
Yellow	**3.0**	**3.3**	**3.0**	**3.3**		**3.3**	**3.0**	**3.3**								
Red	**0.0**	**2.5**	**0.0**	**2.7**		**2.5**	**0.0**	**2.7**								
Walk		**7**		**7**		**15**		**7**								
Ped Clr		**16**		**21**		**16**		**21**								
Max 1	**15**	**35**	**10**	**35**		**50**	**10**	**35**								
Max 2																
Mx 3 Lim																
Mx 3 Adh																
TBR																
TTR																
Min Gap																
AI/Act																
Max In																

TP3

PHASE TIMES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial	**5**	**10**	**5**	**10**		**10**	**5**	**10**								
Passage																
Yellow	**3.0**	**3.3**	**3.0**	**3.3**		**3.3**	**3.0**	**3.3**								
Red	**0.0**	**2.5**	**0.0**	**2.7**		**2.5**	**0.0**	**2.7**								
Walk		**7**		**7**		**15**		**7**								
Ped Clr		**16**		**21**		**16**		**21**								
Max 1	**15**	**30**	**10**	**35**		**50**	**10**	**35**								
Max 2																
Mx 3 Lim																
Mx 3 Adh																
TBR																
TTR																
Min Gap																
AI/Act																
Max In																

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL	1						X										
ENTRY	2						X										
ASSIGN-	3								X								
MENTS	4								X								
	5																
	6		X														
	7				X												
	8				X												

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**1**	0=TOD, 1=CL, 2=INT
Split Source:	**1**	0=TOD, 1=CL, 2=INT
Offset Source:	**1**	0=TOD, 1=CL, 2=INT

Free Source:	**1**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	**N**	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	**N**	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	**N**	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	**Y**	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	**1**	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**			
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1	4/1		
CYCLE & OFFSETS	Length	**80**	**90**	**90**			
	Offset 1	**63**	**56**	**31**			
	Offset 2						
	Offset 3						
	Offset 4						
	Offset 5						
	Max Dwell	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD PHASES	**1-1**		**X**				**X**										
	2-1		**X**				**X**										
	3-1		**X**				**X**										
	4-1																

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	**0**

Mode

0 Add only, cycle times 20% slow only to get in sync

1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step

2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	**Y**	Y/N: See note	Invert Free In:	**N**	Y/N: See note
Central Override:	**N**	Y/N: See note	Split Matrix:	**N**	Y/N: See note
No PCL Offset Adjust:	**N**	Y/N: See note	4 Splits/Cycle:	**Y**	Y/N: See note
			No Early Coord Ped:	**N**	Y/N: See note

Yeil Percent	**0**	0-10%: See note
EGB%	**0**	0-100%: See note
RGB%	**0**	0-100%: See note
# Cycles to out of step:	**0**	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	**0**	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	**0**	Cycle 2:	**0**	Cycle 3:	**0**
Cycle 4:	**0**	Cycle 5:	**0**	Cycle 6:	**0**

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	**N**	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	**0**	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

LOAD MANUAL PERMISSIVES (MM-3-2-9-3-2) ONLY USED IF AUTO PERM & FO MODE = N

Cycle 1	Split 1/PH	1	2	3	4	5	6	7	8
	Start	**39**		**8**	**8**			**8**	**8**
MANUAL	End	**72**		**30**	**39**			**30**	**39**
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 2	Split 1/PH	1	2	3	4	5	6	7	8
	Start	**45**		**13**	**13**			**13**	**13**
MANUAL	End	**77**		**35**	**44**			**35**	**44**
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 3	Split 1/PH	1	2	3	4	5	6	7	8
	Start	**44**		**9**	**9**			**9**	**9**
MANUAL	End	**76**		**31**	**43**			**31**	**43**
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 4	Split 1/PH	1	2	3	4	5	6	7	8
	Start								
MANUAL	End								
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

LOAD MANUAL FORCE OFFS (MM-3-2-9-3-3) ONLY USED IF AUTO PERM & FO MODE = N

Cycle 1	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1	**77**		**35**	**66**			**35**	**66**
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 2	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1	**87**		**40**	**71**			**40**	**71**
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 3	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1	**87**		**39**	**70**			**39**	**70**
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 4	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1								
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

CONTROLLER DATA

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	OFF
	00	00		1	1	1		
2	00	00					11(FRE)	OFF
	00	00		1	1	1		
	06	30		2	1	1		
	09	30		1	1	1		
	15	30		3	1	1		
	18	00		1	1	1		

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	65	66	67	68	69	70	71	72
	Function	LL1	LL2	LL3	LL4	LL5	LL6	LL7	LL8
	State								
	Circuit	**73**	**74**	75	76	**77**	78	79	80
	Function	**CN1**	**CN2**	CN3	CN4	**WRM**	MIN	DIM	CVS
	State	**ON**	**ON**			**ON**			
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**00**	**00**	CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	**5**	0-255
	Master Identification	**17**	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

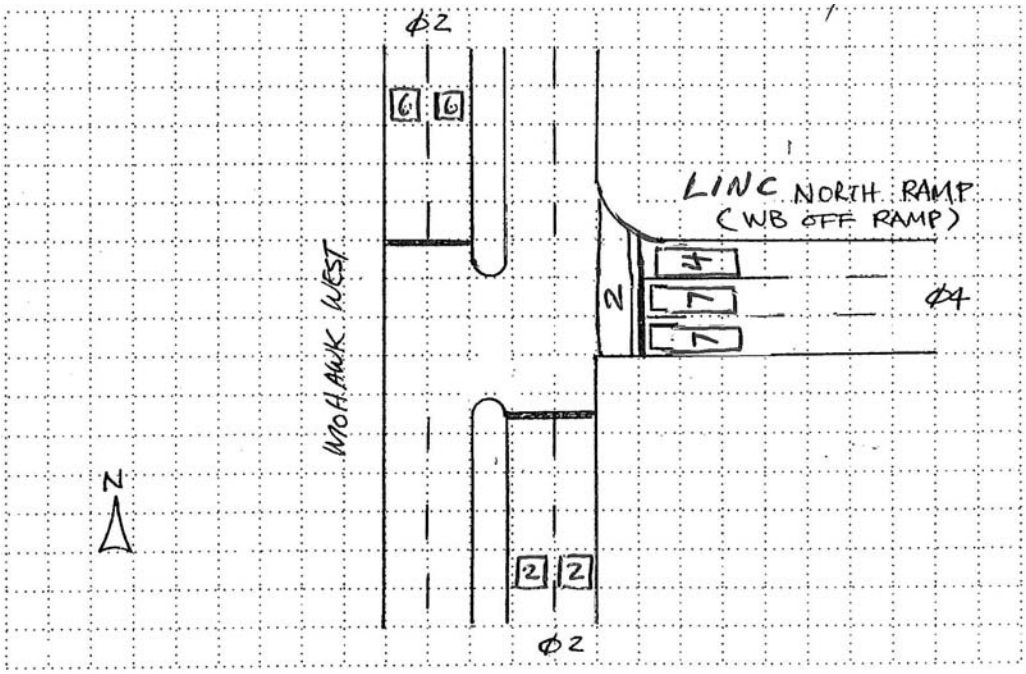
City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **LAP WB Ramp & Mohawk**

Controller Type: **3000E** Page **1** of **12**

Programmed By: **RDG** Installed By:

Date: **Oct 9/13** Date:



ϕ1:
ϕ2: **Mohawk - NB/SB, East Xwalk**
ϕ3:
ϕ4: **LINC - WB**
ϕ5:
ϕ6:
ϕ7:
ϕ8:

Flash Operation: **Red: Mohawk**
Red: LINC WB

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases		X														
	Interval	0	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	10	(0-255 seconds start-up flash time)														
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	2	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		X		X												
	Ring 2																
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		X														
	CO PH 2				X												
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL		X														
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL		X														
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL		X														
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL		X														
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1																
	CNA 2																
	CNA 3																
	CNA 4																
	WRM																
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED		X														

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		20		15												
	Passage		3.5		2.0												
	Yellow		3.3		3.3												
	Red		2.5		2.5												
	Walk		7														
	Ped Clr		12														
	Max 1		20		20												
	Max 2																
	Mx 3 Lim		50		50												
	Mx 3 Adh		2		2												
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**25**		**15**												
	Passage		**3.5**		**2.0**												
	Yellow		**3.3**		**3.3**												
	Red		**2.5**		**2.5**												
	Walk		**7**														
	Ped Clr		**12**														
	Max 1		**20**		**20**												
	Max 2																
	Mx 3 Lim		**50**		**50**												
	Mx 3 Adh		**2**		**2**												
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**25**		**15**												
	Passage		**3.5**		**2.0**												
	Yellow		**3.3**		**3.3**												
	Red		**2.5**		**2.5**												
	Walk		**7**														
	Ped Clr		**12**														
	Max 1		**20**		**20**												
	Max 2																
	Mx 3 Lim		**50**		**50**												
	Mx 3 Adh		**2**		**2**												
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

		TP4															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**25**		**15**												
	Passage		**3.5**		**2.0**												
	Yellow		**3.3**		**3.3**												
	Red		**2.5**		**2.5**												
	Walk		**7**														
	Ped Clr		**12**														
	Max 1		**20**		**20**												
	Max 2																
	Mx 3 Lim		**50**		**50**												
	Mx 3 Adh		**2**		**2**												
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET ASSIGN-MENTS	1																
	2		**X**														
	3																
	4				**X**												
	5																
	6		**X**														
	7				**X**												
	8																

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2		**X**														
ASSIGN-	3																
MENTS	4																
	5																
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode		**0**		**2**		**0**	**0**									
MODES																	

DETECTOR TIMES (MM-3-1-4-4) USE 1 TO ALL 3 DETECTOR TIMING PLANS

TP1

	DET	1	2	3	4	5	6	7	8
DET	Delay				**5**			**0**	
TIMES	Str/Stp								
	DET	9	10	11	12	13	14	15	16
DET	Delay								
TIMES	Str/Stp								

MAX 3 SET-UP (MM-3-1-9-5)

MAX-OUTS TO ADJUST MX3 (How many max-outs in a row will add one adjustment time to max)

PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		1		**1**												

Shift Rigth -->

GAP OUTS TO ADJUST MX3 (How many gap-outs in a row will subtract one adjustment time from max)

PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		2		**2**												

Shift Rigth -->

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**0**	0=TOD, 1=CL, 2=INT
Split Source:	**0**	0=TOD, 1=CL, 2=INT
Offset Source:	**0**	0=TOD, 1=CL, 2=INT

Free Source:	**0**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	ON
	09	00					16(TP4)	ON
	18	00					16(TP4)	OFF
2	00	00					11(FRE)	ON
	06	30					14(TP2)	ON
	09	30					14(TP2)	OFF
	09	30					16(TP4)	ON
	15	30					16(TP4)	OFF
	15	30					15(TP3)	ON
	18	00					15(TP3)	OFF

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	81	82	83	84	85	86	87	88
	Function	TIA	TIB	TIC	N/U	N/U	N/U	PR1	PR2
	State								
	Circuit	89	90	91	92	93	94	95	96
	Function	OR1	OR2	RR1	RR2	M21	M22	DM3	GR2
	State								
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**00**	**00**	CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	**1**	0-255
	Master Identification	**1**	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

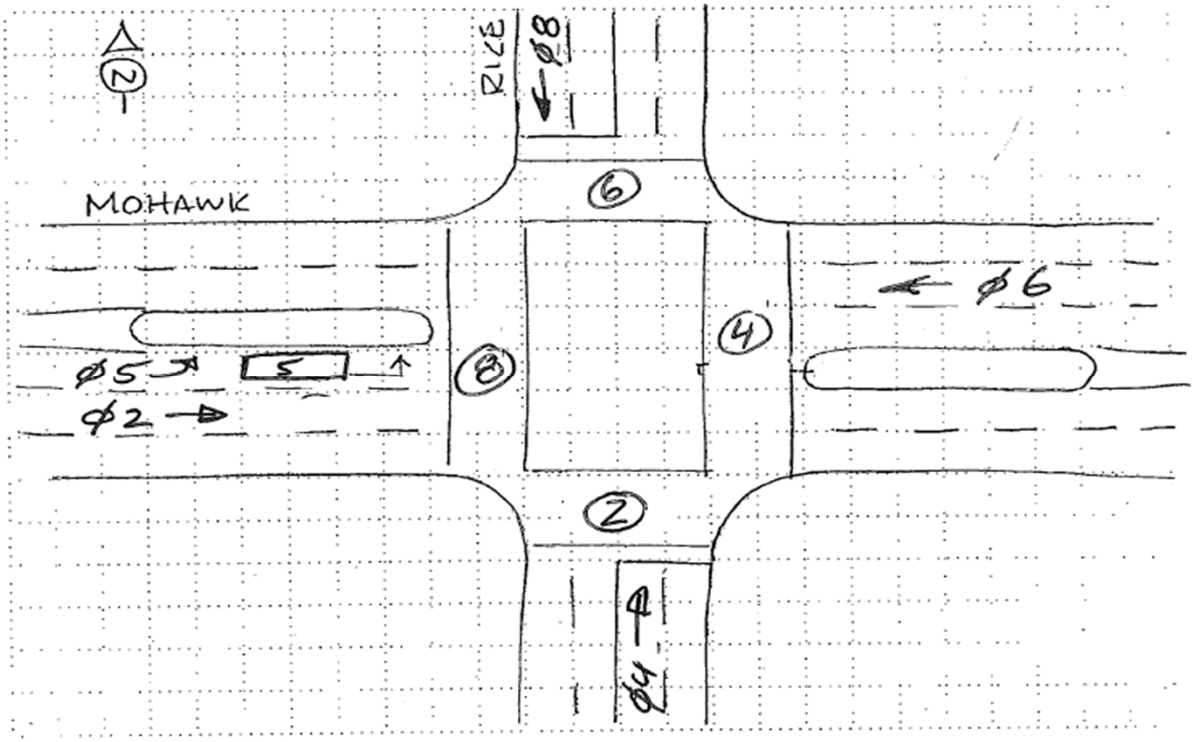
City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Mohawk & Rice**

Controller Type: **3000E** Page **1** of **17**

Programmed By: **RDG** Installed By:

Date: **Oct 6/15** Date:



ϕ1:
ϕ2: **Mohawk - EB, South Xwalk**
ϕ3:
ϕ4: **Rice - NB, East Xwalk**
ϕ5: **Mohawk - EBLT**
ϕ6: **Mohawk - WB, North Xwalk**
ϕ7:
ϕ8: **Rice - SB, West Xwalk**

Flash Operation: **Red: Mohawk**
Red: Rice

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases				**X**				**X**								
	Interval	**0**	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	**10**	(0-255 seconds start-up flash time)														
	Red	**5.0**	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	**3**	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		**X**		**X**												
	Ring 2					**X**	**X**		**X**								
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		**X**			**X**	**X**										
	CO PH 2				**X**				**X**								
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK																
	VEH OMIT					X											
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X		X		X		X								
	CNA 2																
	CNA 3																
	CNA 4		X		X		X		X								
	WRM																
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		20		10	5	20		10								
	Passage					2.0											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.8		2.6	0.0	2.8		2.6								
	Walk		12		12		12		12								
	Ped Clr		17		20		17		20								
	Max 1		50		40	20	60		40								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**	**5**	**20**		**10**								
	Passage					**2.0**											
	Yellow		**3.3**		**3.3**	**3.0**	**3.3**		**3.3**								
	Red		**2.8**		**2.6**	**0.0**	**2.8**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**17**		**20**		**17**		**20**								
	Max 1		**60**		**50**	**20**	**70**		**50**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**	**5**	**20**		**10**								
	Passage					**2.0**											
	Yellow		**3.3**		**3.3**	**3.0**	**3.3**		**3.3**								
	Red		**2.8**		**2.6**	**0.0**	**2.8**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**17**		**20**		**17**		**20**								
	Max 1		**60**		**50**	**20**	**70**		**50**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

		TP4															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage																
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**2.8**		**2.6**		**2.8**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**17**		**20**		**17**		**20**								
	Max 1		**60**		**50**		**60**		**50**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL	1																
ENTRY	2						X										
ASSIGN-	3																
MENTS	4								X								
	5		X														
	6		X														
	7																
	8				X												

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH	1																
DET	2																
ASSIGN-	3																
MENTS	4																
	5					X											
	6																
	7																
	8																
	9																

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2																
ASSIGN-	3																
MENTS	4																
	5																
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**								
MODES																	

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	**Lock**																
LOCKS																	

DETECTOR TIMES (MM-3-1-4-4)

	DET	1	2	3	4	5	6	7	8
DET	Delay	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TIMES	Str/Stp								

	DET	9	10	11	12	13	14	15	16
DET	Delay	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TIMES	Str/Stp								

ENHANCED OPTIONS

DYNAMIC OMITS (MM-3-1-9-1-1)

DYNAM OMITS GP1 ENABLE:	**Y**	Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

(X = ENABLE)

GRP1-1	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS					**X**											
OMITS	IF PH ON		**X**				**X**										
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

Select phases to be dynamically omitted from OMIT PHS row. Select the PH-ONs and/or O/L GRNs that will cause those omits. Phases are omitted when controller state matches IF PH ON row or O/L GRN row.
Note that there are 2 groups of dynamic omits, each with 8 patterns. Group 1 is the default group and group 2 can be selected by input or TOD ckt 96. When a group is active, any one or all of the pattterns within that group may be true depending on the controller state.

DYNAMIC RECALLS (MM-3-1-9-1-2)

	Y	Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

DYN. RECALL GP1 ENABLE:

(X = ENABLE)

	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GRP1-1	RCL PHS		**X**				**X**										
DYNAM.	IF PH ON					**X**											
RECALLS	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ASSIGN-	GRN																
MENTS																	

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**1**	0=TOD, 1=CL, 2=INT
Split Source:	**1**	0=TOD, 1=CL, 2=INT
Offset Source:	**1**	0=TOD, 1=CL, 2=INT

Free Source:	**1**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	**N**	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	**N**	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	**N**	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	**Y**	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	**1**	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**	**4**		
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1	4/1			
	Length	**100**	**110**	**110**	**90**			
CYCLE	Offset 1	**7**	**100**	**44**	**23**			**Secs**
&	Offset 2							
OFFSETS	Offset 3							
	Offset 4							
	Offset 5							
	Max Dwell	**32**	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1-1		**X**				**X**										
	2-1		**X**				**X**										
COORD	**3-1**		**X**				**X**										
PHASES	**4-1**		**X**				**X**										

PHASE ALLOCATION (MM-3-2-6)

ENTRY IN:	Secs	% or Secs: Not a controller entry--for reference only. Controller entry is under

	PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE ALLO-CATION	**C1 S1**		**60**		**40**	**16**	**44**		**40**								
	C1 S2																
	C1 S3																
	C1 S4																
	C2 S1		**68**		**42**	**18**	**50**		**42**								
	C2 S2																
	C2 S3																
	C2 S4																
	C3 S1		**68**		**42**	**17**	**51**		**42**								
	C3 S2																
	C3 S3																
	C3 S4																
	C4 S1		**48**		**42**		**48**		**42**								
	C4 S2																
	C4 S3																
	C4 S4																

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	**0**

Mode

0 Add only, cycle times 20% slow only to get in sync

1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step

2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	**Y**	Y/N: See note	Invert Free In:	**N**	Y/N: See note
Central Override:	**N**	Y/N: See note	Split Matrix:	**N**	Y/N: See note
No PCL Offset Adjust:	**N**	Y/N: See note	4 Splits/Cycle:	**Y**	Y/N: See note
			No Early Coord Ped:	**N**	Y/N: See note

Yield Percent	**0**	0-10%: See note
EGB%	**0**	0-100%: See note
RGB%	**0**	0-100%: See note
# Cycles to out of step:	**0**	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	**0**	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	**0**	Cycle 2:	**0**	Cycle 3:	**0**
Cycle 4:	**0**	Cycle 5:	**0**	Cycle 6:	**0**

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	**Y**	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	**0**	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	OFF
	00	00		4	1	1		
	06	00		1	1	1		
	23	00		4	1	1		
2	00	00					11(FRE)	OFF
	00	00		4	1	1		
	06	00		2	1	1		
	10	00		1	1	1		
	14	30		3	1	1		
	18	30		1	1	1		
	23	00		4	1	1		

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	65	66	67	68	69	70	71	72
	Function	LL1	LL2	LL3	LL4	LL5	LL6	LL7	LL8
	State								
	Circuit	**73**	74	75	76	**77**	78	79	80
	Function	**CN1**	CN2	CN3	CN4	**WRM**	MIN	DIM	CVS
	State	**ON**				**ON**			
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**00**	**00**	CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	**7**	0-255
	Master Identification	**17**	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

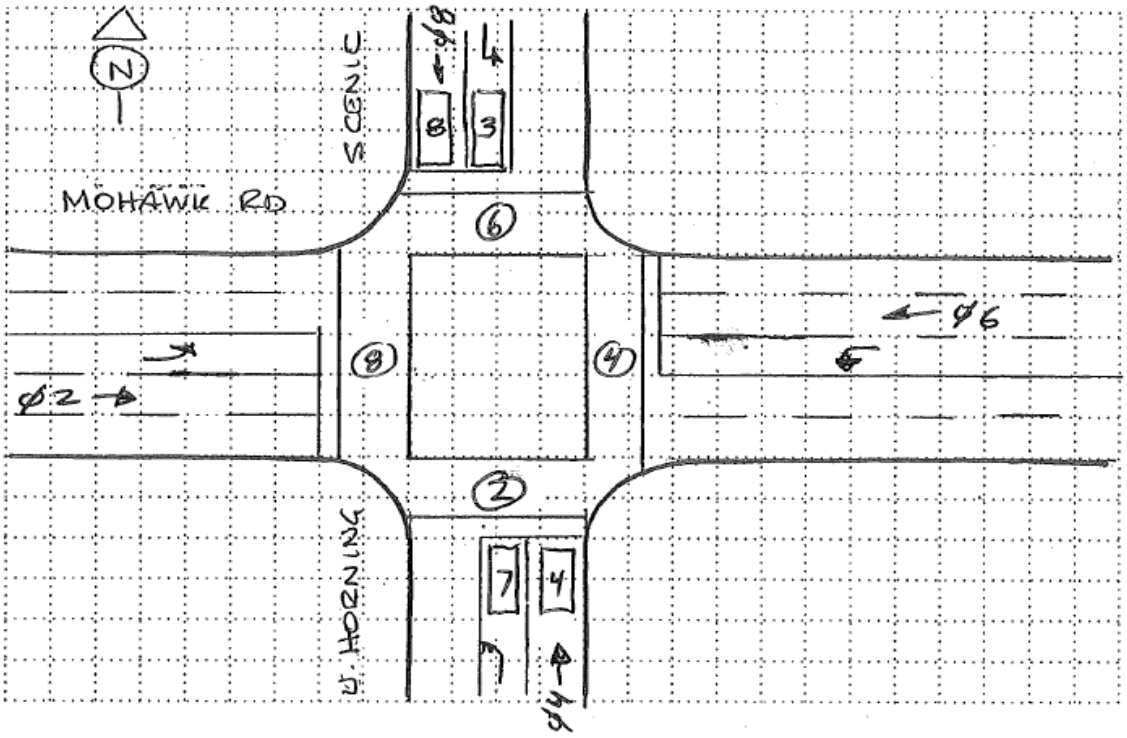
City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Mohawk & Scenic & Upper Horning**

Controller Type: **3000E** Page **1** of **16**

Programmed By: **JC** Installed By: **JC**

Date: **Feb 13/17** Date: **Feb 14/17**



ϕ1:
ϕ2: **Mohawk - EB, South Xwalk**
ϕ3:
ϕ4: **Upper Horning- NB, East Xwalk**
ϕ5:
ϕ6: **Mohawk - WB, North Xwalk**
ϕ7:
ϕ8: **Scenic - SB, West Xwalk**

Flash Operation: **Red: Mohawk**
Red: Scenic / Upper Horning

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases				X				X								
	Interval	0	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	10	(0-255 seconds start-up flash time)														
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	3	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		X		X												
	Ring 2						X		X								
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		X				X										
	CO PH 2				X				X								
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X				X										
	CNA 2																
	CNA 3																
	CNA 4																
	WRM		X				X										
	INH MAX																
	PED RECY		X				X										
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**30**		**10**		**30**		**10**								
	Passage				**3.0**				**3.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**3.0**		**2.6**		**3.0**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**20**		**19**		**20**		**19**								
	Max 1		**32**		**30**		**32**		**30**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage				**3.0**				**3.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**3.0**		**2.6**		**3.0**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**20**		**19**		**20**		**19**								
	Max 1		**70**		**50**		**70**		**50**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage				**3.0**				**3.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**3.0**		**2.6**		**3.0**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**20**		**19**		**20**		**19**								
	Max 1		**70**		**40**		**70**		**40**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

		TP4															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage				**3.0**				**3.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**3.0**		**2.6**		**3.0**		**2.6**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**20**		**19**		**20**		**19**								
	Max 1		**60**		**40**		**60**		**40**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL	1																
ENTRY	2						X										
ASSIGN-	3																
MENTS	4								X								
	5																
	6		X														
	7																
	8				X												

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH	1																
DET	2																
ASSIGN-	3								X								
MENTS	4				X												
	5																
	6																
	7				X												
	8								X								
	9																

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2																
ASSIGN-	3																
MENTS	4				**X**				**X**								
	5																
	6																
	7																
	8				**X**				**X**								

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**								
MODES																	

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	**Lock**																
LOCKS																	

DETECTOR TIMES (MM-3-1-4-4)

	DET	1	2	3	4	5	6	7	8
DET	Delay	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**
TIMES	Str/Stp								

	DET	9	10	11	12	13	14	15	16
DET	Delay	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TIMES	Str/Stp								

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**1**	0=TOD, 1=CL, 2=INT
Split Source:	**1**	0=TOD, 1=CL, 2=INT
Offset Source:	**1**	0=TOD, 1=CL, 2=INT

Free Source:	**1**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	**N**	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	**N**	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	**N**	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	**Y**	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	**0**	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**	**4**		
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1	4/1			
	Length	**100**	**110**	**110**	**90**			
CYCLE	Offset 1	**0**	**83**	**41**	**31**			**Secs**
&	Offset 2							
OFFSETS	Offset 3							
	Offset 4							
	Offset 5							
	Max Dwell	**32**	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1-1		**X**				**X**										
	2-1		**X**				**X**										
COORD	**3-1**		**X**				**X**										
PHASES	**4-1**		**X**				**X**										

PHASE ALLOCATION (MM-3-2-6)

ENTRY IN:	Secs	% or Secs: Not a controller entry--for reference only. Controller entry is under

	PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE ALLO-CATION	**C1 S1**		**60**		**40**		**60**		**40**								
	C1 S2																
	C1 S3																
	C1 S4																
	C2 S1		**64**		**46**		**64**		**46**								
	C2 S2																
	C2 S3																
	C2 S4																
	C3 S1		**70**		**40**		**70**		**40**								
	C3 S2																
	C3 S3																
	C3 S4																
	C4 S1		**50**		**40**		**50**		**40**								
	C4 S2																
	C4 S3																
	C4 S4																

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	**0**

Mode

0 Add only, cycle times 20% slow only to get in sync

1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step

2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	**Y**	Y/N: See note	Invert Free In:	**N**	Y/N: See note
Central Override:	**N**	Y/N: See note	Split Matrix:	**N**	Y/N: See note
No PCL Offset Adjust:	**N**	Y/N: See note	4 Splits/Cycle:	**Y**	Y/N: See note
			No Early Coord Ped:	**N**	Y/N: See note

Yield Percent	**1**	0-10%: See note
EGB%	**0**	0-100%: See note
RGB%	**25**	0-100%: See note
# Cycles to out of step:	**0**	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	**0**	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	**0**	Cycle 2:	**0**	Cycle 3:	**0**
Cycle 4:	**0**	Cycle 5:	**0**	Cycle 6:	**0**

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	**Y**	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	**0**	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00	1					
	07	00	2					
	07	00		1	1	1		
	20	00	1				11(FRE)	ON
2	00	00	1					
	06	00	2					
	06	00		2	1	1		
	10	00		1	1	1		
	14	30		3	1	1		
	18	30		1	1	1		
	20	00	1					

CIRCUIT PLANS (MM-3-3-2)

For each plan, specify up to 4 ckt on/off's (On? = On or Off). The plan is implemented as one event in the day programs.
Use plans when more than one circuit changes state at the same time of day (instead of several events with one circuit change each).

Plan
1
2

Ckt	On?
11	ON
11	OFF

Ckt	On?
77	ON
77	OFF

Ckt	On?
87	OFF
87	ON

Ckt	On?
88	OFF
88	ON

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	**73**	74	75	76	**77**	78	79	80
	Function	**CN1**	CN2	CN3	CN4	**WRM**	MIN	DIM	CVS
	State	**ON**				**TOD**			
	Circuit	81	82	83	84	85	86	87	88
	Function	CVS	TIA	TIB	TIC	N/U	N/U	PR1	PR2
	State							**TOD**	**TOD**
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**00**	**00**	CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	**9**	0-255
	Master Identification	**17**	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Turning Movement Count (655 . RICE AVE & SANATORIUM DR)

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)	Int. Total (1 hr)
	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	U-Turn S:S	Peds S:	Approach Total		
07:00:00	16	0	0	0	16	1	13	0	0	14	8	20	0	0	28	58	
07:15:00	14	3	0	0	17	4	7	0	0	11	5	18	0	1	23	51	
07:30:00	15	2	0	3	17	2	9	0	2	11	5	16	0	0	21	49	
07:45:00	22	6	0	6	28	6	17	0	1	23	12	24	0	1	36	87	245
08:00:00	19	7	0	2	26	3	14	0	1	17	22	29	0	0	51	94	281
08:15:00	23	6	0	2	29	8	20	0	3	28	16	26	0	0	42	99	329
08:30:00	16	9	0	37	25	3	18	0	3	21	33	25	0	1	58	104	384
08:45:00	24	4	0	12	28	9	29	0	6	38	16	24	0	2	40	106	403
BREAK																	
11:00:00	18	2	0	1	20	3	15	0	0	18	10	13	0	1	23	61	
11:15:00	21	6	0	4	27	9	10	0	1	19	16	17	0	0	33	79	
11:30:00	14	1	0	1	15	6	9	0	0	15	10	9	0	0	19	49	
11:45:00	20	8	0	0	28	8	12	0	0	20	17	18	0	0	35	83	272
12:00:00	19	1	0	1	20	9	20	0	3	29	10	8	0	2	18	67	278
12:15:00	18	5	0	1	23	3	16	0	3	19	7	16	0	1	23	65	264
12:30:00	18	3	0	0	21	7	14	0	1	21	16	16	0	1	32	74	289
12:45:00	16	7	0	0	23	5	12	0	0	17	15	14	0	2	29	69	275
13:00:00	17	2	0	1	19	6	16	0	2	22	7	20	0	1	27	68	276
13:15:00	18	8	0	0	26	7	12	0	2	19	15	17	0	2	32	77	288
13:30:00	15	4	0	3	19	6	14	0	0	20	11	18	0	0	29	68	282
13:45:00	14	7	0	1	21	3	16	0	0	19	11	18	0	0	29	69	282
BREAK																	
15:00:00	23	10	0	37	33	11	33	0	8	44	15	19	0	2	34	111	
15:15:00	31	3	0	7	34	8	26	0	3	34	15	21	0	3	36	104	
15:30:00	25	4	0	0	29	10	15	0	4	25	21	19	0	3	40	94	
15:45:00	29	6	0	1	35	11	15	0	0	26	5	26	0	0	31	92	401
16:00:00	36	12	0	5	48	9	19	0	2	28	18	22	0	0	40	116	406
16:15:00	29	0	0	0	29	5	23	0	3	28	18	23	0	1	41	98	400
16:30:00	41	4	0	1	45	9	16	0	1	25	17	18	0	1	35	105	411
16:45:00	27	4	0	4	31	6	19	0	0	25	12	32	0	0	44	100	419
17:00:00	38	1	0	0	39	7	17	0	4	24	13	22	1	0	36	99	402
17:15:00	22	3	0	2	25	10	19	0	2	29	9	17	0	1	26	80	384
17:30:00	31	2	0	3	33	10	17	0	0	27	10	26	0	0	36	96	375

17:45:00	23	3	0	3	26	5	11	0	4	16	6	25	0	0	31	73	348
Grand Total	712	143	0	138	855	209	523	0	59	732	421	636	1	26	1058	**2645**	-
Approach%	83.3%	16.7%	0%		-	28.6%	71.4%	0%		-	39.8%	60.1%	0.1%		-	**-**	-
Totals %	26.9%	5.4%	0%		32.3%	7.9%	19.8%	0%		27.7%	15.9%	24%	0%		40%	**-**	-
Heavy	3	0	0		-	0	0	0		-	0	1	0		-	**-**	-
Heavy %	0.4%	0%	0%		-	0%	0%	0%		-	0%	0.2%	0%		-	**-**	-
Bicycles	-	-	-		-	-	-	-		-	-	-	-		-	**-**	-
Bicycle %	-	-	-		-	-	-	-		-	-	-	-		-	**-**	-

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Peak Hour: 08:00 AM - 09:00 AM Weather:

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
08:00:00	19	7	0	2	26	3	14	0	1	17	22	29	0	0	51	94
08:15:00	23	6	0	2	29	8	20	0	3	28	16	26	0	0	42	99
08:30:00	16	9	0	37	25	3	18	0	3	21	33	25	0	1	58	104
08:45:00	24	4	0	12	28	9	29	0	6	38	16	24	0	2	40	106
Grand Total	82	26	0	53	108	23	81	0	13	104	87	104	0	3	191	**403**
Approach%	75.9%	24.1%	0%		-	22.1%	77.9%	0%		-	45.5%	54.5%	0%		-	**-**
Totals %	20.3%	6.5%	0%		26.8%	5.7%	20.1%	0%		25.8%	21.6%	25.8%	0%		47.4%	**-**
PHF	0.85	0.72	0		0.93	0.64	0.7	0		0.68	0.66	0.9	0		0.82	**-**
Heavy	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Lights	75	25	0		100	23	74	0		97	82	94	0		176	**-**
Lights %	91.5%	96.2%	0%		92.6%	100%	91.4%	0%		93.3%	94.3%	90.4%	0%		92.1%	**-**
Mediums	7	1	0		8	0	7	0		7	5	9	0		14	**-**
Mediums %	8.5%	3.8%	0%		7.4%	0%	8.6%	0%		6.7%	5.7%	8.7%	0%		7.3%	**-**
Articulated Trucks	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0		0	0	0	0		0	0	1	0		1	**-**
Bicycles on Road %	0%	0%	0%		0%	0%	0%	0%		0%	0%	1%	0%		0.5%	**-**
Pedestrians	-	-	-	53	-	-	-	-	13	-	-	-	-	3	-	**-**
Pedestrians%	-	-	-	76.8%		-	-	-	18.8%		-	-	-	4.3%		**-**

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Peak Hour: 11:45 AM - 12:45 PM Weather:

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
11:45:00	20	8	0	0	28	8	12	0	0	20	17	18	0	0	35	83
12:00:00	19	1	0	1	20	9	20	0	3	29	10	8	0	2	18	67
12:15:00	18	5	0	1	23	3	16	0	3	19	7	16	0	1	23	65
12:30:00	18	3	0	0	21	7	14	0	1	21	16	16	0	1	32	74
Grand Total	75	17	0	2	92	27	62	0	7	89	50	58	0	4	108	**289**
Approach%	81.5%	18.5%	0%		-	30.3%	69.7%	0%		-	46.3%	53.7%	0%		-	**-**
Totals %	26%	5.9%	0%		31.8%	9.3%	21.5%	0%		30.8%	17.3%	20.1%	0%		37.4%	**-**
PHF	0.94	0.53	0		0.82	0.75	0.78	0		0.77	0.74	0.81	0		0.77	**-**
Heavy	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Heavy %	1.3%	0%	0%		1.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Lights	69	17	0		86	27	59	0		86	47	55	0		102	**-**
Lights %	92%	100%	0%		93.5%	100%	95.2%	0%		96.6%	94%	94.8%	0%		94.4%	**-**
Mediums	4	0	0		4	0	3	0		3	3	3	0		6	**-**
Mediums %	5.3%	0%	0%		4.3%	0%	4.8%	0%		3.4%	6%	5.2%	0%		5.6%	**-**
Articulated Trucks	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	1.3%	0%	0%		1.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Bicycles on Road	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Bicycles on Road %	1.3%	0%	0%		1.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	2	-	-	-	-	7	-	-	-	-	4	-	**-**
Pedestrians%	-	-	-	15.4%		-	-	-	53.8%		-	-	-	30.8%		**-**

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

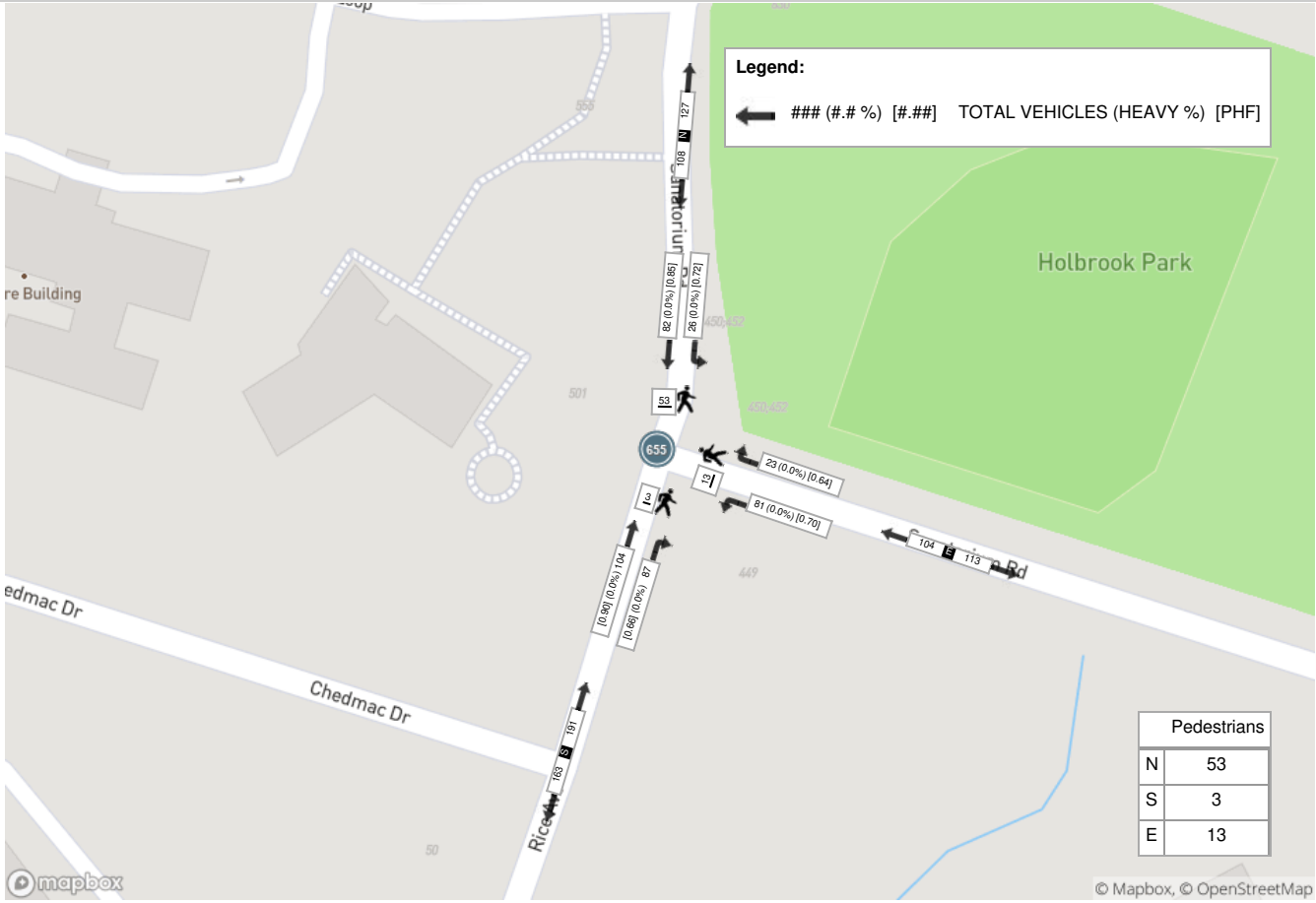
Peak Hour: 04:00 PM - 05:00 PM Weather:

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
16:00:00	36	12	0	5	48	9	19	0	2	28	18	22	0	0	40	116
16:15:00	29	0	0	0	29	5	23	0	3	28	18	23	0	1	41	98
16:30:00	41	4	0	1	45	9	16	0	1	25	17	18	0	1	35	105
16:45:00	27	4	0	4	31	6	19	0	0	25	12	32	0	0	44	100
Grand Total	133	20	0	10	153	29	77	0	6	106	65	95	0	2	160	**419**
Approach%	86.9%	13.1%	0%		-	27.4%	72.6%	0%		-	40.6%	59.4%	0%		-	**-**
Totals %	31.7%	4.8%	0%		36.5%	6.9%	18.4%	0%		25.3%	15.5%	22.7%	0%		38.2%	**-**
PHF	0.81	0.42	0		0.8	0.81	0.84	0		0.95	0.9	0.74	0		0.91	**-**
Heavy	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Lights	121	20	0		141	29	70	0		99	59	90	0		149	**-**
Lights %	91%	100%	0%		92.2%	100%	90.9%	0%		93.4%	90.8%	94.7%	0%		93.1%	**-**
Mediums	12	0	0		12	0	6	0		6	6	5	0		11	**-**
Mediums %	9%	0%	0%		7.8%	0%	7.8%	0%		5.7%	9.2%	5.3%	0%		6.9%	**-**
Articulated Trucks	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0		0	0	1	0		1	0	0	0		0	**-**
Bicycles on Road %	0%	0%	0%		0%	0%	1.3%	0%		0.9%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	10	-	-	-	-	6	-	-	-	-	2	-	**-**
Pedestrians%	-	-	-	55.6%		-	-	-	33.3%		-	-	-	11.1%		**-**

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

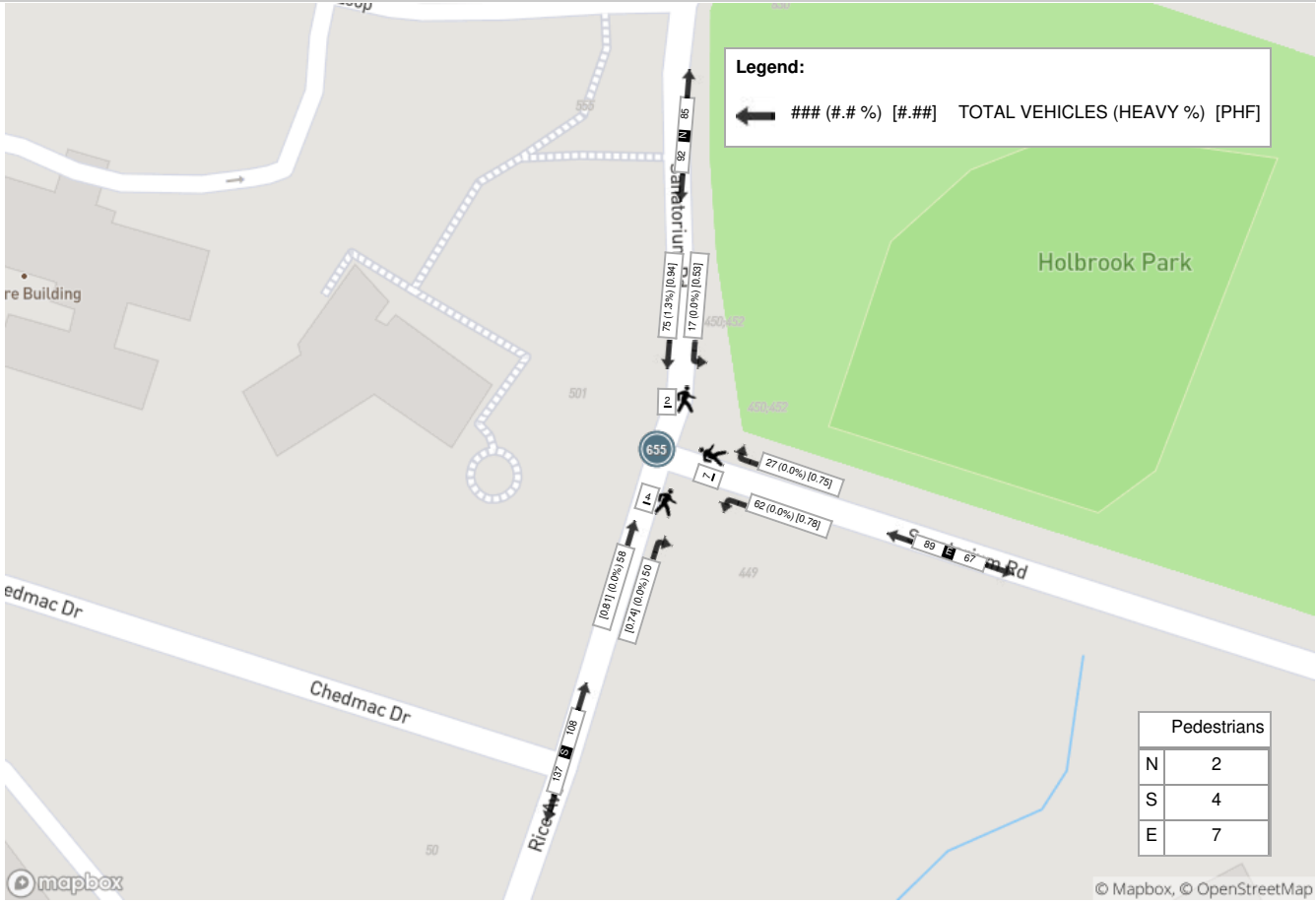
Peak Hour: 08:00 AM - 09:00 AM Weather:



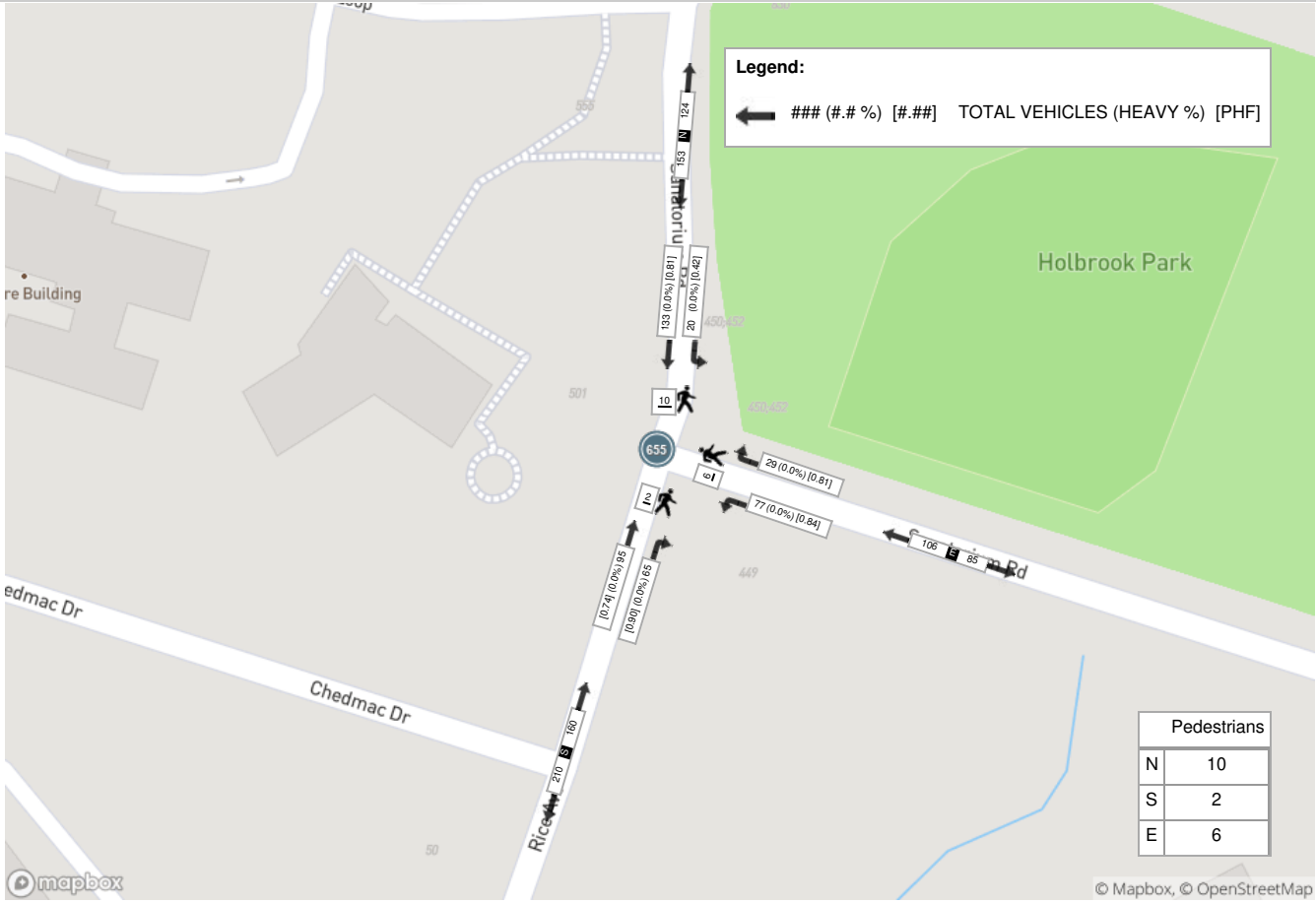
Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Peak Hour: 11:45 AM - 12:45 PM Weather:



Peak Hour: 04:00 PM - 05:00 PM Weather:



Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Turning Movement Count (655 . RICE AVE & SANATORIUM DR)

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)	Int. Total (1 hr)
	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	U-Turn S:S	Peds S:	Approach Total		
07:00:00	16	0	0	0	16	1	13	0	0	14	8	20	0	0	28	58	
07:15:00	14	3	0	0	17	4	7	0	0	11	5	18	0	1	23	51	
07:30:00	15	2	0	3	17	2	9	0	2	11	5	16	0	0	21	49	
07:45:00	22	6	0	6	28	6	17	0	1	23	12	24	0	1	36	87	245
08:00:00	19	7	0	2	26	3	14	0	1	17	22	29	0	0	51	94	281
08:15:00	23	6	0	2	29	8	20	0	3	28	16	26	0	0	42	99	329
08:30:00	16	9	0	37	25	3	18	0	3	21	33	25	0	1	58	104	384
08:45:00	24	4	0	12	28	9	29	0	6	38	16	24	0	2	40	106	403
BREAK																	
11:00:00	18	2	0	1	20	3	15	0	0	18	10	13	0	1	23	61	
11:15:00	21	6	0	4	27	9	10	0	1	19	16	17	0	0	33	79	
11:30:00	14	1	0	1	15	6	9	0	0	15	10	9	0	0	19	49	
11:45:00	20	8	0	0	28	8	12	0	0	20	17	18	0	0	35	83	272
12:00:00	19	1	0	1	20	9	20	0	3	29	10	8	0	2	18	67	278
12:15:00	18	5	0	1	23	3	16	0	3	19	7	16	0	1	23	65	264
12:30:00	18	3	0	0	21	7	14	0	1	21	16	16	0	1	32	74	289
12:45:00	16	7	0	0	23	5	12	0	0	17	15	14	0	2	29	69	275
13:00:00	17	2	0	1	19	6	16	0	2	22	7	20	0	1	27	68	276
13:15:00	18	8	0	0	26	7	12	0	2	19	15	17	0	2	32	77	288
13:30:00	15	4	0	3	19	6	14	0	0	20	11	18	0	0	29	68	282
13:45:00	14	7	0	1	21	3	16	0	0	19	11	18	0	0	29	69	282
BREAK																	
15:00:00	23	10	0	37	33	11	33	0	8	44	15	19	0	2	34	111	
15:15:00	31	3	0	7	34	8	26	0	3	34	15	21	0	3	36	104	
15:30:00	25	4	0	0	29	10	15	0	4	25	21	19	0	3	40	94	
15:45:00	29	6	0	1	35	11	15	0	0	26	5	26	0	0	31	92	401
16:00:00	36	12	0	5	48	9	19	0	2	28	18	22	0	0	40	116	406
16:15:00	29	0	0	0	29	5	23	0	3	28	18	23	0	1	41	98	400
16:30:00	41	4	0	1	45	9	16	0	1	25	17	18	0	1	35	105	411
16:45:00	27	4	0	4	31	6	19	0	0	25	12	32	0	0	44	100	419
17:00:00	38	1	0	0	39	7	17	0	4	24	13	22	1	0	36	99	402
17:15:00	22	3	0	2	25	10	19	0	2	29	9	17	0	1	26	80	384
17:30:00	31	2	0	3	33	10	17	0	0	27	10	26	0	0	36	96	375

17:45:00	23	3	0	3	26	5	11	0	4	16	6	25	0	0	31	73	348
Grand Total	712	143	0	138	855	209	523	0	59	732	421	636	1	26	1058	**2645**	-
Approach%	83.3%	16.7%	0%		-	28.6%	71.4%	0%		-	39.8%	60.1%	0.1%		-	**-**	-
Totals %	26.9%	5.4%	0%		32.3%	7.9%	19.8%	0%		27.7%	15.9%	24%	0%		40%	**-**	-
Heavy	3	0	0		-	0	0	0		-	0	1	0		-	**-**	-
Heavy %	0.4%	0%	0%		-	0%	0%	0%		-	0%	0.2%	0%		-	**-**	-
Bicycles	-	-	-		-	-	-	-		-	-	-	-		-	**-**	-
Bicycle %	-	-	-		-	-	-	-		-	-	-	-		-	**-**	-

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Peak Hour: 08:00 AM - 09:00 AM Weather:

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
08:00:00	19	7	0	2	26	3	14	0	1	17	22	29	0	0	51	94
08:15:00	23	6	0	2	29	8	20	0	3	28	16	26	0	0	42	99
08:30:00	16	9	0	37	25	3	18	0	3	21	33	25	0	1	58	104
08:45:00	24	4	0	12	28	9	29	0	6	38	16	24	0	2	40	106
Grand Total	82	26	0	53	108	23	81	0	13	104	87	104	0	3	191	**403**
Approach%	75.9%	24.1%	0%		-	22.1%	77.9%	0%		-	45.5%	54.5%	0%		-	**-**
Totals %	20.3%	6.5%	0%		26.8%	5.7%	20.1%	0%		25.8%	21.6%	25.8%	0%		47.4%	**-**
PHF	0.85	0.72	0		0.93	0.64	0.7	0		0.68	0.66	0.9	0		0.82	**-**
Heavy	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Lights	75	25	0		100	23	74	0		97	82	94	0		176	**-**
Lights %	91.5%	96.2%	0%		92.6%	100%	91.4%	0%		93.3%	94.3%	90.4%	0%		92.1%	**-**
Mediums	7	1	0		8	0	7	0		7	5	9	0		14	**-**
Mediums %	8.5%	3.8%	0%		7.4%	0%	8.6%	0%		6.7%	5.7%	8.7%	0%		7.3%	**-**
Articulated Trucks	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0		0	0	0	0		0	0	1	0		1	**-**
Bicycles on Road %	0%	0%	0%		0%	0%	0%	0%		0%	0%	1%	0%		0.5%	**-**
Pedestrians	-	-	-	53	-	-	-	-	13	-	-	-	-	3	-	**-**
Pedestrians%	-	-	-	76.8%		-	-	-	18.8%		-	-	-	4.3%		**-**

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Peak Hour: 11:45 AM - 12:45 PM Weather:

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
11:45:00	20	8	0	0	28	8	12	0	0	20	17	18	0	0	35	83
12:00:00	19	1	0	1	20	9	20	0	3	29	10	8	0	2	18	67
12:15:00	18	5	0	1	23	3	16	0	3	19	7	16	0	1	23	65
12:30:00	18	3	0	0	21	7	14	0	1	21	16	16	0	1	32	74
Grand Total	75	17	0	2	92	27	62	0	7	89	50	58	0	4	108	**289**
Approach%	81.5%	18.5%	0%		-	30.3%	69.7%	0%		-	46.3%	53.7%	0%		-	**-**
Totals %	26%	5.9%	0%		31.8%	9.3%	21.5%	0%		30.8%	17.3%	20.1%	0%		37.4%	**-**
PHF	0.94	0.53	0		0.82	0.75	0.78	0		0.77	0.74	0.81	0		0.77	**-**
Heavy	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Heavy %	1.3%	0%	0%		1.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Lights	69	17	0		86	27	59	0		86	47	55	0		102	**-**
Lights %	92%	100%	0%		93.5%	100%	95.2%	0%		96.6%	94%	94.8%	0%		94.4%	**-**
Mediums	4	0	0		4	0	3	0		3	3	3	0		6	**-**
Mediums %	5.3%	0%	0%		4.3%	0%	4.8%	0%		3.4%	6%	5.2%	0%		5.6%	**-**
Articulated Trucks	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	1.3%	0%	0%		1.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Bicycles on Road	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Bicycles on Road %	1.3%	0%	0%		1.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	2	-	-	-	-	7	-	-	-	-	4	-	**-**
Pedestrians%	-	-	-	15.4%		-	-	-	53.8%		-	-	-	30.8%		**-**

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

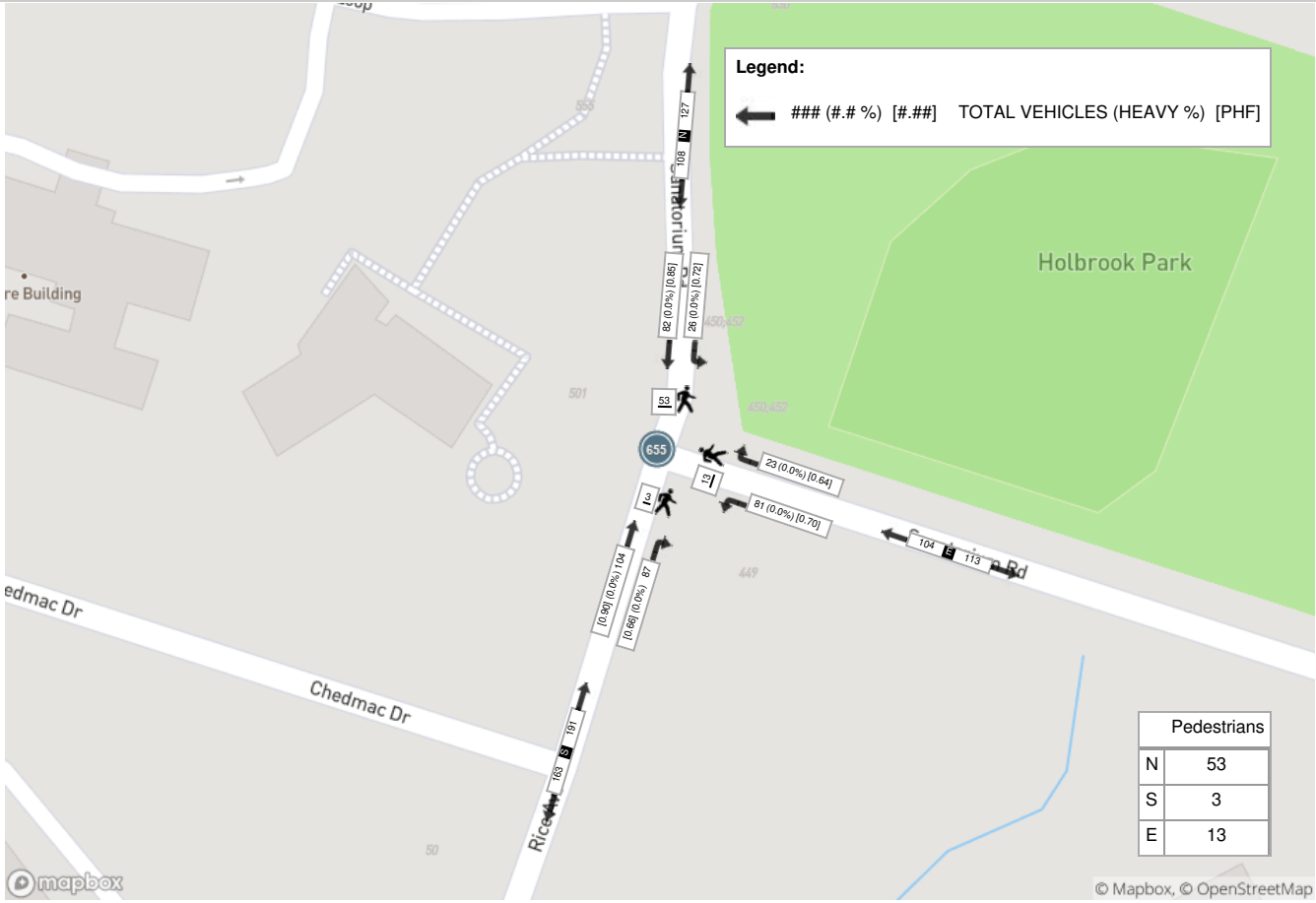
Peak Hour: 04:00 PM - 05:00 PM Weather:

Start Time	N Approach RICE AVENUE					E Approach SANATORIUM DRIVE					S Approach RICE AVENUE					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
16:00:00	36	12	0	5	48	9	19	0	2	28	18	22	0	0	40	116
16:15:00	29	0	0	0	29	5	23	0	3	28	18	23	0	1	41	98
16:30:00	41	4	0	1	45	9	16	0	1	25	17	18	0	1	35	105
16:45:00	27	4	0	4	31	6	19	0	0	25	12	32	0	0	44	100
Grand Total	133	20	0	10	153	29	77	0	6	106	65	95	0	2	160	**419**
Approach%	86.9%	13.1%	0%		-	27.4%	72.6%	0%		-	40.6%	59.4%	0%		-	**-**
Totals %	31.7%	4.8%	0%		36.5%	6.9%	18.4%	0%		25.3%	15.5%	22.7%	0%		38.2%	**-**
PHF	0.81	0.42	0		0.8	0.81	0.84	0		0.95	0.9	0.74	0		0.91	**-**
Heavy	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Lights	121	20	0		141	29	70	0		99	59	90	0		149	**-**
Lights %	91%	100%	0%		92.2%	100%	90.9%	0%		93.4%	90.8%	94.7%	0%		93.1%	**-**
Mediums	12	0	0		12	0	6	0		6	6	5	0		11	**-**
Mediums %	9%	0%	0%		7.8%	0%	7.8%	0%		5.7%	9.2%	5.3%	0%		6.9%	**-**
Articulated Trucks	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0		0	0	1	0		1	0	0	0		0	**-**
Bicycles on Road %	0%	0%	0%		0%	0%	1.3%	0%		0.9%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	10	-	-	-	-	6	-	-	-	-	2	-	**-**
Pedestrians%	-	-	-	55.6%		-	-	-	33.3%		-	-	-	11.1%		**-**

Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

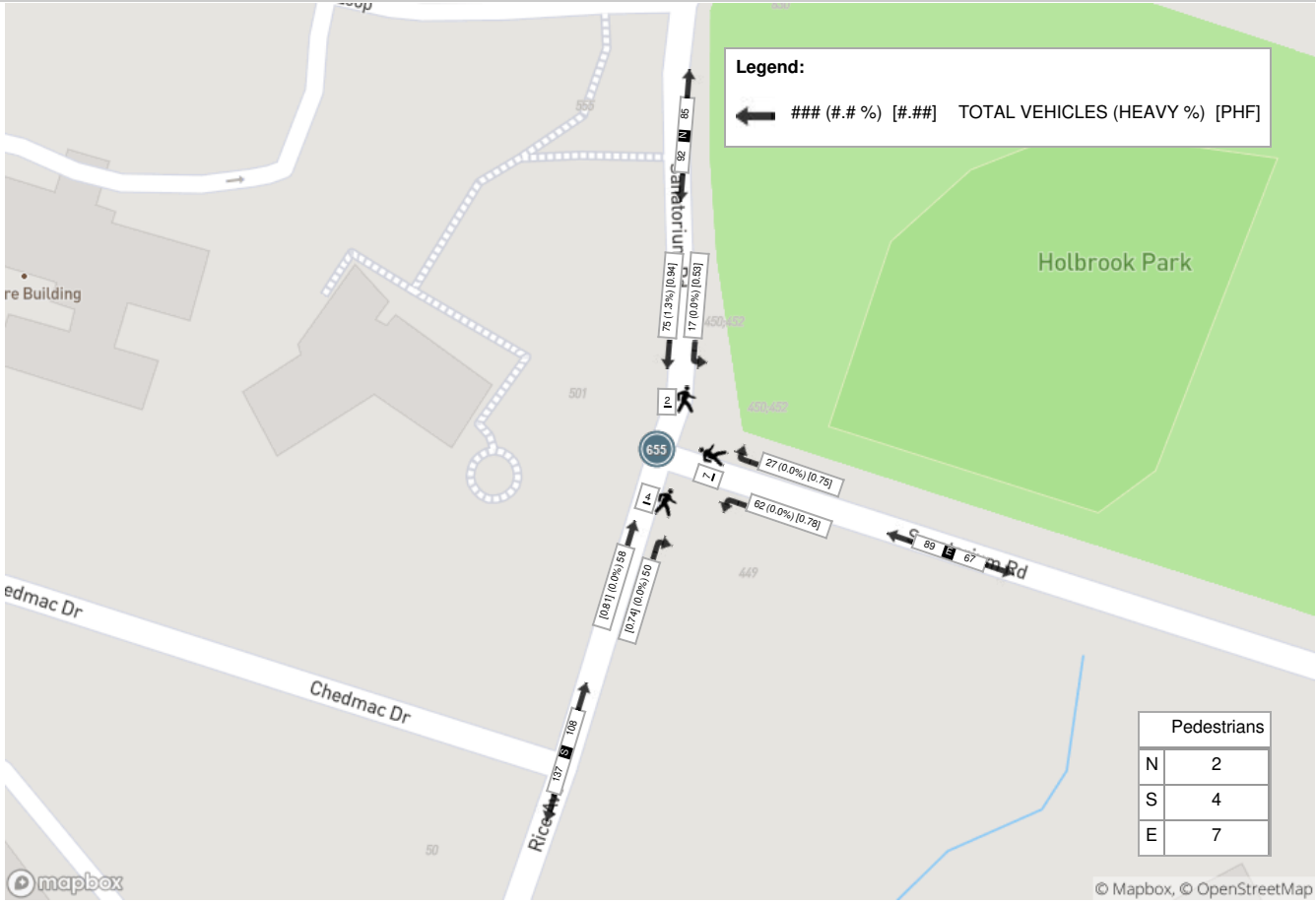
Peak Hour: 08:00 AM - 09:00 AM Weather:



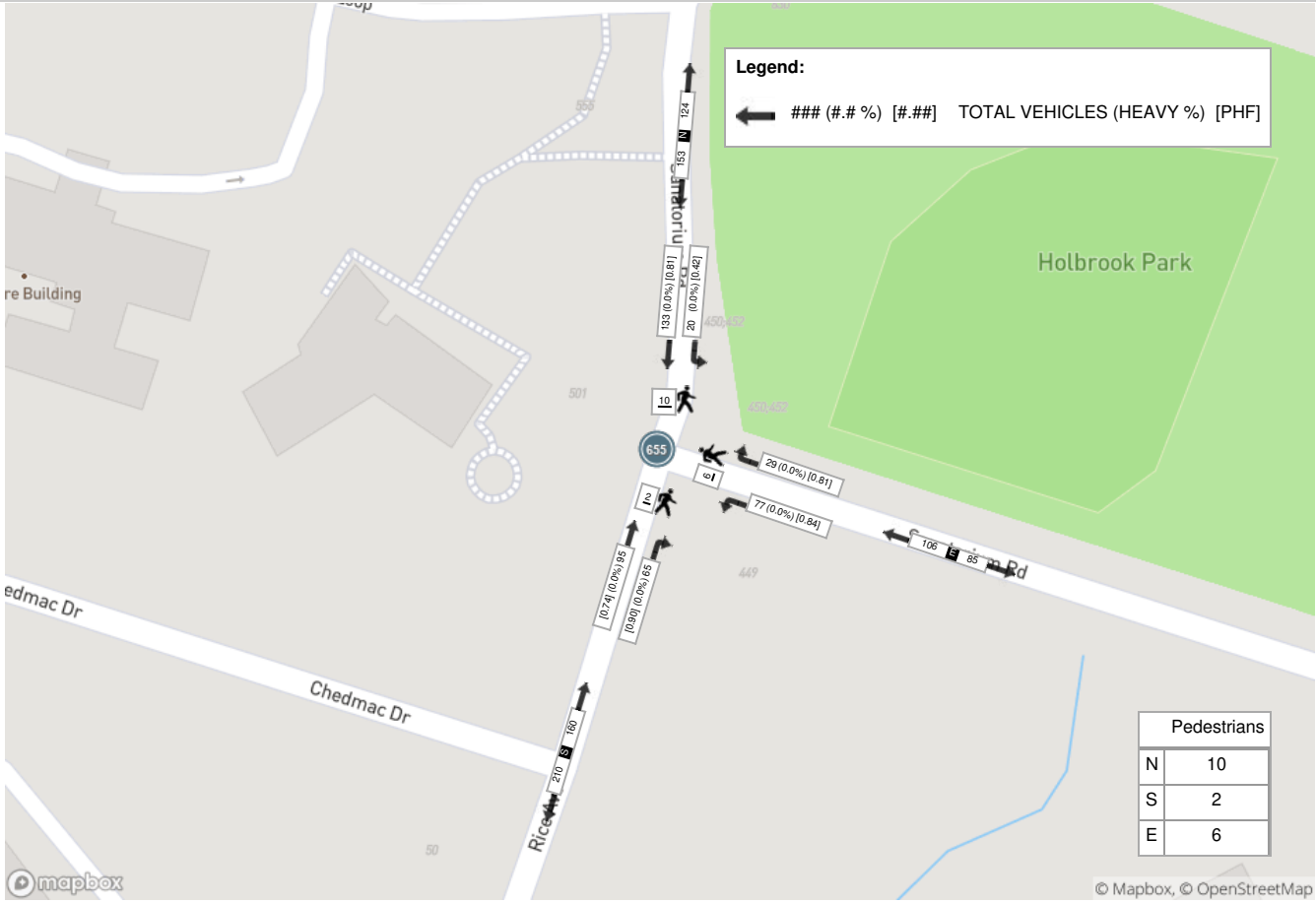
Spectrum

Turning Movement Count
Location Name: RICE AVE & SANATORIUM DR
Date: Tue, Nov 06, 2018 Deployment Lead: Peter Ilias

Peak Hour: 11:45 AM - 12:45 PM Weather:



Peak Hour: 04:00 PM - 05:00 PM Weather:



NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6

Turning Movement Count (3 . SCENIC DR & ANGELA AVE)

Start Time	N Approach SCENIC DR					E Approach ANGELA AVE					S Approach SCENIC DR					Int. Total (15 min)	Int. Total (1 hr)
	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	U-Turn S:S	Peds S:	Approach Total		
07:00:00	3	0	0	0	3	0	0	0	2	0	0	38	0	0	38	41	
07:15:00	16	0	0	0	16	0	2	0	1	2	1	48	0	0	49	67	
07:30:00	15	0	0	0	15	0	3	0	0	3	2	53	0	0	55	73	
07:45:00	19	0	1	0	20	0	3	0	5	3	2	56	0	0	58	81	262
08:00:00	19	0	0	0	19	0	1	0	2	1	1	63	0	0	64	84	305
08:15:00	21	0	0	0	21	0	2	0	1	2	4	58	0	0	62	85	323
08:30:00	26	0	0	0	26	0	2	0	1	2	1	55	0	0	56	84	334
08:45:00	24	0	0	0	24	0	1	0	2	1	2	50	0	0	52	77	330
09:00:00	20	0	0	0	20	0	1	0	1	1	1	37	0	0	38	59	305
09:15:00	14	1	0	0	15	1	0	0	1	1	0	20	0	0	20	36	256
09:30:00	12	0	0	0	12	0	0	0	1	0	0	28	0	0	28	40	212
09:45:00	25	0	0	0	25	0	1	0	5	1	0	24	0	0	24	50	185
BREAK																	
16:00:00	42	0	0	0	42	0	3	0	2	3	1	34	0	0	35	80	
16:15:00	50	1	0	0	51	0	3	0	1	3	4	32	0	0	36	90	
16:30:00	50	1	0	0	51	1	1	0	2	2	2	29	0	0	31	84	
16:45:00	53	0	0	0	53	0	0	0	2	0	2	28	0	0	30	83	337
17:00:00	55	0	0	0	55	0	1	0	0	1	2	31	0	0	33	89	346
17:15:00	70	0	0	0	70	0	2	0	0	2	5	18	0	0	23	95	351
17:30:00	34	0	0	0	34	0	1	0	1	1	1	34	0	0	35	70	337
17:45:00	42	0	0	0	42	2	2	0	4	4	0	25	0	0	25	71	325
18:00:00	33	1	0	0	34	0	9	0	4	9	2	19	0	0	21	64	300
18:15:00	32	0	0	0	32	0	3	0	2	3	3	21	0	0	24	59	264
18:30:00	28	0	0	0	28	1	1	0	2	2	2	27	0	0	29	59	253

18:45:00	33	0	0	0	33	1	0	0	1	1	2	30	0	0	32	66	248
Grand Total	736	4	1	0	741	6	42	0	43	48	40	858	0	0	898	**1687**	-
Approach%	99.3%	0.5%	0.1%		-	12.5%	87.5%	0%		-	4.5%	95.5%	0%		-	**-**	-
Totals %	43.6%	0.2%	0.1%		43.9%	0.4%	2.5%	0%		2.8%	2.4%	50.9%	0%		53.2%	**-**	-
Heavy	0	0	0		-	0	0	0		-	0	2	0		-	**-**	-
Heavy %	0%	0%	0%		-	0%	0%	0%		-	0%	0.2%	0%		-	**-**	-
Bicycles	-	-	-		-	-	-	-		-	-	-	-		-	**-**	-
Bicycle %	-	-	-		-	-	-	-		-	-	-	-		-	**-**	-

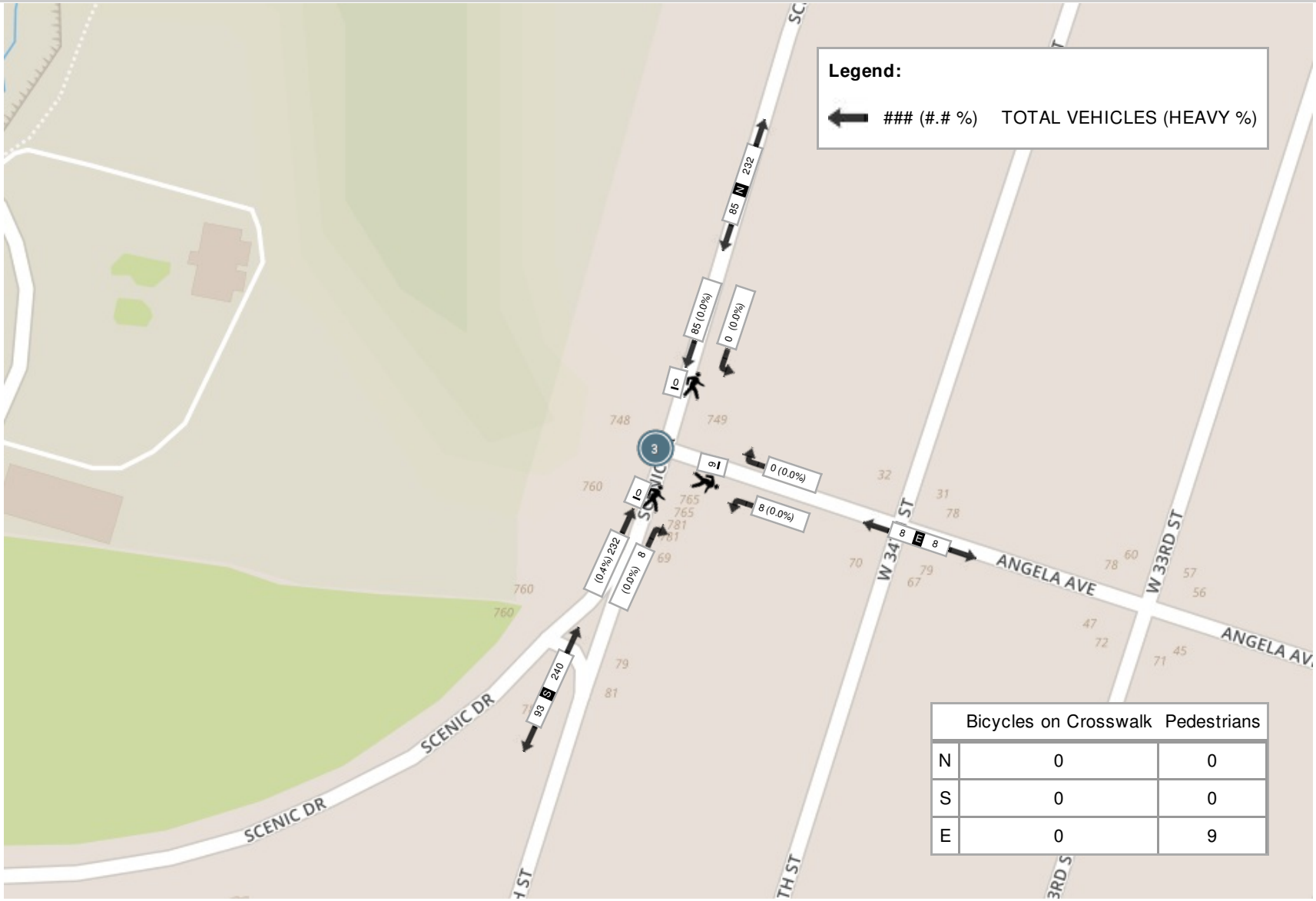
Peak Hour: 07:45 AM - 08:45 AM Weather: Unknown (11.6 °C)

Start Time	N Approach SCENIC DR					E Approach ANGELA AVE					S Approach SCENIC DR					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
07:45:00	19	0	1	0	20	0	3	0	5	3	2	56	0	0	58	81
08:00:00	19	0	0	0	19	0	1	0	2	1	1	63	0	0	64	84
08:15:00	21	0	0	0	21	0	2	0	1	2	4	58	0	0	62	85
08:30:00	26	0	0	0	26	0	2	0	1	2	1	55	0	0	56	84
Grand Total	85	0	1	0	86	0	8	0	9	8	8	232	0	0	240	**334**
Approach%	98.8%	0%	1.2%		-	0%	100%	0%		-	3.3%	96.7%	0%		-	-
Totals %	25.4%	0%	0.3%		25.7%	0%	2.4%	0%		2.4%	2.4%	69.5%	0%		71.9%	-
PHF	0.82	0	0.25		0.83	0	0.67	0		0.67	0.5	0.92	0		0.94	-
Heavy	0	0	0		0	0	0	0		0	0	1	0		1	-
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0.4%	0%		0.4%	-
Lights	83	0	1		84	0	8	0		8	7	223	0		230	-
Lights %	97.6%	0%	100%		97.7%	0%	100%	0%		100%	87.5%	96.1%	0%		95.8%	-
Mediums	2	0	0		2	0	0	0		0	0	6	0		6	-
Mediums %	2.4%	0%	0%		2.3%	0%	0%	0%		0%	0%	2.6%	0%		2.5%	-
Articulated Trucks	0	0	0		0	0	0	0		0	0	1	0		1	-
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0.4%	0%		0.4%	-
Bicycles on Road	0	0	0		0	0	0	0		0	1	2	0		3	-
Bicycles on Road %	0%	0%	0%		0%	0%	0%	0%		0%	12.5%	0.9%	0%		1.3%	-
Pedestrians	-	-	-	0	-	-	-	-	9	-	-	-	-	0	-	-
Pedestrians%	-	-	-	0%		-	-	-	100%		-	-	-	0%		-
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

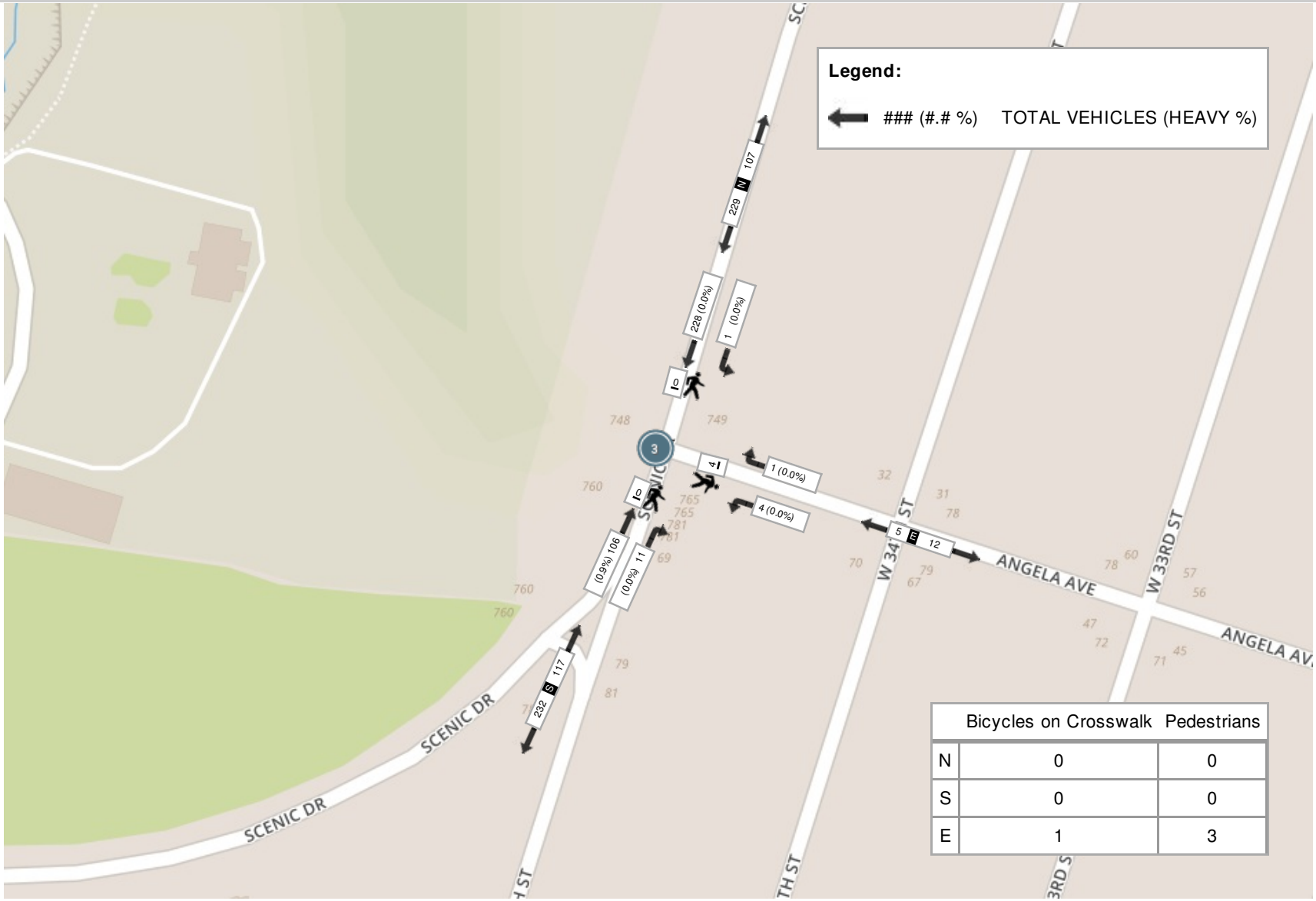
Peak Hour: 04:30 PM - 05:30 PM Weather: Unknown (26.5 °C)

Start Time	N Approach SCENIC DR					E Approach ANGELA AVE					S Approach SCENIC DR					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
16:30:00	50	1	0	0	51	1	1	0	2	2	2	29	0	0	31	84
16:45:00	53	0	0	0	53	0	0	0	2	0	2	28	0	0	30	83
17:00:00	55	0	0	0	55	0	1	0	0	1	2	31	0	0	33	89
17:15:00	70	0	0	0	70	0	2	0	0	2	5	18	0	0	23	95
Grand Total	228	1	0	0	229	1	4	0	4	5	11	106	0	0	117	**351**
Approach%	99.6%	0.4%	0%		-	20%	80%	0%		-	9.4%	90.6%	0%		-	-
Totals %	65%	0.3%	0%		65.2%	0.3%	1.1%	0%		1.4%	3.1%	30.2%	0%		33.3%	-
PHF	0.81	0.25	0		0.82	0.25	0.5	0		0.63	0.55	0.85	0		0.89	-
Heavy	0	0	0		0	0	0	0		0	0	1	0		1	-
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0.9%	0%		0.9%	-
Lights	221	1	0		222	1	4	0		5	9	103	0		112	-
Lights %	96.9%	100%	0%		96.9%	100%	100%	0%		100%	81.8%	97.2%	0%		95.7%	-
Mediums	5	0	0		5	0	0	0		0	0	1	0		1	-
Mediums %	2.2%	0%	0%		2.2%	0%	0%	0%		0%	0%	0.9%	0%		0.9%	-
Articulated Trucks	0	0	0		0	0	0	0		0	0	1	0		1	-
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0.9%	0%		0.9%	-
Bicycles on Road	2	0	0		2	0	0	0		0	2	1	0		3	-
Bicycles on Road %	0.9%	0%	0%		0.9%	0%	0%	0%		0%	18.2%	0.9%	0%		2.6%	-
Pedestrians	-	-	-	0	-	-	-	-	3	-	-	-	-	0	-	-
Pedestrians%	-	-	-	0%		-	-	-	75%		-	-	-	0%		-
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	0%		-	-	-	25%		-	-	-	0%		-

Peak Hour: 07:45 AM - 08:45 AM Weather: Unknown (11.6 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Unknown (26.5 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	0
S	0	0
E	1	3

NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6

Turning Movement Count (1 . SCENIC DR & SANATORIUM RD)

Start Time	N Approach SANATORIUM RD						E Approach SCENIC DR						S Approach SANATORIUM RD						W Approach SCENIC DR						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	0	1	0	0	1	1	0	3	0	0	0	3	19	3	4	0	0	26	4	18	0	0	0	22	52	
07:15:00	0	2	2	0	0	4	0	13	5	0	0	18	22	2	4	0	1	28	7	24	0	0	4	31	81	
07:30:00	0	1	0	0	1	1	0	7	5	0	0	12	25	4	6	0	2	35	5	30	0	0	4	35	83	
07:45:00	0	2	2	0	0	4	0	13	8	0	0	21	19	1	1	0	2	21	7	34	0	0	2	41	87	303
08:00:00	0	1	0	0	0	1	0	12	10	0	0	22	24	5	6	0	5	35	5	48	0	0	5	53	111	362
08:15:00	0	1	0	0	0	1	2	13	12	0	0	27	18	2	9	0	1	29	14	41	0	0	2	55	112	393
08:30:00	0	1	1	0	0	2	0	24	9	0	0	33	15	2	14	0	0	31	18	40	0	0	1	58	124	434
08:45:00	0	2	0	0	0	2	0	19	6	0	0	25	17	1	17	0	0	35	13	40	0	0	2	53	115	462
09:00:00	0	2	1	0	0	3	2	11	12	0	0	25	17	2	9	0	2	28	13	19	0	0	3	32	88	439
09:15:00	0	1	0	0	7	1	0	9	2	0	0	11	6	2	6	0	3	14	13	15	0	0	11	28	54	381
09:30:00	0	2	1	0	0	3	0	9	5	0	1	14	11	4	5	0	2	20	7	17	1	0	1	25	62	319
09:45:00	0	1	2	0	0	3	1	16	9	0	1	26	3	2	8	1	0	14	7	17	1	0	2	25	68	272
BREAK																										
16:00:00	0	3	0	0	1	3	0	26	16	0	0	42	15	2	14	0	5	31	7	21	0	0	4	28	104	
16:15:00	0	1	1	0	0	2	2	27	21	0	0	50	13	3	7	0	2	23	17	22	0	0	3	39	114	
16:30:00	0	4	0	0	0	4	3	29	23	0	1	55	9	2	14	0	2	25	10	24	0	0	2	34	118	
16:45:00	0	2	0	0	0	2	0	36	19	0	0	55	10	2	12	0	1	24	16	21	0	0	0	37	118	454
17:00:00	0	4	0	0	0	4	1	29	23	0	0	53	12	3	10	0	1	25	9	20	0	0	0	29	111	461
17:15:00	0	1	0	0	0	1	2	41	17	0	0	60	6	1	10	0	0	17	7	17	0	0	1	24	102	449
17:30:00	0	3	0	0	0	3	1	32	15	0	0	48	13	1	8	0	0	22	15	24	0	0	3	39	112	443
17:45:00	0	4	1	0	0	5	1	23	18	0	1	42	10	4	11	0	2	25	15	14	0	0	3	29	101	426
18:00:00	0	0	1	0	1	1	0	25	17	0	0	42	5	1	10	0	5	16	10	18	0	0	4	28	87	402
18:15:00	0	1	0	0	0	1	4	15	16	0	0	35	10	1	7	0	1	18	8	13	0	0	1	21	75	375
18:30:00	0	1	0	0	0	1	0	20	10	0	0	30	14	2	8	0	1	24	16	13	0	0	0	29	84	347
18:45:00	0	1	1	0	0	2	3	21	11	0	0	35	13	1	10	1	1	25	13	16	1	0	4	30	92	338
Grand Total	0	42	13	0	11	55	22	473	289	0	4	784	326	53	210	2	39	591	256	566	3	0	62	825	**2255**	-
Approach%	0%	76.4%	23.6%	0%		-	2.8%	60.3%	36.9%	0%		-	55.2%	9%	35.5%	0.3%		-	31%	68.6%	0.4%	0%		-	-	-
Totals %	0%	1.9%	0.6%	0%		2.4%	1%	21%	12.8%	0%		34.8%	14.5%	2.4%	9.3%	0.1%		26.2%	11.4%	25.1%	0.1%	0%		36.6%	-	-
Heavy	0	0	0	0		-	0	0	0	0		-	0	0	0	0		-	0	1	0	0		-	-	-
Heavy %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0.2%	0%	0%		-	-	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-

NexTrans
4261-A14 Highway 7 East
Suite 489
Markham ON, CANADA, L3R 9W6

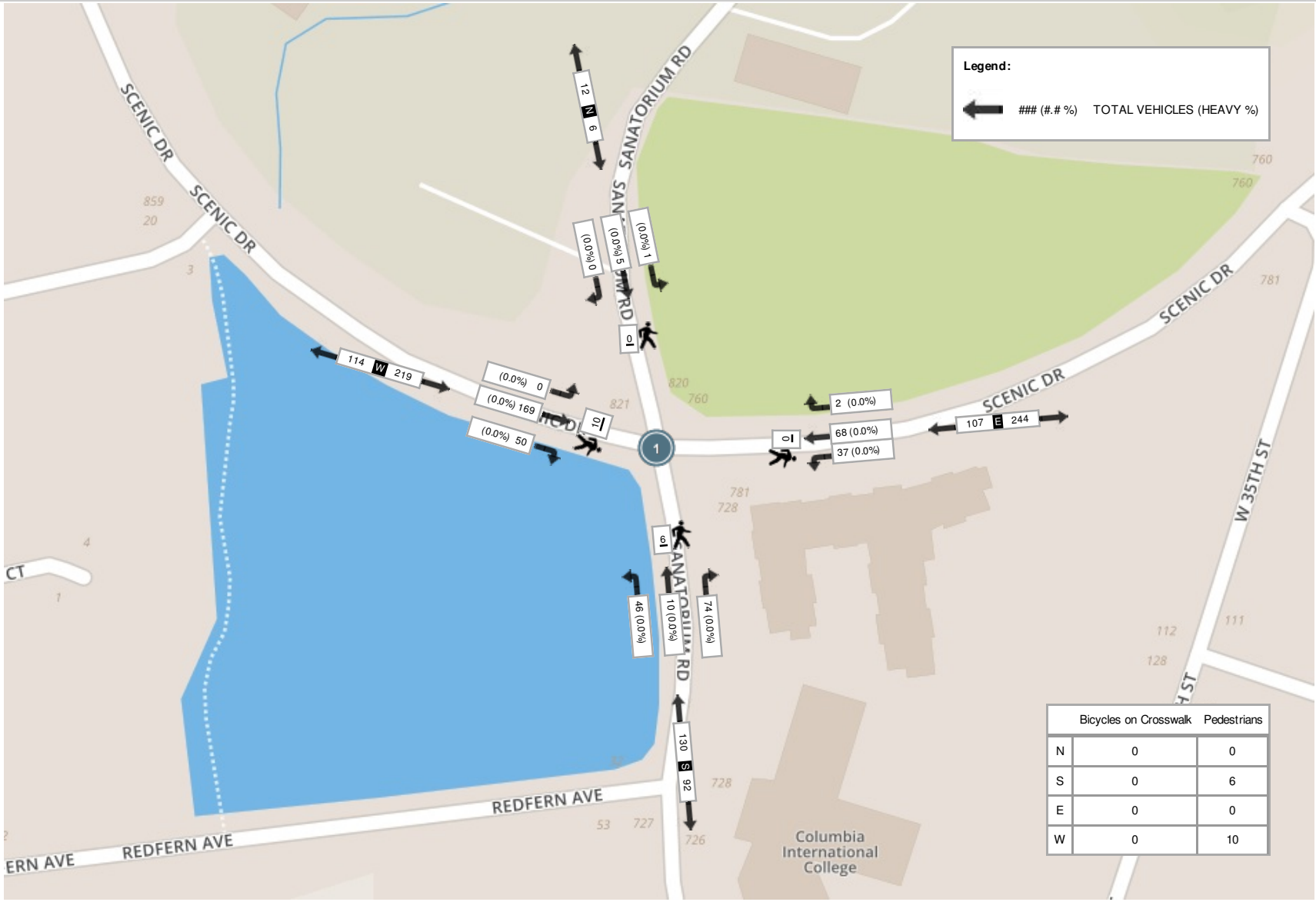
Peak Hour: 08:00 AM - 09:00 AM Weather: Unknown (11.6 °C)

Start Time	N Approach SANATORIUM RD						E Approach SCENIC DR						S Approach SANATORIUM RD						W Approach SCENIC DR						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
08:00:00	0	1	0	0	0	1	0	12	10	0	0	22	24	5	6	0	5	35	5	48	0	0	5	53	111
08:15:00	0	1	0	0	0	1	2	13	12	0	0	27	18	2	9	0	1	29	14	41	0	0	2	55	112
08:30:00	0	1	1	0	0	2	0	24	9	0	0	33	15	2	14	0	0	31	18	40	0	0	1	58	124
08:45:00	0	2	0	0	0	2	0	19	6	0	0	25	17	1	17	0	0	35	13	40	0	0	2	53	115
Grand Total	0	5	1	0	0	6	2	68	37	0	0	107	74	10	46	0	6	130	50	169	0	0	10	219	**462**
Approach%	0%	83.3%	16.7%	0%		-	1.9%	63.6%	34.6%	0%		-	56.9%	7.7%	35.4%	0%		-	22.8%	77.2%	0%	0%		-	**-**
Totals %	0%	1.1%	0.2%	0%		1.3%	0.4%	14.7%	8%	0%		23.2%	16%	2.2%	10%	0%		28.1%	10.8%	36.6%	0%	0%		47.4%	**-**
PHF	0	0.63	0.25	0		0.75	0.25	0.71	0.77	0		0.81	0.77	0.5	0.68	0		0.93	0.69	0.88	0	0		0.94	**-**
Heavy	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Heavy %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Lights	0	0	1	0		1	2	67	35	0		104	71	1	45	0		117	44	166	0	0		210	**-**
Lights %	0%	0%	100%	0%		16.7%	100%	98.5%	94.6%	0%		97.2%	95.9%	10%	97.8%	0%		90%	88%	98.2%	0%	0%		95.9%	**-**
Mediums	0	5	0	0		5	0	0	2	0		2	2	6	0	0		8	4	1	0	0		5	**-**
Mediums %	0%	100%	0%	0%		83.3%	0%	0%	5.4%	0%		1.9%	2.7%	60%	0%	0%		6.2%	8%	0.6%	0%	0%		2.3%	**-**
Articulated Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	0	0	0		0	0	1	0	0		1	1	3	1	0		5	2	2	0	0		4	**-**
Bicycles on Road %	0%	0%	0%	0%		0%	0%	1.5%	0%	0%		0.9%	1.4%	30%	2.2%	0%		3.8%	4%	1.2%	0%	0%		1.8%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	6	-	-	-	-	-	10	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	37.5%		-	-	-	-	62.5%		**-**
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Peak Hour: 04:15 PM - 05:15 PM Weather: Unknown (26.5 °C)

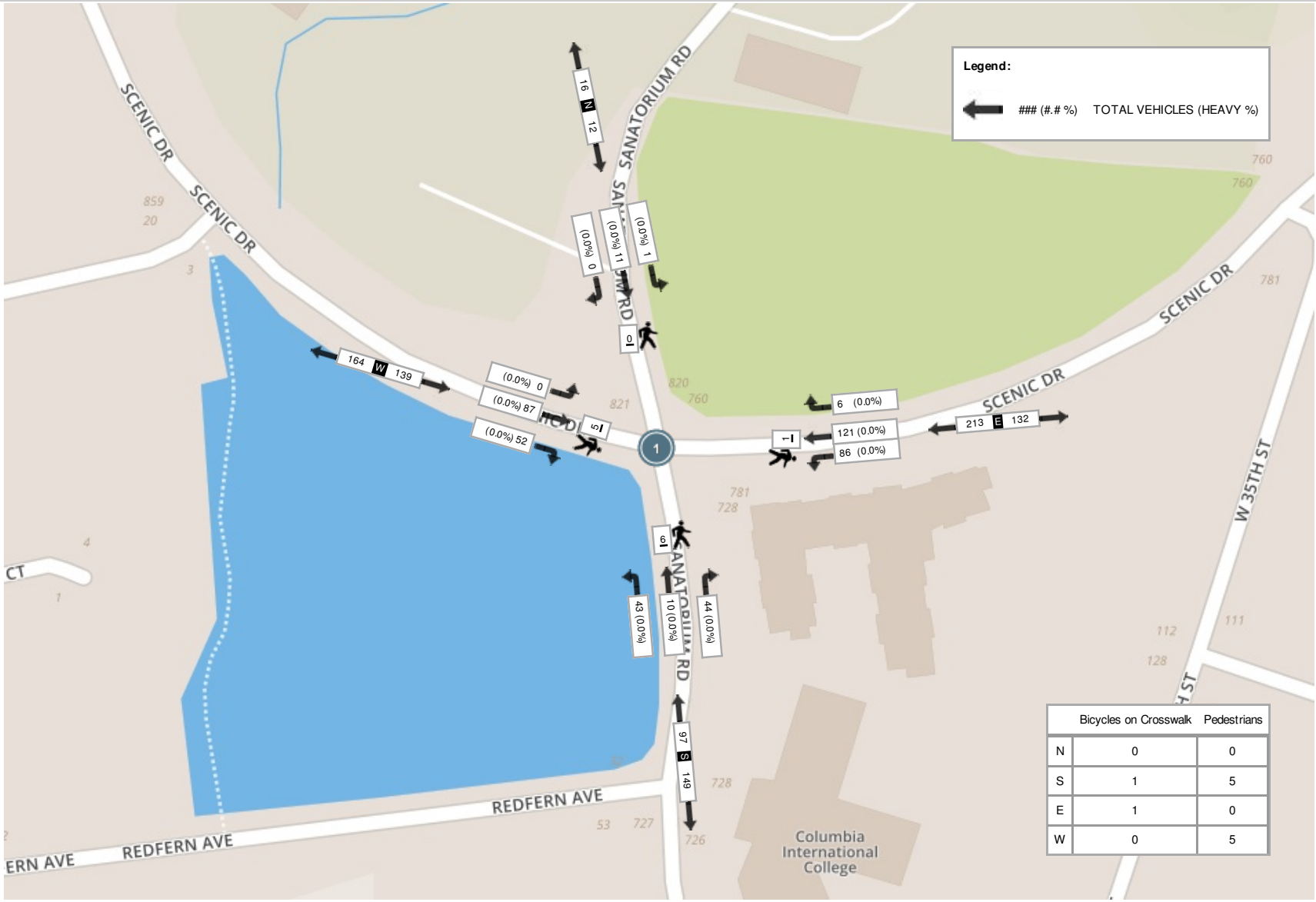
Start Time	N Approach SANATORIUM RD						E Approach SCENIC DR						S Approach SANATORIUM RD						W Approach SCENIC DR						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:15:00	0	1	1	0	0	2	2	27	21	0	0	50	13	3	7	0	2	23	17	22	0	0	3	39	114
16:30:00	0	4	0	0	0	4	3	29	23	0	1	55	9	2	14	0	2	25	10	24	0	0	2	34	118
16:45:00	0	2	0	0	0	2	0	36	19	0	0	55	10	2	12	0	1	24	16	21	0	0	0	37	118
17:00:00	0	4	0	0	0	4	1	29	23	0	0	53	12	3	10	0	1	25	9	20	0	0	0	29	111
Grand Total	0	11	1	0	0	12	6	121	86	0	1	213	44	10	43	0	6	97	52	87	0	0	5	139	**461**
Approach%	0%	91.7%	8.3%	0%		-	2.8%	56.8%	40.4%	0%		-	45.4%	10.3%	44.3%	0%		-	37.4%	62.6%	0%	0%		-	**-**
Totals %	0%	2.4%	0.2%	0%		2.6%	1.3%	26.2%	18.7%	0%		46.2%	9.5%	2.2%	9.3%	0%		21%	11.3%	18.9%	0%	0%		30.2%	**-**
PHF	0	0.69	0.25	0		0.75	0.5	0.84	0.93	0		0.97	0.85	0.83	0.77	0		0.97	0.76	0.91	0	0		0.89	**-**
Heavy	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Heavy %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Lights	0	1	1	0		2	5	117	86	0		208	43	3	41	0		87	49	85	0	0		134	**-**
Lights %	0%	9.1%	100%	0%		16.7%	83.3%	96.7%	100%	0%		97.7%	97.7%	30%	95.3%	0%		89.7%	94.2%	97.7%	0%	0%		96.4%	**-**
Mediums	0	6	0	0		6	0	1	0	0		1	1	7	0	0		8	1	1	0	0		2	**-**
Mediums %	0%	54.5%	0%	0%		50%	0%	0.8%	0%	0%		0.5%	2.3%	70%	0%	0%		8.2%	1.9%	1.1%	0%	0%		1.4%	**-**
Articulated Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	**-**
Bicycles on Road	0	4	0	0		4	1	3	0	0		4	0	0	2	0		2	2	1	0	0		3	**-**
Bicycles on Road %	0%	36.4%	0%	0%		33.3%	16.7%	2.5%	0%	0%		1.9%	0%	0%	4.7%	0%		2.1%	3.8%	1.1%	0%	0%		2.2%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	5	-	-	-	-	-	5	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	41.7%		-	-	-	-	41.7%		**-**
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	**-**
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	8.3%		-	-	-	-	8.3%		-	-	-	-	0%		**-**

Peak Hour: 08:00 AM - 09:00 AM Weather: Unknown (11.6 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	0
S	0	6
E	0	0
W	0	10

Peak Hour: 04:15 PM - 05:15 PM Weather: Unknown (26.5 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	0
S	1	5
E	1	0
W	0	5

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 73

Intersection: **Garth St** **at** **Denlow Ave** Total Vehicles: 11,522 Date: Tuesday
Direction: (North/South) (East/West) M.V.E./Year: 8.031 Sep 20, 2016
Road Condition: Dry Weather: Clear AWDT Factor: 2.05 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	1	225	0	3	0	0	0	43	27	0	0	0	299	0	0	0	4
7:30	2	281	0	0	0	4	0	80	16	0	0	0	383	0	0	0	2
7:45	3	282	0	0	0	3	0	65	31	0	0	0	384	0	0	0	3
8:00 *	2	253	0	7	0	5	0	92	33	0	0	0	392	0	0	0	2
8:15 *	2	214	0	3	0	0	0	108	32	0	0	0	359	0	0	0	3
8:30 *	1	205	0	3	0	6	0	112	47	0	0	0	374	0	0	0	1
8:45 *	7	219	0	4	0	7	0	129	44	0	0	0	410	0	0	0	2
9:00	9	181	0	3	0	6	0	130	36	0	0	0	365	0	0	0	1
9:15	6	189	0	3	0	2	0	120	40	0	0	0	360	0	0	0	0
9:30	4	150	0	3	0	7	0	97	32	0	0	0	293	0	0	1	2
9:45	4	180	0	2	0	2	0	109	20	0	0	0	317	0	0	0	1
10:00	7	143	0	3	0	3	0	101	25	0	0	0	282	0	0	0	2
13:45	4	75	0	2	0	2	0	80	31	0	0	0	194	0	0	1	1
14:00	6	115	0	2	0	7	0	185	53	0	0	0	368	0	0	1	1
14:15	5	99	0	4	0	2	0	149	59	0	0	0	318	0	0	0	0
14:30	7	127	0	3	0	2	0	164	58	0	0	0	361	0	0	0	1
14:45 *	3	126	0	6	0	3	0	160	62	0	0	0	360	0	0	0	2
15:00 *	7	119	0	11	0	3	0	211	73	0	0	0	424	0	0	1	1
15:15 *	3	113	0	7	0	17	0	216	72	0	0	0	428	0	0	1	1
15:30 *	4	116	0	8	0	4	0	215	84	0	0	0	431	0	0	0	0
16:15	2	114	0	11	0	14	0	224	116	0	0	0	481	0	0	0	2
16:30	9	129	0	15	0	3	0	319	129	0	0	0	604	0	0	0	1
16:45	3	139	0	5	0	8	0	250	104	0	0	0	509	0	0	2	1
17:00 *	5	128	0	6	0	11	0	309	125	0	0	0	584	0	0	0	2
17:15 *	5	130	0	2	0	12	0	330	116	0	0	0	595	0	0	1	1
17:30 *	1	122	0	4	0	3	0	308	133	0	0	0	571	0	0	0	1
17:45 *	6	170	0	1	0	10	0	253	122	0	0	0	562	0	0	0	6
18:00	5	139	0	10	0	3	0	265	92	0	0	0	514	0	0	0	1
TOTAL	123	4,483	0	131	0	149	0	4,824	1,812	0	0	0		0	0	8	45
APPR.		4,606			280			6,636			0		11,522			53	

TRUCKS & BUSES

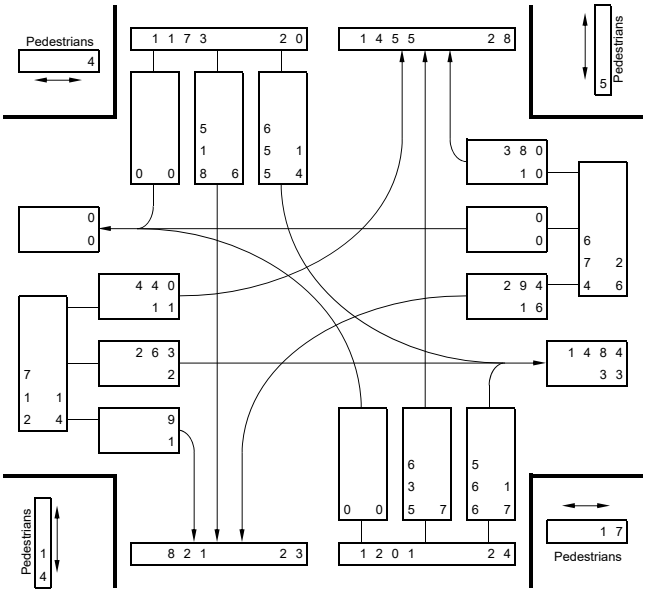
15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	4	0	0	0	0	0	2	3	0	0	0	9
7:30	0	1	0	0	0	0	0	5	1	0	0	0	7
7:45	1	2	0	0	0	1	0	3	6	0	0	0	13
8:00 *	1	4	0	1	0	0	0	3	5	0	0	0	14
8:15 *	0	3	0	0	0	0	0	1	3	0	0	0	7
8:30 *	0	6	0	0	0	0	0	1	2	0	0	0	9
8:45 *	0	5	0	0	0	1	0	2	2	0	0	0	10
9:00	0	1	0	0	0	3	0	2	1	0	0	0	7
9:15	1	3	0	0	0	0	0	3	1	0	0	0	8
9:30	0	1	0	0	0	0	0	1	1	0	0	0	3
9:45	0	2	0	0	0	0	0	3	1	0	0	0	6
10:00	0	4	0	0	0	0	0	1	1	0	0	0	6
13:45	0	2	0	0	0	0	0	0	0	0	0	0	2
14:00	0	0	0	0	0	0	0	3	1	0	0	0	4
14:15	0	0	0	0	0	0	0	2	0	0	0	0	2
14:30	0	2	0	0	0	0	0	1	0	0	0	0	3
14:45 *	0	1	0	0	0	0	0	3	1	0	0	0	5
15:00 *	0	2	0	0	0	0	0	2	1	0	0	0	5
15:15 *	1	5	0	0	0	2	0	3	6	0	0	0	17
15:30 *	0	1	0	0	0	0	0	4	3	0	0	0	8
16:15	0	2	0	0	0	3	0	1	5	0	0	0	11
16:30	0	4	0	0	0	1	0	1	4	0	0	0	10
16:45	0	7	0	0	0	0	0	1	3	0	0	0	11
17:00 *	0	3	0	0	0	0	0	3	3	0	0	0	9
17:15 *	0	3	0	0	0	0	0	7	2	0	0	0	12
17:30 *	0	3	0	0	0	0	0	1	1	0	0	0	5
17:45 *	0	3	0	0	0	0	0	1	5	0	0	0	9
18:00	0	3	0	0	0	0	0	1	1	0	0	0	5
TOTAL	4	77	0	1	0	11	0	61	63	0	0	0	
APPR.		81			12			124			0		217

TRUCKS

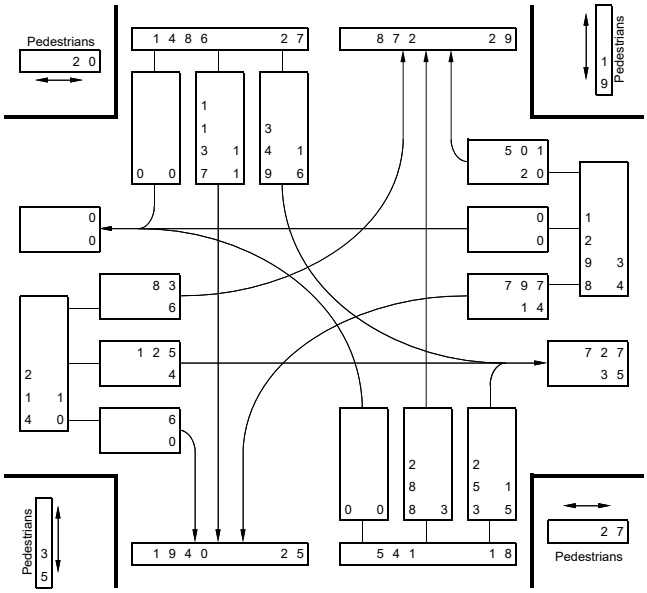
7:15	0	2	0	0	0	0	0	0	0	0	0	0	2
7:30	0	0	0	0	0	0	0	1	0	0	0	0	1
7:45	1	0	0	0	0	1	0	0	3	0	0	0	5
8:00 *	1	2	0	1	0	0	0	1	0	0	0	0	5
8:15 *	0	2	0	0	0	0	0	0	1	0	0	0	3
8:30 *	0	1	0	0	0	0	0	0	0	0	0	0	1
8:45 *	0	0	0	0	0	0	0	0	1	0	0	0	1
9:00	0	0	0	0	0	2	0	1	0	0	0	0	3
9:15	1	0	0	0	0	0	0	0	0	0	0	0	1
9:30	0	0	0	0	0	0	0	0	1	0	0	0	1
9:45	0	1	0	0	0	0	0	2	0	0	0	0	3
10:00	0	4	0	0	0	0	0	0	1	0	0	0	5
13:45	0	1	0	0	0	0	0	0	0	0	0	0	1
14:00	0	0	0	0	0	0	0	2	0	0	0	0	2
14:15	0	0	0	0	0	0	0	1	0	0	0	0	1
14:30	0	1	0	0	0	0	0	0	0	0	0	0	1
14:45 *	0	0	0	0	0	0	0	1	0	0	0	0	1
15:00 *	0	1	0	0	0	0	0	0	0	0	0	0	1
15:15 *	1	0	0	0	0	0	0	0	3	0	0	0	4
15:30 *	0	0	0	0	0	0	0	1	2	0	0	0	3
16:15	0	0	0	0	0	0	0	0	1	0	0	0	1
16:30	0	0	0	0	0	1	0	0	0	0	0	0	1
16:45	0	2	0	0	0	0	0	1	1	0	0	0	4
17:00 *	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15 *	0	2	0	0	0	0	0	0	0	0	0	0	2
17:30 *	0	1	0	0	0	0	0	0	1	0	0	0	2
17:45 *	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	20	0	1	0	4	0	11	15	0	0	0	
APPR.		24			5			26			0		55

City of Hamilton **TURNING MOVEMENT FLOW CHART** Loc. Code: 72

Intersection: **Garth St** **at** **Fennell Ave** Total Vehicles: 20,374 Date: Monday
Direction: (North/South) (East/West) M.V.E./Year: 14.201 Oct 3, 2016
Road Condition: Dry Weather: Overcast AWDT Factor: 2.05 Period: 7 hours
Comments:

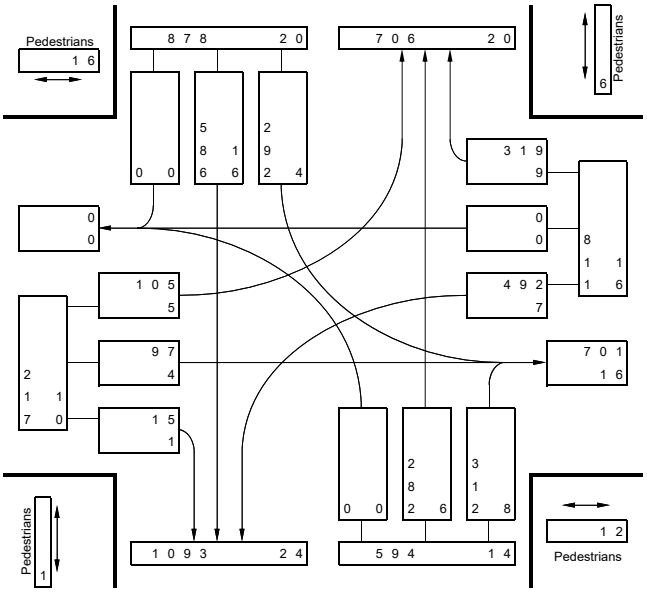


A.M. PEAK HOUR = 8:00 AM - 9:00 AM

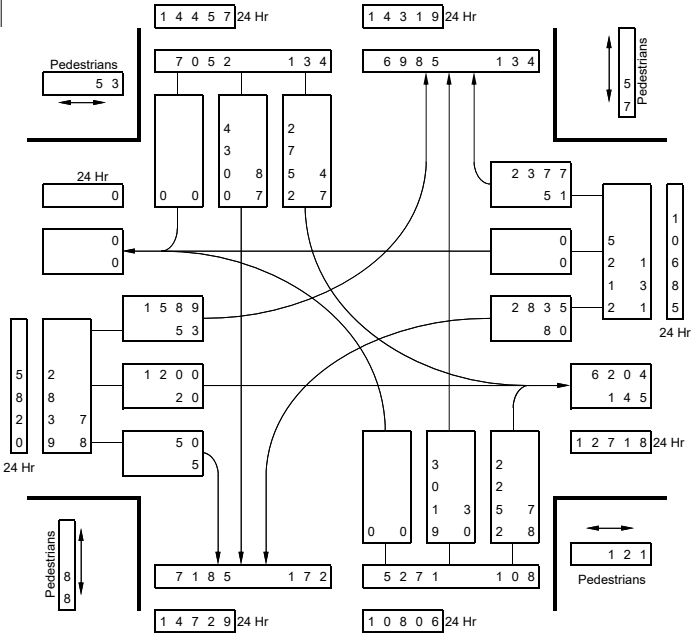


P.M. PEAK HOUR = 4:30 PM - 5:30 PM

N



NORMAL HOUR = 2:30 PM - 3:30 PM



7 Hr & 24 Hr TOTAL VOLUMES

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 72

Intersection: **Garth St** **at** **Fennell Ave** Total Vehicles: 20,374 Date: Monday
Direction: (North/South) (East/West) M.V.E./Year: 14.201 Oct 3, 2016
Road Condition: Dry Weather: Overcast AWDT Factor: 2.05 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	0	214	45	93	39	1	30	49	0	22	0	40	533	1	1	5	1
7:30	0	199	76	166	76	2	107	89	0	34	0	63	812	1	1	3	0
7:45	0	174	88	205	87	2	132	96	0	34	0	65	883	3	2	7	3
8:00	0	168	99	124	119	2	233	119	0	48	0	70	982	0	3	7	2
8:15 *	0	161	157	92	55	6	182	131	0	56	0	86	926	0	1	7	6
8:30 *	0	146	123	99	81	2	131	129	0	59	0	94	864	1	0	2	3
8:45 *	0	160	136	126	59	0	186	101	0	96	0	108	972	1	3	3	2
9:00 *	0	168	150	123	68	1	156	157	0	83	0	92	998	2	1	5	3
9:15	0	171	121	70	51	1	125	140	0	58	0	72	809	0	3	5	6
9:30	0	130	93	76	40	2	139	96	0	50	0	67	693	0	0	4	2
9:45	0	91	73	14	47	1	38	68	0	46	0	33	411	0	4	1	4
10:00	0	74	70	14	44	0	137	120	0	60	0	73	592	0	0	2	2
13:45	0	54	51	23	18	1	53	112	0	61	0	59	432	4	4	6	0
14:00	0	75	79	35	27	1	79	123	0	85	0	83	587	0	0	4	2
14:15	0	84	40	19	32	1	40	85	0	98	0	90	489	0	1	7	3
14:30	0	80	38	28	21	0	40	66	0	107	0	77	457	0	1	0	0
14:45 *	0	58	67	28	28	4	49	134	0	112	0	81	561	11	2	6	0
15:00 *	0	82	87	20	27	3	67	124	0	107	0	71	588	3	1	1	0
15:15 *	0	71	71	14	13	6	79	157	0	123	0	77	611	1	0	3	1
15:30 *	0	71	87	43	29	2	97	171	0	150	0	90	740	1	3	2	0
16:15	0	63	53	24	34	2	65	180	0	137	0	125	683	1	1	3	5
16:30	0	89	60	33	20	0	88	231	0	198	0	101	820	2	2	6	4
16:45 *	0	79	68	22	32	0	101	230	0	165	0	107	804	17	15	18	22
17:00 *	0	71	75	22	20	3	101	307	0	222	0	123	944	2	0	2	3
17:15 *	0	70	51	24	23	2	82	286	0	203	0	173	914	1	2	2	3
17:30 *	0	68	59	15	50	1	65	314	0	207	0	98	877	0	2	5	7
17:45	0	69	58	16	30	1	53	266	0	118	0	78	689	0	0	1	2
18:00	0	79	77	21	30	3	97	219	0	96	0	81	703	1	4	4	2
TOTAL	0	3,019	2,252	1,589	1,200	50	2,752	4,300	0	2,835	0	2,377		53	57	121	88
APPR.		5,271			2,839			7,052			5,212		20,374			319	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	1	2	6	0	0	0	4	0	7	0	1	21
7:30	0	1	1	4	1	0	0	1	0	2	0	0	10
7:45	0	4	2	5	1	0	1	6	0	4	0	1	24
8:00	0	1	5	4	0	1	0	4	0	3	0	1	19
8:15 *	0	1	3	3	0	0	1	3	0	1	0	3	15
8:30 *	0	2	4	3	2	1	6	0	0	3	0	5	26
8:45 *	0	1	6	4	0	0	5	2	0	7	0	1	26
9:00 *	0	3	4	1	0	0	2	1	0	5	0	1	17
9:15	0	2	3	2	1	0	1	3	0	1	0	1	14
9:30	0	1	5	0	1	1	0	4	0	4	0	1	17
9:45	0	1	1	1	2	0	0	3	0	4	0	0	12
10:00	0	1	1	0	1	0	0	3	0	2	0	1	9
13:45	0	0	2	0	1	0	0	2	0	2	0	0	7
14:00	0	0	0	1	0	0	1	2	0	3	0	0	7
14:15	0	1	2	1	1	0	1	3	0	2	0	1	12
14:30	0	1	2	1	0	0	6	4	0	2	0	0	16
14:45 *	0	2	1	1	2	0	0	3	0	2	0	4	15
15:00 *	0	1	1	2	0	0	1	2	0	3	0	3	13
15:15 *	0	2	2	0	0	0	2	7	0	1	0	1	15
15:30 *	0	1	4	2	2	1	1	4	0	1	0	1	17
16:15	0	0	2	3	0	1	0	3	0	2	0	3	14
16:30	0	0	2	1	1	0	1	7	0	3	0	0	15
16:45 *	0	2	3	3	1	0	1	3	0	5	0	1	19
17:00 *	0	1	8	1	3	0	13	4	0	1	0	1	32
17:15 *	0	0	2	1	0	0	2	2	0	7	0	18	32
17:30 *	0	0	2	1	0	0	0	2	0	1	0	0	6
17:45	0	0	2	1	0	0	0	3	0	0	0	0	6
18:00	0	0	6	1	0	0	2	2	0	2	0	2	15
TOTAL	0	30	78	53	20	5	47	87	0	80	0	51	
APPR.		108			78			134			131		451

TRUCKS

7:15	0	0	0	1	0	0	0	1	0	1	0	0	3
7:30	0	1	0	0	0	0	0	0	0	0	0	0	1
7:45	0	4	0	0	1	0	0	1	0	1	0	0	7
8:00	0	1	3	0	0	0	0	1	0	0	0	0	5
8:15 *	0	0	2	1	0	0	0	2	0	1	0	2	8
8:30 *	0	1	1	1	0	0	1	0	0	2	0	2	8
8:45 *	0	1	2	0	0	0	0	1	0	4	0	1	9
9:00 *	0	1	2	0	0	0	0	0	0	3	0	0	6
9:15	0	2	1	1	1	0	0	1	0	1	0	0	7
9:30	0	0	1	0	1	1	0	1	0	2	0	1	7
9:45	0	1	0	0	0	0	0	2	0	3	0	0	6
10:00	0	1	1	0	0	0	0	3	0	1	0	1	7
13:45	0	0	1	0	0	0	0	0	0	1	0	0	2
14:00	0	0	0	0	0	0	0	2	0	2	0	0	4
14:15	0	1	1	0	0	0	0	2	0	2	0	1	7
14:30	0	1	1	1	0	0	5	4	0	1	0	0	13
14:45 *	0	1	0	0	2	0	0	2	0	0	0	0	5
15:00 *	0	1	0	0	0	0	1	1	0	1	0	1	5
15:15 *	0	1	1	0	0	0	0	2	0	0	0	1	5
15:30 *	0	1	3	0	1	0	0	1	0	0	0	1	7
16:15	0	0	0	0	0	0	0	1	0	0	0	1	2
16:30	0	0	0	0	0	0	0	0	0	2	0	0	2
16:45 *	0	2	0	0	0	0	0	0	0	3	0	1	6
17:00 *	0	1	1	0	1	0	0	0	0	0	0	0	3
17:15 *	0	0	1	0	0	0	0	0	0	0	0	0	1
17:30 *	0	0	1	0	0	0	0	1	0	0	0	0	2
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	1	0	0	0	0	2	3
TOTAL	0	22	23	5	7	1	8	29	0	31	0	15	
APPR.		45			13			37			46		141

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 8

Intersection: **Mohawk Rd** **at** **Scenic Dr/Upper Horning Rd** Total Vehicles: 10,187 Date: Thursday
Direction: (East/West) (North/South) M.V.E./Year: 7.655 Feb 15, 2018
Road Condition: Wet Weather: Cloudy AWDT Factor: 2.21 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	17	1	1	13	41	4	4	2	26	6	84	2	201	0	1	2	1
7:30	27	3	2	12	62	2	3	6	31	15	92	4	259	6	4	2	2
7:45	30	0	7	13	62	7	9	4	30	13	120	4	299	1	0	0	1
8:00 *	17	2	8	20	123	5	6	3	37	19	127	6	373	7	5	7	5
8:15 *	19	1	11	21	140	6	6	2	47	13	115	7	388	7	4	2	3
8:30 *	23	1	9	19	151	6	15	5	39	12	134	6	420	3	1	4	4
8:45 *	22	2	7	19	118	6	18	6	41	19	126	8	392	2	1	5	2
9:00	15	2	6	24	112	5	5	5	37	7	106	8	332	1	1	2	3
9:15	12	0	7	14	93	6	5	1	22	12	133	6	311	2	0	5	1
9:30	7	1	6	16	98	2	4	0	26	14	97	2	273	0	0	3	1
9:45	14	0	7	19	83	5	6	0	39	11	91	4	279	1	0	1	2
10:00	13	2	3	19	79	4	7	0	25	11	104	6	273	0	2	4	1
13:45	20	5	7	18	105	13	12	0	15	6	115	7	323	1	6	4	0
14:00	8	0	5	25	103	7	7	0	22	9	107	9	302	1	0	4	1
14:15	13	2	4	18	113	5	7	1	30	10	116	11	330	5	1	1	3
14:30	16	1	7	18	122	13	4	4	30	12	120	0	347	2	1	1	0
14:45 *	9	3	3	23	150	10	11	3	20	6	136	8	382	8	3	5	1
15:00 *	8	2	5	26	141	9	7	2	25	4	135	11	375	15	7	4	5
15:15 *	19	1	4	34	112	9	6	3	24	7	132	9	360	3	3	4	2
15:30 *	15	3	7	32	135	7	8	1	24	14	156	9	411	1	1	2	1
16:15	10	5	4	29	153	8	7	7	27	12	148	13	423	2	2	1	0
16:30 *	25	4	5	34	182	14	3	6	24	2	140	4	443	1	0	0	0
16:45 *	12	2	11	42	132	12	9	2	29	14	167	10	442	2	1	2	0
17:00 *	10	0	6	31	137	16	5	1	37	6	195	7	451	0	1	3	2
17:15 *	13	2	5	39	184	18	7	5	44	16	157	15	505	1	0	0	1
17:30	6	0	7	33	156	18	4	1	35	7	150	15	432	3	1	4	4
17:45	12	2	1	40	151	16	12	2	19	13	148	9	425	0	0	4	4
18:00	16	3	3	42	141	19	10	4	36	5	149	8	436	1	1	0	0
TOTAL	428	50	158	693	3,379	252	207	76	841	295	3,600	208		76	47	76	50
APPR.		636			4,324			1,124			4,103		10,187			249	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	0	0	2	6	1	2	0	0	0	3	1	15
7:30	0	1	0	1	2	0	0	0	0	0	7	2	13
7:45	0	0	0	1	6	1	2	0	2	0	3	2	17
8:00 *	0	0	0	2	6	1	1	0	2	2	7	2	23
8:15 *	0	0	0	2	6	0	1	0	1	0	0	3	13
8:30 *	0	0	0	1	6	0	3	0	3	0	8	1	22
8:45 *	1	0	0	3	7	0	4	0	1	0	6	1	23
9:00	0	0	0	0	3	0	0	1	0	0	2	1	7
9:15	0	0	0	0	3	0	1	0	0	0	1	1	6
9:30	0	0	0	1	4	0	1	0	0	0	3	0	9
9:45	0	0	0	1	3	0	1	0	0	0	1	1	7
10:00	0	0	0	0	2	0	0	0	0	0	1	1	4
13:45	0	0	0	0	1	0	1	0	1	0	3	1	7
14:00	0	0	0	0	4	0	1	0	2	0	3	1	11
14:15	0	0	0	1	4	0	0	0	0	0	2	1	8
14:30	0	0	0	2	7	0	1	0	0	0	3	0	13
14:45 *	0	0	0	1	3	0	5	0	0	0	3	3	15
15:00 *	0	0	0	0	3	1	3	0	0	0	4	2	13
15:15 *	0	0	0	0	5	0	3	0	1	1	2	2	14
15:30 *	0	0	0	1	7	0	0	0	1	0	2	2	13
16:15	0	0	0	0	2	0	2	0	1	0	1	2	8
16:30 *	0	0	0	0	3	0	0	0	1	0	2	1	7
16:45 *	0	0	0	0	2	0	2	0	0	0	5	2	11
17:00 *	0	0	0	0	2	0	1	0	0	0	1	2	6
17:15 *	0	0	0	0	2	0	2	0	1	0	6	1	12
17:30	0	0	0	0	2	0	0	0	0	0	1	1	4
17:45	0	0	0	0	0	0	1	0	0	0	4	0	5
18:00	0	0	0	0	1	0	1	0	0	0	1	2	5
TOTAL	1	1	0	19	102	4	39	1	17	3	85	39	
APPR.		2			125			57			127		311

TRUCKS

7:15	0	0	0	1	3	1	0	0	0	0	2	0	7
7:30	0	1	0	1	0	0	0	0	0	0	3	0	5
7:45	0	0	0	1	2	0	0	0	0	0	2	0	5
8:00 *	0	0	0	1	3	1	0	0	1	2	2	0	10
8:15 *	0	0	0	1	2	0	0	0	0	0	0	0	3
8:30 *	0	0	0	0	3	0	0	0	3	0	2	0	8
8:45 *	1	0	0	1	1	0	0	0	1	0	1	0	5
9:00	0	0	0	0	2	0	0	0	0	0	1	0	3
9:15	0	0	0	0	2	0	0	0	0	0	0	0	2
9:30	0	0	0	1	4	0	0	0	0	0	2	0	7
9:45	0	0	0	0	2	0	0	0	0	0	1	0	3
10:00	0	0	0	0	1	0	0	0	0	0	0	0	1
13:45	0	0	0	0	1	0	0	0	1	0	2	0	4
14:00	0	0	0	0	3	0	0	0	2	0	2	0	7
14:15	0	0	0	1	3	0	0	0	0	0	2	0	6
14:30	0	0	0	0	2	0	0	0	0	0	0	0	2
14:45 *	0	0	0	0	2	0	0	0	0	0	1	0	3
15:00 *	0	0	0	0	2	1	0	0	0	0	2	0	5
15:15 *	0	0	0	0	2	0	0	0	0	1	0	0	3
15:30 *	0	0	0	1	4	0	0	0	0	0	0	0	5
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30 *	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 *	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00 *	0	0	0	0	1	0	0	0	0	0	0	0	1
17:15 *	0	0	0	0	2	0	0	0	0	0	3	0	5
17:30	0	0	0	0	1	0	0	0	0	0	1	0	2
17:45	0	0	0	0	0	0	0	0	0	0	2	0	2
18:00	0	0	0	0	1	0	0	0	0	0	1	0	2
TOTAL	1	1	0	9	49	3	0	0	8	3	32	0	
APPR.		2			61			8			35		106

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Turning Movement Count (3 . UPPER PARADISE RD & SCENIC DR)

Start Time	N Approach UPPER PARADISE RD						E Approach SCENIC DR						S Approach UPPER PARADISE RD						W Approach SCENIC DR						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	2	6	3	0	3	11	0	2	2	0	2	4	29	6	1	0	0	36	1	45	4	0	1	50	101	
07:15:00	0	3	1	0	0	4	0	3	6	0	0	9	32	0	1	0	0	33	5	46	1	0	1	52	98	
07:30:00	2	2	0	0	1	4	0	3	16	0	0	19	44	4	0	0	0	48	11	49	0	0	0	60	131	
07:45:00	1	3	0	0	0	4	0	8	10	0	2	18	41	2	3	0	1	46	10	36	2	0	5	48	116	446
08:00:00	0	2	1	0	1	3	1	2	2	0	1	5	36	3	2	0	0	41	4	44	0	0	1	48	97	442
08:15:00	2	1	1	0	2	4	1	5	6	0	0	12	27	2	3	0	0	32	11	36	2	0	0	49	97	441
08:30:00	1	6	0	0	2	7	2	7	13	0	2	22	34	7	3	0	1	44	8	48	0	0	3	56	129	439
08:45:00	2	5	2	0	1	9	1	3	2	0	1	6	19	5	2	0	0	26	8	35	0	0	1	43	84	407
09:00:00	2	3	1	0	0	6	0	1	5	0	2	6	14	10	2	0	0	26	3	21	2	0	2	26	64	374
09:15:00	3	3	0	0	1	6	0	4	0	0	2	4	15	9	4	0	0	28	0	24	0	0	2	24	62	339
09:30:00	1	1	1	0	0	3	0	2	2	0	1	4	20	3	5	0	1	28	1	18	1	0	1	20	55	265
09:45:00	0	3	3	0	4	6	0	2	1	0	2	3	11	2	1	0	3	14	2	21	1	0	2	24	47	228
BREAK																										
16:00:00	1	9	0	0	1	10	4	30	11	0	0	45	4	3	2	0	1	9	4	17	0	0	0	21	85	
16:15:00	2	6	0	0	0	8	2	35	22	0	0	59	16	4	3	0	1	23	5	13	0	0	1	18	108	
16:30:00	1	11	1	0	0	13	1	35	13	0	2	49	15	6	6	0	0	27	5	19	1	0	0	25	114	
16:45:00	2	5	0	0	0	7	3	36	28	0	1	67	18	4	3	0	0	25	2	23	1	0	0	26	125	432
17:00:00	0	1	3	0	2	4	3	49	24	0	0	76	31	5	3	0	2	39	4	12	1	0	2	17	136	483
17:15:00	3	1	2	0	0	6	3	34	20	1	0	58	18	2	2	0	0	22	1	21	0	0	0	22	108	483
17:30:00	2	6	2	0	1	10	3	34	15	0	1	52	16	2	4	0	0	22	4	21	2	0	2	27	111	480
17:45:00	1	2	3	0	1	6	1	29	12	0	4	42	17	10	2	0	0	29	3	20	5	0	2	28	105	460
18:00:00	1	5	2	0	3	8	4	40	11	0	2	55	16	8	1	0	0	25	3	24	1	0	1	28	116	440
18:15:00	4	8	1	0	2	13	2	20	10	0	2	32	21	3	1	0	0	25	2	25	1	0	5	28	98	430
18:30:00	1	8	1	0	0	10	2	28	17	0	2	47	19	5	2	0	2	26	1	19	0	0	2	20	103	422
18:45:00	1	3	3	0	1	7	8	26	7	0	6	41	11	3	2	0	4	16	2	19	2	0	11	23	87	404
Grand Total	35	103	31	0	26	169	41	438	255	1	35	735	524	108	58	0	16	690	100	656	27	0	45	783	**2377**	-
Approach%	20.7%	60.9%	18.3%	0%		-	5.6%	59.6%	34.7%	0.1%		-	75.9%	15.7%	8.4%	0%		-	12.8%	83.8%	3.4%	0%		-	-	-
Totals %	1.5%	4.3%	1.3%	0%		7.1%	1.7%	18.4%	10.7%	0%		30.9%	22%	4.5%	2.4%	0%		29%	4.2%	27.6%	1.1%	0%		32.9%	-	-
Heavy	0	0	0	0		-	0	1	1	0		-	0	0	0	0		-	0	0	0	0		-	-	-
Heavy %	0%	0%	0%	0%		-	0%	0.2%	0.4%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	-	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-

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Peak Hour: 07:00 AM - 08:00 AM Weather: Unknown (19.4 °C)

Start Time	N Approach UPPER PARADISE RD						E Approach SCENIC DR						S Approach UPPER PARADISE RD						W Approach SCENIC DR						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:00:00	2	6	3	0	3	11	0	2	2	0	2	4	29	6	1	0	0	36	1	45	4	0	1	50	101
07:15:00	0	3	1	0	0	4	0	3	6	0	0	9	32	0	1	0	0	33	5	46	1	0	1	52	98
07:30:00	2	2	0	0	1	4	0	3	16	0	0	19	44	4	0	0	0	48	11	49	0	0	0	60	131
07:45:00	1	3	0	0	0	4	0	8	10	0	2	18	41	2	3	0	1	46	10	36	2	0	5	48	116
Grand Total	5	14	4	0	4	23	0	16	34	0	4	50	146	12	5	0	1	163	27	176	7	0	7	210	**446**
Approach%	21.7%	60.9%	17.4%	0%		-	0%	32%	68%	0%		-	89.6%	7.4%	3.1%	0%		-	12.9%	83.8%	3.3%	0%		-	-
Totals %	1.1%	3.1%	0.9%	0%		5.2%	0%	3.6%	7.6%	0%		11.2%	32.7%	2.7%	1.1%	0%		36.5%	6.1%	39.5%	1.6%	0%		47.1%	-
PHF	0.63	0.58	0.33	0		0.52	0	0.5	0.53	0		0.66	0.83	0.5	0.42	0		0.85	0.61	0.9	0.44	0		0.88	-
Heavy	0	0	0	0		0	0	1	1	0		2	0	0	0	0		0	0	0	0	0		0	-
Heavy %	0%	0%	0%	0%		0%	0%	6.3%	2.9%	0%		4%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Lights	5	12	3	0		20	0	12	24	0		36	139	8	5	0		152	26	166	7	0		199	-
Lights %	100%	85.7%	75%	0%		87%	0%	75%	70.6%	0%		72%	95.2%	66.7%	100%	0%		93.3%	96.3%	94.3%	100%	0%		94.8%	-
Mediums	0	0	0	0		0	0	2	8	0		10	5	0	0	0		5	0	8	0	0		8	-
Mediums %	0%	0%	0%	0%		0%	0%	12.5%	23.5%	0%		20%	3.4%	0%	0%	0%		3.1%	0%	4.5%	0%	0%		3.8%	-
Articulated Trucks	0	0	0	0		0	0	1	1	0		2	0	0	0	0		0	0	0	0	0		0	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	6.3%	2.9%	0%		4%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	2	1	0		3	0	1	1	0		2	2	4	0	0		6	1	2	0	0		3	-
Bicycles on Road %	0%	14.3%	25%	0%		13%	0%	6.3%	2.9%	0%		4%	1.4%	33.3%	0%	0%		3.7%	3.7%	1.1%	0%	0%		1.4%	-
Pedestrians	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	1	-	-	-	-	-	7	-	-
Pedestrians%	-	-	-	-	25%		-	-	-	-	25%		-	-	-	-	6.3%		-	-	-	-	43.8%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

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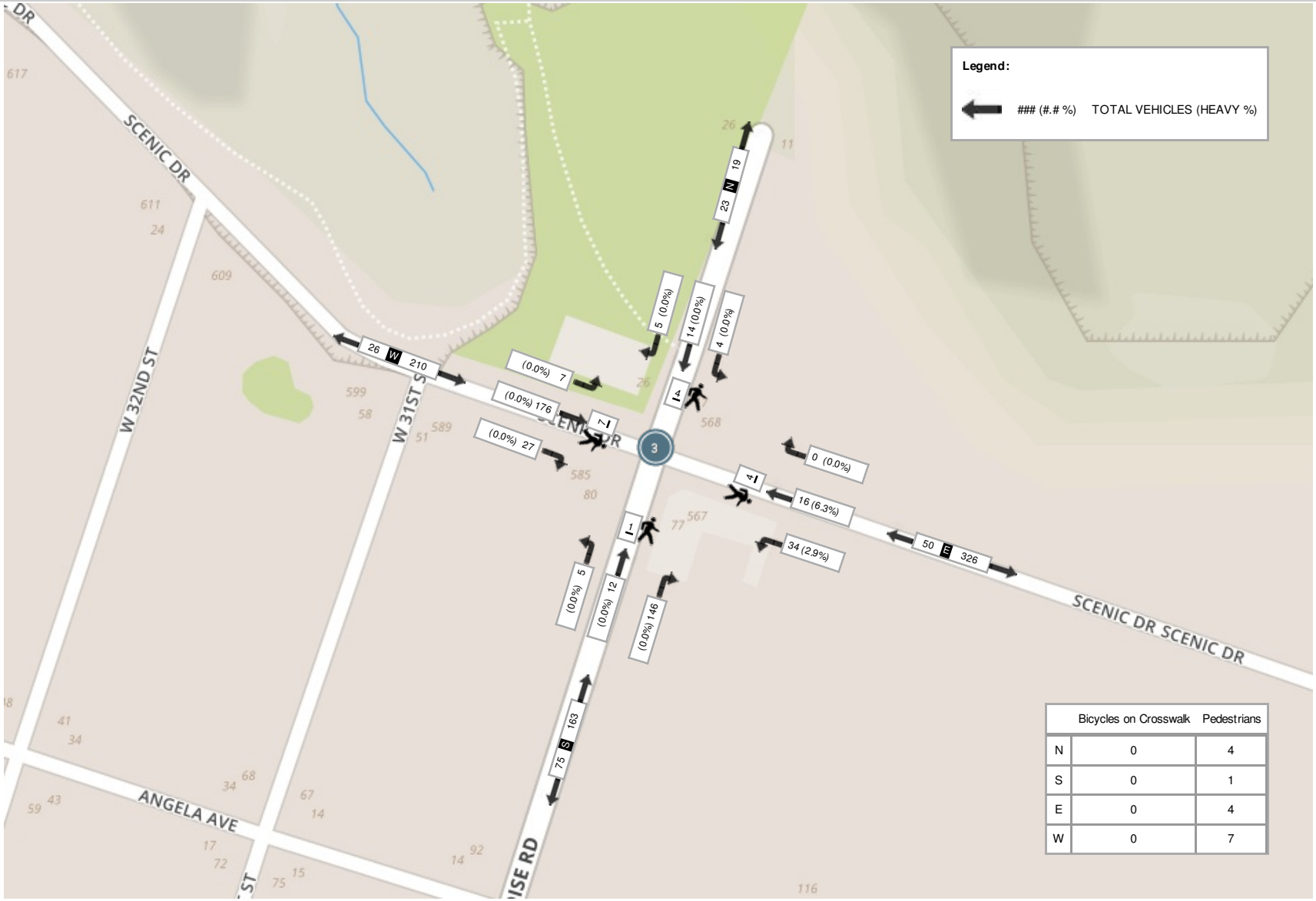
Markham ON, CANADA, L3R 9W6

Peak Hour: 04:30 PM - 05:30 PM Weather: Unknown (24.5 °C)

Start Time	N Approach UPPER PARADISE RD						E Approach SCENIC DR						S Approach UPPER PARADISE RD						W Approach SCENIC DR						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:30:00	1	11	1	0	0	13	1	35	13	0	2	49	15	6	6	0	0	27	5	19	1	0	0	25	114
16:45:00	2	5	0	0	0	7	3	36	28	0	1	67	18	4	3	0	0	25	2	23	1	0	0	26	125
17:00:00	0	1	3	0	2	4	3	49	24	0	0	76	31	5	3	0	2	39	4	12	1	0	2	17	136
17:15:00	3	1	2	0	0	6	3	34	20	1	0	58	18	2	2	0	0	22	1	21	0	0	0	22	108
Grand Total	6	18	6	0	2	30	10	154	85	1	3	250	82	17	14	0	2	113	12	75	3	0	2	90	**483**
Approach%	20%	60%	20%	0%		-	4%	61.6%	34%	0.4%		-	72.6%	15%	12.4%	0%		-	13.3%	83.3%	3.3%	0%		-	-
Totals %	1.2%	3.7%	1.2%	0%		6.2%	2.1%	31.9%	17.6%	0.2%		51.8%	17%	3.5%	2.9%	0%		23.4%	2.5%	15.5%	0.6%	0%		18.6%	-
PHF	0.5	0.41	0.5	0		0.58	0.83	0.79	0.76	0.25		0.82	0.66	0.71	0.58	0		0.72	0.6	0.82	0.75	0		0.87	-
Heavy	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Heavy %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Lights	5	17	6	0		28	9	144	76	0		229	77	15	12	0		104	10	71	3	0		84	-
Lights %	83.3%	94.4%	100%	0%		93.3%	90%	93.5%	89.4%	0%		91.6%	93.9%	88.2%	85.7%	0%		92%	83.3%	94.7%	100%	0%		93.3%	-
Mediums	0	0	0	0		0	0	7	8	1		16	4	0	0	0		4	0	1	0	0		1	-
Mediums %	0%	0%	0%	0%		0%	0%	4.5%	9.4%	100%		6.4%	4.9%	0%	0%	0%		3.5%	0%	1.3%	0%	0%		1.1%	-
Articulated Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Bicycles on Road	1	1	0	0		2	1	3	1	0		5	1	2	2	0		5	2	3	0	0		5	-
Bicycles on Road %	16.7%	5.6%	0%	0%		6.7%	10%	1.9%	1.2%	0%		2%	1.2%	11.8%	14.3%	0%		4.4%	16.7%	4%	0%	0%		5.6%	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	2	-	-	-	-	-	2	-	-
Pedestrians%	-	-	-	-	22.2%		-	-	-	-	33.3%		-	-	-	-	22.2%		-	-	-	-	22.2%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 07:00 AM - 08:00 AM Weather: Unknown (19.4 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	4
S	0	1
E	0	4
W	0	7

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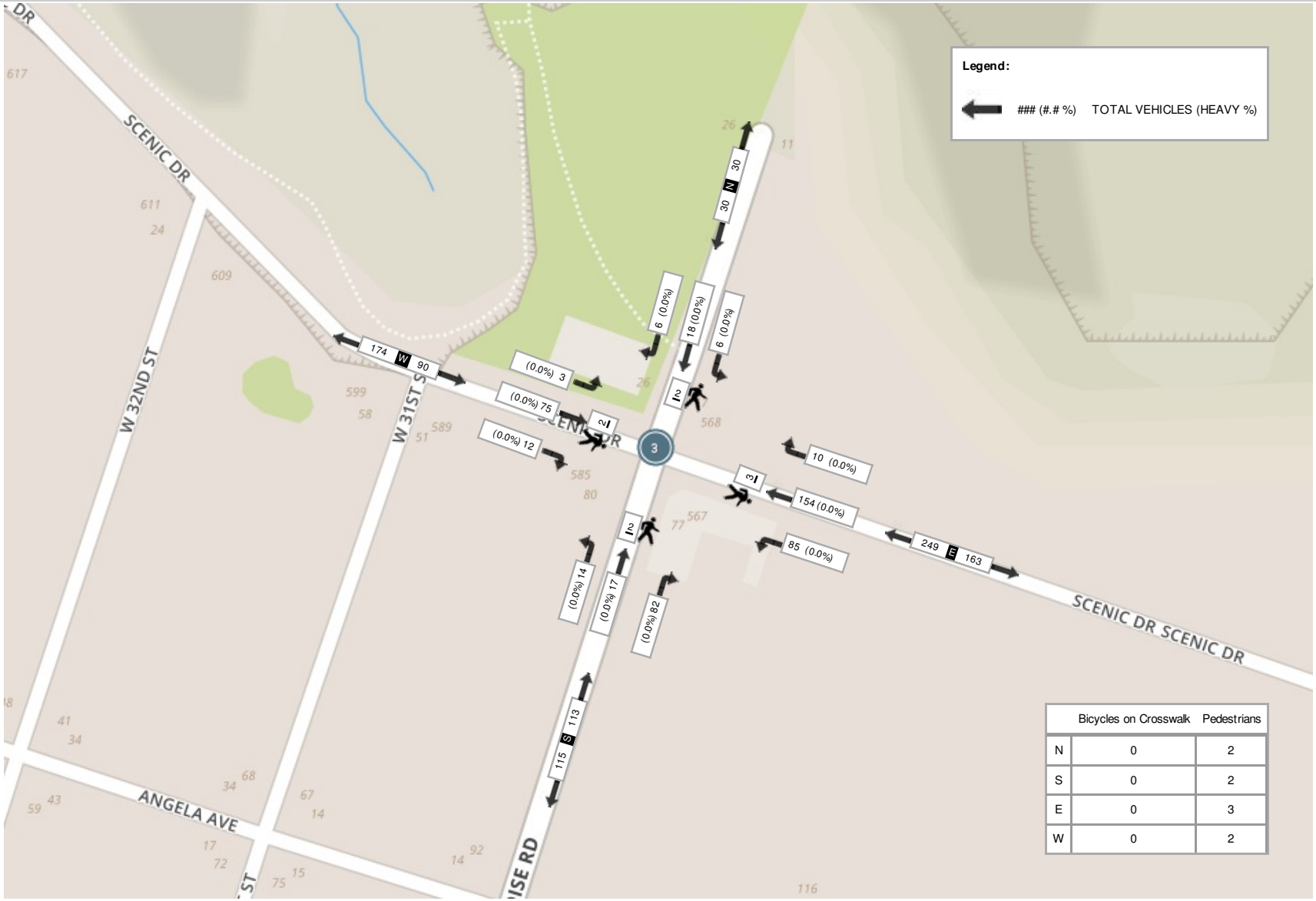
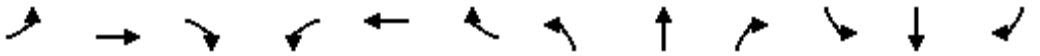
Peak Hour: 04:30 PM - 05:30 PM Weather: Unknown (24.5 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	2
S	0	2
E	0	3
W	0	2

Appendix C
Existing Traffic Level of Service Calculations

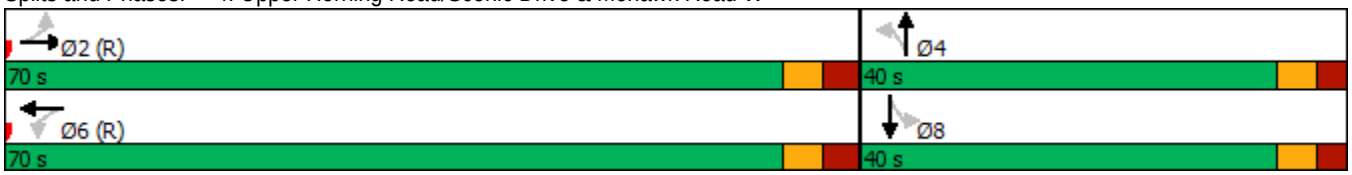


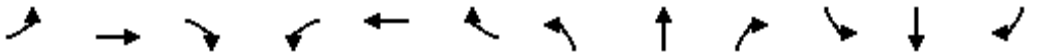
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	557	24	65	523	34	82	60	35	54	16	171
Future Volume (vph)	87	557	24	65	523	34	82	60	35	54	16	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	35.0		0.0	50.0		0.0	35.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1638	3374	0	1733	3358	0	1767	1760	0	1526	1526	0
Flt Permitted	0.421			0.408			0.452			0.680		
Satd. Flow (perm)	716	3374	0	735	3358	0	832	1760	0	1081	1526	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			10			28			182	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		377.4			794.6			245.0			973.4	
Travel Time (s)		27.2			57.2			22.1			70.1	
Confl. Peds. (#/hr)	19		18	18		19	14		11	11		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	9%	5%	4%	3%	4%	21%	1%	0%	0%	17%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	619	0	69	592	0	87	101	0	57	199	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	10.0		20.0	20.0		10.0	10.0	
Minimum Split (s)	38.3	38.3		38.3	38.3		36.9	36.9		36.9	36.9	
Total Split (s)	70.0	70.0		70.0	70.0		40.0	40.0		40.0	40.0	
Total Split (%)	63.6%	63.6%		63.6%	63.6%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	63.7	63.7		63.7	63.7		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	78.4	78.4		78.4	78.4		21.4	21.4		21.4	21.4	
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.19	0.19		0.19	0.19	
v/c Ratio	0.18	0.26		0.13	0.25		0.54	0.28		0.27	0.45	
Control Delay	6.4	5.9		3.5	4.6		53.3	29.2		41.4	10.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.4	5.9		3.5	4.6		53.3	29.2		41.4	10.7	
LOS	A	A		A	A		D	C		D	B	
Approach Delay		5.9			4.4			40.3			17.5	
Approach LOS		A			A			D			B	
Queue Length 50th (m)	6.0	22.1		6.4	30.9		17.9	14.1		11.1	3.2	
Queue Length 95th (m)	13.1	31.4		1.9	5.3		35.1	29.2		23.1	23.2	
Internal Link Dist (m)		353.4			770.6			221.0			949.4	
Turn Bay Length (m)	35.0			50.0			35.0			45.0		
Base Capacity (vph)	509	2405		523	2395		265	580		344	610	
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	0.18	0.26		0.13	0.25		0.33	0.17		0.17	0.33	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 83 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.54			
Intersection Signal Delay: 10.6		Intersection LOS: B	
Intersection Capacity Utilization 94.6%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 4: Upper Horning Road/Scenic Drive & Mohawk Road W





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	137	518	6	66	424	97	20	35	117	107	25	120
Future Volume (vph)	137	518	6	66	424	97	20	35	117	107	25	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	42.0		0.0	30.0		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1716	3458	0	1684	3272	0	1700	1579	0	1638	1572	0
Flt Permitted	0.395			0.427			0.515			0.492		
Satd. Flow (perm)	692	3458	0	749	3272	0	898	1579	0	844	1572	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			30			133			136	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		209.7			766.0			141.5			406.9	
Travel Time (s)		15.1			55.2			12.7			29.3	
Confl. Peds. (#/hr)	45		12	12		45	32		7	7		32
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	3%	0%	6%	4%	4%	5%	3%	4%	9%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	156	596	0	75	592	0	23	173	0	122	164	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	35.1		35.1	35.1		37.9	37.9		37.9	37.9	
Total Split (s)	20.0	70.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	18.2%	63.6%		45.5%	45.5%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	17.0	63.9		43.9	43.9		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.0	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.8		2.8	2.8		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	2.0	5.1		5.1	5.1		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)		12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		17.0		17.0	17.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	83.5	80.4		69.0	69.0		19.6	19.6		19.6	19.6	
Actuated g/C Ratio	0.76	0.73		0.63	0.63		0.18	0.18		0.18	0.18	
v/c Ratio	0.25	0.24		0.16	0.29		0.14	0.44		0.81	0.42	
Control Delay	5.1	5.0		12.0	10.4		36.9	14.0		78.6	12.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.1	5.0		12.0	10.4		36.9	14.0		78.6	12.4	
LOS	A	A		B	B		D	B		E	B	
Approach Delay		5.0			10.6			16.7			40.6	
Approach LOS		A			B			B			D	
Queue Length 50th (m)	6.9	17.2		6.4	27.6		4.4	7.7		26.8	5.4	
Queue Length 95th (m)	16.0	29.8		17.5	48.3		10.8	23.7		43.8	20.9	
Internal Link Dist (m)		185.7			742.0			117.5			382.9	
Turn Bay Length (m)	42.0			30.0			30.0			30.0		
Base Capacity (vph)	692	2526		469	2062		286	594		269	594	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.24		0.16	0.29		0.08	0.29		0.45	0.28	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 10 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 87.1% ICU Level of Service E
Analysis Period (min) 15

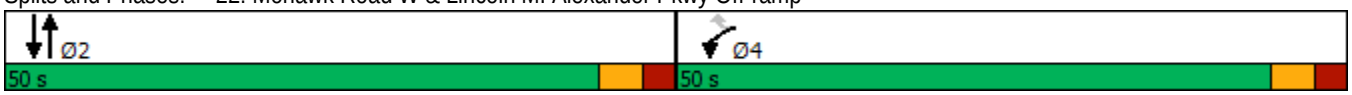
Splits and Phases: 9: Rice Avenue & Mohawk Road W

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	343	129	615	0	0	502
Future Volume (vph)	343	129	615	0	0	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	0.0	
Storage Lanes	2	1		0	0	
Taper Length (m)	7.5				7.5	
Satd. Flow (prot)	3429	1551	3570	0	0	3570
Flt Permitted	0.950					
Satd. Flow (perm)	3429	1551	3570	0	0	3570
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		136				
Link Speed (k/h)	50		50			50
Link Distance (m)	82.5		247.1			153.8
Travel Time (s)	5.9		17.8			11.1
Confl. Peds. (#/hr)				3	3	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	361	136	647	0	0	528
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.0		0.0			0.0
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	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Detector Phase	4	4	2			2
Switch Phase						
Minimum Initial (s)	15.0	15.0	25.0			25.0
Minimum Split (s)	23.8	23.8	30.8			30.8
Total Split (s)	50.0	50.0	50.0			50.0
Total Split (%)	50.0%	50.0%	50.0%			50.0%
Maximum Green (s)	44.2	44.2	44.2			44.2
Yellow Time (s)	3.3	3.3	3.3			3.3
All-Red Time (s)	2.5	2.5	2.5			2.5
Lost Time Adjust (s)	-1.0	-1.0	-1.0			-1.0
Total Lost Time (s)	4.8	4.8	4.8			4.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Minimum Gap (s)	3.0	3.0	3.0			3.0
Time Before Reduce (s)	0.0	0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0	0.0			0.0
Recall Mode	None	None	Max			Max
Walk Time (s)	0.0	0.0	7.0			7.0
Flash Dont Walk (s)	0.0	0.0	12.0			12.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	16.1	16.1	45.2			45.2
Actuated g/C Ratio	0.23	0.23	0.64			0.64
v/c Ratio	0.46	0.30	0.28			0.23
Control Delay	25.9	6.6	6.1			5.8
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	25.9	6.6	6.1			5.8
LOS	C	A	A			A
Approach Delay	20.7		6.1			5.8
Approach LOS	C		A			A
Queue Length 50th (m)	22.5	0.0	18.1			14.2
Queue Length 95th (m)	34.6	12.7	26.4			21.1
Internal Link Dist (m)	58.5		223.1			129.8
Turn Bay Length (m)						
Base Capacity (vph)	2185	1037	2275			2275
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.17	0.13	0.28			0.23

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 70.9			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 10.3		Intersection LOS: B	
Intersection Capacity Utilization 41.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 22: Mohawk Road W & Lincoln M. Alexander Pkwy Off-ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	451	265	10	310	0	390	0	642	583	669	524	0
Future Volume (vph)	451	265	10	310	0	390	0	642	583	669	524	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1750	3502	0	3298	0	1551	0	3535	1551	1592	3309	0
Flt Permitted	0.950			0.950						0.223	0.545	
Satd. Flow (perm)	1743	3502	0	3237	0	1526	0	3535	1523	373	1837	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		4							367			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			277.3	
Travel Time (s)		14.7			23.9			10.3			20.0	
Confl. Peds. (#/hr)	4		17	17		4	14		5	5		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	1%	10%	5%	0%	3%	0%	1%	3%	2%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										50%		
Lane Group Flow (vph)	460	280	0	316	0	398	0	655	595	341	877	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	9.5	34.0		9.5		11.0		28.8	28.8	9.5	36.8	
Total Split (s)	10.0	35.0		10.0		35.0		30.0	30.0	15.0	45.0	
Total Split (%)	11.1%	38.9%		11.1%		38.9%		33.3%	33.3%	16.7%	50.0%	
Maximum Green (s)	7.0	29.0		7.0		29.0		24.2	24.2	12.0	39.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	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	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	38.5	27.5		8.0		27.5		25.8	25.8	45.5	42.7	
Actuated g/C Ratio	0.43	0.31		0.09		0.31		0.29	0.29	0.51	0.47	
v/c Ratio	0.62	0.26		1.08		0.86		0.65	0.85	0.87	0.96dl	
Control Delay	23.1	23.3		115.8		47.8		31.9	25.2	42.1	27.2	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	23.1	23.3		115.8		47.8		31.9	25.2	42.1	27.2	
LOS	C	C		F		D		C	C	D	C	
Approach Delay		23.2			77.9			28.7			31.3	
Approach LOS		C			E			C			C	
Queue Length 50th (m)	57.0	18.9		~33.4		64.8		55.2	41.0	43.2	63.7	
Queue Length 95th (m)	86.5	28.9		#60.0		#111.2		74.5	#107.9	#101.2	#95.6	
Internal Link Dist (m)		180.4			308.2			119.1			253.3	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	745	1170		293		508		1013	698	391	1071	
Starvation Cap Reductn	0	0		0		0		0	0	0	0	
Spillback Cap Reductn	0	0		0		0		0	0	0	0	
Storage Cap Reductn	0	0		0		0		0	0	0	0	
Reduced v/c Ratio	0.62	0.24		1.08		0.78		0.65	0.85	0.87	0.82	

Intersection Summary

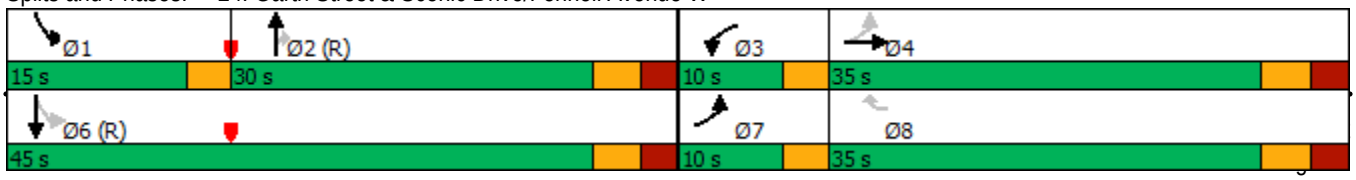
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 56 (62%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 37.4 Intersection LOS: D
Intersection Capacity Utilization 89.5% ICU Level of Service E
Analysis Period (min) 15

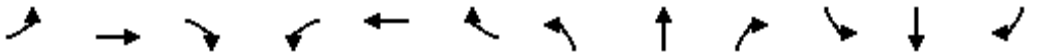
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W





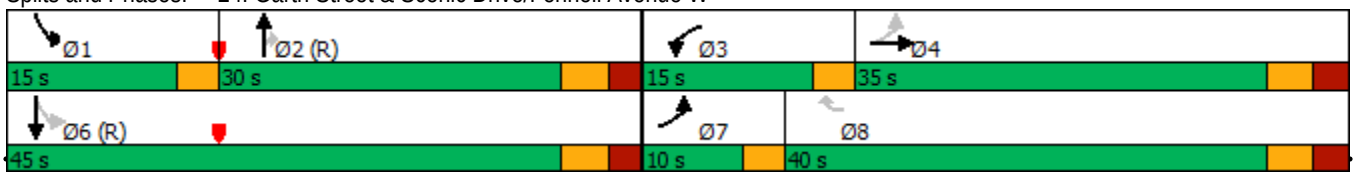
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	451	265	10	310	0	390	0	642	583	669	524	0
Future Volume (vph)	451	265	10	310	0	390	0	642	583	669	524	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1750	3502	0	3298	0	1551	0	3535	1551	1592	3309	0
Flt Permitted	0.950			0.950						0.198	0.549	
Satd. Flow (perm)	1743	3502	0	3233	0	1527	0	3535	1523	331	1850	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		4							382			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			277.3	
Travel Time (s)		14.7			23.9			10.3			20.0	
Confl. Peds. (#/hr)	4		17	17		4	14		5	5		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	1%	10%	5%	0%	3%	0%	1%	3%	2%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										50%		
Lane Group Flow (vph)	460	280	0	316	0	398	0	655	595	341	877	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	8.0	34.0		8.0		11.0		28.8	28.8	8.0	36.8	
Total Split (s)	10.0	35.0		15.0		40.0		30.0	30.0	15.0	45.0	
Total Split (%)	10.5%	36.8%		15.8%		42.1%		31.6%	31.6%	15.8%	47.4%	
Maximum Green (s)	7.0	29.0		12.0		34.0		24.2	24.2	12.0	39.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	

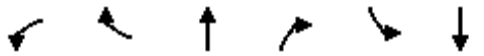
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes		Yes		Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	36.2	25.2		12.7		29.8		25.2	25.2	48.2	45.4	
Actuated g/C Ratio	0.38	0.27		0.13		0.31		0.27	0.27	0.51	0.48	
v/c Ratio	0.69	0.30		0.72		0.83		0.70	0.87	0.84	0.91dl	
Control Delay	28.1	27.5		49.4		45.2		36.2	26.9	39.3	26.9	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	28.1	27.5		49.4		45.2		36.2	26.9	39.3	26.9	
LOS	C	C		D		D		D	C	D	C	
Approach Delay		27.9			47.1			31.8			30.4	
Approach LOS		C			D			C			C	
Queue Length 50th (m)	62.4	22.1		30.4		69.4		59.9	41.3	45.4	65.3	
Queue Length 95th (m)	85.1	31.1		44.9		100.4		80.0	#109.6	#116.8	#111.0	
Internal Link Dist (m)		180.4			308.2			119.1			253.3	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	663	1108		451		562		937	684	408	1119	
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	0.69	0.25		0.70		0.71		0.70	0.87	0.84	0.78	

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 56 (59%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 33.4 Intersection LOS: C
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.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W

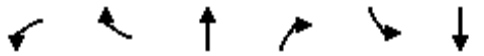




Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	81	23	104	87	26	82
Future Volume (vph)	81	23	104	87	26	82
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	87	25	112	94	28	88

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	112	206	116
Volume Left (vph)	87	0	28
Volume Right (vph)	25	94	0
Hadj (s)	0.02	-0.27	0.05
Departure Headway (s)	4.6	4.0	4.4
Degree Utilization, x	0.14	0.23	0.14
Capacity (veh/h)	724	862	774
Control Delay (s)	8.4	8.2	8.2
Approach Delay (s)	8.4	8.2	8.2
Approach LOS	A	A	A

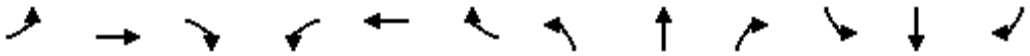
Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	8	0	232	8	0	85
Future Volume (Veh/h)	8	0	232	8	0	85
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	0	247	9	0	90
Pedestrians	9					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	350	260			265	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	350	260			265	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	646	777			1301	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	256	90
Volume Left	9	0	0
Volume Right	0	9	0
cSH	646	1700	1301
Volume to Capacity	0.01	0.15	0.00
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	10.7	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.7	0.0	0.0
Approach LOS	B		

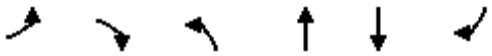
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	176	27	34	26	0	5	12	146	4	14	5
Future Volume (vph)	7	176	27	34	26	0	5	12	146	4	14	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	200	31	39	30	0	6	14	166	5	16	6

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	239	39	30	6	180	27
Volume Left (vph)	8	39	0	6	0	5
Volume Right (vph)	31	0	0	0	166	6
Hadj (s)	-0.07	0.55	0.10	0.50	-0.65	-0.10
Departure Headway (s)	5.1	5.8	5.4	5.8	4.7	5.5
Degree Utilization, x	0.34	0.06	0.04	0.01	0.23	0.04
Capacity (veh/h)	680	583	632	585	724	608
Control Delay (s)	10.6	8.0	7.4	7.7	7.9	8.7
Approach Delay (s)	10.6	7.8		7.9		8.7
Approach LOS	B	A		A		A

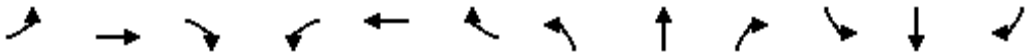
Intersection Summary				
Delay	9.2			
Level of Service	A			
Intersection Capacity Utilization	36.0%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	19	13	909	448	168
Future Volume (Veh/h)	18	19	13	909	448	168
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	19	20	14	967	477	179
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					143	
pX, platoon unblocked						
vC, conflicting volume	1086	336	664			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1086	336	664			
tC, single (s)	6.9	7.0	4.3			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.3			
p0 queue free %	90	97	98			
cM capacity (veh/h)	200	647	876			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	19	20	336	645	318	338
Volume Left	19	0	14	0	0	0
Volume Right	0	20	0	0	0	179
cSH	200	647	876	1700	1700	1700
Volume to Capacity	0.10	0.03	0.02	0.38	0.19	0.20
Queue Length 95th (m)	2.5	0.8	0.4	0.0	0.0	0.0
Control Delay (s)	24.9	10.7	0.6	0.0	0.0	0.0
Lane LOS	C	B	A			
Approach Delay (s)	17.6		0.2		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	169	50	37	68	2	46	10	74	1	5	0
Future Volume (vph)	0	169	50	37	68	2	46	10	74	1	5	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	180	53	39	72	2	49	11	79	1	5	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	233	113	139	6
Volume Left (vph)	0	39	49	1
Volume Right (vph)	53	2	79	0
Hadj (s)	-0.14	0.06	-0.27	0.03
Departure Headway (s)	4.2	4.5	4.4	4.9
Degree Utilization, x	0.27	0.14	0.17	0.01
Capacity (veh/h)	821	750	759	668
Control Delay (s)	8.8	8.3	8.3	7.9
Approach Delay (s)	8.8	8.3	8.3	7.9
Approach LOS	A	A	A	A

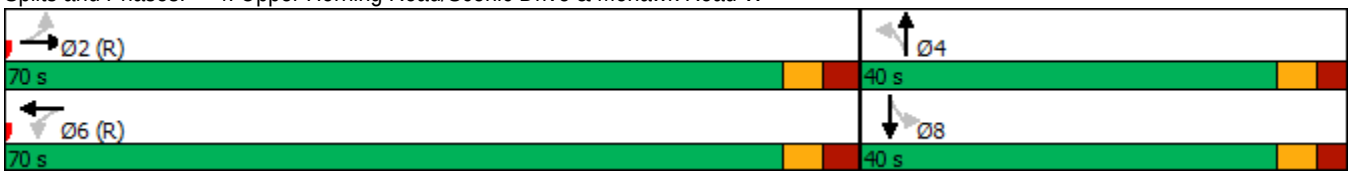
Intersection Summary				
Delay	8.6			
Level of Service	A			
Intersection Capacity Utilization	42.3%	ICU Level of Service	A	
Analysis Period (min)	15			

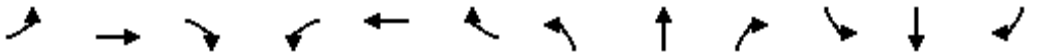
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	644	60	38	673	42	60	8	27	29	14	136
Future Volume (vph)	146	644	60	38	673	42	60	8	27	29	14	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	35.0		0.0	50.0		0.0	35.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	3483	0	1785	3439	0	1785	1645	0	1526	1587	0
Flt Permitted	0.336			0.341			0.528			0.732		
Satd. Flow (perm)	630	3483	0	639	3439	0	990	1645	0	1173	1587	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			10			30			149	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		377.4			794.6			245.0			973.4	
Travel Time (s)		27.2			57.2			22.1			70.1	
Confl. Peds. (#/hr)	4		5	5		4	3		2	2		3
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	0%	2%	14%	0%	0%	0%	17%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	160	774	0	42	786	0	66	39	0	32	164	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	10.0		20.0	20.0		10.0	10.0	
Minimum Split (s)	38.3	38.3		38.3	38.3		36.9	36.9		36.9	36.9	
Total Split (s)	70.0	70.0		70.0	70.0		40.0	40.0		40.0	40.0	
Total Split (%)	63.6%	63.6%		63.6%	63.6%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	63.7	63.7		63.7	63.7		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	78.8	78.8		78.8	78.8		21.0	21.0		21.0	21.0	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.19	0.19		0.19	0.19	
v/c Ratio	0.35	0.31		0.09	0.32		0.35	0.12		0.14	0.39	
Control Delay	8.5	5.9		3.7	6.3		44.7	17.5		39.1	10.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.5	5.9		3.7	6.3		44.7	17.5		39.1	10.9	
LOS	A	A		A	A		D	B		D	B	
Approach Delay		6.4			6.2			34.6			15.5	
Approach LOS		A			A			C			B	
Queue Length 50th (m)	12.0	28.6		3.9	45.1		13.1	1.7		6.1	2.8	
Queue Length 95th (m)	23.4	36.7		1.4	18.5		27.1	11.1		15.2	21.4	
Internal Link Dist (m)		353.4			770.6			221.0			949.4	
Turn Bay Length (m)	35.0			50.0			35.0			45.0		
Base Capacity (vph)	451	2499		457	2466		315	545		374	607	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.35	0.31		0.09	0.32		0.21	0.07		0.09	0.27	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 83 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.39			
Intersection Signal Delay: 8.6		Intersection LOS: A	
Intersection Capacity Utilization 88.0%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 4: Upper Horning Road/Scenic Drive & Mohawk Road W





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	141	501	17	63	604	120	21	18	43	113	23	160
Future Volume (vph)	141	501	17	63	604	120	21	18	43	113	23	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	42.0		0.0	30.0		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1767	3506	0	1733	3425	0	1700	1660	0	1716	1554	0
Flt Permitted	0.332			0.453			0.406			0.716		
Satd. Flow (perm)	615	3506	0	816	3425	0	724	1660	0	1286	1554	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			25			44			165	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		209.7			766.0			141.5			404.3	
Travel Time (s)		15.1			55.2			12.7			29.1	
Confl. Peds. (#/hr)	9		14	14		9	5		6	6		5
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	6%	3%	1%	1%	5%	0%	0%	4%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	145	534	0	65	747	0	22	63	0	116	189	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	35.1		35.1	35.1		37.9	37.9		37.9	37.9	
Total Split (s)	20.0	70.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	18.2%	63.6%		45.5%	45.5%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	17.0	63.9		43.9	43.9		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.0	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.8		2.8	2.8		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	2.0	5.1		5.1	5.1		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)		12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		17.0		17.0	17.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	86.5	83.4		72.6	72.6		16.6	16.6		16.6	16.6	
Actuated g/C Ratio	0.79	0.76		0.66	0.66		0.15	0.15		0.15	0.15	
v/c Ratio	0.25	0.20		0.12	0.33		0.20	0.22		0.60	0.51	
Control Delay	4.4	4.1		9.2	9.0		43.0	18.2		55.6	13.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	4.4	4.1		9.2	9.0		43.0	18.2		55.6	13.5	
LOS	A	A		A	A		D	B		E	B	
Approach Delay		4.2			9.0			24.7			29.5	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	5.8	14.0		4.9	33.1		4.4	3.8		24.9	4.8	
Queue Length 95th (m)	13.2	24.2		13.4	55.7		11.6	15.1		41.3	24.0	
Internal Link Dist (m)		185.7			742.0			117.5			380.3	
Turn Bay Length (m)	42.0			30.0			30.0			30.0		
Base Capacity (vph)	671	2658		539	2270		231	559		410	608	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.20		0.12	0.33		0.10	0.11		0.28	0.31	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 10 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 11.3 Intersection LOS: B
Intersection Capacity Utilization 72.5% ICU Level of Service C
Analysis Period (min) 15

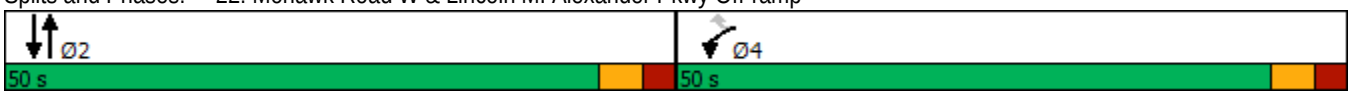
Splits and Phases: 9: Rice Avenue & Mohawk Road W

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	580	133	960	0	0	688
Future Volume (vph)	580	133	960	0	0	688
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	0.0	
Storage Lanes	2	1		0	0	
Taper Length (m)	7.5				7.5	
Satd. Flow (prot)	3463	1597	3570	0	0	3570
Flt Permitted	0.950					
Satd. Flow (perm)	3463	1597	3570	0	0	3570
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		62				
Link Speed (k/h)	50		50			50
Link Distance (m)	82.5		247.1			153.8
Travel Time (s)	5.9		17.8			11.1
Confl. Peds. (#/hr)				1	1	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	586	134	970	0	0	695
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.0		0.0			0.0
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	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Detector Phase	4	4	2			2
Switch Phase						
Minimum Initial (s)	15.0	15.0	25.0			25.0
Minimum Split (s)	23.8	23.8	30.8			30.8
Total Split (s)	50.0	50.0	50.0			50.0
Total Split (%)	50.0%	50.0%	50.0%			50.0%
Maximum Green (s)	44.2	44.2	44.2			44.2
Yellow Time (s)	3.3	3.3	3.3			3.3
All-Red Time (s)	2.5	2.5	2.5			2.5
Lost Time Adjust (s)	-1.0	-1.0	-1.0			-1.0
Total Lost Time (s)	4.8	4.8	4.8			4.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Minimum Gap (s)	3.0	3.0	3.0			3.0
Time Before Reduce (s)	0.0	0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0	0.0			0.0
Recall Mode	None	None	Max			Max
Walk Time (s)	0.0	0.0	7.0			7.0
Flash Dont Walk (s)	0.0	0.0	12.0			12.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	19.1	19.1	45.3			45.3
Actuated g/C Ratio	0.26	0.26	0.61			0.61
v/c Ratio	0.65	0.29	0.44			0.32
Control Delay	28.2	14.1	8.9			7.8
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	28.2	14.1	8.9			7.8
LOS	C	B	A			A
Approach Delay	25.6		8.9			7.8
Approach LOS	C		A			A
Queue Length 50th (m)	39.4	8.2	34.2			22.1
Queue Length 95th (m)	55.3	21.4	57.6			38.5
Internal Link Dist (m)	58.5		223.1			129.8
Turn Bay Length (m)						
Base Capacity (vph)	2117	1000	2183			2183
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.28	0.13	0.44			0.32

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 74			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 13.6		Intersection LOS: B	
Intersection Capacity Utilization 51.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 22: Mohawk Road W & Lincoln M. Alexander Pkwy Off-ramp



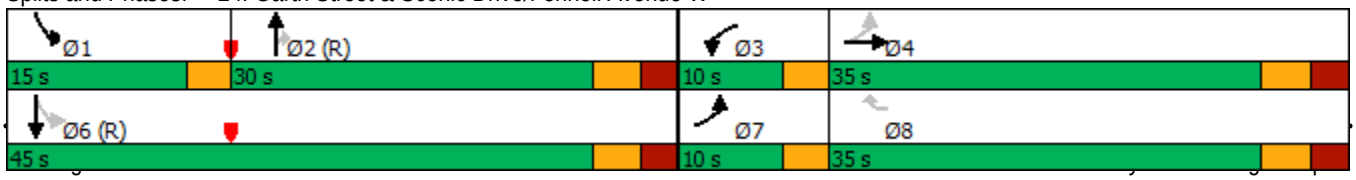
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	129	6	811	0	521	0	291	268	365	1148	0
Future Volume (vph)	89	129	6	811	0	521	0	291	268	365	1148	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	3444	0	3395	0	1536	0	3535	1507	1562	3376	0
Flt Permitted	0.950			0.950						0.485	0.938	
Satd. Flow (perm)	1636	3444	0	3274	0	1490	0	3535	1456	787	3172	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		5							285			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			262.0	
Travel Time (s)		14.7			23.9			10.3			18.9	
Confl. Peds. (#/hr)	20		27	27		20	35		19	19		35
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	3%	0%	2%	0%	4%	0%	1%	6%	4%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	95	143	0	863	0	554	0	310	285	349	1260	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	9.5	34.0		9.5		11.0		28.8	28.8	9.5	36.8	
Total Split (s)	10.0	35.0		10.0		35.0		30.0	30.0	15.0	45.0	
Total Split (%)	11.1%	38.9%		11.1%		38.9%		33.3%	33.3%	16.7%	50.0%	
Maximum Green (s)	7.0	29.0		7.0		29.0		24.2	24.2	12.0	39.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	

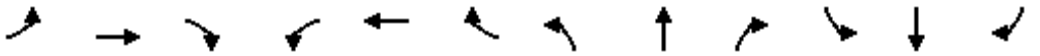
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes		Yes		Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	40.8	30.0		8.0		32.0		25.2	25.2	43.0	40.2	
Actuated g/C Ratio	0.45	0.33		0.09		0.36		0.28	0.28	0.48	0.45	
v/c Ratio	0.13	0.12		2.87		1.05		0.31	0.47	0.72	0.88	
Control Delay	13.6	20.5		867.9		83.6		26.7	6.0	26.0	30.9	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	13.6	20.5		867.9		83.6		26.7	6.0	26.0	30.9	
LOS	B	C		F		F		C	A	C	C	
Approach Delay		17.8			561.3			16.8			29.8	
Approach LOS		B			F			B			C	
Queue Length 50th (m)	9.2	9.1		~140.4		~116.9		23.3	0.0	45.0	107.6	
Queue Length 95th (m)	17.9	15.9		#177.6		#180.0		35.0	18.7	#71.6	#143.1	
Internal Link Dist (m)		180.4			308.2			119.1			238.0	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	748	1151		301		529		989	612	487	1439	
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	0.13	0.12		2.87		1.05		0.31	0.47	0.72	0.88	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 56 (62%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.87
Intersection Signal Delay: 222.2 Intersection LOS: F
Intersection Capacity Utilization 106.8% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W



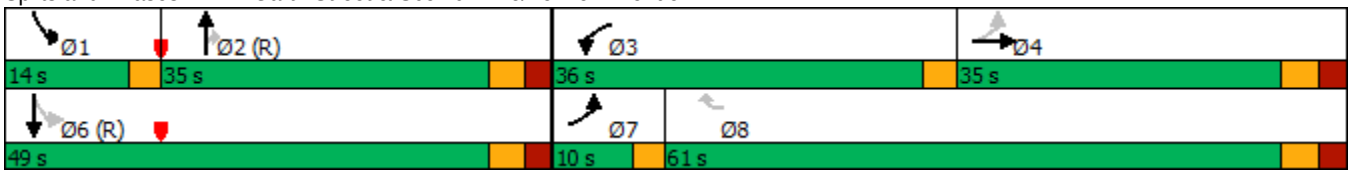


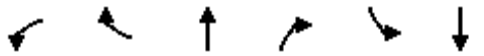
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	129	6	811	0	521	0	291	268	365	1148	0
Future Volume (vph)	89	129	6	811	0	521	0	291	268	365	1148	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	3443	0	3395	0	1536	0	3535	1507	1562	3376	0
Flt Permitted	0.950			0.950						0.464	0.936	
Satd. Flow (perm)	1625	3443	0	3234	0	1498	0	3535	1445	750	3164	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		3							285			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			262.0	
Travel Time (s)		14.7			23.9			10.3			18.9	
Confl. Peds. (#/hr)	20		27	27		20	35		19	19		35
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	3%	0%	2%	0%	4%	0%	1%	6%	4%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	95	143	0	863	0	554	0	310	285	349	1260	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	8.0	34.0		9.5		11.0		28.8	28.8	8.0	36.8	
Total Split (s)	10.0	35.0		36.0		61.0		35.0	35.0	14.0	49.0	
Total Split (%)	8.3%	29.2%		30.0%		50.8%		29.2%	29.2%	11.7%	40.8%	
Maximum Green (s)	7.0	29.0		33.0		55.0		29.2	29.2	11.0	43.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	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	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	35.6	24.7		33.3		50.0		32.0	32.0	53.1	50.3	
Actuated g/C Ratio	0.30	0.21		0.28		0.42		0.27	0.27	0.44	0.42	
v/c Ratio	0.20	0.20		0.92		0.89		0.33	0.48	0.79	0.93	
Control Delay	17.5	37.9		57.3		49.2		37.2	7.1	42.7	47.6	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	17.5	37.9		57.3		49.2		37.2	7.1	42.7	47.6	
LOS	B	D		E		D		D	A	D	D	
Approach Delay		29.8			54.2			22.8			46.6	
Approach LOS		C			D			C			D	
Queue Length 50th (m)	10.9	15.0		106.1		120.7		33.3	0.0	69.4	162.0	
Queue Length 95th (m)	18.3	23.4		#142.0		164.5		46.9	22.5	#142.8	#235.5	
Internal Link Dist (m)		180.4			308.2			119.1			238.0	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	485	863		961		699		941	593	441	1349	
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	0.20	0.17		0.90		0.79		0.33	0.48	0.79	0.93	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 56 (47%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 115			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 44.7		Intersection LOS: D	
Intersection Capacity Utilization 106.8%		ICU Level of Service G	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W





Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	62	27	58	50	17	75
Future Volume (vph)	62	27	58	50	17	75
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	65	28	61	53	18	79

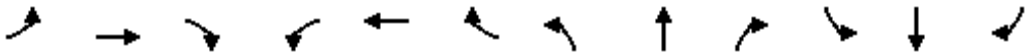
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	93	114	97
Volume Left (vph)	65	0	18
Volume Right (vph)	28	53	0
Hadj (s)	-0.04	-0.28	0.04
Departure Headway (s)	4.3	3.9	4.3
Degree Utilization, x	0.11	0.12	0.11
Capacity (veh/h)	796	882	821
Control Delay (s)	7.8	7.5	7.8
Approach Delay (s)	7.8	7.5	7.8
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	1	106	11	1	228
Future Volume (Veh/h)	4	1	106	11	1	228
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	1	119	12	1	256
Pedestrians	4					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	387	129			135	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	387	129			135	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	618	923			1457	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	131	257
Volume Left	4	0	1
Volume Right	1	12	0
cSH	662	1700	1457
Volume to Capacity	0.01	0.08	0.00
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	10.5	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	0.0
Approach LOS	B		

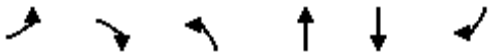
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	22.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	3	75	12	85	154	10	14	17	82	6	18	6
Future Volume (vph)	3	75	12	85	154	10	14	17	82	6	18	6
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	86	14	98	177	11	16	20	94	7	21	7

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	103	98	188	16	114	35
Volume Left (vph)	3	98	0	16	0	7
Volume Right (vph)	14	0	11	0	94	7
Hadj (s)	-0.08	0.50	-0.04	0.50	-0.58	-0.08
Departure Headway (s)	5.2	5.5	5.0	6.0	4.9	5.6
Degree Utilization, x	0.15	0.15	0.26	0.03	0.16	0.05
Capacity (veh/h)	666	625	696	563	681	598
Control Delay (s)	9.1	8.3	8.5	8.0	7.7	8.9
Approach Delay (s)	9.1	8.5		7.7		8.9
Approach LOS	A	A		A		A

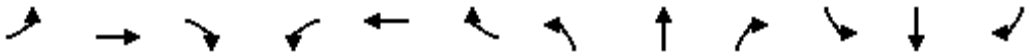
Intersection Summary				
Delay	8.4			
Level of Service	A			
Intersection Capacity Utilization	25.3%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	36	17	562	1212	507
Future Volume (Veh/h)	13	36	17	562	1212	507
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	13	37	18	579	1249	523
Pedestrians	10			1		
Lane Width (m)	3.5			3.5		
Walking Speed (m/s)	1.2			1.2		
Percent Blockage	1			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					143	
pX, platoon unblocked	0.69	0.69	0.69			
vC, conflicting volume	1846	897	1782			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1329	0	1236			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	95	95			
cM capacity (veh/h)	97	747	391			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	13	37	211	386	833	939
Volume Left	13	0	18	0	0	0
Volume Right	0	37	0	0	0	523
cSH	97	747	391	1700	1700	1700
Volume to Capacity	0.13	0.05	0.05	0.23	0.49	0.55
Queue Length 95th (m)	3.6	1.2	1.2	0.0	0.0	0.0
Control Delay (s)	47.6	10.1	1.9	0.0	0.0	0.0
Lane LOS	E	B	A			
Approach Delay (s)	19.8		0.7		0.0	
Approach LOS	C					

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	60.4%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	87	52	86	121	6	43	10	44	1	11	0
Future Volume (vph)	0	87	52	86	121	6	43	10	44	1	11	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	0	90	54	89	125	6	44	10	45	1	11	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	144	220	99	12
Volume Left (vph)	0	89	44	1
Volume Right (vph)	54	6	45	0
Hadj (s)	-0.22	0.06	-0.18	0.02
Departure Headway (s)	4.2	4.4	4.5	4.9
Degree Utilization, x	0.17	0.27	0.12	0.02
Capacity (veh/h)	828	789	734	672
Control Delay (s)	8.0	9.0	8.2	7.9
Approach Delay (s)	8.0	9.0	8.2	7.9
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.5			
Level of Service	A			
Intersection Capacity Utilization	42.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Appendix D

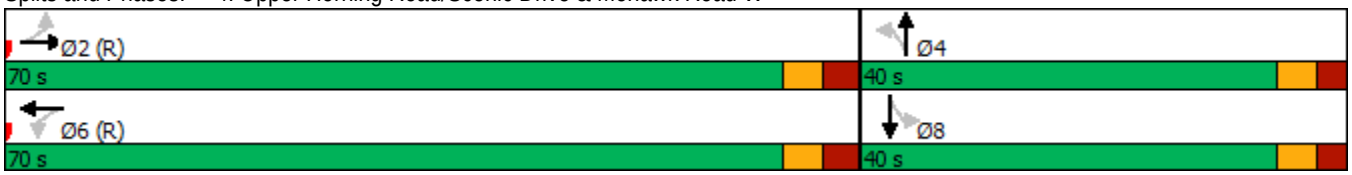
2026 Future Background Level of Service Calculations

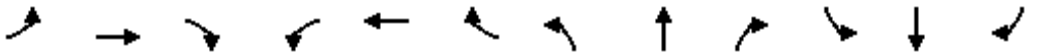
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	724	24	65	723	34	82	76	35	54	20	171
Future Volume (vph)	87	724	24	65	723	34	82	76	35	54	20	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	35.0		0.0	50.0		0.0	35.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1638	3378	0	1733	3376	0	1767	1777	0	1526	1533	0
Flt Permitted	0.328			0.331			0.444			0.640		
Satd. Flow (perm)	560	3378	0	598	3376	0	817	1777	0	1018	1533	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			7			22			180	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		377.4			794.6			245.0			973.4	
Travel Time (s)		27.2			57.2			22.1			70.1	
Confl. Peds. (#/hr)	19		18	18		19	14		11	11		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	9%	5%	4%	3%	4%	21%	1%	0%	0%	17%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	796	0	69	805	0	87	118	0	57	203	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	10.0		20.0	20.0		10.0	10.0	
Minimum Split (s)	38.3	38.3		38.3	38.3		36.9	36.9		36.9	36.9	
Total Split (s)	70.0	70.0		70.0	70.0		40.0	40.0		40.0	40.0	
Total Split (%)	63.6%	63.6%		63.6%	63.6%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	63.7	63.7		63.7	63.7		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	78.3	78.3		78.3	78.3		21.5	21.5		21.5	21.5	
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.20	0.20		0.20	0.20	
v/c Ratio	0.23	0.33		0.16	0.33		0.55	0.32		0.29	0.46	
Control Delay	7.4	6.4		3.1	4.4		54.0	33.3		42.0	11.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.4	6.4		3.1	4.4		54.0	33.3		42.0	11.4	
LOS	A	A		A	A		D	C		D	B	
Approach Delay		6.5			4.3			42.1			18.1	
Approach LOS		A			A			D			B	
Queue Length 50th (m)	6.3	30.5		3.1	45.8		18.0	18.7		11.2	4.3	
Queue Length 95th (m)	14.4	42.6		2.3	8.6		35.1	35.2		23.3	24.5	
Internal Link Dist (m)		353.4			770.6			221.0			949.4	
Turn Bay Length (m)	35.0			50.0			35.0			45.0		
Base Capacity (vph)	399	2407		425	2406		260	582		324	611	
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	0.23	0.33		0.16	0.33		0.33	0.20		0.18	0.33	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 83 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 10.3		Intersection LOS: B	
Intersection Capacity Utilization 94.7%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 4: Upper Horning Road/Scenic Drive & Mohawk Road W





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	657	6	66	538	103	20	44	117	127	32	180
Future Volume (vph)	155	657	6	66	538	103	20	44	117	127	32	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	42.0		0.0	30.0		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1716	3462	0	1684	3294	0	1700	1592	0	1638	1563	0
Flt Permitted	0.325			0.366			0.373			0.497		
Satd. Flow (perm)	573	3462	0	644	3294	0	653	1592	0	852	1563	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			24			128			205	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		209.7			766.0			141.5			406.9	
Travel Time (s)		15.1			55.2			12.7			29.3	
Confl. Peds. (#/hr)	45		12	12		45	32		7	7		32
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	3%	0%	6%	4%	4%	5%	3%	4%	9%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	176	754	0	75	728	0	23	183	0	144	241	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	35.1		35.1	35.1		37.9	37.9		37.9	37.9	
Total Split (s)	20.0	70.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	18.2%	63.6%		45.5%	45.5%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	17.0	63.9		43.9	43.9		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.0	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.8		2.8	2.8		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	2.0	5.1		5.1	5.1		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)		12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		17.0		17.0	17.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	80.8	77.7		65.5	65.5		22.3	22.3		22.3	22.3	
Actuated g/C Ratio	0.73	0.71		0.60	0.60		0.20	0.20		0.20	0.20	
v/c Ratio	0.33	0.31		0.20	0.37		0.17	0.43		0.83	0.50	
Control Delay	7.0	6.5		15.0	13.3		35.9	14.7		76.4	11.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.0	6.5		15.0	13.3		35.9	14.7		76.4	11.0	
LOS	A	A		B	B		D	B		E	B	
Approach Delay		6.6			13.4			17.1			35.5	
Approach LOS		A			B			B			D	
Queue Length 50th (m)	9.1	26.4		7.2	40.2		4.3	10.4		31.5	6.7	
Queue Length 95th (m)	20.4	44.0		20.0	68.6		10.6	26.0		49.3	24.4	
Internal Link Dist (m)		185.7			742.0			117.5			382.9	
Turn Bay Length (m)	42.0			30.0			30.0			30.0		
Base Capacity (vph)	607	2444		383	1971		208	595		271	638	
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	0.29	0.31		0.20	0.37		0.11	0.31		0.53	0.38	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 10 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 88.6% ICU Level of Service E
Analysis Period (min) 15

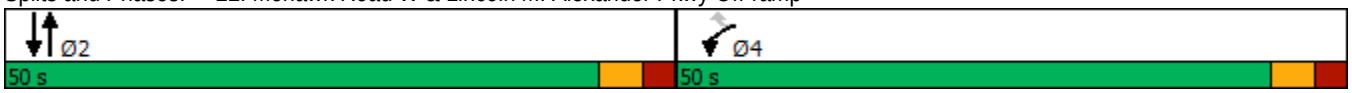
Splits and Phases: 9: Rice Avenue & Mohawk Road W

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	343	132	795	0	0	687
Future Volume (vph)	343	132	795	0	0	687
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	0.0	
Storage Lanes	2	1		0	0	
Taper Length (m)	7.5				7.5	
Satd. Flow (prot)	3429	1551	3570	0	0	3570
Flt Permitted	0.950					
Satd. Flow (perm)	3429	1551	3570	0	0	3570
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		91				
Link Speed (k/h)	50		50			50
Link Distance (m)	82.5		247.1			153.8
Travel Time (s)	5.9		17.8			11.1
Confl. Peds. (#/hr)				3	3	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	361	139	837	0	0	723
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.0		0.0			0.0
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	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Detector Phase	4	4	2			2
Switch Phase						
Minimum Initial (s)	15.0	15.0	25.0			25.0
Minimum Split (s)	23.8	23.8	30.8			30.8
Total Split (s)	50.0	50.0	50.0			50.0
Total Split (%)	50.0%	50.0%	50.0%			50.0%
Maximum Green (s)	44.2	44.2	44.2			44.2
Yellow Time (s)	3.3	3.3	3.3			3.3
All-Red Time (s)	2.5	2.5	2.5			2.5
Lost Time Adjust (s)	-1.0	-1.0	-1.0			-1.0
Total Lost Time (s)	4.8	4.8	4.8			4.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Minimum Gap (s)	3.0	3.0	3.0			3.0
Time Before Reduce (s)	0.0	0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0	0.0			0.0
Recall Mode	None	None	Max			Max
Walk Time (s)	0.0	0.0	7.0			7.0
Flash Dont Walk (s)	0.0	0.0	12.0			12.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	16.1	16.1	45.2			45.2
Actuated g/C Ratio	0.23	0.23	0.64			0.64
v/c Ratio	0.46	0.33	0.37			0.32
Control Delay	25.9	12.0	6.7			6.3
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	25.9	12.0	6.7			6.3
LOS	C	B	A			A
Approach Delay	22.1		6.7			6.3
Approach LOS	C		A			A
Queue Length 50th (m)	22.5	5.4	25.1			20.8
Queue Length 95th (m)	34.6	19.1	35.5			29.8
Internal Link Dist (m)	58.5		223.1			129.8
Turn Bay Length (m)						
Base Capacity (vph)	2185	1021	2275			2275
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.17	0.14	0.37			0.32

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 70.9			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 10.3		Intersection LOS: B	
Intersection Capacity Utilization 42.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 22: Mohawk Road W & Lincoln M. Alexander Pkwy Off-ramp

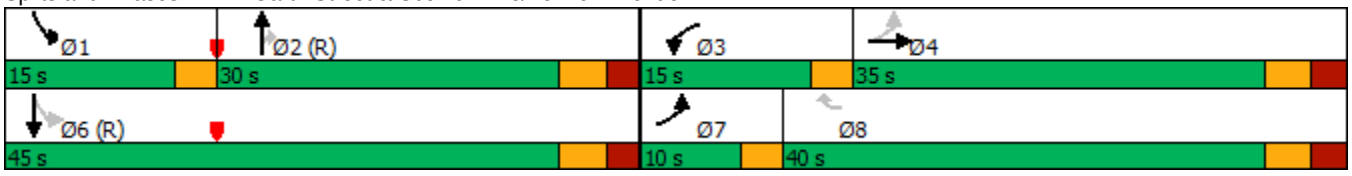


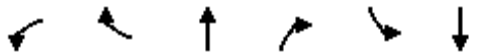
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	458	350	10	310	0	390	0	847	583	669	694	0
Future Volume (vph)	458	350	10	310	0	390	0	847	583	669	694	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1750	3509	0	3298	0	1551	0	3535	1551	1592	3321	0
Flt Permitted	0.950			0.950						0.148	0.556	
Satd. Flow (perm)	1743	3509	0	3241	0	1527	0	3535	1523	248	1876	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		3							325			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			277.3	
Travel Time (s)		14.7			23.9			10.3			20.0	
Confl. Peds. (#/hr)	4		17	17		4	14		5	5		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	1%	10%	5%	0%	3%	0%	1%	3%	2%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										48%		
Lane Group Flow (vph)	467	367	0	316	0	398	0	864	595	355	1036	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	9.5	34.0		9.5		11.0		28.8	28.8	9.5	36.8	
Total Split (s)	10.0	35.0		15.0		40.0		30.0	30.0	15.0	45.0	
Total Split (%)	10.5%	36.8%		15.8%		42.1%		31.6%	31.6%	15.8%	47.4%	
Maximum Green (s)	7.0	29.0		12.0		34.0		24.2	24.2	12.0	39.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	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	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	36.2	25.2		12.7		29.8		25.2	25.2	48.2	45.4	
Actuated g/C Ratio	0.38	0.27		0.13		0.31		0.27	0.27	0.51	0.48	
v/c Ratio	0.70	0.39		0.72		0.83		0.92	0.93	0.93	0.92	
Control Delay	28.6	28.9		49.4		45.2		50.5	38.2	57.5	37.2	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	28.6	28.9		49.4		45.2		50.5	38.2	57.5	37.2	
LOS	C	C		D		D		D	D	E	D	
Approach Delay		28.7			47.1			45.5			42.4	
Approach LOS		C			D			D			D	
Queue Length 50th (m)	63.8	29.8		30.4		69.4		85.3	55.8	56.9	82.4	
Queue Length 95th (m)	86.9	40.4		44.9		100.4		#122.9	#127.3	#136.2	#167.0	
Internal Link Dist (m)		180.4			308.2			119.1			253.3	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	663	1110		451		562		937	642	382	1129	
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	0.70	0.33		0.70		0.71		0.92	0.93	0.93	0.92	

Intersection Summary			
Area Type:	Other		
Cycle Length: 95			
Actuated Cycle Length: 95			
Offset: 56 (59%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 41.6		Intersection LOS: D	
Intersection Capacity Utilization 90.4%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W





Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	81	29	156	87	45	172
Future Volume (vph)	81	29	156	87	45	172
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	87	31	168	94	48	185

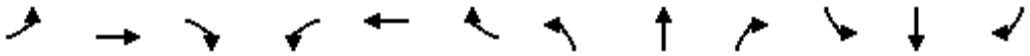
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	118	262	233
Volume Left (vph)	87	0	48
Volume Right (vph)	31	94	0
Hadj (s)	-0.01	-0.22	0.04
Departure Headway (s)	5.0	4.3	4.5
Degree Utilization, x	0.16	0.31	0.29
Capacity (veh/h)	659	814	761
Control Delay (s)	9.0	9.2	9.4
Approach Delay (s)	9.0	9.2	9.4
Approach LOS	A	A	A

Intersection Summary			
Delay	9.2		
Level of Service	A		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	8	0	301	8	0	111
Future Volume (Veh/h)	8	0	301	8	0	111
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	0	320	9	0	118
Pedestrians	9					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	452	334			338	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	452	334			338	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	565	708			1223	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	329	118
Volume Left	9	0	0
Volume Right	0	9	0
cSH	565	1700	1223
Volume to Capacity	0.02	0.19	0.00
Queue Length 95th (m)	0.4	0.0	0.0
Control Delay (s)	11.5	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.5	0.0	0.0
Approach LOS	B		

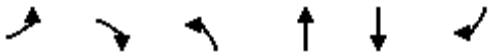
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	230	27	34	36	0	5	15	146	4	18	5
Future Volume (vph)	7	230	27	34	36	0	5	15	146	4	18	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	261	31	39	41	0	6	17	166	5	20	6

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	300	39	41	6	183	31
Volume Left (vph)	8	39	0	6	0	5
Volume Right (vph)	31	0	0	0	166	6
Hadj (s)	-0.06	0.55	0.10	0.50	-0.63	-0.08
Departure Headway (s)	5.1	5.9	5.5	6.0	4.9	5.7
Degree Utilization, x	0.43	0.06	0.06	0.01	0.25	0.05
Capacity (veh/h)	673	571	617	561	687	576
Control Delay (s)	11.9	8.2	7.7	7.9	8.3	9.0
Approach Delay (s)	11.9	7.9		8.3		9.0
Approach LOS	B	A		A		A

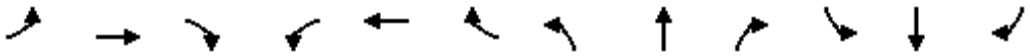
Intersection Summary				
Delay	10.1			
Level of Service	B			
Intersection Capacity Utilization	37.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	19	13	1199	591	171
Future Volume (Veh/h)	18	19	13	1199	591	171
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	19	20	14	1276	629	182
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					143	
pX, platoon unblocked						
vC, conflicting volume	1394	414	819			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1394	414	819			
tC, single (s)	6.9	7.0	4.3			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.3			
p0 queue free %	85	97	98			
cM capacity (veh/h)	125	576	763			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	19	20	439	851	419	392
Volume Left	19	0	14	0	0	0
Volume Right	0	20	0	0	0	182
cSH	125	576	763	1700	1700	1700
Volume to Capacity	0.15	0.03	0.02	0.50	0.25	0.23
Queue Length 95th (m)	4.2	0.9	0.4	0.0	0.0	0.0
Control Delay (s)	39.0	11.5	0.5	0.0	0.0	0.0
Lane LOS	E	B	A			
Approach Delay (s)	24.9		0.2		0.0	
Approach LOS	C					

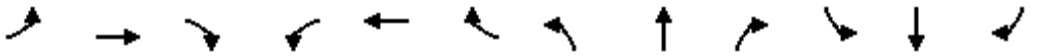
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	214	50	40	86	2	46	13	81	1	6	0
Future Volume (vph)	0	214	50	40	86	2	46	13	81	1	6	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	228	53	43	91	2	49	14	86	1	6	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	281	136	149	7
Volume Left (vph)	0	43	49	1
Volume Right (vph)	53	2	86	0
Hadj (s)	-0.11	0.05	-0.28	0.03
Departure Headway (s)	4.3	4.6	4.6	5.1
Degree Utilization, x	0.34	0.18	0.19	0.01
Capacity (veh/h)	803	733	727	630
Control Delay (s)	9.5	8.6	8.6	8.1
Approach Delay (s)	9.5	8.6	8.6	8.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay	9.1			
Level of Service	A			
Intersection Capacity Utilization	46.2%	ICU Level of Service	A	
Analysis Period (min)	15			

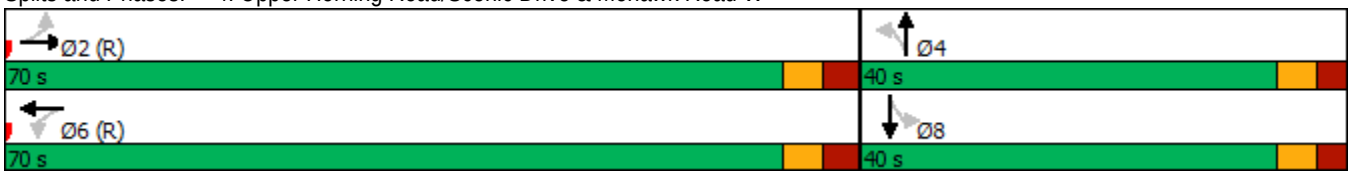


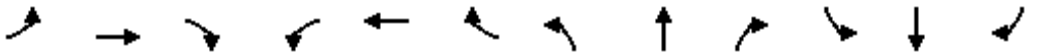
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	877	60	38	891	42	60	10	27	29	18	136
Future Volume (vph)	146	877	60	38	891	42	60	10	27	29	18	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	35.0		0.0	50.0		0.0	35.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	3495	0	1785	3453	0	1785	1655	0	1526	1595	0
Flt Permitted	0.251			0.249			0.516			0.730		
Satd. Flow (perm)	471	3495	0	467	3453	0	967	1655	0	1170	1595	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			7			30			119	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		377.4			794.6			245.0			973.4	
Travel Time (s)		27.2			57.2			22.1			70.1	
Confl. Peds. (#/hr)	4		5	5		4	3		2	2		3
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	0%	2%	14%	0%	0%	0%	17%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	160	1030	0	42	1025	0	66	41	0	32	169	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	10.0		20.0	20.0		10.0	10.0	
Minimum Split (s)	38.3	38.3		38.3	38.3		36.9	36.9		36.9	36.9	
Total Split (s)	70.0	70.0		70.0	70.0		40.0	40.0		40.0	40.0	
Total Split (%)	63.6%	63.6%		63.6%	63.6%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	63.7	63.7		63.7	63.7		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	78.8	78.8		78.8	78.8		21.0	21.0		21.0	21.0	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.19	0.19		0.19	0.19	
v/c Ratio	0.47	0.41		0.13	0.41		0.36	0.12		0.14	0.42	
Control Delay	12.3	6.8		3.2	6.3		45.2	18.1		39.1	16.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.3	6.8		3.2	6.3		45.2	18.1		39.1	16.8	
LOS	B	A		A	A		D	B		D	B	
Approach Delay		7.5			6.1			34.8			20.4	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	13.6	42.4		3.0	64.8		13.1	2.1		6.1	9.5	
Queue Length 95th (m)	30.1	53.2		1.2	7.7		27.2	11.7		15.2	29.7	
Internal Link Dist (m)		353.4			770.6			221.0			949.4	
Turn Bay Length (m)	35.0			50.0			35.0			45.0		
Base Capacity (vph)	337	2506		334	2475		308	548		373	589	
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	0.47	0.41		0.13	0.41		0.21	0.07		0.09	0.29	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 83 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 9.1		Intersection LOS: A	
Intersection Capacity Utilization 88.2%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 4: Upper Horning Road/Scenic Drive & Mohawk Road W





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	201	635	17	63	766	139	21	23	43	125	29	197
Future Volume (vph)	201	635	17	63	766	139	21	23	43	125	29	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	42.0		0.0	30.0		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1767	3511	0	1733	3434	0	1700	1677	0	1716	1554	0
Flt Permitted	0.257			0.396			0.305			0.713		
Satd. Flow (perm)	477	3511	0	715	3434	0	544	1677	0	1281	1554	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			23			44			203	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		209.7			766.0			141.5			404.3	
Travel Time (s)		15.1			55.2			12.7			29.1	
Confl. Peds. (#/hr)	9		14	14		9	5		6	6		5
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	6%	3%	1%	1%	5%	0%	0%	4%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	207	673	0	65	933	0	22	68	0	129	233	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	35.1		35.1	35.1		37.9	37.9		37.9	37.9	
Total Split (s)	20.0	70.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	18.2%	63.6%		45.5%	45.5%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	17.0	63.9		43.9	43.9		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.0	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.8		2.8	2.8		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	2.0	5.1		5.1	5.1		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)		12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		17.0		17.0	17.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	85.5	82.4		70.4	70.4		17.6	17.6		17.6	17.6	
Actuated g/C Ratio	0.78	0.75		0.64	0.64		0.16	0.16		0.16	0.16	
v/c Ratio	0.42	0.26		0.14	0.42		0.26	0.22		0.63	0.56	
Control Delay	9.5	4.7		10.9	11.2		45.5	18.5		56.0	13.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.5	4.7		10.9	11.2		45.5	18.5		56.0	13.3	
LOS	A	A		B	B		D	B		E	B	
Approach Delay		5.9			11.2			25.1			28.5	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	9.2	19.8		5.3	48.3		4.4	4.7		27.6	5.9	
Queue Length 95th (m)	28.5	33.5		15.1	81.1		11.7	16.2		44.8	27.3	
Internal Link Dist (m)		185.7			742.0			117.5			380.3	
Turn Bay Length (m)	42.0			30.0			30.0			30.0		
Base Capacity (vph)	581	2630		457	2205		173	565		408	634	
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	0.36	0.26		0.14	0.42		0.13	0.12		0.32	0.37	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 10 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 12.4 Intersection LOS: B
Intersection Capacity Utilization 72.5% ICU Level of Service C
Analysis Period (min) 15

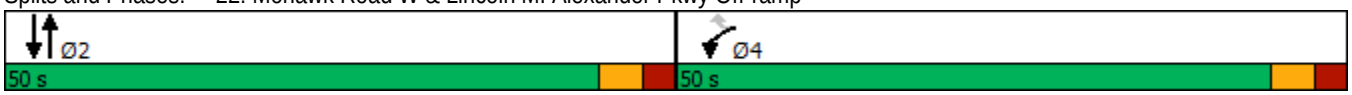
Splits and Phases: 9: Rice Avenue & Mohawk Road W

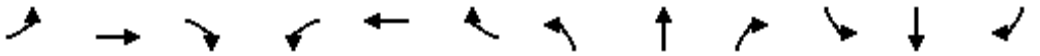
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	580	142	1269	0	0	905
Future Volume (vph)	580	142	1269	0	0	905
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	0.0	
Storage Lanes	2	1		0	0	
Taper Length (m)	7.5				7.5	
Satd. Flow (prot)	3463	1597	3570	0	0	3570
Flt Permitted	0.950					
Satd. Flow (perm)	3463	1597	3570	0	0	3570
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		23				
Link Speed (k/h)	50		50			50
Link Distance (m)	82.5		247.1			153.8
Travel Time (s)	5.9		17.8			11.1
Confl. Peds. (#/hr)				1	1	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	586	143	1282	0	0	914
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.0		0.0			0.0
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	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Detector Phase	4	4	2			2
Switch Phase						
Minimum Initial (s)	15.0	15.0	25.0			25.0
Minimum Split (s)	23.8	23.8	30.8			30.8
Total Split (s)	50.0	50.0	50.0			50.0
Total Split (%)	50.0%	50.0%	50.0%			50.0%
Maximum Green (s)	44.2	44.2	44.2			44.2
Yellow Time (s)	3.3	3.3	3.3			3.3
All-Red Time (s)	2.5	2.5	2.5			2.5
Lost Time Adjust (s)	-1.0	-1.0	-1.0			-1.0
Total Lost Time (s)	4.8	4.8	4.8			4.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Minimum Gap (s)	3.0	3.0	3.0			3.0
Time Before Reduce (s)	0.0	0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0	0.0			0.0
Recall Mode	None	None	Max			Max
Walk Time (s)	0.0	0.0	7.0			7.0
Flash Dont Walk (s)	0.0	0.0	12.0			12.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	19.1	19.1	45.3			45.3
Actuated g/C Ratio	0.26	0.26	0.61			0.61
v/c Ratio	0.65	0.33	0.59			0.42
Control Delay	28.2	20.6	10.6			8.6
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	28.2	20.6	10.6			8.6
LOS	C	C	B			A
Approach Delay	26.7		10.6			8.6
Approach LOS	C		B			A
Queue Length 50th (m)	39.4	14.1	51.3			31.5
Queue Length 95th (m)	55.3	28.5	85.3			53.4
Internal Link Dist (m)	58.5		223.1			129.8
Turn Bay Length (m)						
Base Capacity (vph)	2117	985	2183			2183
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.28	0.15	0.59			0.42

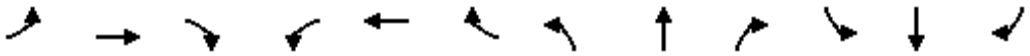
Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 74			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 14.0		Intersection LOS: B	
Intersection Capacity Utilization 59.6%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 22: Mohawk Road W & Lincoln M. Alexander Pkwy Off-ramp





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	170	6	811	0	521	0	384	268	365	1523	0
Future Volume (vph)	94	170	6	811	0	521	0	384	268	365	1523	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	3446	0	3395	0	1536	0	3535	1507	1562	3380	0
Flt Permitted	0.950			0.950						0.410	0.937	
Satd. Flow (perm)	1615	3446	0	3203	0	1495	0	3535	1434	664	3169	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		2							271			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			262.0	
Travel Time (s)		14.7			23.9			10.3			18.9	
Confl. Peds. (#/hr)	20		27	27		20	35		19	19		35
Confl. Bikes (#/hr)												
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	3%	0%	2%	0%	4%	0%	1%	6%	4%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	95	178	0	819	0	526	0	388	271	332	1575	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	8.0	34.0		9.5		11.0		28.8	28.8	8.0	36.8	
Total Split (s)	8.0	34.0		40.0		66.0		30.0	30.0	46.0	76.0	
Total Split (%)	5.3%	22.7%		26.7%		44.0%		20.0%	20.0%	30.7%	50.7%	
Maximum Green (s)	5.0	28.0		37.0		60.0		24.2	24.2	43.0	70.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	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	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	34.1	25.1		37.8		56.9		46.6	46.6	78.1	75.3	
Actuated g/C Ratio	0.23	0.17		0.25		0.38		0.31	0.31	0.52	0.50	
v/c Ratio	0.26	0.31		0.96		0.93		0.35	0.43	0.66	0.97	
Control Delay	30.4	54.6		76.9		68.1		43.9	7.3	29.8	52.3	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	30.4	54.6		76.9		68.1		43.9	7.3	29.8	52.3	
LOS	C	D		E		E		D	A	C	D	
Approach Delay		46.2			73.4			28.9			48.4	
Approach LOS		D			E			C			D	
Queue Length 50th (m)	16.3	25.1		131.1		151.3		51.3	0.0	71.2	~264.7	
Queue Length 95th (m)	27.8	37.0		#172.3		#218.1		74.8	26.2	101.7	#331.5	
Internal Link Dist (m)		180.4			308.2			119.1			238.0	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	368	667		860		607		1099	632	608	1624	
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	0.26	0.27		0.95		0.87		0.35	0.43	0.55	0.97	

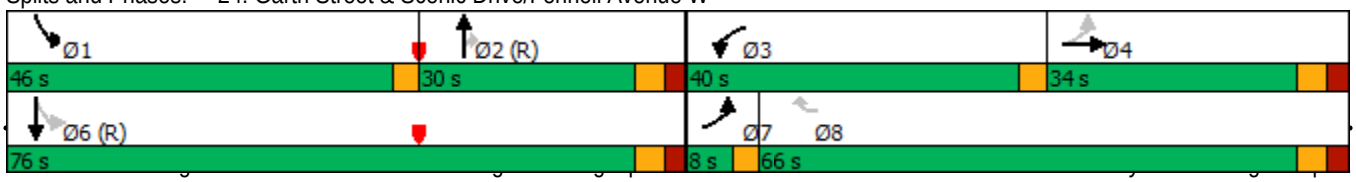
Intersection Summary

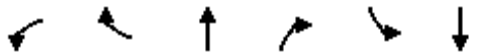
Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 56 (37%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 53.2 Intersection LOS: D
Intersection Capacity Utilization 117.1% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W





Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	62	47	153	50	29	136
Future Volume (vph)	62	47	153	50	29	136
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	65	49	161	53	31	143

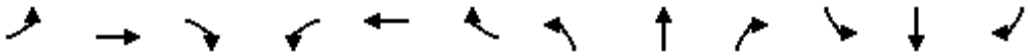
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	114	214	174
Volume Left (vph)	65	0	31
Volume Right (vph)	49	53	0
Hadj (s)	-0.14	-0.15	0.04
Departure Headway (s)	4.6	4.2	4.4
Degree Utilization, x	0.15	0.25	0.21
Capacity (veh/h)	718	821	775
Control Delay (s)	8.4	8.6	8.7
Approach Delay (s)	8.4	8.6	8.7
Approach LOS	A	A	A

Intersection Summary			
Delay	8.6		
Level of Service	A		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	1	139	11	1	236
Future Volume (Veh/h)	4	1	139	11	1	236
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	1	156	12	1	265
Pedestrians	4					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	433	166			172	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	433	166			172	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	581	881			1413	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	168	266
Volume Left	4	0	1
Volume Right	1	12	0
cSH	624	1700	1413
Volume to Capacity	0.01	0.10	0.00
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	10.8	0.0	0.0
Approach LOS	B		

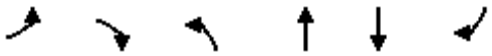
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	3	100	12	85	203	10	14	22	82	6	23	6
Future Volume (vph)	3	100	12	85	203	10	14	22	82	6	23	6
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	115	14	98	233	11	16	25	94	7	26	7

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	132	98	244	16	119	40
Volume Left (vph)	3	98	0	16	0	7
Volume Right (vph)	14	0	11	0	94	7
Hadj (s)	-0.06	0.50	-0.03	0.50	-0.55	-0.07
Departure Headway (s)	5.3	5.6	5.1	6.2	5.2	5.8
Degree Utilization, x	0.20	0.15	0.34	0.03	0.17	0.06
Capacity (veh/h)	640	616	685	538	642	566
Control Delay (s)	9.6	8.4	9.5	8.2	8.1	9.2
Approach Delay (s)	9.6	9.2		8.1		9.2
Approach LOS	A	A		A		A

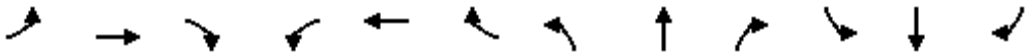
Intersection Summary				
Delay	9.1			
Level of Service	A			
Intersection Capacity Utilization	25.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	36	17	742	1599	515
Future Volume (Veh/h)	13	36	17	742	1599	515
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	13	36	17	749	1615	520
Pedestrians	10			1		
Lane Width (m)	3.5			3.5		
Walking Speed (m/s)	1.2			1.2		
Percent Blockage	1			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					143	
pX, platoon unblocked	0.57	0.57	0.57			
vC, conflicting volume	2294	1078	2145			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1758	0	1496			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	68	94	93			
cM capacity (veh/h)	41	615	256			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	13	36	267	499	1077	1058
Volume Left	13	0	17	0	0	0
Volume Right	0	36	0	0	0	520
cSH	41	615	256	1700	1700	1700
Volume to Capacity	0.32	0.06	0.07	0.29	0.63	0.62
Queue Length 95th (m)	8.6	1.5	1.7	0.0	0.0	0.0
Control Delay (s)	129.8	11.2	2.7	0.0	0.0	0.0
Lane LOS	F	B	A			
Approach Delay (s)	42.7		1.0		0.0	
Approach LOS	E					

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	110	52	94	194	6	43	13	49	1	6	0
Future Volume (vph)	0	110	52	94	194	6	43	13	49	1	6	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	0	113	54	97	200	6	44	13	51	1	6	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	167	303	108	7
Volume Left (vph)	0	97	44	1
Volume Right (vph)	54	6	51	0
Hadj (s)	-0.19	0.05	-0.20	0.03
Departure Headway (s)	4.3	4.4	4.8	5.1
Degree Utilization, x	0.20	0.37	0.14	0.01
Capacity (veh/h)	798	785	690	620
Control Delay (s)	8.4	10.0	8.6	8.2
Approach Delay (s)	8.4	10.0	8.6	8.2
Approach LOS	A	B	A	A

Intersection Summary				
Delay	9.3			
Level of Service	A			
Intersection Capacity Utilization	48.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Appendix E

2016 Transportation Tomorrow Survey Data

Auto Trip Distribution - External of Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: Planning district of destination - pd_dest

Filters:
Primary travel mode of trip - moc M P T U
and
2006 GTA zone of origin - gta06 5140 5160
and
Start time of trip - start_time In 600-900

Trip 2016
Table:

	PD 1 of Tor	PD 5 of Tor	Brampton	Mississaug	Burlington	Flamborough	Dundas	Ancaster	Glanbrook	Stoney Creek	Hamilton	Lincoln	Niagara-on-	St. Catharines	Thorold	Welland	Cambridge	Guelph/Eramosa	Brant	
5139	25	18	59	71	41	76	54	103	103	26	2197	0	0	0	0	21	104	15	27	
5140	24	0	26	0	67	0	13	93	0	50	1021	53	107	34	10	0	0	0	0	
5160	0	0	0	0	0	0	23	0	0	53	47	0	0	0	0	0	0	0	0	
	49	18	85	71	108	76	90	196	103	129	3265	53	107	34	10	21	104	15	27	4561
	1%	0%	2%	2%	2%	2%	2%	4%	2%	3%	72%	1%	2%	1%	0%	0%	2%	0%	1%	

Toronto	1%
Peel	4%
Halton	2%
Niagara	4%
Hamilton	85%
Others	3%
	99%

Auto Trip Distribution - Internal of Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest

Filters:
Primary trav M P T U
and
2006 GTA z 5140 5160
and
Start time of trip - start_time In 600-900
and
Ward number of destination - ward_dest In 171-185

Trip 2016
Table:

	5020	5036	5039	5043	5044	5051	5056	5065	5066	5067	5075	5082	5084	5087	5088	5091	5092	5098	5102	5104	5107	5112	5115	5116	5121	5122	5128	5133	5135	5139	5140	5144	5147	5155	5159	5163	5166	5170	5174	5175	5184	5185	5186	5188	5191	5193	5196	5197	5198	5205	5206	5207	5213	5232	5244	
5139	15	23	19	44	0	26	26	15	0	42	104	98	82	0	0	0	53	118	21	119	25	23	0	0	31	26	26	47	12	537	130	20	26	221	58	14	0	22	34	21	20	0	21	37	0	0	36	0	148	0	0	20	34	76	88	
5140	0	48	0	0	50	0	0	0	132	0	0	0	0	30	0	23	183	0	0	0	0	46	144	24	0	0	0	73	70	42	0	0	25	0	27	0	0	0	0	43	58	34	0	0	0	43	0	21	26	13	24	0	0	0	0	
5160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	
	15	71	19	44	50	26	26	15	132	42	104	98	82	30	53	23	236	118	21	119	25	69	144	24	31	26	26	120	82	579	130	20	51	221	85	14	47	22	34	64	78	34	21	37	23	43	36	21	174	13	24	20	34	76	88	3860
	0%	2%	0%	1%	1%	1%	1%	0%	3%	1%	3%	3%	2%	1%	1%	1%	6%	3%	1%	3%	1%	2%	4%	1%	1%	1%	1%	3%	2%	15%	3%	1%	1%	6%	2%	0%	1%	1%	1%	2%	2%	1%	1%	1%	1%	1%	1%	1%	5%	0%	1%	1%	1%	2%	2%	

South	55%
West	9%
East	11%
North	25%

Mode of Travel - AM Peak Period

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of household - gta06_hhld

Filters:
Primary travel mode of trip - mode_prime In B C D G J M P T U W
and
2006 GTA zone of household - gta06_hhld In 5139 5140 5160
and
Start time of trip - start_time In 600-900

Trip 2016
Table:

Modes of Travel/Traffic Zones	5139	5140	5160	Total	Percentage
Transit excluding GO rail	392	0	0	392	7%
Cycle	0	40	0	40	1%
Auto driver	2686	1298	76	4060	73%
Auto passenger	522	230	23	775	14%
Walk	116	174	0	290	5%
Total	3716	1742	99	5557	100%

Mode of Travel - PM Peak Period

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of household - gta06_hhld

Filters:
Primary travel mode of trip - mode_prime In B C D G J M P T U W
and
2006 GTA zone of household - gta06_hhld In 5139 5140 5160
and
Start time of trip - start_time In 1300-1800

Trip 2016
Table:

Modes of Travel/Traffic Zones	5139	5140	5160	Total	Percentage
Transit excluding GO rail	594	95	0	689	7%
Cycle	15	40	0	55	1%
Auto driver	4771	1917	383	7071	72%
Auto passenger	1090	260	0	1350	14%
Walk	399	227	0	626	6%
Total	6869	2539	383	9791	100%

Transit Trip Distribution - External of Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: Planning district of destination - pd_dest

Filters:
Primary travel mode of trip - mode_prime In B C G J W
and
2006 GTA zone of origin - gta06_orig In 5139 5140 5160
and
Start time of trip - start_time In 600-900

Trip 2016
Table:

	PD 1 of Toronto	Hamilton	Total
5139	22	486	508
5140	0	213	213
	22	699	721
	3%	97%	100%

Transit Trip Distribution - Internal of Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest

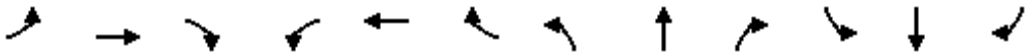
Filters:
Primary trav C G J W
and
2006 GTA z 5140 5160
and
Start time of trip - start_time In 600-900
and
Ward number of destination - ward_dest In 171-185

Trip 2016
Table:

	5051	5066	5104	5114	5139	5140	5142	5184	5195	5197	5198	5199	5203	
5139	21	82	0	30	34	44	0	52	59	0	104	15	44	
5140	0	0	21	0	46	79	27	0	0	40	0	0	0	
	21	82	21	30	80	123	27	52	59	40	104	15	44	698
	3%	12%	3%	4%	11%	18%	4%	7%	8%	6%	15%	2%	6%	

South	35%
East	8%
North	38%
West	16%
	97%

Appendix F
2026 Future Total Level of Service Calculations



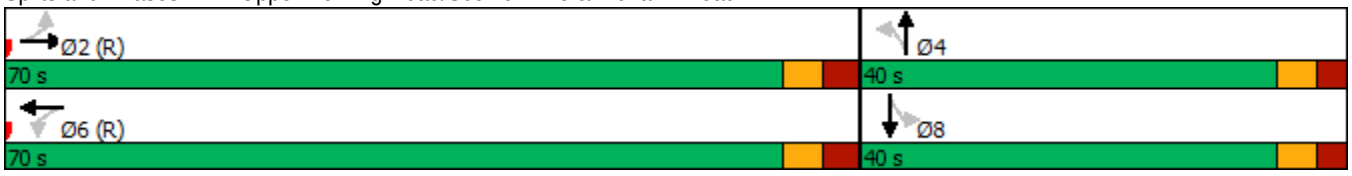
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	745	24	65	792	34	82	76	35	54	20	212
Future Volume (vph)	98	745	24	65	792	34	82	76	35	54	20	212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	35.0		0.0	50.0		0.0	35.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1638	3379	0	1733	3382	0	1767	1777	0	1526	1526	0
Flt Permitted	0.299			0.322			0.354			0.641		
Satd. Flow (perm)	511	3379	0	582	3382	0	652	1777	0	1019	1526	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			7			22			152	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		377.4			794.6			245.0			973.4	
Travel Time (s)		27.2			57.2			22.1			70.1	
Confl. Peds. (#/hr)	19		18	18		19	14		11	11		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	9%	5%	4%	3%	4%	21%	1%	0%	0%	17%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	819	0	69	879	0	87	118	0	57	247	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	10.0		20.0	20.0		10.0	10.0	
Minimum Split (s)	38.3	38.3		38.3	38.3		36.9	36.9		36.9	36.9	
Total Split (s)	70.0	70.0		70.0	70.0		40.0	40.0		40.0	40.0	
Total Split (%)	63.6%	63.6%		63.6%	63.6%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	63.7	63.7		63.7	63.7		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		4.9	4.9		4.9	4.9	

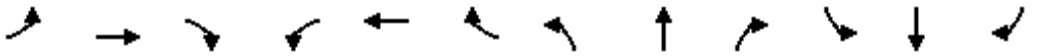
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	77.9	77.9		77.9	77.9		21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.20	0.20		0.20	0.20	
v/c Ratio	0.29	0.34		0.17	0.37		0.67	0.32		0.28	0.58	
Control Delay	8.7	6.7		3.4	4.7		66.5	32.7		41.0	21.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.7	6.7		3.4	4.7		66.5	32.7		41.0	21.2	
LOS	A	A		A	A		E	C		D	C	
Approach Delay		7.0			4.6			47.0			25.0	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	7.3	31.6		2.8	50.0		18.5	18.7		11.2	18.7	
Queue Length 95th (m)	18.4	47.5		2.9	12.0		#38.9	34.3		22.6	43.8	
Internal Link Dist (m)		353.4			770.6			221.0			949.4	
Turn Bay Length (m)	35.0			50.0			35.0			45.0		
Base Capacity (vph)	362	2394		411	2396		208	582		325	590	
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	0.29	0.34		0.17	0.37		0.42	0.20		0.18	0.42	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 83 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 11.8 Intersection LOS: B
Intersection Capacity Utilization 96.3% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Upper Horning Road/Scenic Drive & Mohawk Road W





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	657	6	66	538	103	20	44	117	127	32	249
Future Volume (vph)	176	657	6	66	538	103	20	44	117	127	32	249
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	42.0		0.0	30.0		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1716	3462	0	1684	3294	0	1700	1592	0	1638	1551	0
Flt Permitted	0.324			0.366			0.216			0.499		
Satd. Flow (perm)	572	3462	0	644	3294	0	380	1592	0	856	1551	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			24			128			283	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		209.7			766.0			141.5			406.9	
Travel Time (s)		15.1			55.2			12.7			29.3	
Confl. Peds. (#/hr)	45		12	12		45	32		7	7		32
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	3%	0%	6%	4%	4%	5%	3%	4%	9%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	200	754	0	75	728	0	23	183	0	144	319	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	35.1		35.1	35.1		37.9	37.9		37.9	37.9	
Total Split (s)	20.0	70.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	18.2%	63.6%		45.5%	45.5%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	17.0	63.9		43.9	43.9		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.0	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.8		2.8	2.8		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	2.0	5.1		5.1	5.1		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)		12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		17.0		17.0	17.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	80.6	77.5		64.8	64.8		22.5	22.5		22.5	22.5	
Actuated g/C Ratio	0.73	0.70		0.59	0.59		0.20	0.20		0.20	0.20	
v/c Ratio	0.38	0.31		0.20	0.37		0.30	0.43		0.82	0.59	
Control Delay	8.8	6.6		15.7	13.8		44.0	14.6		74.5	10.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.8	6.6		15.7	13.8		44.0	14.6		74.5	10.7	
LOS	A	A		B	B		D	B		E	B	
Approach Delay		7.0			14.0			17.9			30.5	
Approach LOS		A			B			B			C	
Queue Length 50th (m)	10.5	26.4		7.3	40.6		4.4	10.4		31.4	6.7	
Queue Length 95th (m)	27.7	45.2		20.8	71.2		11.3	25.8		48.8	26.9	
Internal Link Dist (m)		185.7			742.0			117.5			382.9	
Turn Bay Length (m)	42.0			30.0			30.0			30.0		
Base Capacity (vph)	606	2439		379	1949		121	595		273	687	
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	0.33	0.31		0.20	0.37		0.19	0.31		0.53	0.46	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 10 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 90.1% ICU Level of Service E
Analysis Period (min) 15

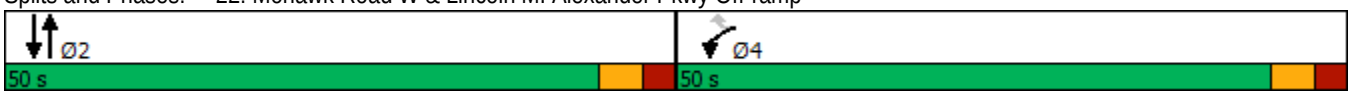
Splits and Phases: 9: Rice Avenue & Mohawk Road W

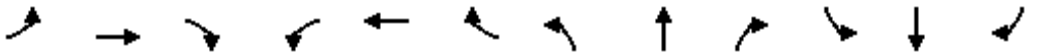
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	343	137	823	0	0	774
Future Volume (vph)	343	137	823	0	0	774
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	0.0	
Storage Lanes	2	1		0	0	
Taper Length (m)	7.5				7.5	
Satd. Flow (prot)	3429	1551	3570	0	0	3570
Flt Permitted	0.950					
Satd. Flow (perm)	3429	1551	3570	0	0	3570
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		84				
Link Speed (k/h)	50		50			50
Link Distance (m)	82.5		247.1			153.8
Travel Time (s)	5.9		17.8			11.1
Confl. Peds. (#/hr)				3	3	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	361	144	866	0	0	815
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.0		0.0			0.0
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	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Detector Phase	4	4	2			2
Switch Phase						
Minimum Initial (s)	15.0	15.0	25.0			25.0
Minimum Split (s)	23.8	23.8	30.8			30.8
Total Split (s)	50.0	50.0	50.0			50.0
Total Split (%)	50.0%	50.0%	50.0%			50.0%
Maximum Green (s)	44.2	44.2	44.2			44.2
Yellow Time (s)	3.3	3.3	3.3			3.3
All-Red Time (s)	2.5	2.5	2.5			2.5
Lost Time Adjust (s)	-1.0	-1.0	-1.0			-1.0
Total Lost Time (s)	4.8	4.8	4.8			4.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Minimum Gap (s)	3.0	3.0	3.0			3.0
Time Before Reduce (s)	0.0	0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0	0.0			0.0
Recall Mode	None	None	Max			Max
Walk Time (s)	0.0	0.0	7.0			7.0
Flash Dont Walk (s)	0.0	0.0	12.0			12.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	16.1	16.1	45.2			45.2
Actuated g/C Ratio	0.23	0.23	0.64			0.64
v/c Ratio	0.46	0.35	0.38			0.36
Control Delay	25.9	13.5	6.8			6.6
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	25.9	13.5	6.8			6.6
LOS	C	B	A			A
Approach Delay	22.4		6.8			6.6
Approach LOS	C		A			A
Queue Length 50th (m)	22.5	6.8	26.2			24.2
Queue Length 95th (m)	34.6	21.0	37.0			34.3
Internal Link Dist (m)	58.5		223.1			129.8
Turn Bay Length (m)						
Base Capacity (vph)	2185	1018	2275			2275
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.17	0.14	0.38			0.36

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 70.9			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 10.3		Intersection LOS: B	
Intersection Capacity Utilization 43.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 22: Mohawk Road W & Lincoln M. Alexander Pkwy Off-ramp





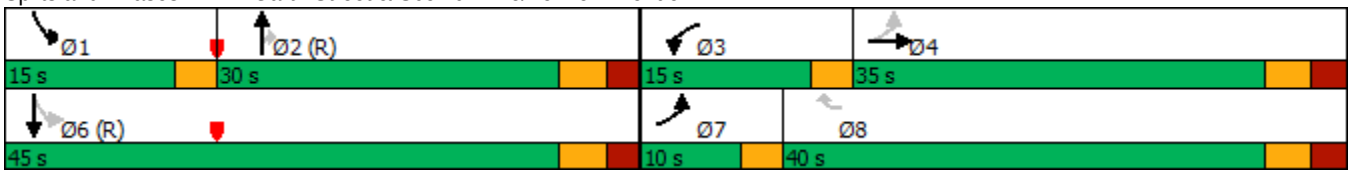
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	478	350	10	310	0	390	0	847	583	669	707	0
Future Volume (vph)	478	350	10	310	0	390	0	847	583	669	707	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1750	3509	0	3298	0	1551	0	3535	1551	1592	3325	0
Flt Permitted	0.950			0.950						0.148	0.554	
Satd. Flow (perm)	1743	3509	0	3241	0	1527	0	3535	1523	248	1869	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		3							325			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			277.3	
Travel Time (s)		14.7			23.9			10.3			20.0	
Confl. Peds. (#/hr)	4		17	17		4	14		5	5		14
Confl. Bikes (#/hr)												
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	1%	10%	5%	0%	3%	0%	1%	3%	2%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										47%		
Lane Group Flow (vph)	488	367	0	316	0	398	0	864	595	362	1042	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	9.5	34.0		9.5		11.0		28.8	28.8	9.5	36.8	
Total Split (s)	10.0	35.0		15.0		40.0		30.0	30.0	15.0	45.0	
Total Split (%)	10.5%	36.8%		15.8%		42.1%		31.6%	31.6%	15.8%	47.4%	
Maximum Green (s)	7.0	29.0		12.0		34.0		24.2	24.2	12.0	39.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	

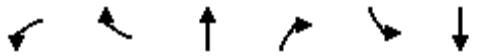
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes		Yes		Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	36.2	25.2		12.7		29.8		25.2	25.2	48.2	45.4	
Actuated g/C Ratio	0.38	0.27		0.13		0.31		0.27	0.27	0.51	0.48	
v/c Ratio	0.74	0.39		0.72		0.83		0.92	0.93	0.95	0.92	
Control Delay	30.1	28.9		49.4		45.2		50.5	38.2	61.1	38.0	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	30.1	28.9		49.4		45.2		50.5	38.2	61.1	38.0	
LOS	C	C		D		D		D	D	E	D	
Approach Delay		29.6			47.1			45.5			44.0	
Approach LOS		C			D			D			D	
Queue Length 50th (m)	67.7	29.8		30.4		69.4		85.3	55.8	58.9	83.0	
Queue Length 95th (m)	92.2	40.4		44.9		100.4		#122.9	#127.3	#140.3	#168.6	
Internal Link Dist (m)		180.4			308.2			119.1			253.3	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	663	1110		451		562		937	642	382	1127	
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	0.74	0.33		0.70		0.71		0.92	0.93	0.95	0.92	

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 56 (59%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 42.2 Intersection LOS: D
Intersection Capacity Utilization 90.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W





Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	81	29	177	87	45	241
Future Volume (vph)	81	29	177	87	45	241
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	87	31	190	94	48	259

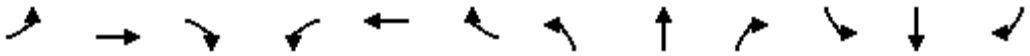
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	118	284	307
Volume Left (vph)	87	0	48
Volume Right (vph)	31	94	0
Hadj (s)	-0.01	-0.20	0.03
Departure Headway (s)	5.2	4.4	4.6
Degree Utilization, x	0.17	0.35	0.39
Capacity (veh/h)	623	792	758
Control Delay (s)	9.3	9.7	10.5
Approach Delay (s)	9.3	9.7	10.5
Approach LOS	A	A	B

Intersection Summary			
Delay	10.0		
Level of Service	A		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	8	0	355	8	0	136
Future Volume (Veh/h)	8	0	355	8	0	136
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	9	0	378	9	0	145
Pedestrians	9					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	536	392			396	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	536	392			396	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	505	657			1165	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	387	145
Volume Left	9	0	0
Volume Right	0	9	0
cSH	505	1700	1165
Volume to Capacity	0.02	0.23	0.00
Queue Length 95th (m)	0.4	0.0	0.0
Control Delay (s)	12.3	0.0	0.0
Lane LOS	B		
Approach Delay (s)	12.3	0.0	0.0
Approach LOS	B		

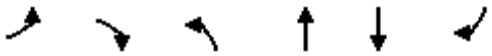
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	250	27	34	61	0	5	15	146	4	18	5
Future Volume (vph)	7	250	27	34	61	0	5	15	146	4	18	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	284	31	39	69	0	6	17	166	5	20	6

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	323	39	69	6	183	31
Volume Left (vph)	8	39	0	6	0	5
Volume Right (vph)	31	0	0	0	166	6
Hadj (s)	-0.05	0.55	0.10	0.50	-0.63	-0.08
Departure Headway (s)	5.2	6.0	5.5	6.2	5.0	5.9
Degree Utilization, x	0.47	0.06	0.11	0.01	0.26	0.05
Capacity (veh/h)	666	567	613	546	664	556
Control Delay (s)	12.6	8.2	8.0	8.0	8.6	9.2
Approach Delay (s)	12.6	8.1		8.6		9.2
Approach LOS	B	A		A		A

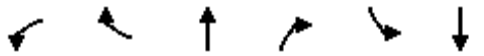
Intersection Summary				
Delay	10.5			
Level of Service	B			
Intersection Capacity Utilization	37.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	53	25	1199	591	184
Future Volume (Veh/h)	18	53	25	1199	591	184
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	19	56	27	1276	629	196
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					143	
pX, platoon unblocked						
vC, conflicting volume	1427	420	833			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1427	420	833			
tC, single (s)	6.9	7.0	4.3			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.3			
p0 queue free %	84	90	96			
cM capacity (veh/h)	116	570	753			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	19	56	452	851	419	406
Volume Left	19	0	27	0	0	0
Volume Right	0	56	0	0	0	196
cSH	116	570	753	1700	1700	1700
Volume to Capacity	0.16	0.10	0.04	0.50	0.25	0.24
Queue Length 95th (m)	4.5	2.6	0.9	0.0	0.0	0.0
Control Delay (s)	41.9	12.0	1.0	0.0	0.0	0.0
Lane LOS	E	B	A			
Approach Delay (s)	19.6		0.4		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	24	39	134	13	9	266
Future Volume (Veh/h)	24	39	134	13	9	266
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	42	146	14	10	289
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	462	153			160	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	462	153			160	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	95			99	
cM capacity (veh/h)	554	893			1419	

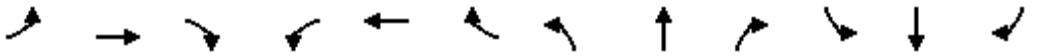
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	68	160	299
Volume Left	26	0	10
Volume Right	42	14	0
cSH	724	1700	1419
Volume to Capacity	0.09	0.09	0.01
Queue Length 95th (m)	2.5	0.0	0.2
Control Delay (s)	10.5	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	6.0
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	308	161	157	107
Demand Flow Rate, veh/h	308	161	157	107
Vehicles Circulating, veh/h	148	73	287	197
Vehicles Exiting, veh/h	156	371	169	37
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	10	0	6	0
Ped Cap Adj	0.999	1.000	0.999	1.000
Approach Delay, s/veh	7.0	4.8	6.1	5.0
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	308	161	157	107
Cap Entry Lane, veh/h	974	1050	848	928
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	308	161	157	107
Cap Entry, veh/h	973	1050	847	928
V/C Ratio	0.316	0.153	0.185	0.115
Control Delay, s/veh	7.0	4.8	6.1	5.0
LOS	A	A	A	A
95th %tile Queue, veh	1	1	1	0



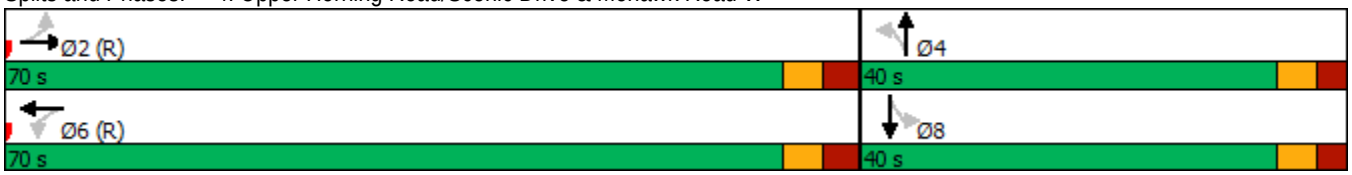
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	943	60	38	938	42	60	10	27	29	18	162
Future Volume (vph)	180	943	60	38	938	42	60	10	27	29	18	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	35.0		0.0	50.0		0.0	35.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	3499	0	1785	3458	0	1785	1655	0	1526	1589	0
Flt Permitted	0.235			0.228			0.449			0.730		
Satd. Flow (perm)	441	3499	0	428	3458	0	842	1655	0	1170	1589	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			7			30			105	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		377.4			794.6			245.0			973.4	
Travel Time (s)		27.2			57.2			22.1			70.1	
Confl. Peds. (#/hr)	4		5	5		4	3		2	2		3
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	0%	2%	14%	0%	0%	0%	17%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	198	1102	0	42	1077	0	66	41	0	32	198	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	20.0	20.0		10.0	10.0		20.0	20.0		10.0	10.0	
Minimum Split (s)	38.3	38.3		38.3	38.3		36.9	36.9		36.9	36.9	
Total Split (s)	70.0	70.0		70.0	70.0		40.0	40.0		40.0	40.0	
Total Split (%)	63.6%	63.6%		63.6%	63.6%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	63.7	63.7		63.7	63.7		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		4.9	4.9		4.9	4.9	

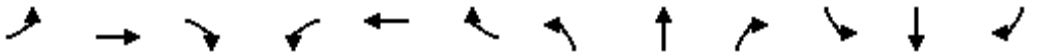
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	20.0	20.0		20.0	20.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	78.8	78.8		78.8	78.8		21.0	21.0		21.0	21.0	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.19	0.19		0.19	0.19	
v/c Ratio	0.63	0.44		0.14	0.43		0.41	0.12		0.14	0.51	
Control Delay	19.0	7.0		3.2	5.8		48.1	18.1		39.1	23.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.0	7.0		3.2	5.8		48.1	18.1		39.1	23.9	
LOS	B	A		A	A		D	B		D	C	
Approach Delay		8.9			5.7			36.6			26.0	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	20.2	47.0		2.7	68.4		13.2	2.1		6.1	18.2	
Queue Length 95th (m)	51.1	58.5		1.3	9.3		27.8	11.7		15.2	41.8	
Internal Link Dist (m)		353.4			770.6			221.0			949.4	
Turn Bay Length (m)	35.0			50.0			35.0			45.0		
Base Capacity (vph)	315	2509		306	2479		268	548		373	578	
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	0.63	0.44		0.14	0.43		0.25	0.07		0.09	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 83 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 10.1 Intersection LOS: B
Intersection Capacity Utilization 90.3% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 4: Upper Horning Road/Scenic Drive & Mohawk Road W





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	267	635	17	63	766	139	21	23	43	125	29	244
Future Volume (vph)	267	635	17	63	766	139	21	23	43	125	29	244
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	42.0		0.0	30.0		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1767	3511	0	1733	3434	0	1700	1677	0	1716	1547	0
Flt Permitted	0.251			0.396			0.227			0.713		
Satd. Flow (perm)	466	3511	0	715	3434	0	405	1677	0	1281	1547	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			23			44			252	
Link Speed (k/h)		50			50			40			50	
Link Distance (m)		209.7			766.0			141.5			404.3	
Travel Time (s)		15.1			55.2			12.7			29.1	
Confl. Peds. (#/hr)	9		14	14		9	5		6	6		5
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	6%	3%	1%	1%	5%	0%	0%	4%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	275	673	0	65	933	0	22	68	0	129	282	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)		3.5			3.5			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	35.1		35.1	35.1		37.9	37.9		37.9	37.9	
Total Split (s)	20.0	70.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	18.2%	63.6%		45.5%	45.5%		36.4%	36.4%		36.4%	36.4%	
Maximum Green (s)	17.0	63.9		43.9	43.9		34.1	34.1		34.1	34.1	
Yellow Time (s)	3.0	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.8		2.8	2.8		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	2.0	5.1		5.1	5.1		4.9	4.9		4.9	4.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)		12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)		17.0		17.0	17.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	85.5	82.4		68.1	68.1		17.6	17.6		17.6	17.6	
Actuated g/C Ratio	0.78	0.75		0.62	0.62		0.16	0.16		0.16	0.16	
v/c Ratio	0.54	0.26		0.15	0.44		0.34	0.22		0.63	0.61	
Control Delay	14.8	4.8		12.8	12.9		53.5	18.5		56.0	13.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.8	4.8		12.8	12.9		53.5	18.5		56.0	13.2	
LOS	B	A		B	B		D	B		E	B	
Approach Delay		7.7			12.9			27.1			26.6	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	18.0	19.8		5.5	50.0		4.5	4.7		27.6	5.9	
Queue Length 95th (m)	46.6	33.7		17.2	92.5		12.2	16.2		44.8	29.7	
Internal Link Dist (m)		185.7			742.0			117.5			380.3	
Turn Bay Length (m)	42.0			30.0			30.0			30.0		
Base Capacity (vph)	579	2630		442	2134		129	565		408	665	
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	0.47	0.26		0.15	0.44		0.17	0.12		0.32	0.42	

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 10 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 13.7		Intersection LOS: B	
Intersection Capacity Utilization 72.5%		ICU Level of Service C	
Analysis Period (min) 15			

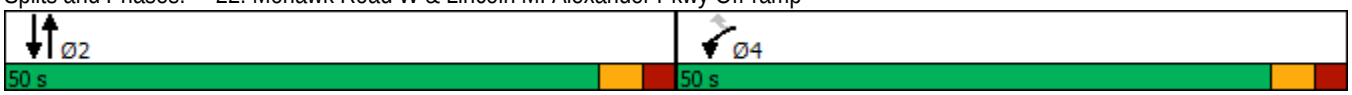
Splits and Phases: 9: Rice Avenue & Mohawk Road W

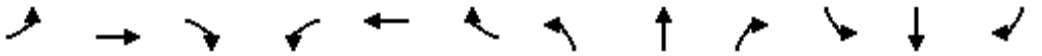
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	580	153	1358	0	0	962
Future Volume (vph)	580	153	1358	0	0	962
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	0.0	
Storage Lanes	2	1		0	0	
Taper Length (m)	7.5				7.5	
Satd. Flow (prot)	3463	1597	3570	0	0	3570
Flt Permitted	0.950					
Satd. Flow (perm)	3463	1597	3570	0	0	3570
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		17				
Link Speed (k/h)	50		50			50
Link Distance (m)	82.5		247.1			153.8
Travel Time (s)	5.9		17.8			11.1
Confl. Peds. (#/hr)				1	1	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	586	155	1372	0	0	972
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	7.0		0.0			0.0
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	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Detector Phase	4	4	2			2
Switch Phase						
Minimum Initial (s)	15.0	15.0	25.0			25.0
Minimum Split (s)	23.8	23.8	30.8			30.8
Total Split (s)	50.0	50.0	50.0			50.0
Total Split (%)	50.0%	50.0%	50.0%			50.0%
Maximum Green (s)	44.2	44.2	44.2			44.2
Yellow Time (s)	3.3	3.3	3.3			3.3
All-Red Time (s)	2.5	2.5	2.5			2.5
Lost Time Adjust (s)	-1.0	-1.0	-1.0			-1.0
Total Lost Time (s)	4.8	4.8	4.8			4.8

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Minimum Gap (s)	3.0	3.0	3.0			3.0
Time Before Reduce (s)	0.0	0.0	0.0			0.0
Time To Reduce (s)	0.0	0.0	0.0			0.0
Recall Mode	None	None	Max			Max
Walk Time (s)	0.0	0.0	7.0			7.0
Flash Dont Walk (s)	0.0	0.0	12.0			12.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	19.1	19.1	45.3			45.3
Actuated g/C Ratio	0.26	0.26	0.61			0.61
v/c Ratio	0.65	0.36	0.63			0.45
Control Delay	28.2	22.3	11.2			8.9
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	28.2	22.3	11.2			8.9
LOS	C	C	B			A
Approach Delay	27.0		11.2			8.9
Approach LOS	C		B			A
Queue Length 50th (m)	39.4	16.4	57.2			34.2
Queue Length 95th (m)	55.3	31.8	94.8			57.7
Internal Link Dist (m)	58.5		223.1			129.8
Turn Bay Length (m)						
Base Capacity (vph)	2117	983	2183			2183
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.28	0.16	0.63			0.45

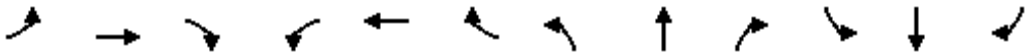
Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 74			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 14.3		Intersection LOS: B	
Intersection Capacity Utilization 62.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 22: Mohawk Road W & Lincoln M. Alexander Pkwy Off-ramp





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	170	6	811	0	521	0	384	268	365	1557	0
Future Volume (vph)	106	170	6	811	0	521	0	384	268	365	1557	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	100.0		0.0	0.0		60.0	30.0		0.0
Storage Lanes	1		0	2		1	0		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	3446	0	3395	0	1536	0	3535	1507	1562	3380	0
Flt Permitted	0.950			0.950						0.410	0.937	
Satd. Flow (perm)	1615	3446	0	3203	0	1495	0	3535	1434	664	3169	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		2							271			
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		204.4			332.2			143.1			262.0	
Travel Time (s)		14.7			23.9			10.3			18.9	
Confl. Peds. (#/hr)	20		27	27		20	35		19	19		35
Confl. Bikes (#/hr)												
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	3%	0%	2%	0%	4%	0%	1%	6%	4%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	107	178	0	819	0	526	0	388	271	332	1610	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)		7.0			7.0			3.5			3.5	
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	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		Prot		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4					8			2	6		
Detector Phase	7	4		3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0		5.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	8.0	34.0		9.5		11.0		28.8	28.8	8.0	36.8	
Total Split (s)	8.0	34.0		40.0		66.0		30.0	30.0	46.0	76.0	
Total Split (%)	5.3%	22.7%		26.7%		44.0%		20.0%	20.0%	30.7%	50.7%	
Maximum Green (s)	5.0	28.0		37.0		60.0		24.2	24.2	43.0	70.2	
Yellow Time (s)	3.0	3.3		3.0		3.3		3.3	3.3	3.0	3.3	
All-Red Time (s)	0.0	2.7		0.0		2.7		2.5	2.5	0.0	2.5	
Lost Time Adjust (s)	-1.0	-1.0		-1.0		-1.0		-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.0		2.0		5.0		4.8	4.8	2.0	4.8	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag	Lead	Lag		Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	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	
Minimum Gap (s)	3.0	3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Recall Mode	None	None		None		None		C-Max	C-Max	None	C-Max	
Walk Time (s)		7.0						7.0	7.0		15.0	
Flash Dont Walk (s)		21.0						16.0	16.0		16.0	
Pedestrian Calls (#/hr)		0						0	0		0	
Act Effct Green (s)	34.1	25.1		37.8		56.9		46.6	46.6	78.1	75.3	
Actuated g/C Ratio	0.23	0.17		0.25		0.38		0.31	0.31	0.52	0.50	
v/c Ratio	0.29	0.31		0.96		0.93		0.35	0.43	0.66	0.99	
Control Delay	32.0	54.6		76.9		68.1		43.9	7.3	29.8	56.9	
Queue Delay	0.0	0.0		0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	32.0	54.6		76.9		68.1		43.9	7.3	29.8	56.9	
LOS	C	D		E		E		D	A	C	E	
Approach Delay		46.1			73.4			28.9			52.3	
Approach LOS		D			E			C			D	
Queue Length 50th (m)	18.6	25.1		131.1		151.3		51.3	0.0	71.2	~287.6	
Queue Length 95th (m)	30.5	37.0		#172.3		#218.1		74.8	26.2	101.7	#343.7	
Internal Link Dist (m)		180.4			308.2			119.1			238.0	
Turn Bay Length (m)	55.0			100.0					60.0	30.0		
Base Capacity (vph)	368	667		860		607		1099	632	608	1624	
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	0.29	0.27		0.95		0.87		0.35	0.43	0.55	0.99	

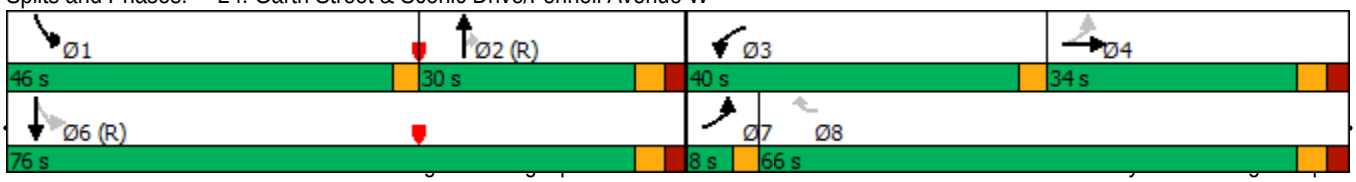
Intersection Summary

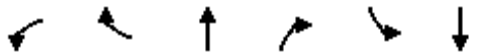
Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 56 (37%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 54.9 Intersection LOS: D
Intersection Capacity Utilization 118.1% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 24: Garth Street & Scenic Drive/Fennell Avenue W





Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	62	47	219	50	29	183
Future Volume (vph)	62	47	219	50	29	183
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	65	49	231	53	31	193

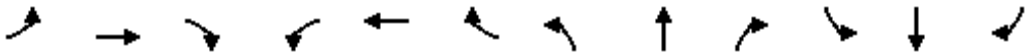
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	114	284	224
Volume Left (vph)	65	0	31
Volume Right (vph)	49	53	0
Hadj (s)	-0.14	-0.11	0.03
Departure Headway (s)	4.9	4.3	4.5
Degree Utilization, x	0.15	0.34	0.28
Capacity (veh/h)	669	802	761
Control Delay (s)	8.8	9.6	9.3
Approach Delay (s)	8.8	9.6	9.3
Approach LOS	A	A	A

Intersection Summary			
Delay	9.3		
Level of Service	A		
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	1	174	11	1	305
Future Volume (Veh/h)	4	1	174	11	1	305
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	1	196	12	1	343
Pedestrians	4					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	551	206			212	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	551	206			212	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	497	837			1366	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	208	344
Volume Left	4	0	1
Volume Right	1	12	0
cSH	541	1700	1366
Volume to Capacity	0.01	0.12	0.00
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	11.7	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	11.7	0.0	0.0
Approach LOS	B		

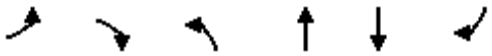
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	3	112	12	85	272	10	14	22	82	6	23	6
Future Volume (vph)	3	112	12	85	272	10	14	22	82	6	23	6
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	129	14	98	313	11	16	25	94	7	26	7

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	146	98	324	16	119	40
Volume Left (vph)	3	98	0	16	0	7
Volume Right (vph)	14	0	11	0	94	7
Hadj (s)	-0.05	0.50	-0.02	0.50	-0.55	-0.07
Departure Headway (s)	5.4	5.7	5.1	6.5	5.4	6.0
Degree Utilization, x	0.22	0.15	0.46	0.03	0.18	0.07
Capacity (veh/h)	626	613	682	514	609	538
Control Delay (s)	10.0	8.5	11.3	8.5	8.4	9.5
Approach Delay (s)	10.0	10.6		8.4		9.5
Approach LOS	A	B		A		A

Intersection Summary				
Delay	10.0			
Level of Service	B			
Intersection Capacity Utilization	39.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	59	52	742	1599	547
Future Volume (Veh/h)	13	59	52	742	1599	547
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	13	60	53	749	1615	553
Pedestrians	10			1		
Lane Width (m)	3.5			3.5		
Walking Speed (m/s)	1.2			1.2		
Percent Blockage	1			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					143	
pX, platoon unblocked	0.55	0.55	0.55			
vC, conflicting volume	2382	1095	2178			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1875	0	1504			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	53	90	78			
cM capacity (veh/h)	28	594	246			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	13	60	303	499	1077	1091
Volume Left	13	0	53	0	0	0
Volume Right	0	60	0	0	0	553
cSH	28	594	246	1700	1700	1700
Volume to Capacity	0.47	0.10	0.22	0.29	0.63	0.64
Queue Length 95th (m)	11.8	2.7	6.4	0.0	0.0	0.0
Control Delay (s)	219.9	11.7	9.1	0.0	0.0	0.0
Lane LOS	F	B	A			
Approach Delay (s)	48.8		3.4		0.0	
Approach LOS	E					

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	24	239	39	32	164
Future Volume (Veh/h)	16	24	239	39	32	164
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	26	260	42	35	178
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	529	281			302	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	529	281			302	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	97			97	
cM capacity (veh/h)	496	758			1259	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	43	302	213
Volume Left	17	0	35
Volume Right	26	42	0
cSH	627	1700	1259
Volume to Capacity	0.07	0.18	0.03
Queue Length 95th (m)	1.8	0.0	0.7
Control Delay (s)	11.2	0.0	1.5
Lane LOS	B		A
Approach Delay (s)	11.2	0.0	1.5
Approach LOS	B		

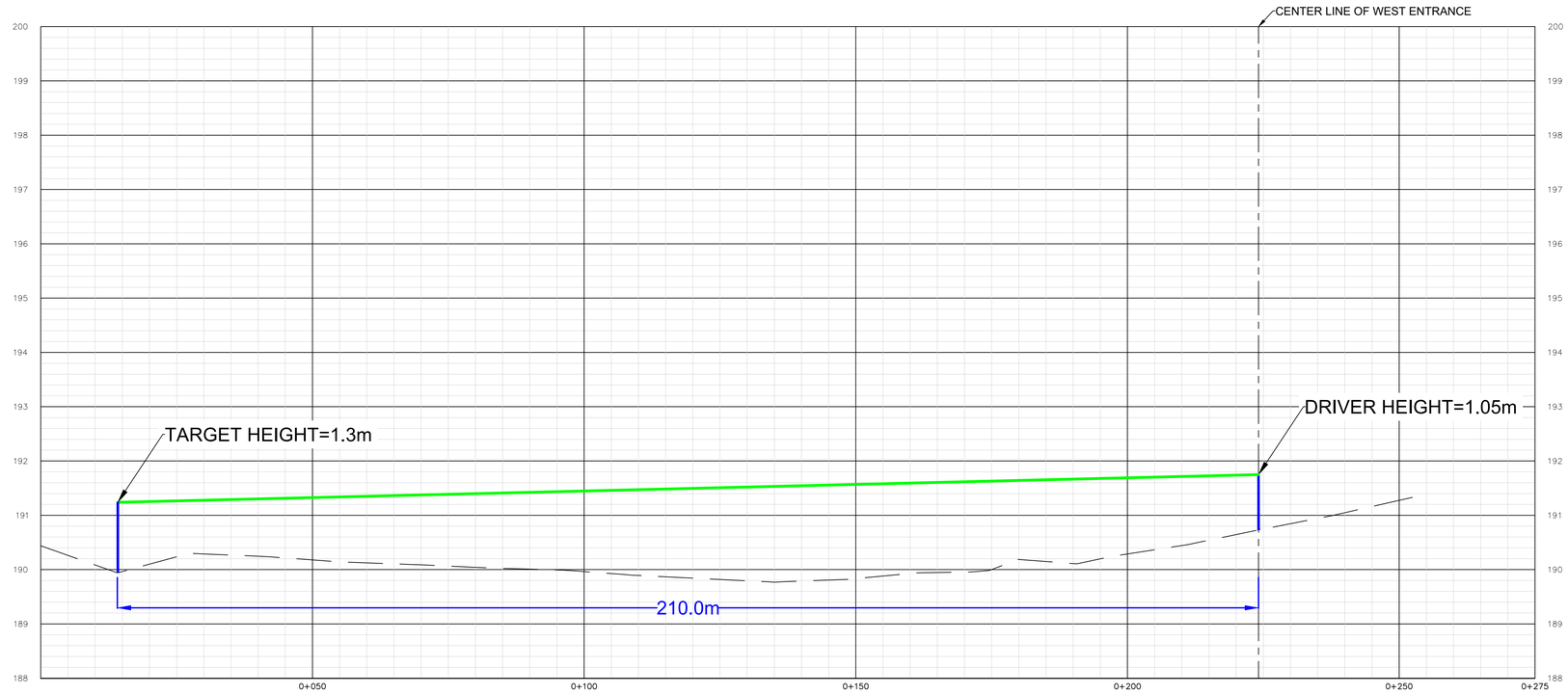
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Intersection Delay, s/veh	6.4
Intersection LOS	A

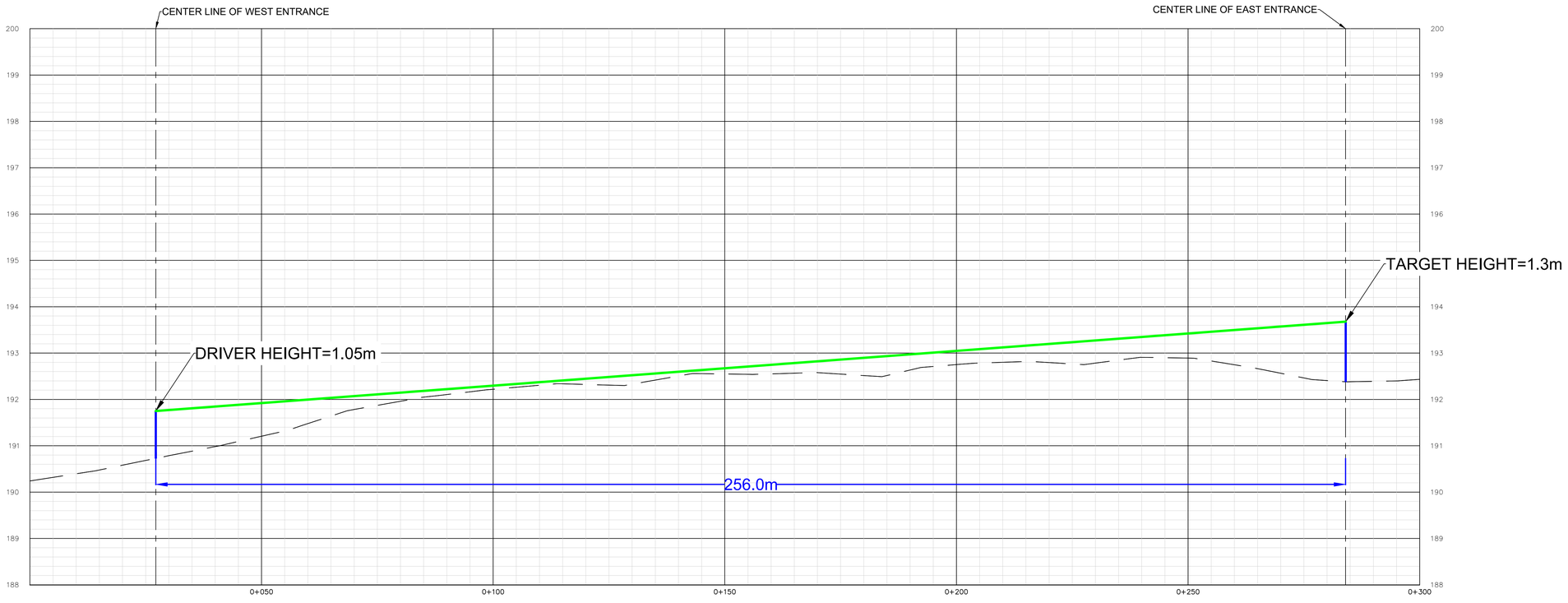
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	186	369	163	70
Demand Flow Rate, veh/h	186	369	163	70
Vehicles Circulating, veh/h	165	114	152	382
Vehicles Exiting, veh/h	287	201	199	101
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	5	1	6	0
Ped Cap Adj	0.999	1.000	0.999	1.000
Approach Delay, s/veh	5.6	7.4	5.3	5.6
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	186	369	163	70
Cap Entry Lane, veh/h	958	1008	971	771
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	186	369	163	70
Cap Entry, veh/h	957	1008	970	771
V/C Ratio	0.194	0.366	0.168	0.091
Control Delay, s/veh	5.6	7.4	5.3	5.6
LOS	A	A	A	A
95th %tile Queue, veh	1	2	1	0

Appendix G
Sight Line Analysis



EASTBOUND APPROACH FOR WEST ENTRANCE



WESTBOUND APPROACH FOR WEST ENTRANCE

KEY PLAN

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

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

LEGEND

No.	Revision	Date	By	Appr'd
4				
3				
2				
1				

BENCHMARK

CONSULTANT

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THE BROWLANDS
801, 820, 828, 885, 865 & 870 SCENIC DRIVE
CITY OF HAMILTON

WEST ENTRANCE ANALYSIS

Surveyed by:		Checked by: A.S.	Project No. NT-18-048
Drawn by: W.L.		Approved by: R.P.	Drawing No.
Designed by: A.S.		Date: July-2020	
Scale	Horizontal: 1:500 Vertical: 1:50		Sheet No. 1 OF 2