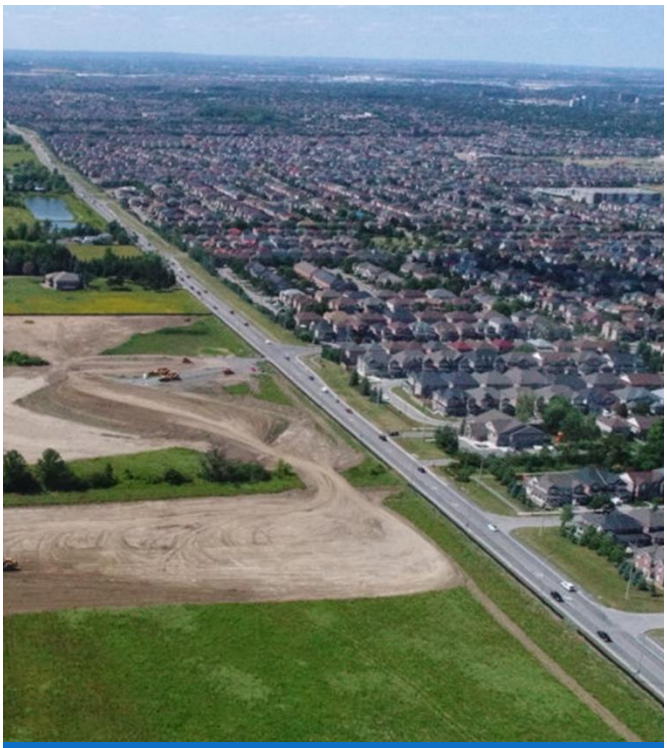

Traffic Analysis Report – Phase 3

Schedule ‘C’ Class Environmental Assessment for Ninth Line from Eglinton Avenue West to Derry Road West

City of Mississauga

June 15, 2021

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Disclaimer

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1 Introduction

To assess the transportation needs for all users on Ninth Line, the City of Mississauga retained HDR to undertake the Municipal Class Environmental Assessment (EA) study for Ninth Line Improvements between Eglinton Avenue and Derry Road West. The EA study is being completed in accordance with the planning and design process for Schedule 'C' projects as outlined in the Municipal Engineers Association (MEA), Municipal Class Environmental Assessment guidelines (October 2000, as amended in 2007, 2011, and 2015).

Ninth Line is a north-south arterial road in the City of Mississauga. The study area spans approximately 6.2 km from Eglinton Avenue West to Derry Road West and consists of a 2 lane semi-rural road cross-section with a centre-left-turn lane. Ninth Line is the eastern border of the Ninth Line Neighbourhood, which is the last remaining greenfield land in Mississauga, and is planned to be sustainable, transit-supportive, connected and distinct. Current and future Ninth Line residents will have access to a linked natural heritage system, multi-use trails, parks and open spaces. Higher-order transit, community amenities and a variety of housing choices and employment opportunities are also anticipated to realize this vision for the emerging neighbourhood.

This report documents the traffic analysis for the preferred scenario of widening Ninth Line from 2 to 4 lanes as recommended in Phase 2 of the study.

1.1 Scope of Work – Phase 3 Traffic Analysis

As part of Phase 1 and 2 of the EA study, HDR assessed and documented the existing traffic operations, road safety, multi-modal level-of-service, and the future travel demand (2031 and 2041). We also recommended improvements and measures to mitigate and solve existing issues and accommodate the future growth. Through discussion with the City and feedback from the public, the Preferred Alternative Solution is a combination of Alternatives 4 – Operational Improvements (including localized intersections), Alternative 5 – Multimodal Improvements (including improved streetscaping), and Alternative 6 – Widen from 2 Lanes to 4 Lanes.

To further investigate the Preferred Alternative Solution, Phase 3 Traffic Analysis developed the future turning movement volumes and assessed the Preferred Alternative Solution at the intersection level in terms of the signal warrants, traffic operations performance, and roundabout screening. It is noted that naming conventions for new access development roads follow the latest versions of the Traffic Impact Studies submitted for the developments. A multi-modal level-of-service analysis of the Preferred Alternative Solution is also included.

The Preferred Alternative Solution consists of a 4-lane widening scenario along Ninth Line between Derry Road and Eglinton Avenue. The proposed improvements also include provisions of continuous dedicated sidewalks and cycling tracks to accommodate both pedestrians and cyclists separately.

The study area corridor and intersections analyzed for each assessment are listed below and illustrated in **Exhibit 1-1**.

- Traffic operations analysis was conducted at the following intersections and future development accesses on Ninth Line within the study area and at the Highway 407 Ramps (along both Britannia Road and Derry Road):
    - Derry Road
    - Derry Road and Highway 407 West Ramp
    - Derry Road and Highway 407 East Ramp
    - Beacham Street
    - Street B North (from 6136-6588 Ninth Line)
    - Doug Leavens Boulevard / Street F (existing east leg, with additional west leg from 6136-6588 Ninth Line)
    - Street C (from 6136-6588 Ninth Line)
    - Foxwood Ave / Street B South (existing east leg, with additional west leg from 6136-6588 Ninth Line)
    - Osprey Boulevard / Street A
    - Britannia Road
    - Britannia Road and Highway 407 West Ramp
    - Britannia Road and Highway 407 East Ramp
    - McDowell Drive
    - Thomas Street
    - Tacc Drive
    - Erin Centre Boulevard
    - Site Access (new development access to 5150 Ninth Line)
    - Skyview Street Access (existing east leg, with additional west leg from 5080 Ninth Line)
    - Eglinton Avenue
- Signal warrant analysis was conducted at the following intersections on Ninth Line:
    - Beacham Street (existing unsignalized collector)
    - Street B North (new development access to 6136-6588 Ninth Line)
    - Street C (new development access to 6136-6588 Ninth Line)
    - Foxwood Ave / Street B South (existing unsignalized collector, with additional west leg to new development access for 6136-6588 Ninth Line)
    - McDowell Drive (existing unsignalized collector)
    - Tacc Drive (existing unsignalized collector)

- Site Access (new development access to 5150 Ninth Line)

Roundabout screening was conducted on all City intersections, which excluded regional roads Britannia Road and Derry Road. A Peel Region Roundabout Assessment method was used to analyze the following regional road intersections on Ninth Line:

- Derry Road
- Britannia Road

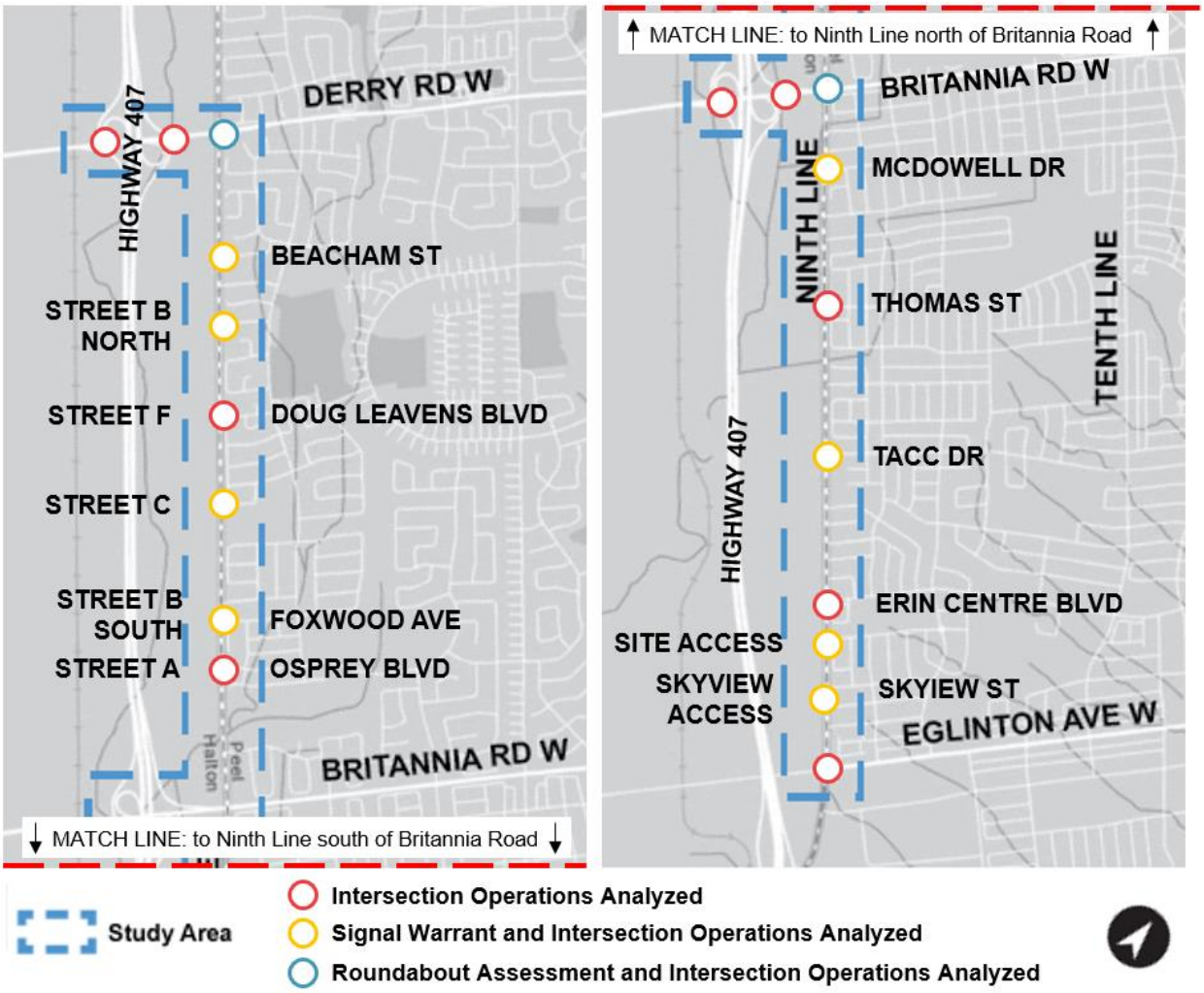


Exhibit 1-1: Study Area Corridor and Intersections

2 Future Intersection Turning Movement Volumes

2.1 Methodology and Assumptions

2.1.1 Review of the Travel Demand Modelling and Future Link Volumes

The City's EMME model volumes plots for 2019, 2031, and 2041 horizon years for the "no-widening" and "widening" scenario along Ninth Line were used to develop future link volumes, with population and employment inputs updated to reflect the future developments between Highway 407 and Ninth Line. The preferred widening scenario assumes a 4-lane cross-section along Ninth Line. The EMME road networks of 2019, 2031 and 2041 are provided in **Appendix A**.

To estimate future volumes, absolute volume growth at the link level were calculated using the EMME volume plots and added to the 2019 balanced volumes to reflect the corresponding future link volumes on Ninth Line. These volumes were used as the future link volumes input described for the "Furness" method in **Section 2.1.2**. The resulting auto volumes along Ninth Line for the widening scenario are shown in **Exhibit 2-1** and **Exhibit 2-2**, respectively.

In the AM Peak hour, as illustrated in **Exhibit 2-1**, the corridor will be below capacity, with the only exception at Eglinton Avenue where southbound volumes will reach capacity at 1,800 vehicles per hour.

In the PM Peak hour, as illustrated in **Exhibit 2-2**, the corridor will be below capacity, with the exception of the segment from Eglinton Avenue to south of Britannia Road. The forecast volumes on this segment will be at capacity. Forecast traffic volume could potentially be reduced with appropriate transportation demand management strategies and investment in active transportation and transit infrastructure.

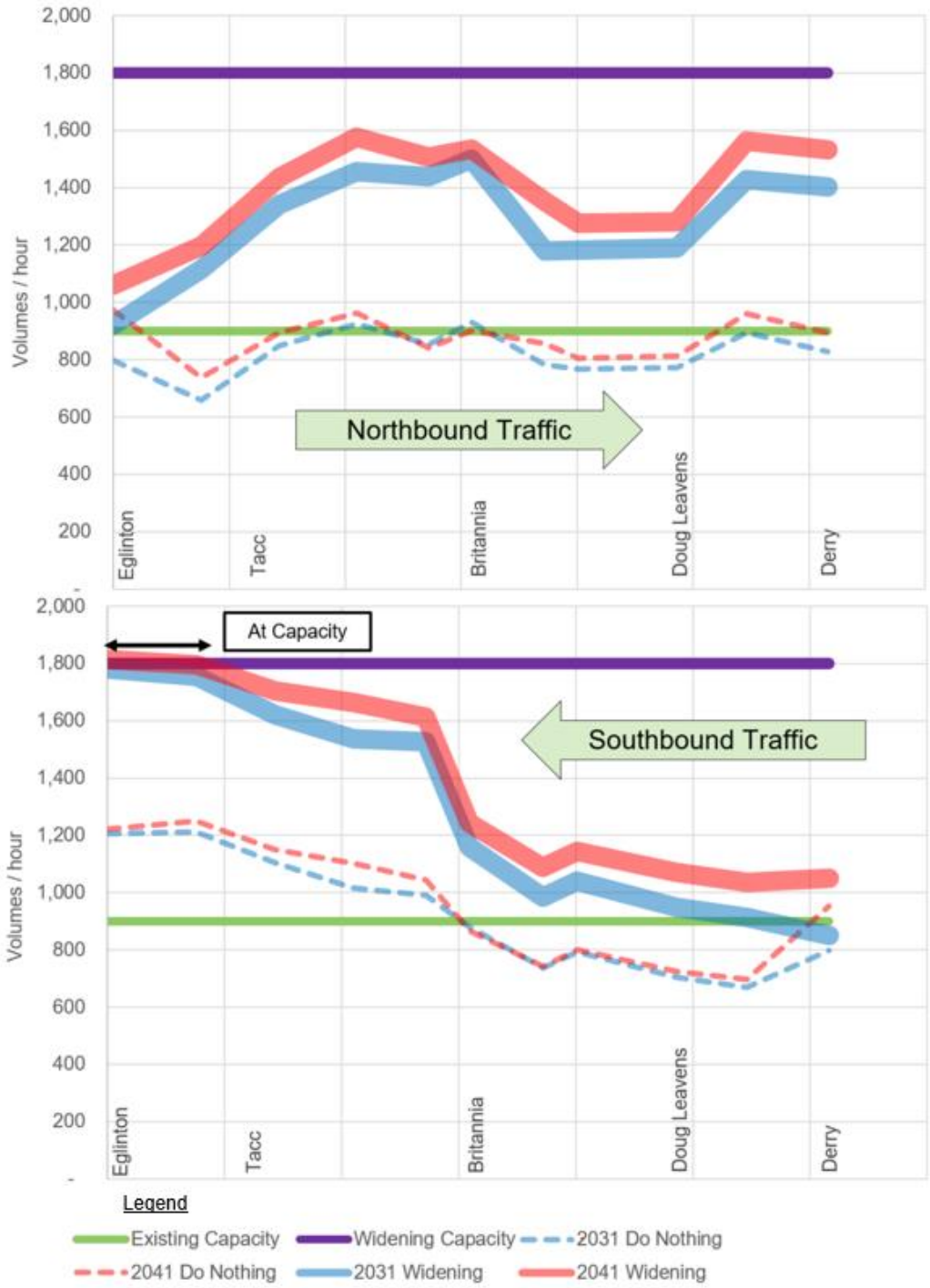


Exhibit 2-1. 2031 and 2041 Do-Nothing and Widening AM Peak Hour Volumes

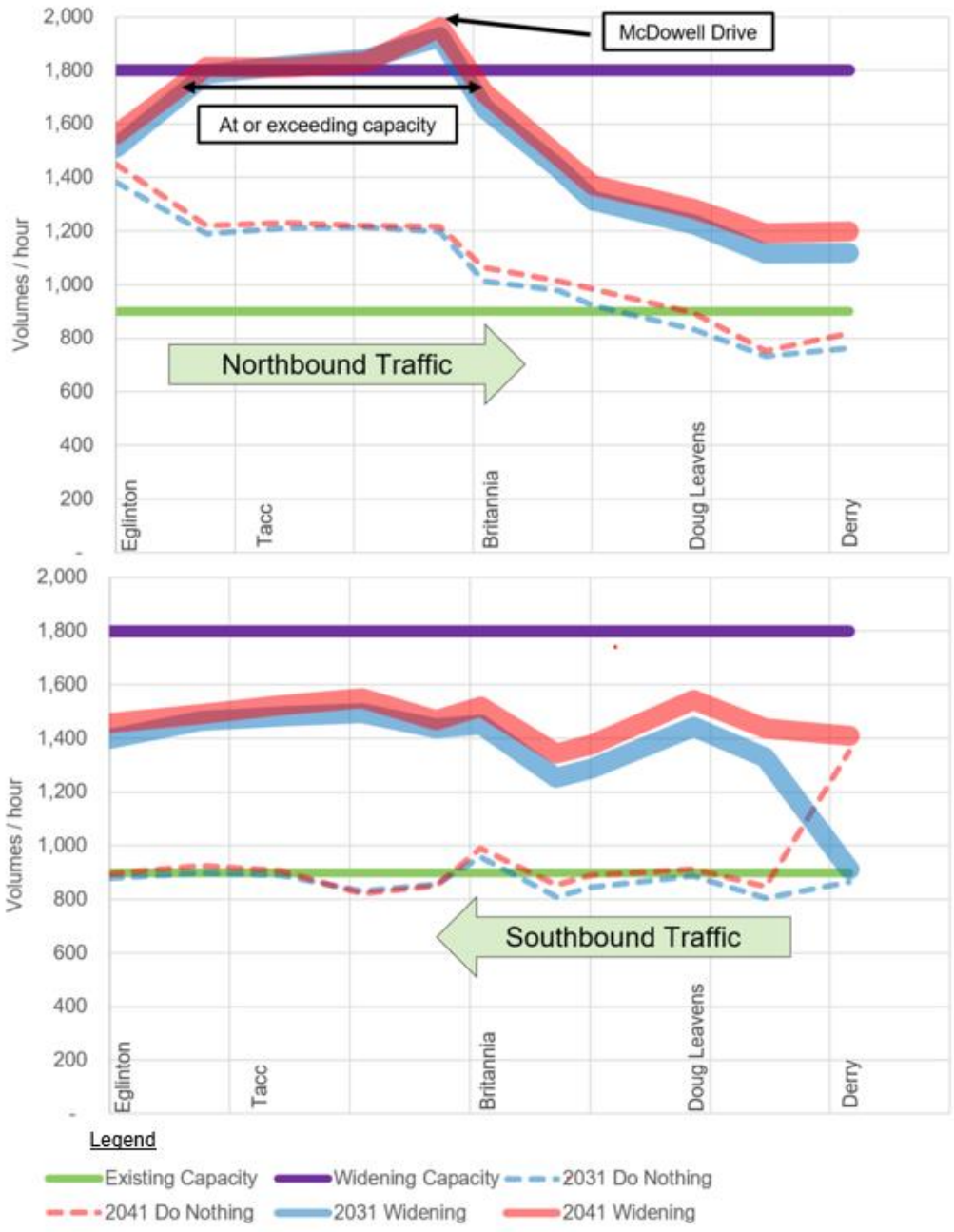


Exhibit 2-2. 2031 and 2041 Do-Nothing and Widening PM Peak Hour Volumes

2.1.2 Furness Existing Turning Movement Volumes to Future Link Volumes

The “Furness” methodology is a useful and reliable method to forecast trip origin-destinations in doubly constrained conditions. While typically applied during trip distribution in a 4-stage travel demand model, the same formula can be applied when forecasting turning movement volumes

based on existing volumes and future link volumes. The Furness approach accounts for existing turning movement patterns while growing link demand to match those projected by EMME, within an acceptable difference.

The Furness equations is as follows:

$$T_{ij} = t_{ij} \times a_i \times b_j$$

Where:

T_{ij}: Future (2031 and 2041) volumes between zones i and j

t_{ij}: Existing volumes between zones i and j

a_i: Balance factor for outbound volume from zone i

b_j: Balance factor for inbound volume to zone j

Here, four zones refer to the east, west, north, south legs of an intersection, and trips refer to turning movements assuming no intra-zonal trips i.e. U-turns. This methodology was applied using existing 2019 balanced counts and the future link volumes obtained from the process described in **Section 2.1.1**.

2.1.3 Further Adjustments/Refinement

The strength of Furness is that it takes into account the existing traffic patterns as well as future target link volumes. However, the Furness function would be hard to converge or result in reasonable turning movement volumes for intersections where future traffic patterns would be vastly different from existing patterns. Further adjustments were required to account for the changed patterns of the turning movement volumes predicted by the EMME model. Future turning volumes were further adjusted and refined for the following reasons:

- Better matching of furnessed volumes to target link volumes.
- Adjusting unjustified lower turning movements in future years to better match higher volumes from earlier years.
- Capping the high left turn and right turn volumes to 400 veh/h at Derry Road, Britannia Road, and Eglinton Avenue intersections.
- Matching existing travel patterns observed at Highway 407 ramp intersections.
- Incorporating side street-related volumes from previous Traffic Impact Studies conducted for developments along Ninth Line.

2.2 2031 and 2041 Turning Movement Volumes

The final turning movement volumes used in the analysis, based on the described methodology and refinements for 2031 and 2041 AM and PM peak hour volumes, are shown in **Appendix B**.

3 Signal Warrant Analysis

Signal warrant analyses are completed to determine whether intersections with existing unsignalized control remain sufficient for future operations. The signal warrant analysis in this section follows the methodology and warrants criteria outlined in the *Ontario Traffic Manual – Book 12 Traffic Signals, March 2012* (OTM Book 12). The analyses were conducted at all intersections with new approaches that serve new developments, in addition to existing collector road intersections. Recommendations from the signal warrant analysis were applied to the 2041 horizon. Intersections where signals are warranted were further assessed under 2031 conditions for phasing purposes. Intersections on Ninth Line that were assessed, from north to south, include:

- Beacham Street (existing unsignalized collector)
- Street B North (new development access to 6136-6588 Ninth Line)
- Street C (new development access to 6136-6588 Ninth Line)
- Foxwood Ave / Street B South (existing unsignalized collector, with additional west leg to new development access for 6136-6588 Ninth Line)
- McDowell Drive (existing unsignalized collector)
- Tacc Drive (existing unsignalized collector)
- Site Access (new development access to 5150 Ninth Line)
- Skyview Street / Street B (existing east leg, with additional west leg from 5080 Ninth Line)

The signal warrant analysis requires inputs including 8-hour turning movement counts and historical collision data. Future 8-hour turning volumes at intersections were developed based on the 2041 furnessed peak hour volumes (as described in **Section 2.2**), which were then proportioned for other hours based on existing 8-hour turning volumes provided by the City of Mississauga and Region of Peel. Collision history was provided by City of Mississauga and Region of Peel. At new locations or existing locations without existing 8-hour turning volumes, travel patterns from similar adjacent intersections were used as a proxy. Based on the criteria listed in OTM Book 12, the intersections at both Beacham Street and at Tacc Drive warrant signals based on Justification 4 – 4-hour Volumes for 2041. These intersections were also confirmed to require signalization by 2031 based on 2031 signal warrants. Full signal warrant details are provided in **Appendix C**.

The intersection of McDowell Drive did not meet the criteria for signals as per OTM Book 12; however, high delays for the westbound left turn movement are expected. The PM Peak Hour Synchro models indicate that approximately 100 veh/h experience 2 minutes and 3 minutes of delay under unsignalized conditions for 2031 and 2041 horizon years, respectively. The west leg of the McDowell Drive intersection is proposed as an access to the future Britannia 407 Transitway Station (beyond the 2041 horizon year) and is approximately 400 m from nearby signalized intersections at Britannia Road and at Thomas Street. In addition, McDowell Drive connects to a larger grid network spanning between Ninth Line to Winston Churchill Boulevard. Therefore, this

intersection is recommended to be signalized by 2041, and traffic operations should be monitored to gage the needs of signalization.

A summary of the signal warrant results and recommended phasing is shown in **Table 3-1**.

Table 3-1. Summary of Signal Warrant Results

Intersection	Signal Warranted by 2031?	Signal Warranted by 2041?	Justification
Beacham Street	Yes	Yes	4-Hour Volumes
Street B North	No	No	n/a
Street C	No	No	n/a
Foxwood Avenue / Street B South	No	No	n/a
McDowell Drive	No	Yes	High PM Delays
Tacc Drive	Yes	Yes	4-Hour Volumes
Site Access	No	No	n/a

In addition, the unsignalized intersections along Ninth Line at both Street 'C' and at Foxwood Avenue are also expected to have high delays for eastbound left turn movements (upwards of 2.5 minutes per vehicle) based on the Synchro results in least one of the peak periods. However, these intersections both have low eastbound left turn volumes (less than 50 veh/h) and vehicles can also access other collector roads with intersections that are signalized if needed, as shown in **Exhibit 3-1**. These intersections also do not connect to a larger grid network unlike McDowell Drive. As a result, these intersections are recommended to remain unsignalized.

It is noted the recommended signalization at Tacc Drive along with the newly installed signals at Burdette Terrace and Henrietta Way for the future Churchill Meadows Community Centre and Parks as of December 7th, 2020 introduces three consecutive signals in the segment. However, the Tacc Drive signal is justified from both the signal warrant analysis and 325 m spacing from Henrietta Way.

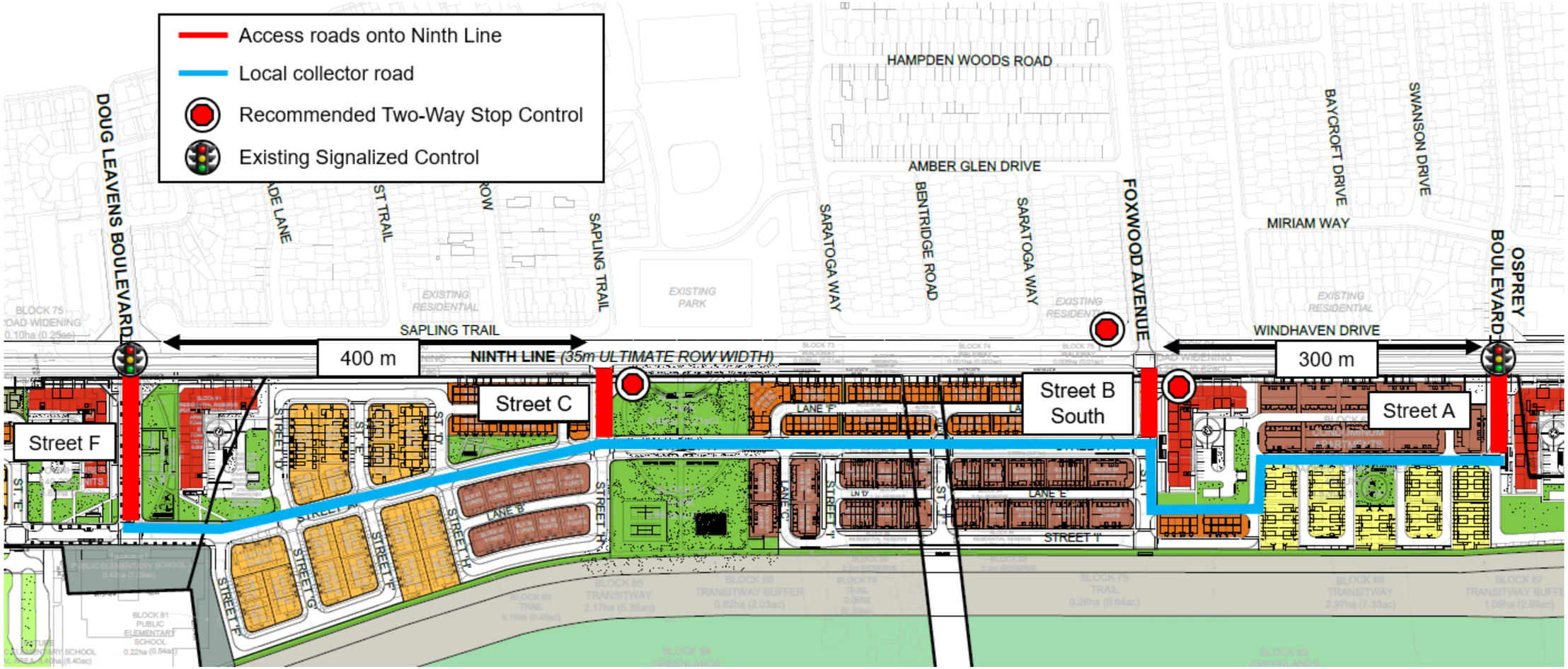


Exhibit 3-1. Ninth Line Access for 6136-6588 Ninth Line development

(Source: Draft Plan of Mattamy Homes 6136-6588 Ninth Line)

4 Traffic Operations Analysis

The traffic operations analysis was conducted using Synchro 10. Synchro can analyze both signalized and unsignalized intersections for single road corridors or road networks, considering the spacing, interaction, queues and operations between intersections.

Synchro models were developed for both 2031 and 2041 horizon years. The City of Mississauga model accounts for potential future developments along Ninth Line that contributes to future trip generation. The future number of lanes for roads within the study area are consistent with the future EMME plots provided by the City.

4.1 Methodology of Scenarios Assessed

To identify the need and justification for potential corridor improvements, three future scenarios were assessed. Each scenario includes additional exclusive turn lanes that may improve traffic operations; however, pedestrian crossing distances will also increase and impact walking and cycling modes. The preferred solution should be chosen based on factors that include available property and road comfort for vulnerable modes (cyclists and pedestrians). The three scenarios and associated assumptions are described below:

- **Scenario 1 (Base Case):** Widening of Ninth Line with shared through/right-turn lanes along Ninth Line. Side street lane configurations remain unchanged.
- **Scenario 2 (Minimum Improvements):** Scenario 1 PLUS critical dedicated right turn lanes for all approaches, including side streets. Engineering judgement was used to determine critical right turn lanes, but generally looked at very high v/c ratios (greater than 1.15 for shared through/right-turn lanes) and/or high turning volumes. Improvements prioritized north-south travel along Ninth Line.
- **Scenario 3 (Ultimate Improvements):** Scenario 2 PLUS additional improvements for all approaches, including side streets. Engineering judgement was used to determine these additional exclusive right-turn lanes, but generally looked at high v/c ratios (greater than 1.0 for shared through/right-turn lanes) and/or high turning volumes.

The general methodology used to assess improvements include:

- Update of clearance times to follow OTM Book 12 as indicated by the City of Mississauga's traffic signal timing standards.
- Addition of protected/permissive turning phases.
- Addition of turning movement storage lanes.
- Change of control type at unsignalized intersections, where justified (as identified for McDowell Drive in **Section 3**).
- Adjustment of cycle lengths at major intersections.

- Adjustment of cycle lengths at minor intersections and at Highway 407 ramps to provide signal coordination opportunities.

The future traffic operations for weekday AM and PM peak hours are summarized in **Sections 4.2** and **4.4** for all signalized and unsignalized intersections, respectively. The lane configuration and overall intersection level of service are presented. Through or shared through movements with v/c ratios of 0.85 or above and exclusive turning movements with v/c ratios of 1.0 or above are summarized. In addition, movements with LOS F and the corresponding delay are summarized. A summary of the methodology to assess intersection capacity and Level of Service can be found in **Appendix D**.

4.2 Mattamy Homes and Your Homes Development

Additional analysis for the segment of Ninth Line between Eglinton Avenue and Erin Centre Boulevard was conducted to address potential operational issues from the Mattamy Homes and Your Homes development within the area. The key concern was to investigate intersection spacing and any queuing impacts due to the closely spaced intersections. Based on a desktop review, analysis for the 2041 horizon was conducted to assess the best option for access to the Your Homes development through either Stardust Drive or Skyview Avenue. Volumes involving the developments access were provided by the City. The following options were assessed, with no changes to the other intersections between Eglinton Avenue and Erin Centre Boulevard:

- Case A: Signalized access at Your Homes development/Stardust Drive (assumed to be best case at Stardust Drive)
- Case B: Signalized access at Your Homes development/Skyview Street
- Case C: Two-way stop-control at Your Homes development/Skyview Street

Based on the analysis, Option B of a signalized access at Skyview Street is determined to be the best option to serve the Your Homes development and has been carried forward for the remainder of the traffic analysis. Option A requires northbound left storage lanes at Stardust Drive and southbound left storage lanes at Eglinton Avenue that exceed the link distance available. Option C results in high delays on the side streets at Skyview Street. Full results are provided in **Appendix E**.

4.3 2031 Traffic Operations Performance

The 2031 traffic operations were assessed for all scenarios. Significant operations deficiencies are anticipated at the major intersections crossing Ninth Line at Derry Road, Britannia Road and Eglinton Avenue. Improvements at each of the major intersections were included and assessed for each scenario. Other intersections have some critical movements but operate below capacity and requires no additional improvements beyond what is assumed in Scenario 1 Base Case. Full results are provided in **Appendix F**.

4.3.1 2031 Arterial Intersection Operations

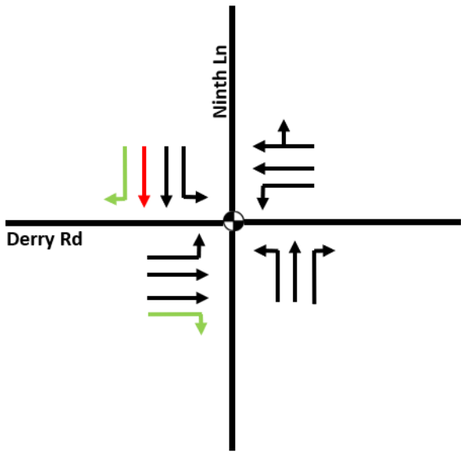
This section compares the intersection operations analyses of Ninth Line at major arterial intersections located at Derry Road, Britannia Road, and Eglinton Avenue for the 2031 horizon as shown in **Table 4-1**.

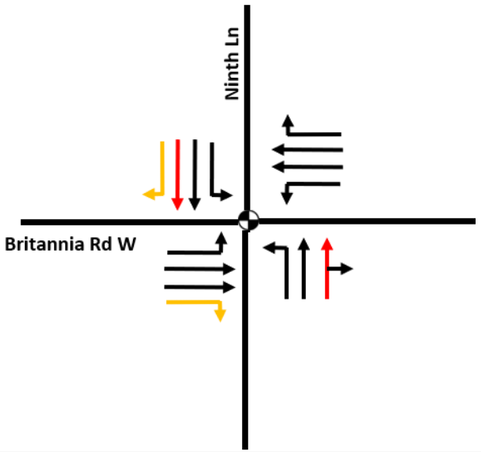
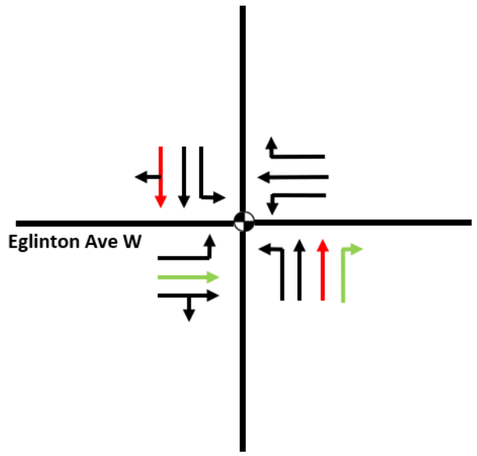
An additional eastbound lane (instead of an eastbound right turn lane) is proposed at Eglinton Avenue for Scenario 3 to match the existing two eastbound receiving lanes east of the intersection.

There are several critical movements under the 2031 conditions at all arterial intersections where improvements are needed under Scenario 1 and Scenario 3; however, no improvements are necessary at Derry Road and Eglinton Avenue based on Scenario 2 conditions and the definitions of the critical movements outlined in **Section 4.1**. Britannia Road has movements significantly exceeding capacity outlined in Scenario 1 and benefits from the southbound and eastbound right turn storage lanes in Scenario 2.

Travel demand measurements such as improving walking and cycling infrastructure and public transit should be considered to relieve some deficiencies at intersections.

Table 4-1. 2031 Intersection Operations Comparison for Arterial Cross Streets at Ninth Line

Intersection	Lane Configuration Schematic Lane Widening (Scenario 1) Scenario 2 Scenario 3	Scenario 1				Scenario 2				Scenario 3			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay
Derry Road and Ninth Line		E	EBTR F (1.10) WBL F (1.01) NBL F (1.18) SBTR F (1.01)	F	EBL F (1.21) EBTR D (0.89) WBL F (0.91) WBTR F (1.13) NBL F (1.18) NBT D (0.93) SBL F (0.98) SBTR E (0.95)	E	EBTR F (1.10) WBL F (1.01) NBL F (1.18) SBTR F (1.01)	F	EBL F (1.21) EBTR D (0.89) WBL F (0.91) WBTR F (1.13) NBL F (1.18) NBT D (0.93) SBL F (0.98) SBTR E (0.95)	E	EBT D (0.96) WBL F (1.01) NBL F (1.04)	F	EBL F (1.03) WBL F (0.91) WBTR F (1.11) NBL F (1.00) NBT D (0.99) SBL F (0.98)

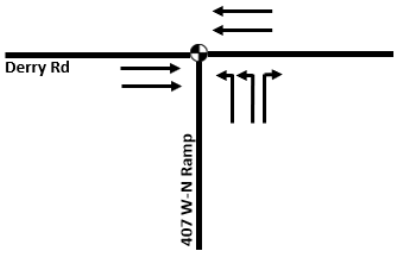
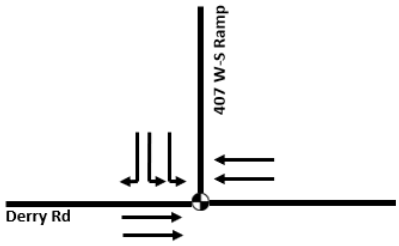
Intersection	Lane Configuration Schematic Lane Widening (Scenario 1) Scenario 2 Scenario 3	Scenario 1				Scenario 2				Scenario 3			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay
Britannia Road and Ninth Line		F	EBTR F (1.47) NBL F (1.53) SBTR E (0.94)	F	EBL F (1.37) EBTR E (1.00) WBL E (0.69) WBT F (1.22) NBL F (1.35) SBTR F (1.11)	E	EBT F (1.14) NBL F (1.27)	F	EBL F (1.29) WBT F (1.11) NBL F (1.25) SBT E (0.96) SBR E (0.48)	E	EBT F (1.14) NBL F (1.27)	F	EBL F (1.29) WBT F (1.11) NBL F (1.25) SBT E (0.96) SBR E (0.48)
Ninth Line and Eglinton Avenue		E	EBTR F (1.15) NBL F (0.62) NBTR E (0.96) SBL F (1.20)	F	EBL F (1.02) EBTR F (1.16) WBL F (0.96) WBT E (1.00) NBTR F (1.12) SBL F (1.18)	E	EBTR F (1.15) NBL F (0.62) NBTR E (0.96) SBL F (1.20)	F	EBL F (1.02) EBTR F (1.16) WBL F (0.96) WBT E (1.00) NBTR F (1.12) SBL F (1.18)	D	SBL D (0.89)	E	EBL F (1.02) WBT E (0.99) NBT E (1.00) SBL F (1.09)

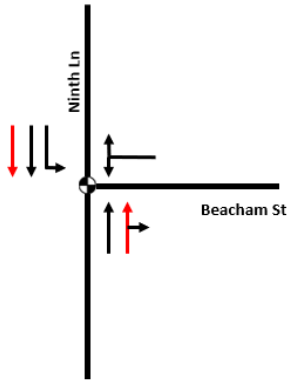
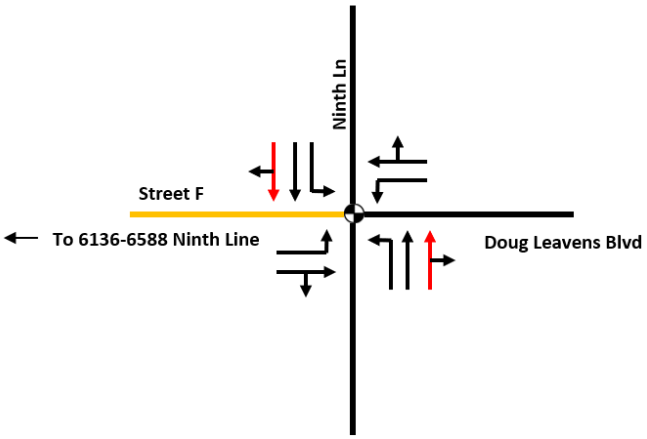
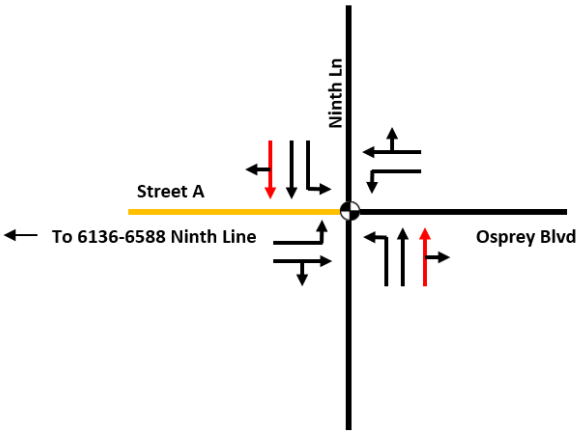
4.3.2 2031 Non-Arterial Intersections

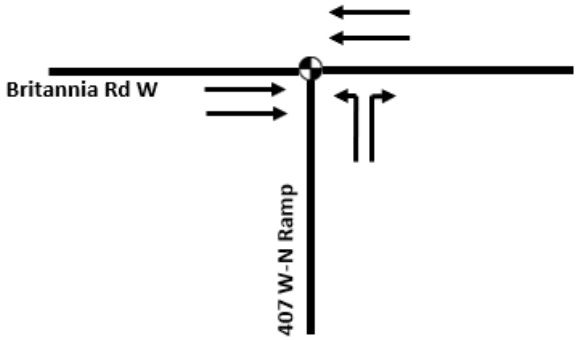
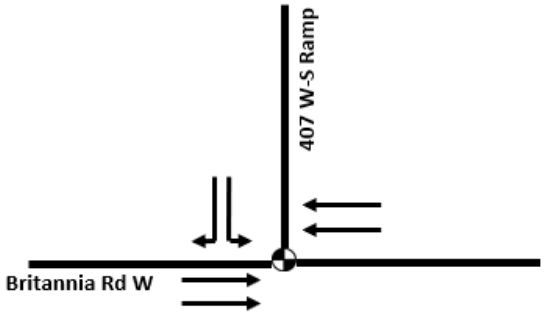
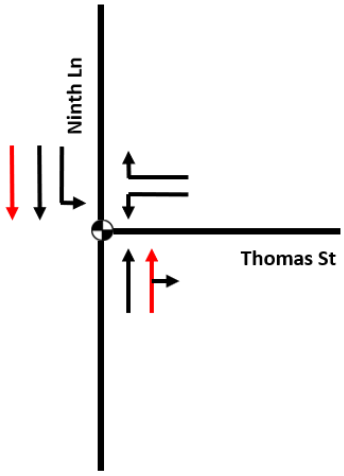
This section shows the intersection operations analysis of all other intersections on Ninth Line that are not major arterials (Derry Road, Britannia Road, and Eglinton Avenue). Generally, these intersections have few critical movements and have no capacity issues; thus, no additional improvements are required beyond what is assumed in Scenario 1 Base Case. Results across all scenarios are generally the same, with minor differences to accommodate cycle length changes at major intersections for coordination opportunities. The results for Scenario 1 Base Case are shown in **Table 4-2** and **Table 4-3** for signalized and unsignalized operations, respectively.

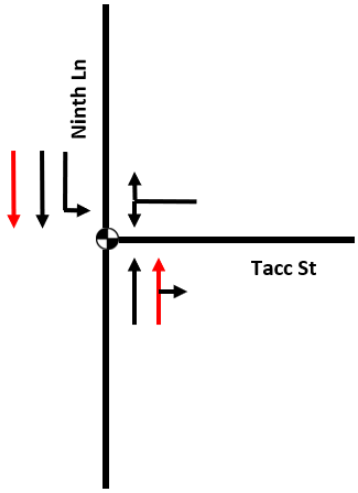
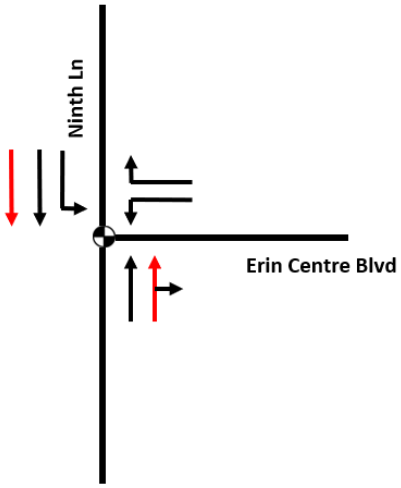
Under the 2031 conditions, the non-arterial intersections of the study area have some critical movements but operate below capacity.

Table 4-2. 2031 Future Signalized Intersection Lane Configurations and Level of Service for Non-Arterial Intersections (Scenario 1 Base Case)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Derry Road NB Off-ramp		B	NBR E (0.44)	C	WBT C (0.92) NBR E (0.85)
Derry Road SB Off-ramp		A	SBL E (0.39) SBR E (0.04)	B	SBL E (0.73) SBR E (0.72)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Beacham Street		A		A	
Doug Leavens Boulevard / Street F		B		A	
Osprey Boulevard / Street A		B		C	WBL D (0.89)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Britannia Road NB Off-ramp		B	NBL E (0.33) NBR E (0.71)	B	NBL E (0.65) NBR E (0.33)
Britannia Road SB Off-ramp		A	SBL E (0.54) SBR E (0.05)	B	WBT C (0.88)
Thomas Street		B		B	WBL E (0.75) WBR E (0.47) SBL E (0.83)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Tacc Street		A		A	
Erin Centre Boulevard		A		B	NBTR B (0.95)

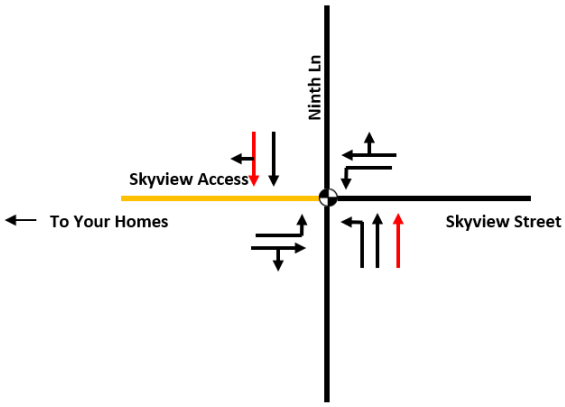
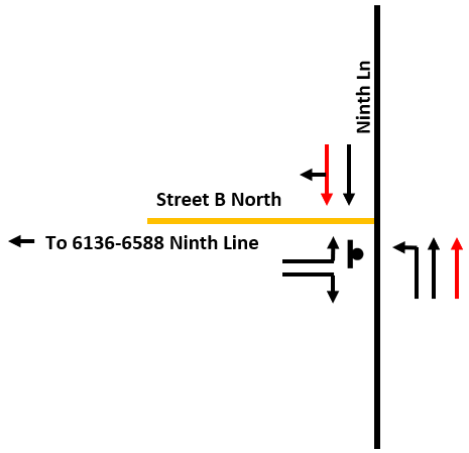
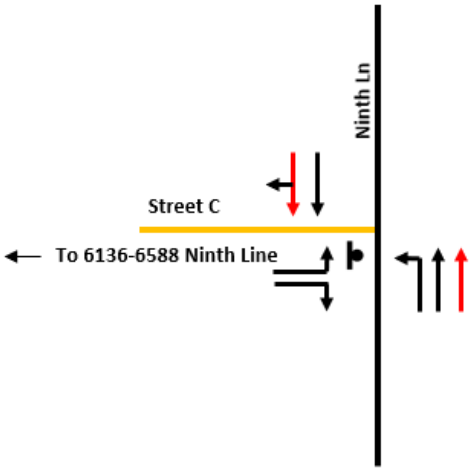
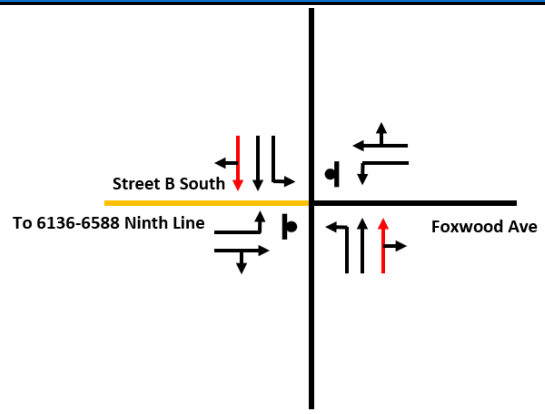
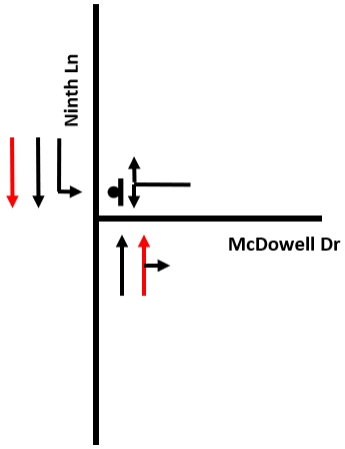
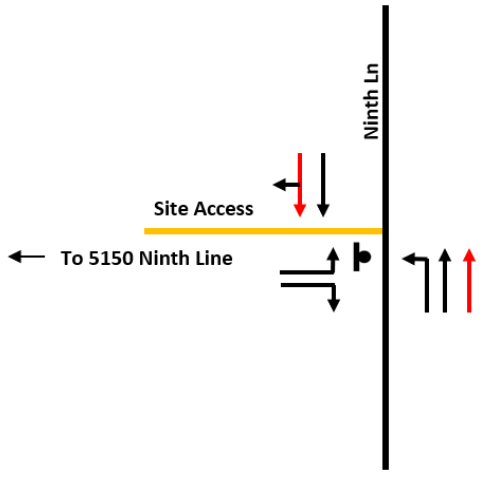
Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Skyview Street		B		B	

Table 4-3. 2031 Future Unsignalized Intersection Lane Configurations and Level of Service (Scenario 1 Base Case)

Intersection	Lane Configuration Schematic Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Street B North		A		A	
Street C		A	EBL F (0.44)	A	EBL F (0.45)

Intersection	Lane Configuration Schematic Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Foxwood Avenue / Street B South		A		A	EBL E (0.13)
McDowell Drive		A		A	WBLR F (0.93)
Site Access		A		A	

4.4 2041 Traffic Operations Performance

The 2041 traffic operations were assessed for all scenarios. Similar to the 2031 operations analyses, significant operation deficiencies are anticipated at the major intersections crossing Ninth Line at Derry Road, Britannia Road, and Eglinton Avenue in 2041. Improvements at each of the above intersections for each scenario were included and assessed. Non-arterial intersections have some critical movements but operate below capacity and thus no improvements are required beyond what is assumed in Scenario 1 Base Case. Full results are provided in **Appendix G**.

Ninth Line north of Derry Road is already planned to be widened to four lanes by 2041 (and after the 2031 horizon year) and the intersection will have corresponding approach lanes to reflect the future receiving lane configuration. Additionally, the intersection of Ninth Line and McDowell Drive is analyzed as a signalized intersection for the 2041 horizon year as discussed in **Section 3**.

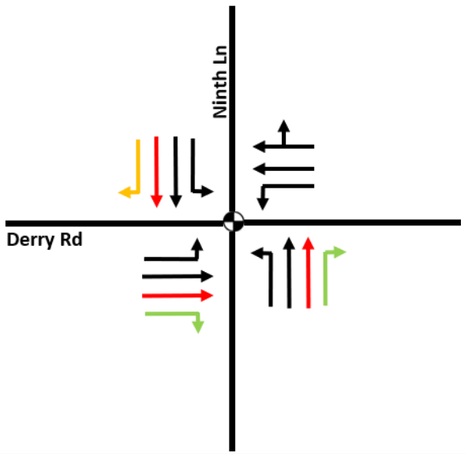
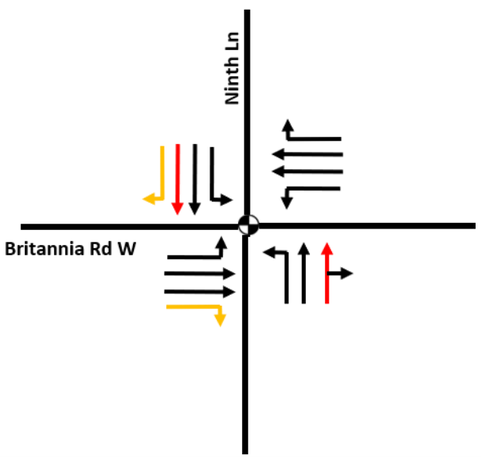
4.4.1 2041 Arterial Intersection Operations

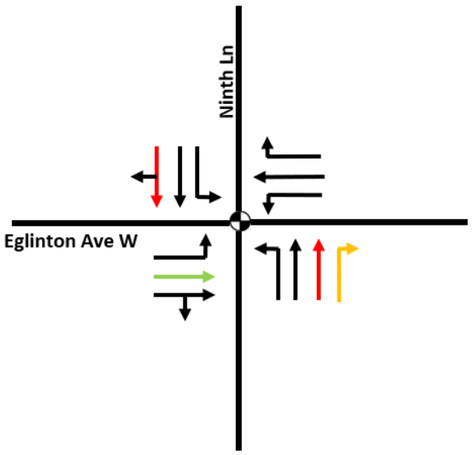
This section compares the intersection operations analysis of Ninth Line at major arterial intersections located at Derry Road, Britannia Road, and Eglinton Avenue for the 2041 horizon as shown in **Table 4-4**. An additional eastbound lane is proposed at Eglinton Avenue for Scenario 3 Ultimate Improvements to match the existing two eastbound receiving lanes east of the intersection.

There are several critical movements at all intersections across all scenarios analyzed. The widening of Ninth Line north of Derry Road and associated travel pattern changes require an additional southbound right-turn lane, which greatly improves operations as seen in Scenario 2. The Scenario 3 results at Derry Road indicate there is also improvement in operations with a northbound and eastbound right turn lane; however, the provision of a westbound right turn lane has very little benefit. The additional southbound and eastbound right turn lanes at Britannia Road and northbound right turn lane at Eglinton Avenue also improve operations in Scenario 2.

Travel demand management measures such as improving walking and cycling infrastructure and public transit should be considered to help relieve capacity deficiencies at intersections.

Table 4-4. 2041 Intersection Operations Comparison for Arterial Cross Streets at Ninth Line

Intersection	Lane Configuration Schematic Lane Widening (Scenario 1) Scenario 2 Scenario 3	Scenario 1				Scenario 2				Scenario 3			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay
Derry Road and Ninth Line		F	EBL F (1.29) EBTR F (1.11) WBL E (0.88) NBL F (1.38) SBTR F (1.17)	F	EBL F (1.32) WBTR F (1.32) NBL F (1.23) NBTR D (0.85) SBTR E (1.17)	E	EBTR F (1.08) WBL F (0.88) NBL F (1.10) SBL E (0.32) SBT F (0.96)	F	EBL F (1.18) WBTR F (1.20) NBL F (1.16) NBTR D (1.00) SBT F (0.97) SBR E (0.59)	E	EBL D (0.91) EBT E (0.98) WBL F (0.88) NBL F (1.03) SBT E (0.92)	F	EBL F (1.18) WBT F (1.17) NBL F (1.16) NBT E (0.86) SBT F (0.97) SBR E (0.59)
Britannia Road and Ninth Line		E	EBTR F (1.35) WBL E (0.76) NBL F (1.40) SBTR F (1.07)	F	EBL F (1.41) EBTR E (1.00) WBL E (0.70) WBT F (1.32) NBL F (1.47) SBTR F (1.11)	E	EBT F (1.07) WBL F (0.86) NBL F (1.17) SBT F (0.93)	F	EBL F (1.28) WBT F (1.15) NBL F (1.24) SBL E (0.69) SBT F (1.00) SBR E (0.53)	E	EBT F (1.07) WBL F (0.86) NBL F (1.17) SBT F (0.93)	F	EBL F (1.28) WBT F (1.15) NBL F (1.24) SBL E (0.69) SBT F (1.00) SBR E (0.53)

Intersection	Lane Configuration Schematic Lane Widening (Scenario 1) Scenario 2 Scenario 3	Scenario 1				Scenario 2				Scenario 3			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay	Overall LOS	Critical Movement v/c, LOS, and delay
Ninth Line and Eglinton Avenue		**E**	EBTR F (1.16) NBL F (0.82) NBTR F (1.08) SBL F (1.20)	**F**	EBL F (1.08) EBTR F (1.15) WBL F (1.07) WBT F (1.04) NBL E (0.81) NBTR F (1.18) SBL F (1.32)	**E**	EBTR F (1.15) NBL F (0.82) NBTR F (1.08) SBL F (1.20)	**F**	EBL F (1.08) EBTR F (1.15) WBL F (1.07) WBT F (1.04) NBL E (0.81) NBTR F (1.00) SBL F (1.32)	**D**	EBTR E (0.86) SBL F (0.92)	**E**	EBL F (1.08) WBL F (1.07) WBT F (1.07) NBT F (1.02) SBL F (1.17)

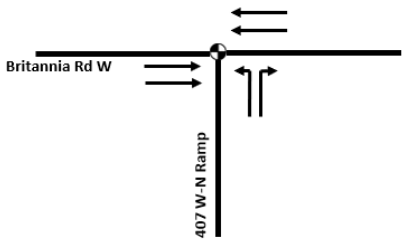
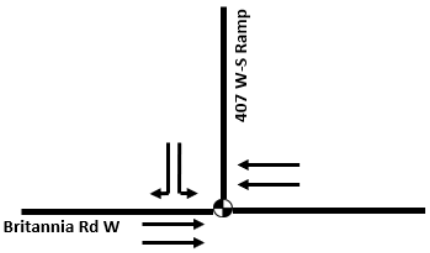
4.4.2 2041 Non-Arterial Intersections

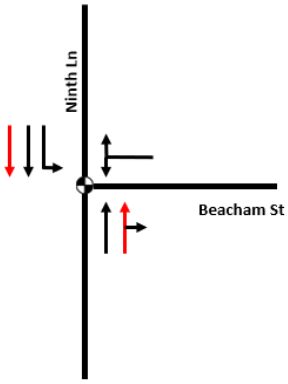
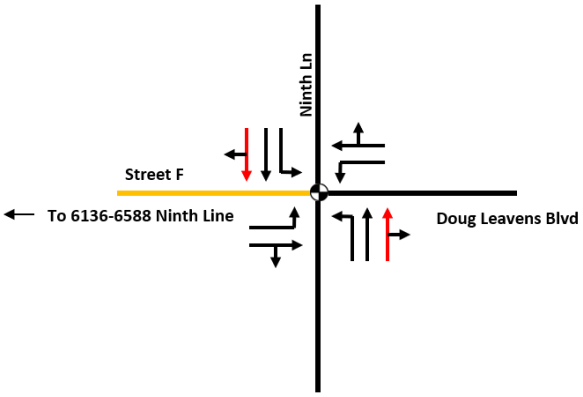
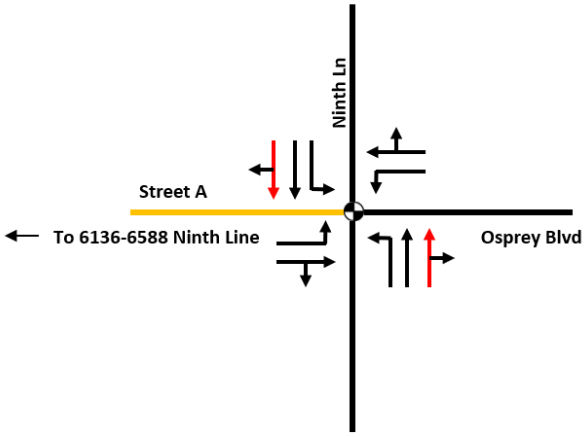
This section shows the intersection operations analysis of all other intersections that are not major arterials such as Derry Road, Britannia Road, and Eglinton Avenue. Generally, these intersections have few critical movements and have no capacity issues; thus, no additional improvements are needed from Scenario 1 Base Case. Results across all scenarios are generally the same, with minor differences to accommodate cycle length changes at major intersections for coordination opportunities. The results for Scenario 1 Base Case are shown in **Table 4-5** and **Table 4-6** for signalized and unsignalized operations, respectively.

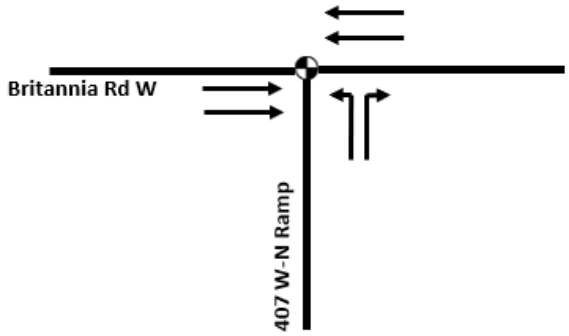
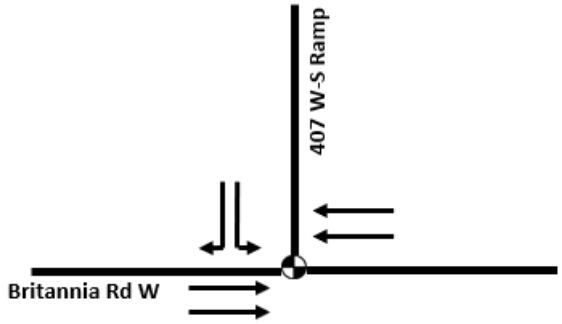
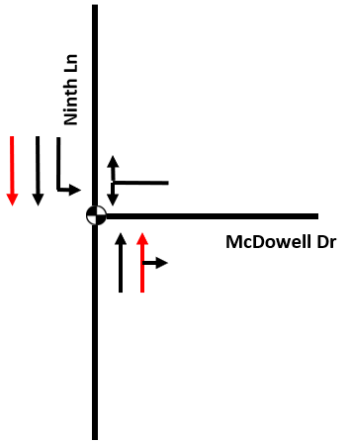
It is noted the intersection of Ninth Line and McDowell Drive has also been updated to a signalized intersection for the 2041 horizon year as noted in **Section 3**.

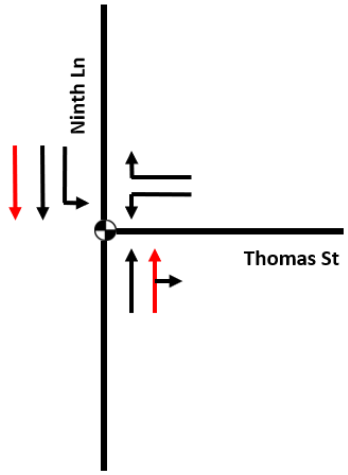
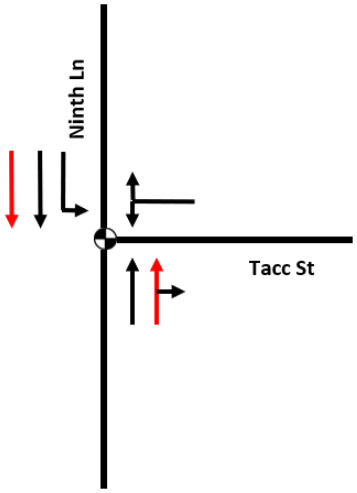
Under the 2041 conditions, the non-arterial intersections of the study area have some critical movements but operate below capacity.

Table 4-5. 2041 Future Signalized Intersection Lane Configurations and Level of Service (Scenario 1 Base Case)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Derry Road NB Off-ramp		B		D	WBT C (0.95) NBR F (0.99)
Derry Road SB Off-ramp		A	SBL E (0.36) SBR E (0.04)	C	SBL E (0.58) SBR E (0.80)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Beacham Street		A		A	
Doug Leavens Boulevard / Street F		C	NBTR B (0.88)	A	
Osprey Boulevard / Street A		B		B	WBL D (0.87)

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Britannia Road NB Off-ramp		B		B	
Britannia Road SB Off-ramp		A	SBL E (0.54) SBR E (0.05)	B	SBL E (0.45) SBR E (0.81)
McDowell Drive		A		A	

Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Thomas Street		C	NBTR D (0.96)	C	WBL E (0.76) WBR E (0.56) NBTR B (0.85) SBL E (0.88)
Tacc Street		A		A	

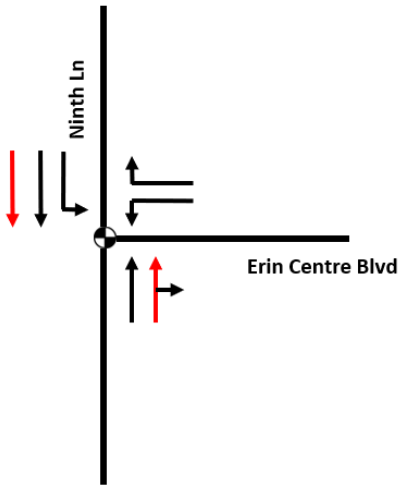
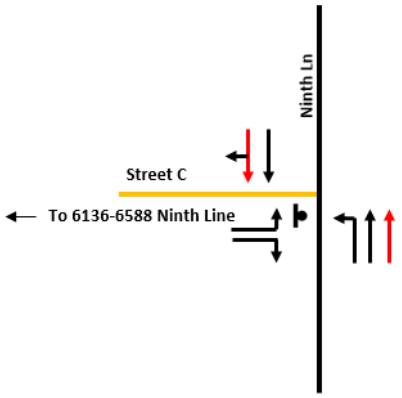
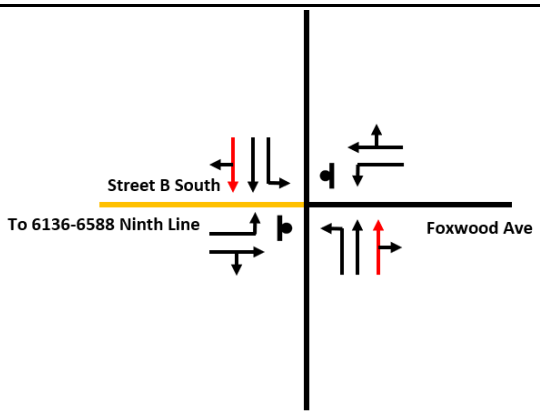
Intersection	Lane Configuration Schematic (Scenario 1) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Erin Centre Boulevard		A		B	NBTR C (0.95)

Table 4-6. 2041 Future Unsignalized Intersection Lane Configurations and Level of Service (Scenario 1 Base Case)

Intersection	Lane Configuration Schematic (Scenario) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Street B North		A		A	

Intersection	Lane Configuration Schematic (Scenario) Lane Widening New Approach	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Street C		A	EBL F (0.55)	A	EBL F (0.55)
Foxwood Avenue / Street B South		A		A	EBL E (0.15)
Site Access		A		A	

4.5 Preferred Alternative

Based on the traffic analysis results, physical constraints, and comments from both the City of Mississauga and Region of Peel, the preferred alternative is **Scenario 3 – Ultimate Improvements**. Lane configurations for the 2041 horizon for intersections analyzed as part of the Ninth Line EA are shown in **Table 4-7**. It is noted lane configurations and approaches for proposed developments are excluded as they are currently not approved.

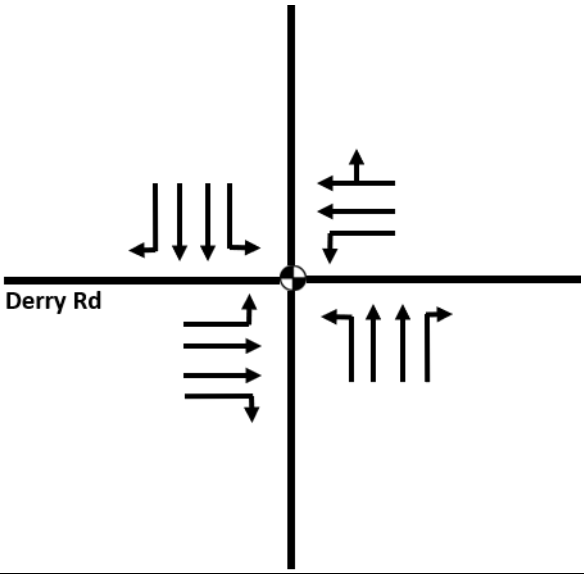
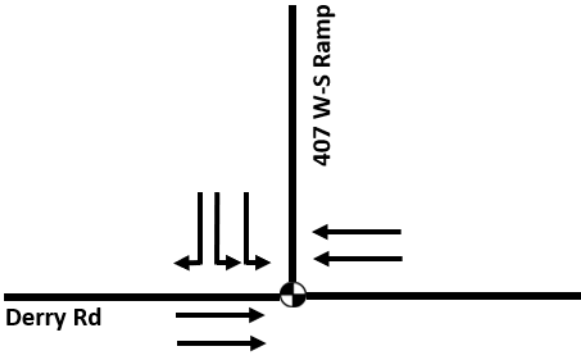
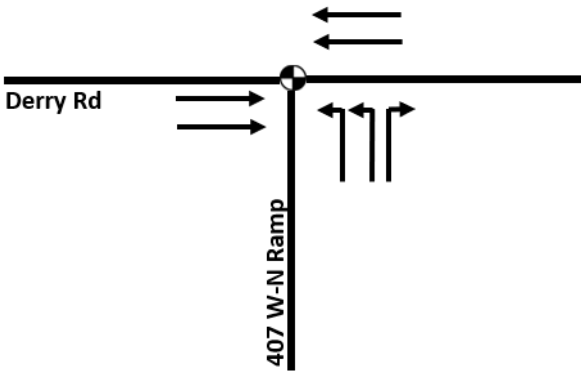
The queues for the preferred alternative are presented in **Table 4-5**. Critical locations along Ninth Line for the northbound and southbound directions where 95th percentile queues will exceed future storage provided are highlighted in red in the table. It is noted the preliminary design primarily addresses changes along Ninth Line only. Full intersection improvements including side streets intersecting Ninth Line will be confirmed during detailed design in coordination with the City of Mississauga. As a result, the eastbound and westbound queues on side streets were compared to existing storage lengths and length issues are highlighted in grey in the table. It is also noted 36 metres have been protected for the northbound left storage lane at the Skyview Street intersection; however, the length is subject to change since it is under development application.

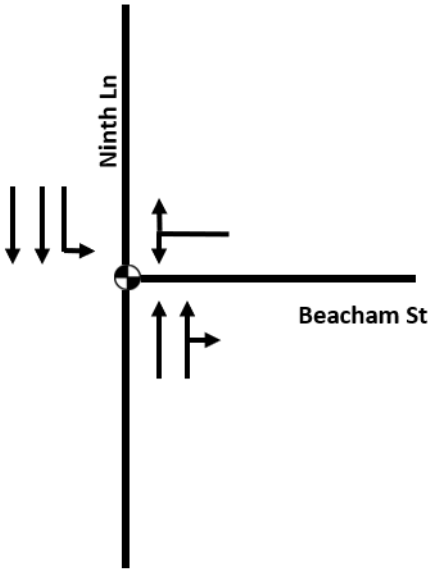
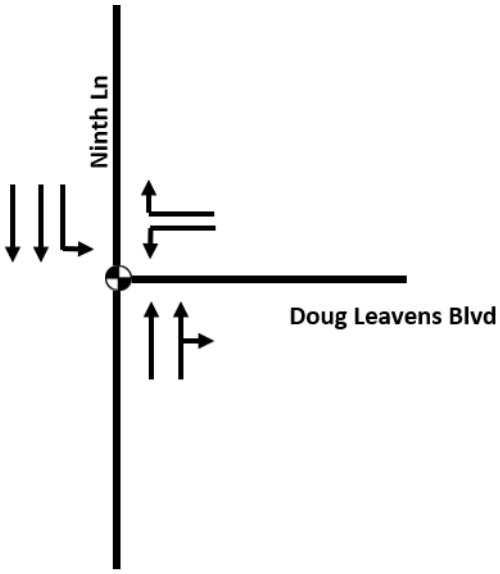
There is generally sufficient storage along the corridor, although there are localized congestion points that experience queuing issues during peak hours. The critical locations are summarized below:

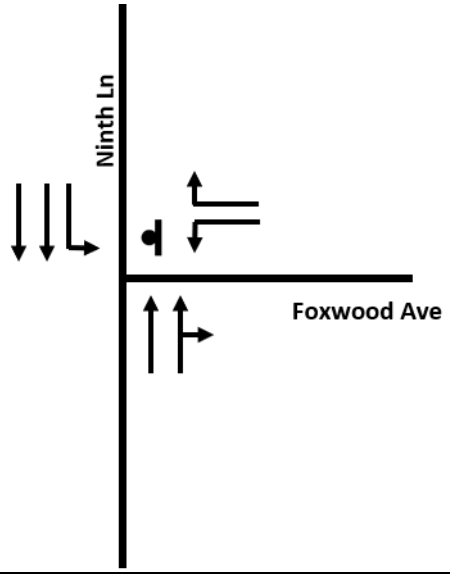
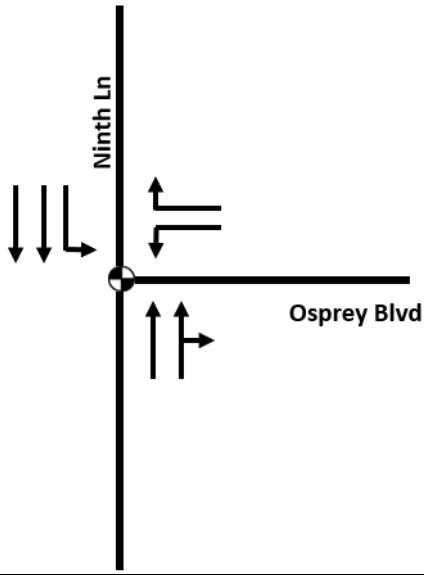
- Ninth Line at Skyview Street / Skyview Access
    - the southbound left queue during the AM peak hour is 41m while the protected storage length is 36m.
- Ninth Line at Eglinton Avenue
    - the southbound left queue during the AM and PM peak hours are 108m and 130m, respectively, while the storage is 90m

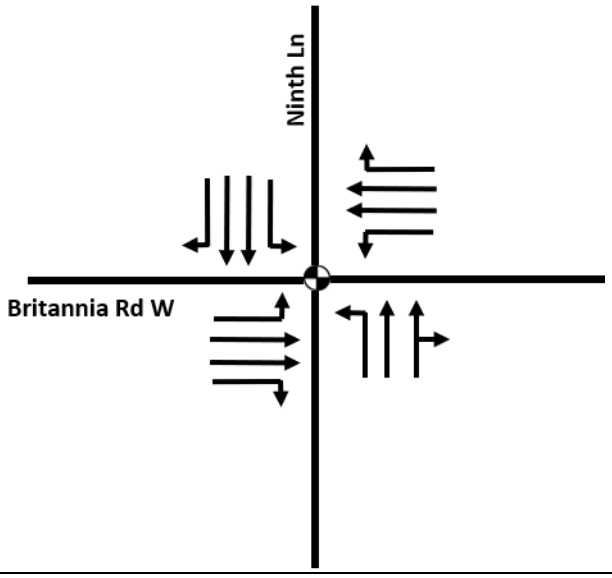
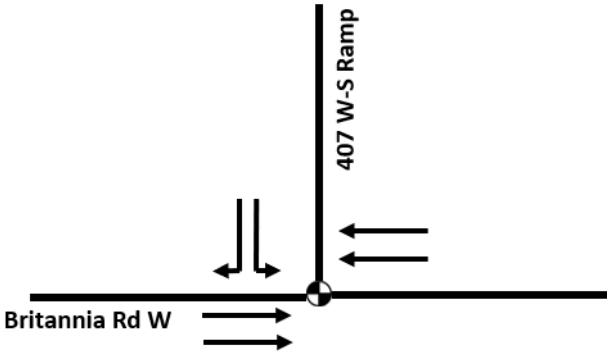
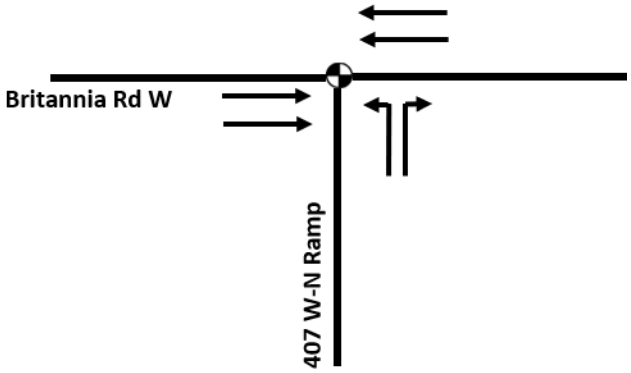
The storage lengths at these locations should be monitored to ensure adequate storage to accommodate queueing.

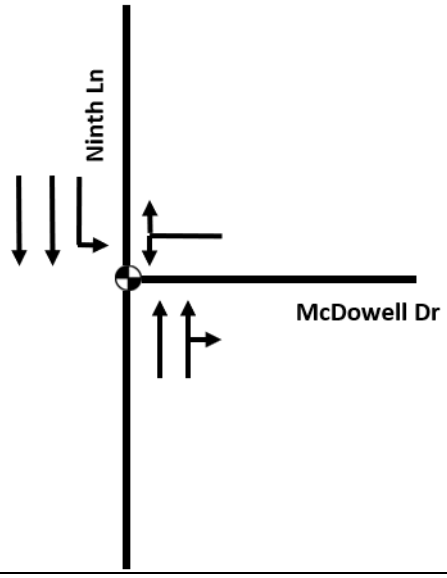
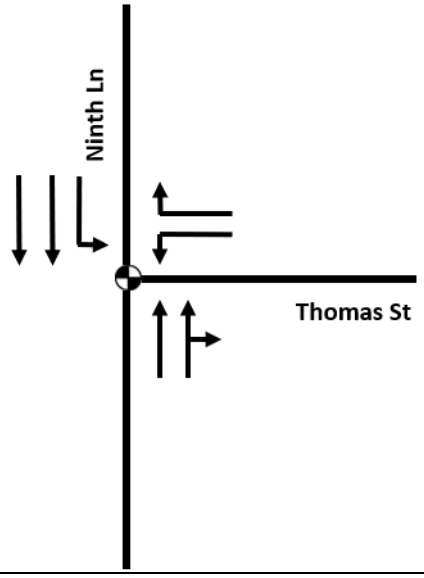
Table 4-7. Preferred Alternative Lane Configuration Schematics

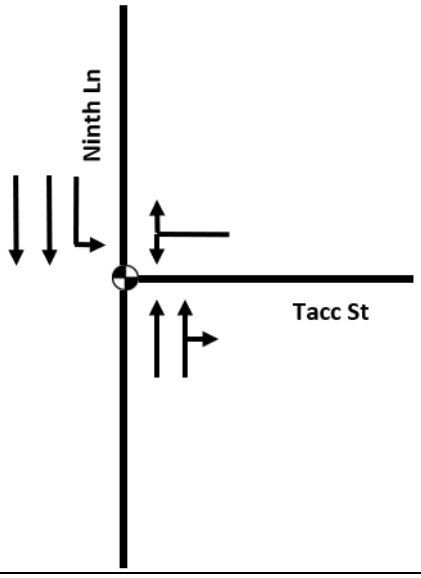
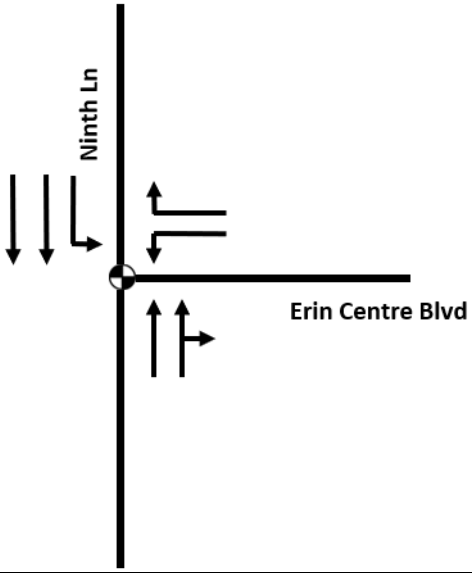
Intersection	Lane Configuration Schematic
Derry Road	
Highway 407 Southbound Off-Ramp / Derry Road	
Highway 407 Northbound Off-Ramp / Derry Road	

Intersection	Lane Configuration Schematic
Beacham Street	
Doug Leavens Boulevard	

Intersection	Lane Configuration Schematic
Foxwood Avenue	
Osprey Boulevard	

Intersection	Lane Configuration Schematic
Britannia Road	
Highway 407 Southbound Off-Ramp / Britannia Road	
Highway 407 Northbound Off-Ramp / Britannia Road	

Intersection	Lane Configuration Schematic
McDowell Drive	
Thomas Street	

Intersection	Lane Configuration Schematic
Tacc Drive	
Erin Centre Boulevard	

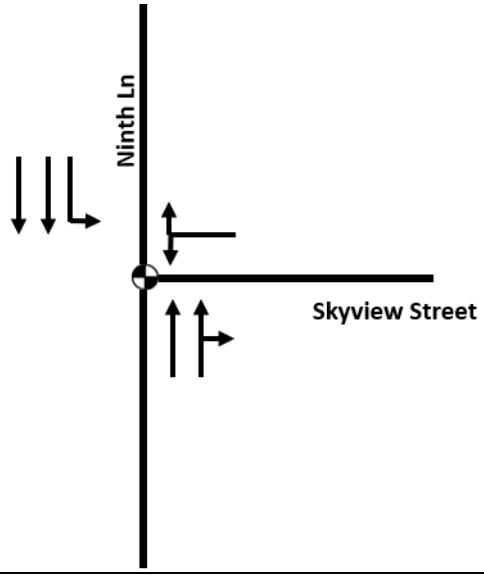
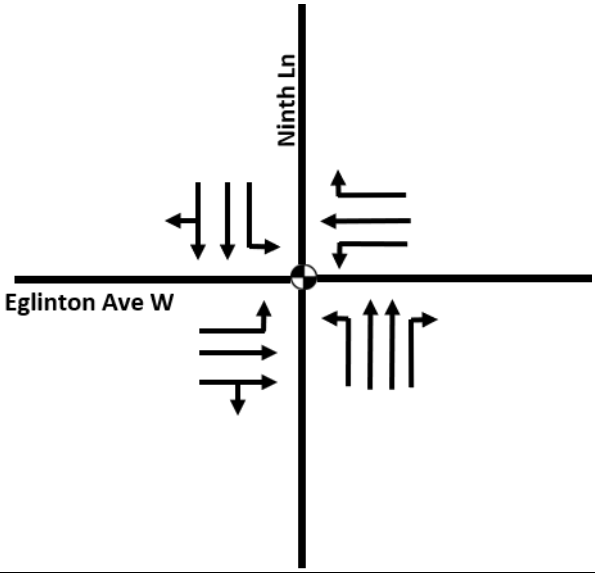
Intersection	Lane Configuration Schematic
Skyview Street / Skyview Access	
Eglinton Avenue	

Table 4-8. 2041 AM and PM Peak Hour 95th Percentile Queues

2041 AM Peak Hour - Preferred Alternative

Intersection	95th Percentile Queues															
	EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue
Derry Road	75	110.3	45	34.5	80	51.1	-	0	155	154.4	41	40.2	20	13	76	29.9
Beacham Street	-	-	-	-	-	35	-	-	-	-	-	-	45	14.9	-	-
Street B North	-	-	-	-	-	-	-	-	15	0.1	-	-	-	-	-	-
Doug Leavens Boulevard / Street F	-	32.3	-	-	25	22.4	-	-	20	1.6	-	-	41	23.7	-	-
Street C	-	-	-	-	-	-	-	-	15	0.3	-	-	-	-	-	-
Foxwood Avenue / Street B South	15	4	-	-	15	5.6	-	-	15	0.4	-	-	15	0.05	-	-
Osprey Boulevard / Street A	-	17.3	-	-	10	42.5	-	-	15	3.4	-	-	35	7	-	-
Britannia Road	80	61.3	60	69.8	70	40.7	70	4	189	160.8	-	0	25	18.1	67	20.2
McDowell Drive	-	-	-	-	-	23.7	-	0	-	-	-	-	15	0.9	-	-
Thomas Street	-	-	-	-	-	37.3	-	12.1	-	-	-	-	83	17.3	-	-
Tacc Drive	-	-	-	-	-	24	-	-	-	-	-	-	40	12.2	-	-
Erin Centre Boulevard	-	-	-	-	-	26.7	-	8.4	-	-	-	-	22	8.5	-	-
Site Access	-	-	-	-	-	-	-	-	15	0.6	-	-	-	-	-	-
Skyview Street / Skyview Access	-	21.3	-	-	-	2.4	-	-	36	40.8	-	-	15	0.1	-	-
Eglinton Avenue	20	16.1	-	-	35	28	-	16.9	33	16.5	35	23	90	107.5	-	-
407 Northbound Off-ramp at Derry Road	-	-	-	-	-	-	-	-	-	10.8	-	75.8	-	-	-	-
407 Southbound Off-ramp at Derry Road	-	-	-	-	-	-	-	-	-	-	-	-	-	13.3	-	11.8
407 Northbound Off-ramp at Britannia Road	-	-	-	-	-	-	-	-	-	27.3	-	65.6	-	-	-	-
407 Southbound Off-ramp at Britannia Road	-	-	-	-	-	-	-	-	-	-	-	-	-	31.4	-	12.8

2041 PM Peak Hour - Preferred Alternative

Intersection	95th Percentile Queues															
	EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue	Storage	95th Queue
Derry Road	75	164.7	45	39.2	80	30.1	-	0	155	117.1	41	18.9	20	19.7	76	75.9
Beacham Street	-	-	-	-	-	36.3	-	-	-	-	-	-	45	4.9	-	-
Street B North	-	-	-	-	-	-	-	-	15	0.4	-	-	-	-	-	-
Doug Leavens Boulevard / Street F	-	18.3	-	-	25	31.3	-	-	20	12.2	-	-	41	40.6	-	-
Street C	-	-	-	-	-	-	-	-	15	1.2	-	-	-	-	-	-
Foxwood Avenue / Street B South	15	3.6	-	-	15	0.5	-	-	15	0	-	-	15	0	-	-
Osprey Boulevard / Street A	-	13.9	-	-	10	70.9	-	-	15	13	-	-	35	12.3	-	-
Britannia Road	80	146.5	60	33.8	70	26.2	70	4.1	189	188.9	-	-	25	24.9	100	96.2
McDowell Drive	-	-	-	-	-	34.3	-	-	-	-	-	-	15	0.9	-	-
Thomas Street	-	-	-	-	-	66	-	51.4	-	-	-	-	83	82.8	-	-
Tacc Drive	-	-	-	-	-	33.5	-	-	-	-	-	-	40	38.5	-	-
Erin Centre Boulevard	-	-	-	-	-	26.8	-	12.1	-	-	-	-	22	21.8	-	-
Site Access	-	-	-	-	-	-	-	-	15	1.7	-	-	-	-	-	-
Skyview Street / Skyview Access	-	18.4	-	-	-	2.5	-	-	36	27.2	-	-	15	2.7	-	-
Eglinton Avenue	20	41.7	-	-	35	42.4	-	100	33	32.6	35	33.1	90	130	-	-
407 Northbound Off-ramp at Derry Road	-	-	-	-	-	-	-	-	-	12.7	-	182.3	-	-	-	-
407 Southbound Off-ramp at Derry Road	-	-	-	-	-	-	-	-	-	-	-	-	-	59.6	-	79.3
407 Northbound Off-ramp at Britannia Road	-	-	-	-	-	-	-	-	-	76.8	-	26.6	-	-	-	-
407 Southbound Off-ramp at Britannia Road	-	-	-	-	-	-	-	-	-	-	-	-	-	60.1	-	83.7

LEGEND

95th percentile queues along Ninth Line exceed proposed storage

95th percentile queues exceed existing storage. It is noted the design for the Ninth Line EA did not investigate side streets (eastbound and westbound approaches)

New storage lane (either from operation needs or new approach)

Length protected for turning lane that is under development application

Note: Storage lengths include parallel plus partial taper. Storage is measured to the location in the approximate location in the taper where one vehicle can be accomodated within the lane without blocking through traffic.

5 Roundabout Screening

A roundabout assessment was conducted for all signalized intersections within the Ninth Line study area, including the Regional intersections at Britannia Road and Derry Road. The assessment included a stage 1 screening phase based on suitability and feasibility check of roundabouts, followed by a stage 2 assessment phase. Based on the Stage 1 screening phase, it is not recommended to consider roundabout controls at all City of Mississauga intersections due to large physical footprint requirements based on future traffic volumes, which would impact adjacent properties, and the proximity to the nearest intersection (both signalized and unsignalized).

A separate roundabout feasibility screening was conducted along Ninth Line where the road intersects with Regional arterial roads – Britannia Road and Derry Road. A roundabout assessment tool provided by the Region of Peel was used to qualitatively assess whether a roundabout should be considered. Some considerations include daily traffic volumes, collisions, delays, property impacts, and roundabout user impacts. The full assessments can be found in **Appendix H**

The results of the assessment indicate that traffic volumes at both Derry Road and Britannia Road would require 3-lane roundabouts with a typical inscribed circle diameters (ICD) of between 67 m and 91 m. With these diameters' property impacts are expected (although they would need to be further analyzed and confirmed).

There is a potential that future traffic volumes from the Highway 407 signalized ramps may induce queue spill-backs into the potential roundabout locations along Britannia Road and Derry Road, which suggests roundabouts at these two locations are not recommended.

Road users may be unfamiliar with roundabouts, especially multi-lane roundabouts. Pedestrians and cyclists may also find multi-lane roundabouts more difficult to navigate. Public education and consultation would be required.

Based on the arguments presented, it is recommended both Britannia Road and Derry Road remain signalized intersections.

6 Active Transportation Analysis

This section will document the analysis of the proposed active transportation facilities along Ninth Line in the future between Derry Road and Eglinton Avenue. The improvements include sidewalks of 2 metres wide on both sides of Ninth Line separated by approximately 3 to 5.5 metres of boulevard on the west side, and 3 to 18 metres of boulevards on the east side. Cycling tracks of 2 metres wide are also proposed on both sides, 1 metre away from the curb and gutter.

6.1 Pedestrian Level of Service (PLOS)

A PLOS analysis evaluates the pedestrian comfort, safety and convenience of pedestrian facilities at the user level. The PLOS methodology is based on the City of Ottawa's Multimodal Level of Service (MMLOS) Analysis Guidelines (2015). PLOS is calculated at the intersection and midblock locations to recognize the differences in experience a pedestrian may experience at both types of locations.

6.1.1 PLOS Methodology

Segment PLOS evaluation uses a look-up table approach based on considerations such as cross-section and roadway characteristics. Characteristics include sidewalk and boulevard widths, traffic volumes, presence of on-street parking, and posted speeds. Higher segment scores are characterized by locations where lower vehicle speeds, lower volumes, wider sidewalks, and larger boulevards with ample separation from moving traffic are present. Lower segment scores are observed in locations where high vehicle speeds, narrow sidewalks, and minimal separation from traffic are present.

Intersection PLOS uses the Pedestrian Exposure to Traffic at Signalized Intersections (PETSI) and assigns points based on a number of crossing characteristics (e.g., crossing distance, presence of a median, presence of a crossing refuge, turning restrictions, right hand turn characteristics, curb radii, etc.). The score of each intersection approach is averaged to determine the overall intersection PLOS. The City of Ottawa MMLOS guidelines only provides directions regarding the evaluation of signalized intersections, not unsignalized intersections.

As the Ninth Line EA study area contains context-specific elements such as unsignalized intersections, certain modifications and assumptions have been made to adapt the Ottawa methodology to the study area. These revisions include:

- Understanding that stop / yield controlled intersections affect the pedestrian experience the same way a "permissive" signalized movement does, such as when a right-turn-on-red is allowed and a green is permissive. Because the turn is allowed based on driver judgment, pedestrians will feel less safe where a car is waiting to make the turn in their vicinity.

The inputs for the PLOS are summarized in **Exhibit 6-1**.

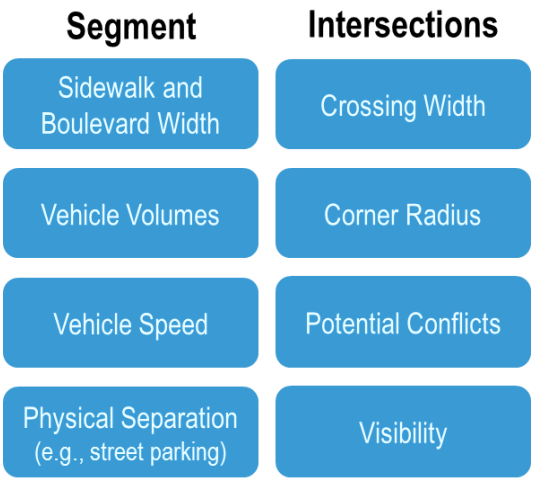


Exhibit 6-1. Inputs for Pedestrian LOS

PLOS scores range between “A” and “F” to help describe a variety of pedestrian conditions:

- **PLOS “A” to “C”** describes an environment that is attractive to most pedestrians, including locations where lower speeds and volumes, wider sidewalks, and larger boulevards with ample separation from moving traffic are present. Crosswalks are provided on all four legs of the intersections and with shorter crossing distances at intersections. A high quality pedestrian environment is shown in **Exhibit 6-2**, receiving a PLOS “A” thanks to a wide sidewalk that is offset from the road via a planted boulevard.
- **PLOS “D” to “E”** has elements may not appeal to pedestrians due to narrow sidewalks, lack of separation from traffic, longer crossing distances, etc. Though acceptable, streets with narrow sidewalks and minimal separation from high volume and/or high speed roads receive PLOS scores between “D” and “E. An example in the City of Mississauga can be seen in **Exhibit 6-2.**
- **PLOS “F”** refers to a pedestrian environment that is not adequate, locations without any facility or where no buffer is provided adjacent to high speed and high volume traffic. No crosswalks provided and long crossing distances at intersections. The high adjacent traffic speeds, lack of separation from vehicles and narrow sidewalk explain the PLOS “F” example in **Exhibit 6-2.**

Exhibit 6-2: Segment PLOS Examples

Source: Google Streetview

Exhibit 6-3 also shows examples of intersection PLOS.

PLOS A: City Centre Dr at Duke of York Blvd, City of Mississauga

PLOS C: Rathburn Rd at Hammerson Dr, City of Mississauga

PLOS F: Hurontario St at Square One Dr, City of Mississauga

Exhibit 6-3: Intersection PLOS Examples

Source: Google Streetview

6.1.2 PLOS Results

Future intersection and segment PLOS based on the Preferred Alternative is summarized in **Table 6-1** and **Table 6-2**.

Table 6-1. Future Intersection PLOS

North-South Street	East-West Street	Future PLOS
Ninth Line	Derry Road	**E**
	Beacham Street	**C**
	Street B North	**D**

North-South Street	East-West Street	Future PLOS
	Doug Leavens Boulevard / Street F	C
	Street C	C
	Foxwood Avenue / Street B South	C
	Osprey Boulevard / Street A	C
	Britannia Road	E
	McDowell Drive	C
	Thomas Street	D
	Tacc Drive	C
	Erin Centre Boulevard	D
	Site Access	D
	Skyview Street	D
	Eglinton Avenue	E

Table 6-2. Future Segment PLOS

Segment	From	To	West Side	East Side
Segment 1	Derry Avenue	Lisgar Neighbourhood Square Access	B	B
Segment 2	Lisgar Neighbourhood Square Access	Doug Leavens Boulevard	B	B
Segment 3	Doug Leavens Boulevard	Osprey Boulevard	B	C
Segment 4	Osprey Boulevard	North end of Osprey Marsh (240m N of Parkgate Drive)	C	B
Segment 5	North end of Osprey Marsh (240m N of Parkgate Drive)	Parkgate Drive	B	B
Segment 6	Parkgate Drive	Brittania Road	C	B
Segment 7	Brittania Road	Thomas Street	B	B
Segment 8	Thomas Street	Deepwood Heights	B	B
Segment 9	Deepwood Heights	Tacc Drive	C	B
Segment 10	Tacc Drive	35m South of Tacc Drive	B	B
Segment 11	35m South of Tacc Drive	130m North of Janice Drive	B	B
Segment 12	130m North of Janice Drive	Janice Drive	B	B

Segment	From	To	West Side	East Side
Segment 13	Janice Drive	Henrietta Way	**B**	**B**
Segment 14	Henrietta Way	Mayla Drive	**B**	**B**
Segment 15	Mayla Drive	Erin Centre Boulevard	**B**	**B**
Segment 16	Erin Centre Boulevard	Quiet Creek Drive (North Portion)	**B**	**C**
Segment 17	Quiet Creek Drive (North Portion)	Skyview Street	**B**	**B**
Segment 18	Skyview Street	Stardust Drive	**B**	**B**
Segment 19	Stardust Drive	133m North of Eglinton Avenue	**B**	**B**
Segment 20	133m North of Eglinton Avenue	Eglinton Avenue	**B**	**B**

Intersection PLOS results indicate intersections along Ninth Line will operate at LOS C to E in the future preferred alternative, compared to LOS B to E under existing conditions. Results have not changed significantly, as the LOS B captured in existing conditions only reflects one intersection at Foxwood Avenue. Contributing factors to the scoring despite future proposed changes include additional through lanes from the Ninth Line widening, turning lanes to accommodate critical movements, and new approaches at existing intersections due to future developments west of Ninth Line. To further improve pedestrian conditions, it is recommended the detailed design considers measures such as reducing curb radii, providing high-visibility/tactile markings at crosswalks, and including items such as medians, curb extensions, and bollards.

Segment PLOS results operate at LOS B to C along both sides of Ninth Line for the future preferred alternative, compared to LOS F on the west side and LOS B to F on the east side under existing conditions. The provision of a dedicated pedestrian facility on the west side of Ninth Line to serve the new developments is a key contributor to the score improvement. Other proposed characteristics that improve the scoring on both sides of the corridor include consistent 2 meter sidewalks, wide boulevards (3 to 18 metres) separating the sidewalk from road traffic, and reduced posted speeds along the corridor.

6.2 Biking Level of Service (BLOS)

Similar to the PLOS analysis, the BLOS also used the City of MMLOS Analysis Guidelines (2015). The facilities are assessed using considerations such as user comfort, safety, and convenience. BLOS is calculated both at the intersection and mid-block in recognition that a cyclist's experience is determined by the conditions both between crossings and at the crossing itself.

6.2.1 BLOS Methodology

Segment BLOS evaluation uses a look-up table approach based on roadway characteristics and facility type and quality. The score is influenced by factors such as facility type, street width, vehicular speed, and parking characteristics.

Intersection BLOS, a similar look-up table approach is used to evaluate the left- and right-turning conditions for cyclists at the intersection. Intersection BLOS is affected by vehicular turning and operating speeds, vehicular dual turning lanes and bike boxes. Other impediments to cyclists seeking to turn right or left (such as right-turn lane length and crossing distances) also factor into the assessment. Intersection BLOS is the function of right-turn LOS and left-turn LOS. The average score of all approaches (north, south, west and east) is then used to determine the overall intersection BLOS.

Segment BLOS is most sensitive to facility type, with physically separated bikeways such as cycle tracks, protected bike lanes and multi-use paths receiving a score of 'A' while cycling in mixed traffic conditions with varying operating speeds and street widths generally scoring lower – 'D' to 'F'. The scoring ranges as follows:

- **BLOS 'A' to 'B'** describes a setting with physically separated facilities such as cycle tracks, protected bike lanes, and multi-use paths (MUP) that are attractive to most cyclists and typically result in scores within this range. Other situations with scores in this range include designated bike lanes that are wider than 1.5 m, or ones adjacent to roads with low speeds or with raised medians separating two lanes of traffic in each direction. Shared roadways may receive scores in this range if they are low volume residential streets with low speeds (50 km/h and lower), no marked centerline and with less than three lanes of traffic in all directions. At intersections, continuous cycling facilities are provided and separated from vehicles and pedestrians.
- **BLOS 'C' to 'D'** refers to locations with designated bike lanes adjacent to roads with high speeds or high number of lanes or ones that are narrower than 1.5 m may result in scores in this range. Shared facilities on low volume, low speed streets with wide curb lanes provide some comfort but the majority of cyclists typically will not cycle. Greater conflicts at intersections with turning vehicles are experienced.
- **BLOS 'E' to 'F'** is characteristic of non-separated, shared roadways with high traffic volumes and speeds, and no accommodations at intersections.

The complete, detailed BLOS methodology is provided in **Appendix I.** Examples of segment and intersection BLOS are shown in **Exhibit 6-4** and **Exhibit 6-5**, respectively

Exhibit 6-4: BLOS Examples
Source: Google Streetview

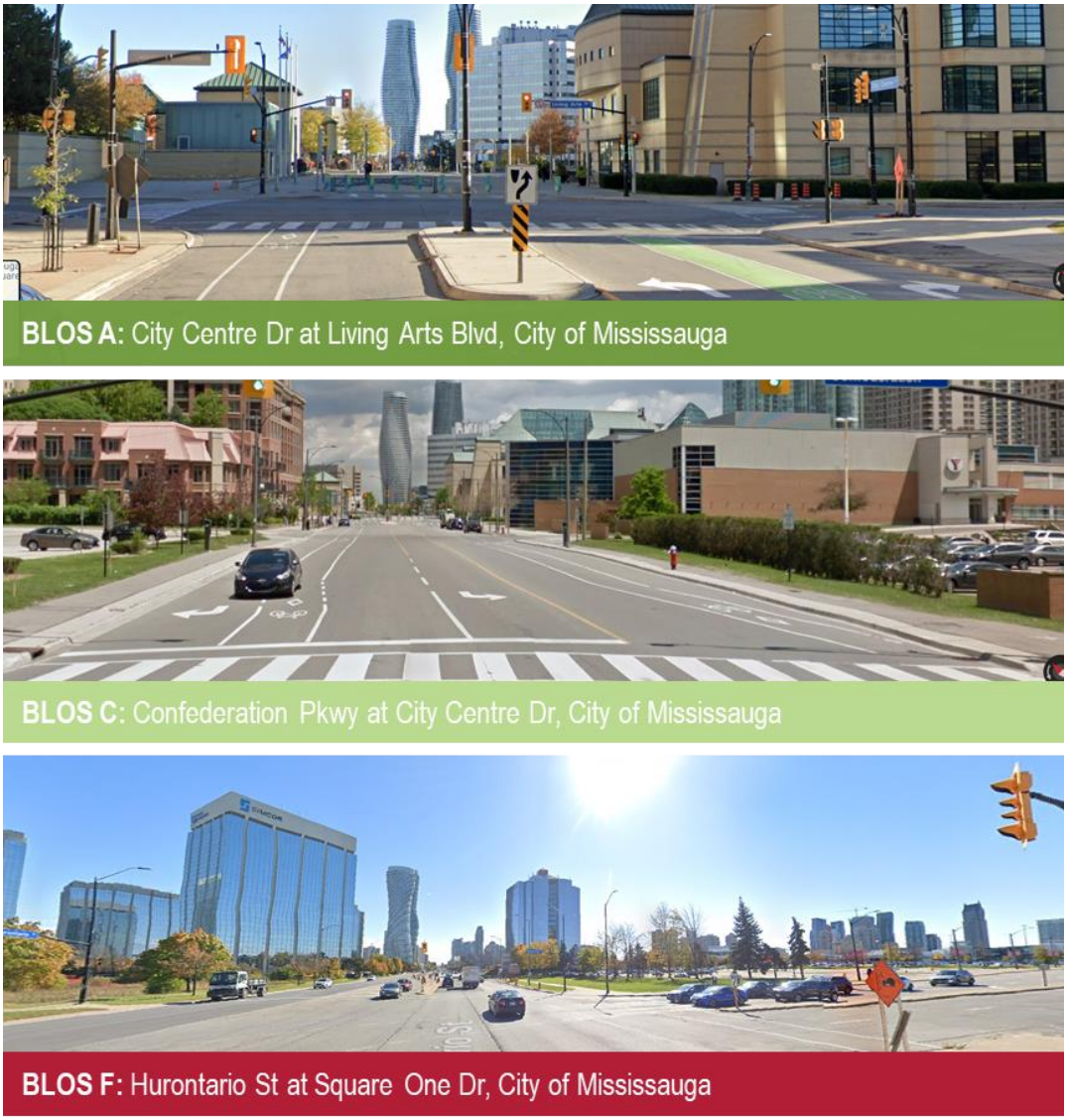


Exhibit 6-5: Intersection BLOS Examples
Source: Google Streetview

6.2.2 BLOS Results

Future intersection and segment BLOS based on the preferred design is summarized in **Table 6-3** and **Table 6-4**.

Table 6-3. Future Intersection BLOS

N-S street	E-W street	Future BLOS
Ninth Line	Derry Road	C
	Beacham Street	B
	Street B North	B
	Doug Leavens Boulevard / Street F	C
	Street C	B

N-S street	E-W street	Future BLOS
	Foxwood Avenue / Street B South	B
	Osprey Boulevard / Street A	C
	Britannia Road	C
	McDowell Drive	B
	Thomas Street	B
	Tacc Drive	B
	Erin Centre Boulevard	B
	Site Access	B
	Skyview Street	C
	Eglinton Avenue	D

Table 6-4. Future Segment BLOS

Segment	From	To	West side	East side
Segment 1	Derry Avenue	Lisgar Neighbourhood Square Access	A	A
Segment 2	Lisgar Neighbourhood Square Access	Doug Leavens Boulevard	A	A
Segment 3	Doug Leavens Boulevard	Osprey Boulevard	A	A
Segment 4	Osprey Boulevard	North end of Osprey Marsh (240m N of Parkgate Drive)	A	A
Segment 5	North end of Osprey Marsh (240m N of Parkgate Drive)	Parkgate Drive	A	A
Segment 6	Parkgate Drive	Brittania Road	A	A
Segment 7	Brittania Road	Thomas Street	A	A
Segment 8	Thomas Street	Deepwood Heights	A	A
Segment 9	Deepwood Heights	Tacc Drive	A	A
Segment 10	Tacc Drive	35m South of Tacc Drive	A	A
Segment 11	35m South of Tacc Drive	130m North of Janice Drive	A	A
Segment 12	130m North of Janice Drive	Janice Drive	A	A
Segment 13	Janice Drive	Henrietta Way	A	A
Segment 14	Henrietta Way	Mayla Drive	A	A

Segment	From	To	West side	East side
Segment 15	Mayla Drive	Erin Centre Boulevard	**A**	**A**
Segment 16	Erin Centre Boulevard	Quiet Creek Drive (North Portion)	**A**	**A**
Segment 17	Quiet Creek Drive (North Portion)	Skyview Street	**A**	**A**
Segment 18	Skyview Street	Stardust Drive	**A**	**A**
Segment 19	Stardust Drive	133m North of Eglinton Avenue	**A**	**A**
Segment 20	133m North of Eglinton Avenue	Eglinton Avenue	**A**	**A**

Intersection BLOS results indicate intersections along Ninth Line will operate at LOS B to D in the future preferred alternative, compared to LOS D to E in the existing conditions. Results have improved at all intersections along the corridor primarily due to the provision of shared protected pedestrian and cycling cross-rides to accommodate left turns.

Segment BLOS results indicate operations of LOS A along both sides of Ninth Line for the future preferred alternative, compared to primarily LOS F in the existing conditions. The 2-metre wide dedicated cycling facility and reduced posted speeds both contribute to the improved scoring.

7 Conclusions

7.1 Signal Warrant Analysis

Signal warrant analyses were conducted for several locations along Ninth Line, including any unsignalized intersections of major collectors and access driveways for new developments. The warrant followed the criteria outlined in *Ontario Traffic Manual – Book 12 Traffic Signals, March 2012* (OTM Book 12). Ninth Line at Beacham Street and at Tacc Drive both warrant signalization based on 4-hour volumes. The McDowell Drive intersection did not warrant signalization based on OTM Book 12 methodology; however, signalization is recommended due to high volumes and delays experienced on side streets during the PM peak hour. It is noted the signal at Tacc Drive is required by 2031 whereas the signal at McDowell Drive is required by 2041.

7.2 Traffic Operations

Analysis for both 2031 and 2041 horizon years under all 3 future scenarios show traffic operations at the major intersections of Derry Road, Britannia Road, and Eglinton Avenue operate at or near capacity during the AM and PM peak hours, with LOS ‘E’ or ‘F’ and multiple critical movements, especially for exclusive turning movements. Other intersections (including minor intersections and Highway 407 ramps) have some critical movements but operate below capacity. Travel demand management (TDM) should be provided to support growth along Ninth Line and relieve the

congestion on the road network. Examples of TDM measures include providing improved biking and cycling infrastructure, improved transit operations, and coordinated rideshare opportunities.

The preferred solution for Ninth Line is Scenario 3 – Ultimate Improvements scenario.

7.3 Roundabout Screening

A roundabout assessment was conducted for all signalized intersections within the Ninth Line study area, including the Regional intersections at Britannia Road and Derry Road. The assessment included a Stage 1 Screening phase based on suitability and feasibility check of roundabouts, followed by a Stage 2 Assessment phase. Based on the Stage 1 Screening, it is not recommended to consider roundabout controls at all City of Mississauga intersections due to large physical footprint requirements and the proximity to adjacent intersections (both signalized and unsignalized). Only the intersections at Britannia Road and Derry Road met the suitability and feasibility factors for roundabouts. Based on the Stage 2 Assessment, both intersections are recommended to remain signalized due to the anticipated future Highway 407 signalized ramp(s) queuing spill-back potential and property impacts.

7.4 Active Transportation

PLOS and BLOS analyses were conducted for both intersections and segments to evaluate the future active transportation facilities along Ninth Lines based on parameters such as user comfort, safety, and convenience of facilities. The Preferred Alternative features both sidewalks and cycling tracks 2 metres wide each, with separations to auto traffic up to 18 metres and 1 metre, respectively.

BLOS and PLOS results for segments, as well as BLOS results for intersections, indicate the facilities will operate at LOS B to D in the Preferred Alternative compared to LOS D to F under existing conditions. At segments, the improvement in score for both modes is attributed to the provision of separated dedicated facilities with sufficient separation from auto traffic, which greatly improves the user experience. At intersections, the shared pedestrian and cycling cross-rides facilitate safer left turning for cyclists which also improves scores.

PLOS results for intersections indicate the facilities will operate at LOS C to E in the Preferred Alternative compared to LOS B to E under existing conditions. The improvement in scores as a result of better active transportation facilities are balanced by other factors that reduce the scores which include the longer crossing distances at intersections due to the widening along Ninth Line and the additional turning lanes to improve critical movements, and more conflicts due to the new approaches to serve future developments west of Ninth Line. Detailed design considerations to improve the pedestrian realm at intersections include reducing curb radii, providing high-visibility/tactile markings at crosswalks, and items such as medians, curb extensions, and bollards.