Final Report

1161-1167 North Shore Boulevard Transportation Impact and Parking Study

Prepared for Amico Properties Inc.
by IBI Group

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1 Introduction

IBI Group was retained by Amico Properties Inc. (“Amico”) and Spruce Partners Inc. to undertake a transportation impact study and a parking study for a proposed seniors living campus located in the City of Burlington, Ontario.

1.1 Background

The proposed development (hereinafter referred to as the “subject site”) will require the demolition of the existing buildings at 1161-1167 North Shore Boulevard (Brant Park Co-Op). The seniors living campus is proposed to consist of four buildings of varying heights up to 17 storeys. These include 56 memory care units, 106 assisted living units, and 330 independent living units, totalling 492 units. Vehicle access to the proposed development will be provided from the existing private driveway located on North Shore Boulevard, approximately 170 metres east of the Queen Elizabeth Way (QEW).

Note that the analysis was completed with respect to 492 units, but the final application is for 475 units, including 95 memory care units, 71 assisted living units, and 309 independent living units. A total of 200 parking spaces are proposed via underground parking facilities. As the analysis was completed with more units than ultimately proposed, this analysis is considered slightly conservative. The most recent site plan is shown in **Exhibit 2-16**.

1.2 Study Scope

The report is divided into a transportation impact study and a parking assessment. The transportation impact study examines the proposed development’s anticipated impact on the study area’s traffic operations, and identifies improvements that would improve study area operations. The parking assessment reviews the proposed development’s projected parking demand, and proposes a Zoning By-law parking requirement variance, if warranted.

This report adheres to the scope of work developed by IBI Group and agreed upon by the City of Burlington (“City”) and the Ontario Ministry of Transportation (“MTO”). The correspondence and confirmed scope of work is presented in **Appendix A**. To support the study scope, the following tasks are completed:

Transportation Impact Study

- **Development Study Area and Analysis Details**: Examines the existing transportation facilities and discusses analysis details, such as signal timing plans, turning movement counts, analysis periods, and study intersections.
- **Existing Conditions Assessment**: Examines current traffic operations and identifies existing operational issues.
- **Future Background Assessment**: Projects future traffic operations under the full build out (2023), full build out +5 years, and full build out +10 years conditions without the proposed development. Anticipated future operational issues are identified.
- **Site Traffic Generation and Assignment**: Estimates the number of trips generated by the proposed development and assigns them to the study area road network.

- **Future Total Assessment:** Projects future traffic operations under the full build out (2023), full build out +5 years, and full build out +10 years conditions with the proposed development, and compares the traffic operational results to the corresponding future background scenario results. Any operational issues resulting from the additional site generated trips are identified. Road improvements aimed at mitigating the identified operational issues are proposed, if necessary.
- **Traffic Signal Warrant and Road Improvement Assessment**: Determines if the installation of a traffic signal at the subject site access fronting North Shore Boulevard is required. Additionally, an eastbound left turn lane assessment is completed to assess whether a dedicated turning lane is beneficial.

Parking Study

- **City of Burlington Zoning By-law review**: The proposed development's parking requirements as per City of Burlington Zoning By-law 2020 are determined and used as a baseline for comparison with the parking demand observed during the parking utilization survey.
- **Parking Utilization Survey**: To estimate the proposed development's peak parking demand, parking utilization surveys were conducted at one proxy site of similar nature to the proposed development.
- **Parking Demand Review**: Using the observed parking demand obtained from the proxy site survey data, a parking rate is recommended that is deemed applicable to the senior living centre land use. The recommended rate is then applied to the subject site to estimate the number of parking spaces needed to meet the projected parking demand.

2 Traffic Assessment

The transportation impact assessment analysis and findings are discussed in this section.

2.1 Existing Traffic Conditions

2.1.1 Existing Road Network

The subject site is located northeast of the North Shore Boulevard / QEW intersection in the City of Burlington, as illustrated in **Exhibit 2-1**. The subject site is located approximately 1.2 km southwest of the Burlington City Centre.

Exhibit 2-1: Study Area



Residential developments are located to the north, east, and west of the subject site. To the south, there is an Ontario Provincial Police detachment, the Halton McMaster Family Health Centre, and the Joseph Brant Hospital. These developments front directly onto North Shore Boulevard, which runs adjacent to Lake Ontario.

The study area intersections were determined through consultation with the City and the MTO:

- North Shore Boulevard East / QEW West Ramp Terminal;
- North Shore Boulevard East / QEW East Ramp Terminal;
- North Shore Boulevard East / Existing Site Driveway;
- North Shore Boulevard East / Joseph Brant Hospital; and
- North Shore Boulevard East / Lakeshore Road and Maple Avenue.

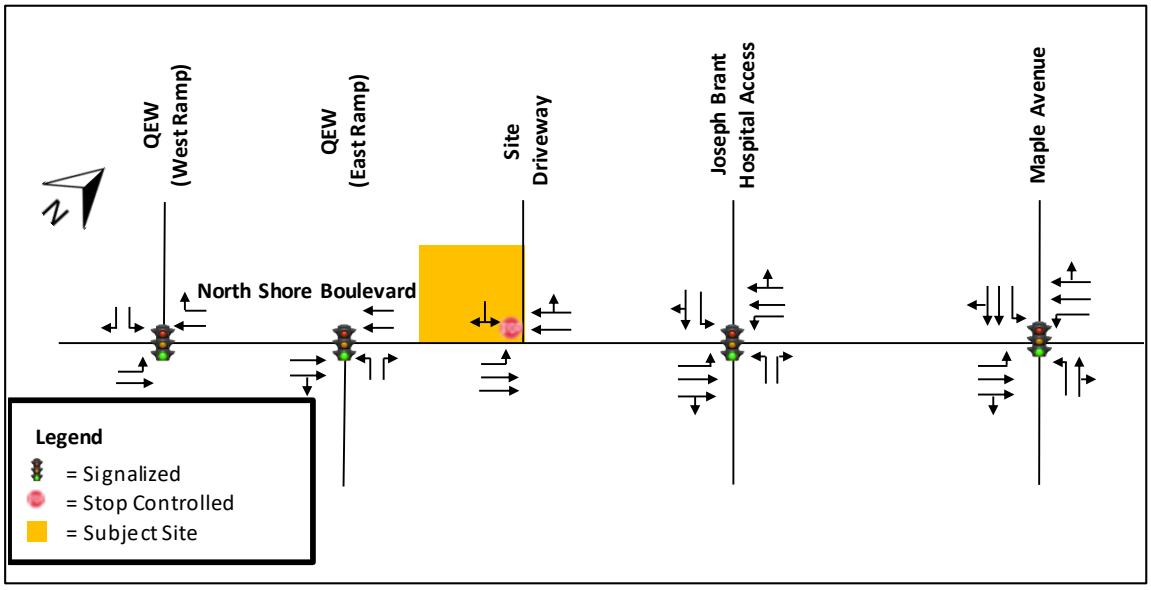
Study area roadways include the following facilities:

- **North Shore Boulevard** is a four-lane, east-west minor arterial road. There are four signalized intersections within the study area on North Shore Boulevard. Dedicated cycling lanes are provided on this corridor with sidewalks on both sides of the street. Burlington Transit bus stops are provided within the study area. The posted speed limit is 60 km/h.
- **The Queen Elizabeth Way** is a 400-series provincial freeway that runs north-south within this section of the City of Burlington. The QEW ties in with Highway 403 to the west and Highway 407 to the north. The posted speed limit is 100 km/h.

- **Joseph Brant Hospital Access Road** (JBH Access) is a two-lane, north-south local road which serves as the access road to the Ontario Provincial Police's Burlington detachment, Joseph Brant Hospital, Halton McMaster Family Health Centre, and the Chartwell Brant Long Term Care residence.
- **Maple Avenue / Lakeshore Road** is a north-south minor arterial road with a four lane cross section north of the intersection and a two lane cross section to the south. Painted cycling lanes are provided on both sides of the road. On the south leg, sidewalks are provided on the west side while Waterfront Trail exists on the east side. The posted speed limit is 50 km/h.

The study area land configuration is illustrated in **Exhibit 2-2**.

Exhibit 2-2: Existing Condition Lane Configurations



2.1.2 Existing Transit / Active Transportation Network

Burlington Transit Route #5 operates along North Shore Boulevard within walking distance of the subject site. **Exhibit 2-3** illustrates the bus stop locations.

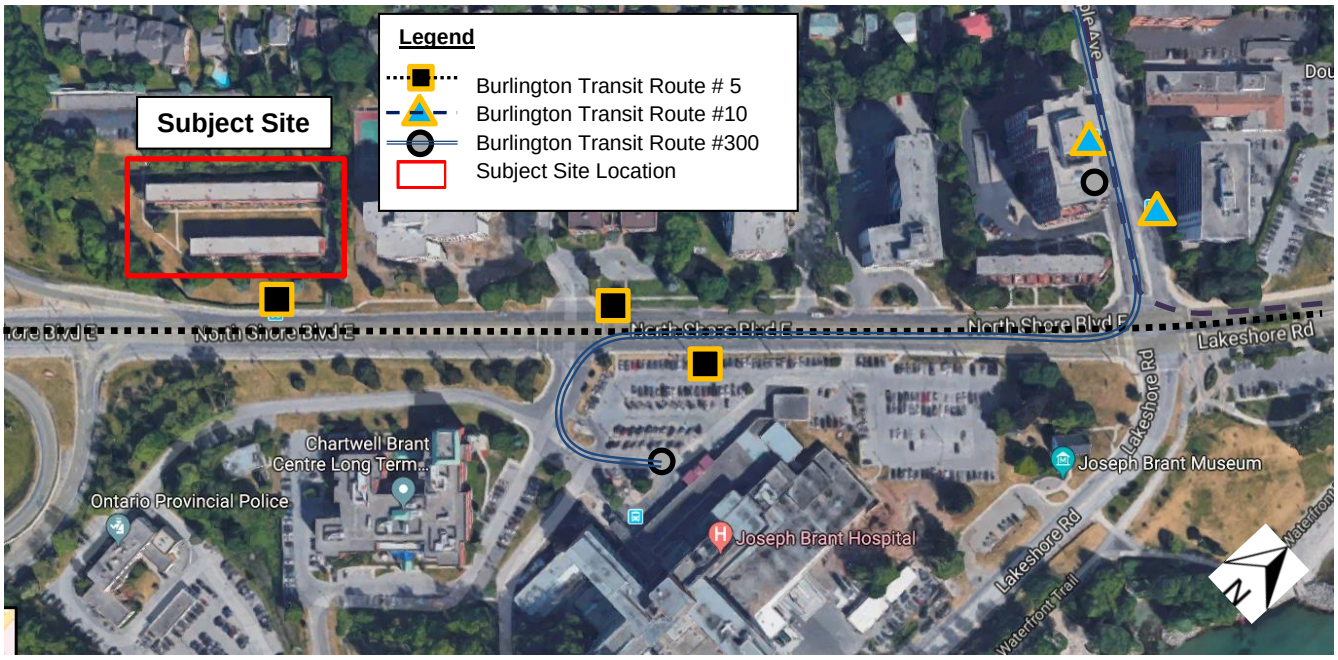
Burlington Transit Route 5 operates with 30 minute headways during the weekday AM peak, PM peak, and weekend peak periods. The route terminates at the Burlington GO station, which offers connections to Toronto and other major cities across Southwestern Ontario.

Burlington Transit Route #10 operates along Maple Avenue with 20 minute headways during the weekday AM and PM peak periods, and 30 minute headways during the weekend peak periods.

Burlington Transit Route #300 operates as a seniors oriented transit service, providing transportation to popular destination spots in the City, such as malls and community centres. Operating only on weekdays, 60 minute headways are scheduled from morning to mid-day.

Cycling facilities are provided along North Shore Boulevard in the form of curbside painted lanes. The Waterfront Trail exists along Lakeshore Road, which facilitates both pedestrian and cyclist traffic via a multi-use path.

Exhibit 2-3: Existing Transit Network

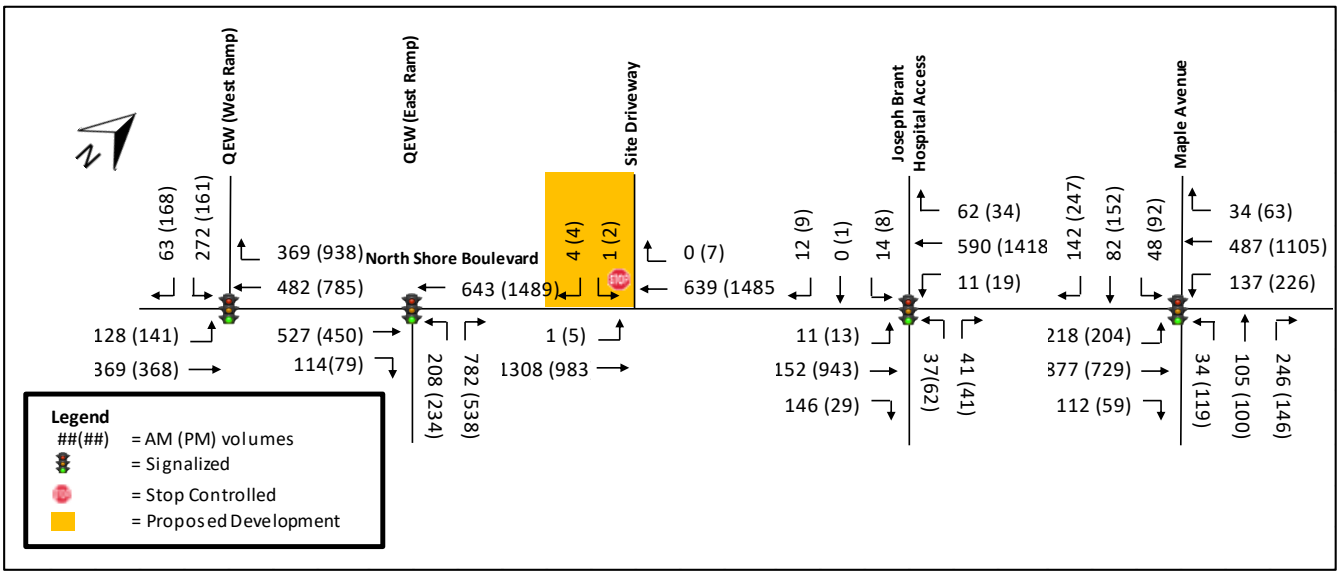


2.1.3 Turning Movement Counts

Turning movement counts (TMCs) for the study area intersections were collected by Ontario Traffic Inc. (OTI) on July 4, 2018 (for weekday AM and PM peak periods) and July 7, 2018 (for the Saturday peak period). Existing traffic volumes collected at the subject site driveway will be removed from the road network to account for the redevelopment of the site for the proposed changes in land use. Additionally, AM and PM peak period TMCs for the two QEW terminal intersections were provided by MTO. Full TMC data is provided in **Appendix B**.

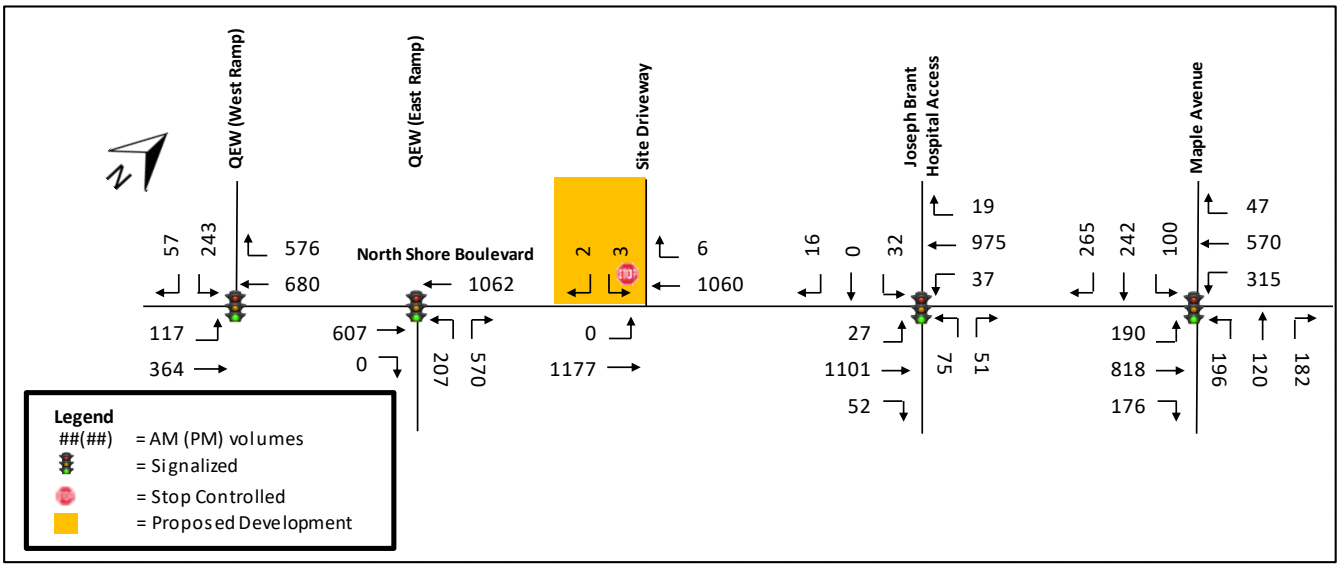
The provided and collected TMCs were used to establish the 2018 existing traffic conditions Synchro model. **Exhibit 2-4** and **Exhibit 2-5** illustrate the AM and PM, and Saturday peak hour traffic volumes, respectively.

Exhibit 2-4: Existing Conditions Traffic Volumes (AM and PM Peak Hours)



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-5: Existing Conditions Traffic Volumes (Saturday Peak Hour)



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

2.1.4 Signal Timing Plans

Signal timing plans for the signalized study area intersections were provided by the City, and are located in **Appendix C.** All intersections operate using an eight-phase semi-actuated and coordinated mode of control during all three peak periods. The subject site access is currently stop controlled and is proposed to remain under these operations.

2.1.5 Start-Up Lost Time Adjustment

It was requested by MTO that the start-up lost time adjustment values for use in the Synchro analysis be calculated via field collected data. The methodology was developed by IBI based on Highway Capacity Manual 2010 (HCM) methodologies and approved by MTO (as per correspondence in **Appendix A**). The start-up lost time data is provided in **Appendix D** and is incorporated into all Synchro existing and future scenario analysis.

2.1.6 Saturation Flow Rate

It was requested by MTO that the roadway saturation flow rates be calculated for the two QEW terminal ramp intersections via field collected data. The methodology was developed by IBI based on HCM methodologies and approved by MTO (as per correspondence in **Appendix A**). The data is provided in **Appendix E** and is incorporated into all Synchro existing and future scenario analysis.

2.1.7 2018 Existing Conditions Analysis

The study area intersections were analyzed using the software package Synchro 9.2, which uses HCM methodology. From the Halton Region Traffic Impact Study (TIS) Guidelines (January 2015), the criteria for identifying critical signalized intersections or movements are:

- Volume to capacity (V/C) ratio of 0.85 for overall intersections operations, through movements, or shared through / turning movements;
- V/C ratio exceeds 0.95 for exclusive movements; and
- 95th percentile queues which exceed available storage.

For unsignalized intersections, the Halton Region TIS Guidelines also states the following criteria for critical movements:

- Level of service (LOS) E for individual movements; and
- 95th percentile queues which exceed available storage.

Based on the MTO's Traffic Impact Study Guidelines (December 2009), ramp terminal approaches with a v/c ratio exceeding 0.75 are considered critical.

Exhibit 2-6 details the weekday AM, PM, and Saturday peak hour traffic operations at the signalized intersections. No operational issues were observed at the unsignalized intersection (site access). Full Synchro and SimTraffic reports are found in **Appendix F**.

Neither Halton Region nor MTO TIS Guidelines identify movements at signalized intersections operating at LOS E as being critical movements. However, these movements have been included in the Synchro summary tables throughout this report for tracking purposes.

Exhibit 2-6: Existing Traffic Operations – Signalized Intersections

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
AM Peak Hour								
QEW West Ramp	C	0.77	WBT	D	0.90	127.4	89.9	-
QEW East Ramp	B	0.92	NBL	D	0.78	70.4	62.1	700
			NBR	A	0.82	0.0	6.6	
Lakeshore Rd & Maple Ave	C	0.68	WBL	C	0.65	54.9	38.2	30
PM Peak Hour								
QEW West Ramp	B	0.71	EBL	C	0.34	12.2	48.0	40
			SBL	E	0.73	61.7	51.6	290
QEW East Ramp	B	0.70	NBL	F	0.92	108.2	103.8	700
JBH Access	A	0.53	NBL	E	0.58	28.9	27.1	30
Lakeshore Rd & Maple Ave	C	0.71	WBL	B	0.54	45.1	39.3	30
			NBT	E	0.79	70.8	77.6	-
Saturday Peak Hour								
QEW West Ramp	B	0.74	SBL	D	0.77	82.4	59.0	290
QEW East Ramp	B	0.77	NBL	D	0.86	61.7	59.7	700
Lakeshore Rd & Maple Ave	C	0.86	WBL	C	0.78	125.0	35.8	30
			NBL	F	0.96	54.3	65.1	105

During the AM peak hour:

- Overall North Shore Boulevard & QEW West Ramp intersection operations are acceptable. With regards to specific movements, the westbound through movement is operating near capacity with a V/C ratio of 0.90;
- QEW East Ramp & North Shore Boulevard operates with an overall V/C ratio of 0.92. In particular, the northbound left and right turn movements operate with V/C ratios of 0.78 and 0.82, respectively; and
- Overall Lakeshore Road / Maple Avenue & North Shore Boulevard operations are acceptable. However, the westbound left movement's 95th percentile queue length exceeds the storage capacity.

During the PM peak hour:

- North Shore Boulevard & QEW West Ramp operates with acceptable overall LOS B. However, the southbound left movement operates with a LOS E;
- QEW East Ramp & North Shore Boulevard operates at an acceptable overall LOS B and a V/C ratio of 0.70. However, the northbound left turn movement operates with a V/C ratio of 0.92 and a LOS F;
- While overall North Shore Boulevard & Joseph Brant Hospital (JBH) Access operations are acceptable, the northbound left movement operates at LOS E; and

- Lakeshore Road / Maple Avenue & North Shore Boulevard is operating with an acceptable overall LOS C. However, the westbound left movement's 95th percentile queue length exceeds the storage capacity.

During the Saturday peak hour:

- North Shore Boulevard & QEW West Ramp operates with an acceptable overall LOS B and V/C ratio of 0.74. However, the southbound left movement is considered critical with a V/C ratio of 0.77;
- QEW East Ramp & North Shore Boulevard operates with an acceptable overall V/C ratio and LOS. However, the northbound left turn movement is critical with a V/C ratio of 0.86; and
- Lakeshore Road / Maple Avenue & North Shore Boulevard is operating with an acceptable overall LOS C. However, the northbound left movement is critical with a V/C of 0.96 and LOS F, and the westbound left movement's 95th percentile queue length exceeds the storage capacity.

In summary, none of the intersections or individual movements are operating at or over capacity; however, a few movements are considered critical based on the MTO and Halton Region guidelines.

2.2 Future Background Traffic Conditions

This section discusses the growth rate, future road network improvements, other background developments, and future traffic conditions under the 2023, 2028, and 2033 horizon years.

2.2.1 Future Road Network Improvements

During the correspondence with MTO and City staff (as per **Appendix A)**, no future road network improvements were identified. A further review of the City's Roadway Capital Projects schedule has not indicated any planned improvements within the study area.

2.2.2 Growth Rates

Upon consultation with MTO staff, a 2% growth rate was required by MTO for ramp terminals unless otherwise justified. City staff also stipulated a 1.1% growth rate for the North Shore Boulevard and Maple Avenue-Lakeshore Boulevard corridors. This correspondence is documented in **Appendix A**. To include both rates into the traffic analysis, traffic volumes entering and exiting the QEW ramps via the study area corridors were grown 2% annually, while the remaining corridor through-traffic was grown 1.1% annually.

2.2.3 Background Developments

City staff identified two background residential developments with the potential for generating additional traffic within the study area. The identified background developments are located at 1159 Bellview Crescent and 490-492 Brock Avenue / 1298 Ontario Street.

The trips generated by the development located at 1159 Bellview Crescent were not considered, since there would be negligible volumes generated, as demonstrated in **Exhibit 2-7.**

Exhibit 2-7: Background Development Trip Generation

Land Use	AM Peak Period			PM Peak Period		
	In	Out	Total	In	Out	Total
1159 Bellview Crescent Single Family Detached, 5 units (LUC 210)	1	3	4	4	1	5
490-492 Brock Avenue / 1298 Ontario Street High-Rise Condominium (LUC 232) Pharmacy/Drugstore (LUC 880)	19	65	84	55	35	90

The trips generated by the development at 490-492 Brock Avenue / 1298 Ontario Street were added and distributed through the study area for the AM and PM peak hours, based on the supporting Parsons TIS reports Appendix G (dated July 12, 2017, provided by City staff) and a review of existing traffic patterns.

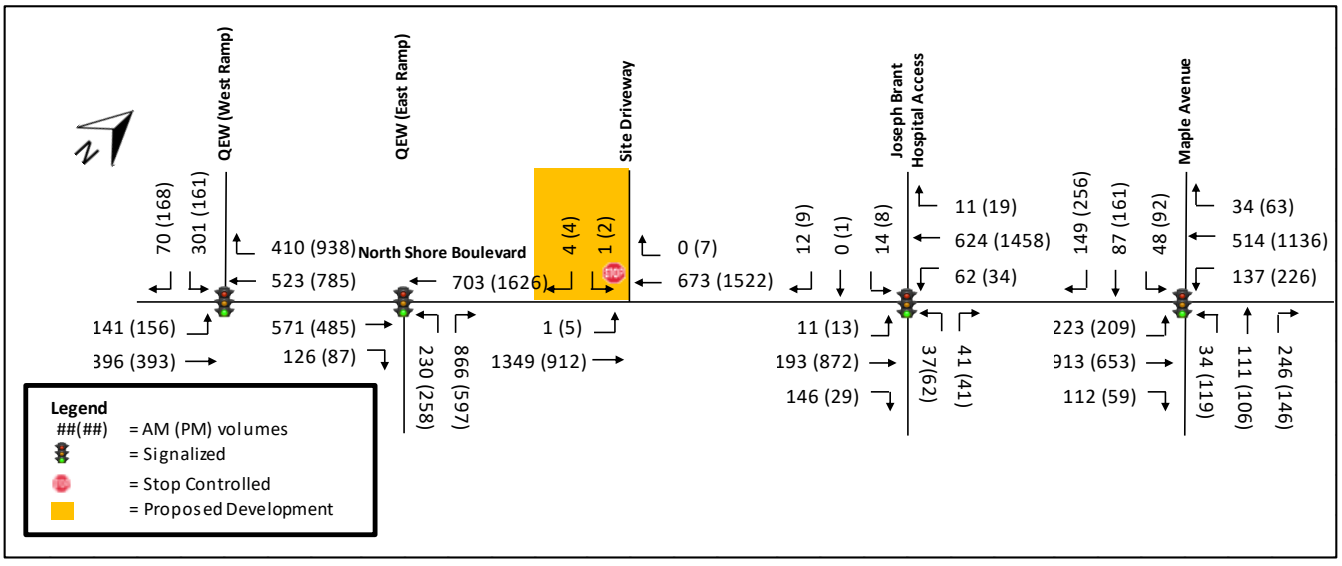
Based on the Parsons TIS report, 14 and 15 trips (inbound and outbound) enter the study area for this report during the weekday AM and PM peak hours, respectively. The Parsons TIS report did not analyze the Saturday peak hour. For the purposes of estimating this background development's Saturday peak hour traffic volumes, the highest of the documented AM and PM peak hour trip volumes were used, which is still regarded as low impact relative to existing traffic activity along the study area corridors.

2.2.4 2023 Future Background Traffic Analysis

To establish the future background condition traffic volumes, the existing traffic volumes were grown and the trips generated by the background development were added.

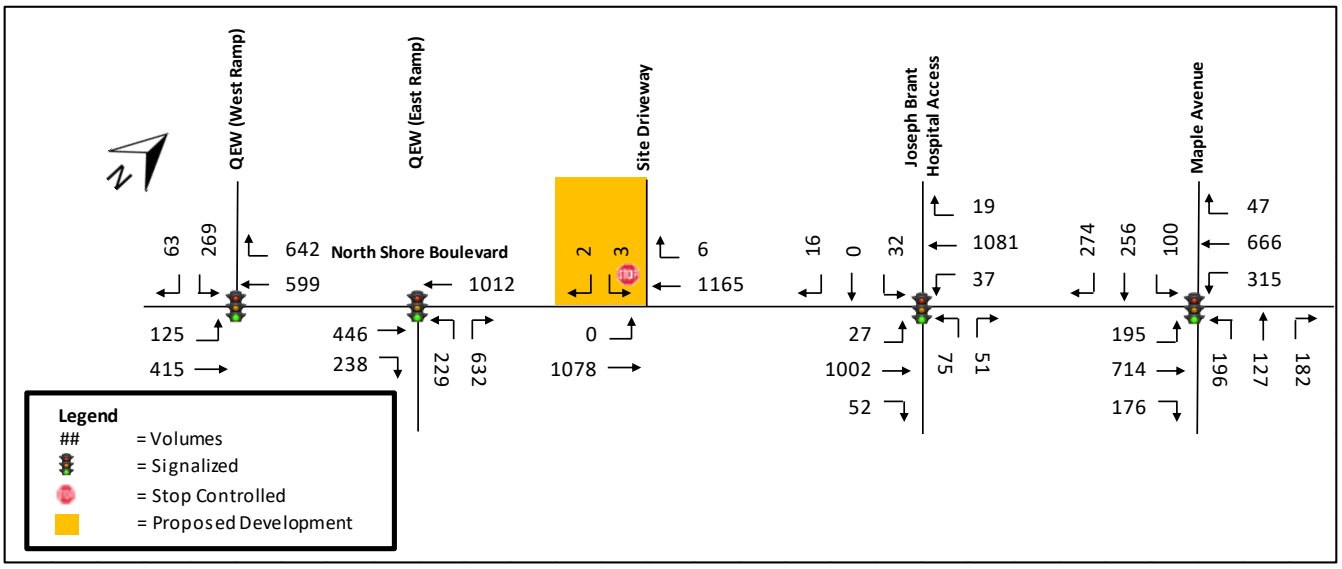
Exhibit 2-8 illustrates 2023 future background traffic volumes during the AM and PM peak hours, and **Exhibit 2-9** illustrates volumes during the Saturday peak hour.

Exhibit 2-8: 2023 Future Background Traffic Volumes (AM and PM Peak Hours)



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-9: 2023 Future Background Traffic Volumes (Saturday Peak Hour)



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-10 and **Exhibit 2-11** summarize the signalized and unsignalized intersection operations during the AM, PM, and Saturday peak hours. Full future background Synchro and SimTraffic reports are provided in **Appendix G**.

Exhibit 2-10: 2023 Future Background Traffic Operations – Signalized Intersections

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
AM Peak Hour								
QEW West Ramp	C	0.85	WBT	E	> 1.0	141.1	94.3	-
QEW East Ramp	B	> 1.0	NBL	D	0.84	81.7	69.2	700
			NBR	B	0.91	35.4	9.3	
Lakeshore Rd & Maple Ave	C	0.74	WBL	C	0.66	54.5	39.5	30
PM Peak Hour								
QEW West Ramp	C	0.79	EBL	C	0.42	13.4	49.9	40
			SBL	E	0.81	72.9	63.4	290
QEW East Ramp	B	0.77	NBL	F	>1.0	123.4	155.2	700
JBH Access	A	0.59	NBL	E	0.58	28.9	26.8	30
Lakeshore Rd & Maple Ave	D	0.79	EBL	E	0.78	85.9	71.9	165
			WBL	B	0.59	45.6	40.4	30
			WBT	D	0.85	212.6	255.7	-
			NBT	E	0.79	72.9	68.8	-
Saturday Peak Hour								
QEW West Ramp	C	0.80	EBL	C	0.31	15.6	42.6	40
			WBT	C	0.88	162.9	91.3	-

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
			SBL	D	0.85	95.1	68.8	290
QEW East Ramp	B	0.85	NBL	E	0.92	75.6	69.0	700
Lakeshore Rd & Maple Ave	D	0.93	WBL	D	0.87	140.2	32.7	30
			NBL	F	0.97	55.4	67.2	105

Exhibit 2-11: 2023 Future Background Traffic Operations – Unsignalized Intersection

North Shore Blvd Intersection	Movement	LOS	Delay (s)	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)
AM Peak Hour						
Site Driveway	SBL/R	B	11.1	0.01	0.2	6.6
PM Peak Hour						
Site Driveway	SBL/R	C	17.9	0.02	0.5	8.4
Saturday Peak Hour						
Site Driveway	SBL/R	C	16.4	0.02	0.4	6.3

As anticipated, the critical movements identified under existing conditions were exacerbated by the background traffic volume growth. When comparing 2023 future background operations to existing conditions, the following additional critical intersections and/or movements were noted:

AM Peak Hour

- The North Shore Boulevard and QEW West Ramp intersection becomes critical with an overall V/C ratio of 0.85;

PM Peak Hour

- The westbound through movement at the Lakeshore Road / Maple Avenue & North Shore Boulevard intersection becomes critical with a V/C ratio of 0.85. Additionally, the eastbound left movement is projected to operate at LOS E;

Saturday Peak Hour

- The westbound through movement at the North Shore Boulevard & QEW West Ramp intersection becomes critical with a V/C ratio of 0.88. Additionally, the eastbound left movement becomes critical due to SimTraffic 95th percentile queues exceeding the available storage; and
- The North Shore Boulevard and QEW East Ramp intersection becomes critical with an overall V/C ratio of 0.85.

The shared southbound left and right turn movement at the subject site driveway was projected in Synchro to operate well, with a LOS of B or C during all peak periods.

2.2.5 2028 Future Background Traffic Analysis

To obtain 2028 future background volumes, the 2023 future background volumes were further grown using the growth rates discussed in **Section 2.2.2**. **Exhibit 2-12** and **Exhibit 2-13** summarize the signalized and unsignalized intersection operations during the weekday AM, PM, and Saturday peak hours, respectively.

Exhibit 2-12: 2028 Future Background Traffic Operations – Signalized Intersections

Intersection			Critical Movement					
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	Storage (m)
AM Peak Hour								
QEW West Ramp	D	0.93	WBT	F	> 1.0	154.8	124.0	-
			SBL	D	0.79	85.3	73.1	290
QEW East Ramp	D	> 1.0	NBL	E	0.89	93.2	81.4	700
			NBR	E	1.00	75.0	52.4	
Lakeshore Rd & Maple Ave	C	0.8	EBT	C	0.87	192.8	165.8	-
			WBL	C	0.66	54.0	37.6	30
PM Peak Hour								
QEW West Ramp	C	0.89	EBL	C	0.53	17.9	50.1	40
			WBT	B	0.85	160.6	98.0	-
			WBR	B	0.88	205.3	103.3	-
			SBL	E	0.89	84.2	67.2	290
QEW East Ramp	B	0.84	NBL	F	> 1.0	139.5	276.8	700
JBH Access	A	0.66	NBL	E	0.58	28.9	26.3	30
Lakeshore Rd & Maple Ave	D	0.86	EBL	E	0.78	87.5	64.7	165
			WBL	B	0.64	46.2	39.6	30
			WBT	D	0.98	262.7	235.6	-
			NBT	E	0.80	75.2	67.5	-
Saturday Peak Hour								
QEW West Ramp	C	0.87	EBL	C	0.38	17.0	44.0	40
			WBT	C	0.94	172.6	94.3	-
			SBL	E	0.94	109.3	81.2	290
QEW East Ramp	B	0.93	NBL	F	1.00	87.1	78.1	700
			NBR	A	0.82	0	3.0	
Lakeshore Rd & Maple Ave	D	1.00	WBL	E	0.98	156.4	34.4	30
			NBL	F	0.96	53.7	78.0	105

Exhibit 2-13: 2028 Future Background Traffic Operations – Unsignalized Intersections

North Shore Blvd Intersection	Movement	LOS	Delay (s)	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)
AM Peak Hour						
Site Driveway	SBL/R	B	11.4	0.01	0.2	6.6
PM Peak Hour						
Site Driveway	SBL/R	C	20.0	0.02	0.6	7.0
Saturday Peak Hour						
Site Driveway	SBL/R	C	17.6	0.02	0.4	8.4

As anticipated, the previously identified critical movements were exacerbated by the additional background traffic volume growth. When comparing 2028 future background operations to 2023 future background operations, the following additional critical intersections and/or movements were noted:

AM Peak Hour

- The southbound left turn movement at the North Shore Boulevard / QEW West Ramp intersection is projected to be critical with a V/C ratio of 0.79;
- The eastbound through movement at the Lakeshore Road / Maple Avenue & North Shore Boulevard intersection becomes critical with a V/C ratio of 0.87;

PM Peak Hour

- The westbound through and westbound right turn movements at the North Shore Boulevard / QEW West Ramp intersection become critical with V/C ratios of 0.85 and 0.88, respectively;
- The North Shore Boulevard intersections with the QEW West Ramp, QEW East Ramp, and Lakeshore Road & Maple Avenue all become critical due to the overall V/C ratios exceeding the 0.85 threshold;

Saturday Peak Hour

- The North Shore Boulevard / QEW West Ramp intersection becomes critical with an overall V/C ratio of 0.87; and
- The northbound left right movement at the North Shore Boulevard / QEW East Ramp intersection is projected to be critical with a V/C ratio of 0.82. However, delays and queues are expected to be acceptable.

The shared southbound left and right turn movement at the subject site driveway is projected to continue to operate well, with a LOS of B or C during all peak periods.

2.2.6 2033 Future Background Traffic Analysis

To obtain 2033 future background volumes, the 2028 future background volumes were further grown using the growth rates discussed in Section 2.2.2. **Exhibit 2-14** and **Exhibit 2-15** summarize the signalized and unsignalized intersection operations, respectively, during the weekday AM, PM, and Saturday peak hours.

Exhibit 2-14: 2033 Future Background Traffic Operations – Signalized Intersections

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
AM Peak Hour								
QEW West Ramp	D	> 1.0	EBL	C	0.71	35.4	41.1	40
			WBT	F	> 1.0	168.5	177.2	-
			SBL	D	0.87	98.1	101.0	290
QEW East Ramp	D	> 1.0	NBL	E	0.96	106.3	152.7	700
			NBR	F	> 1.0	118.4	231.6	
Lakeshore Rd & Maple Ave	D	0.86	EBT	D	0.99	232.6	225.4	-
			WBL	C	0.67	53.5	38.8	30
PM Peak Hour								
QEW West Ramp	C	> 1.0	EBL	D	0.69	41.0	49.9	40
			WBT	B	0.91	232.3	100.0	-
			WBR	C	0.99	375.3	113.2	-
			SBL	F	0.99	97.9	93.2	290
			SBR	E	0.67	49.5	53.5	290
QEW East Ramp	C	0.91	NBL	F	> 1.0	158.1	456.6	700
JBH Access	A	0.73	NBL	E	0.58	28.9	27.9	30
Lakeshore Rd & Maple Ave	E	0.94	EBL	E	0.78	87.2	65.9	165
			WBL	C	0.67	71.2	40.8	30
			WBT	F	> 1.0	317.6	234.9	-
			NBT	E	0.80	77.5	79.6	-
Saturday Peak Hour								
QEW West Ramp	C	0.95	EBL	C	0.47	18.5	46.8	40
			WBT	D	> 1.0	188.6	128.5	-
			SBL	F	> 1.0	124.7	86.8	290
QEW East Ramp	C	> 1.0	NBL	F	> 1.0	99.8	79.9	700
			NBR	B	0.90	0.0	15.1	
Lakeshore Rd & Maple Ave	D	> 1.0	EBT	D	0.92	170.0	131.5	-
			WBL	F	> 1.0	157.2	32.4	30
			NBL	F	0.97	54.6	72.0	105

Exhibit 2-15: 2033 Future Background Traffic Operations – Unsignalized Intersections

North Shore Blvd Intersection	Movement	LOS	Delay (s)	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)
AM Peak Hour						
Site Driveway	SBL/R	B	11.9	0.01	0.2	7.3
PM Peak Hour						
Site Driveway	SBL/R	C	22.1	0.03	0.6	8.1
Saturday Peak Hour						
Site Driveway	SBL/R	C	19.0	0.02	0.4	7.6

As anticipated, existing capacity constraints were increased due to the additional background traffic volume growth. When comparing 2033 future background operations to 2028 future background operations, the following additional critical intersections and/or movements were noted:

AM Peak Hour

- The Lakeshore Road / Maple Avenue & North Shore Boulevard intersection becomes critical with an overall V/C ratio of 0.86;
- The eastbound left movement at the QEW West Ramp becomes critical due to SimTraffic 95th percentile queues exceeding the available storage;

PM Peak Hour

- The eastbound left turn movement at the QEW West Ramp / North Shore Boulevard intersection becomes critical since the 95th percentile queue is projected to exceed the storage length. The southbound right turn movement is also projected to operate at LOS E;
- The QEW East Ramp / North Shore Boulevard intersection becomes critical with an overall V/C ratio of 0.91; and

Saturday Peak Hour

- The eastbound through movement at the Lakeshore Road & Maple Avenue / North Shore Boulevard intersection becomes critical with an overall V/C ratio of 0.92.

The shared southbound left and right turn movement at the subject site driveway is projected to continue to operate well, with a LOS of B or C during all peak periods.

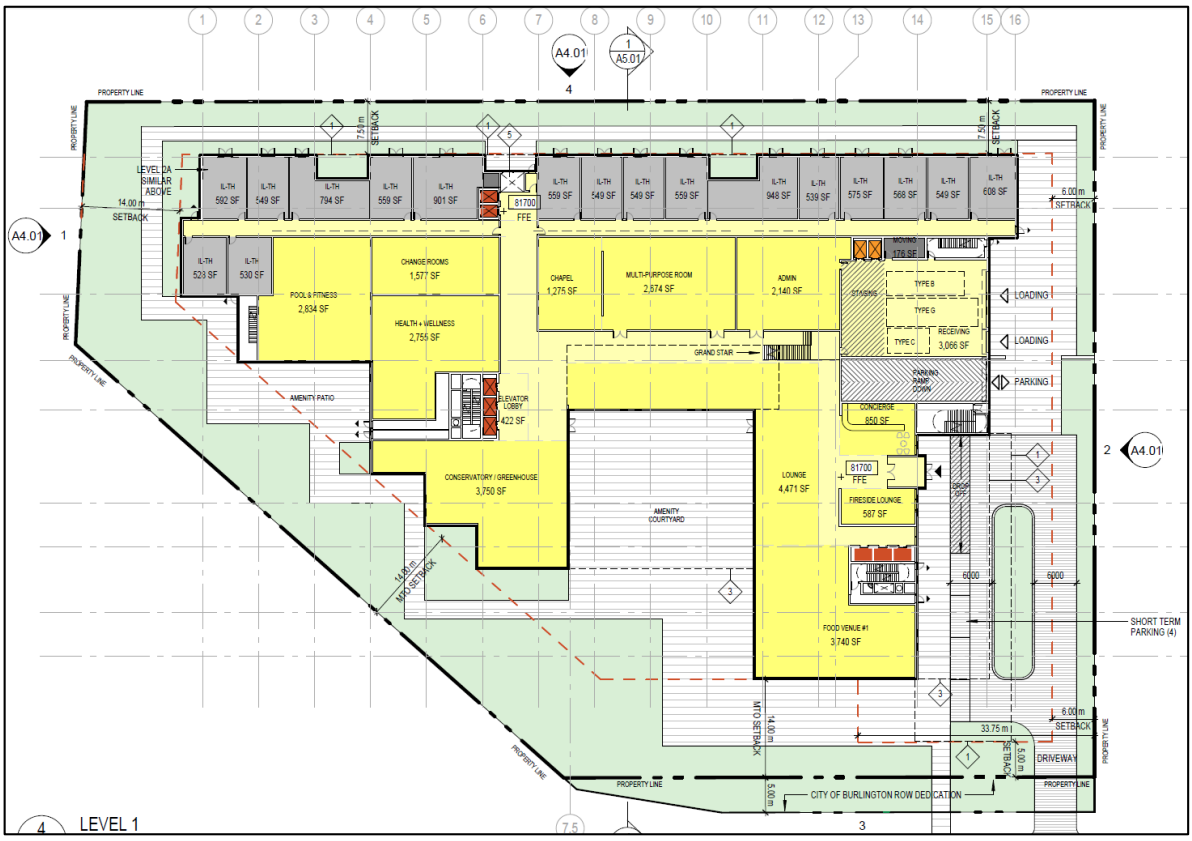
2.3 Future Total Traffic Conditions

2.3.1 Site Development

Amico is proposing to construct a seniors living campus, consisting of four buildings of varying height up to 17 storeys. These include 56 memory care units, 106 assisted living units, and 330 independent living units, for a total of 492 units.

Note that the analysis was completed with respect to 492 units, but the final application is for 475 units, including 95 memory care units, 71 assisted living units, and 309 independent living units. As the analysis was completed with more units than ultimately proposed, this analysis is considered slightly conservative. The most recent site plan (September 5th, 2018) is shown in **Exhibit 2-16**.

Exhibit 2-16: Subject Site Plan



Vehicle access to the proposed development will be provided from the existing private driveway, located approximately 170 metres east of the North Shore Boulevard / QEW east ramp terminal intersection.

2.3.2 Trip Generation

To estimate trips generated by the subject site, trip generation rates were first obtained from the Institute of Transportation Engineers (ITE) Trip Generation Manual – 9th Edition. Specifically, Land Use Code (LUC) 255 (Continuing Care Retirement Community) was considered the best fit for the subject site as this land use includes elements of senior adult living, congregate care, assisted living and skilled nursing care (e.g. memory care) land uses. The trip generation average rate for the AM, PM, and Saturday peak hours are summarized in **Exhibit 2-17**.

Exhibit 2-17: Subject Site Trip Generation (ITE Methodology)

Land Use	Unit	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
Continuing Care Retirement Community, 492 Units (ITE LUC 255)	Trips/Unit	0.12	0.06	**0.18**	0.07	0.12	**0.19**	0.14	0.12	**0.26**
	%	65%	35%	**100%**	39%	61%	**100%**	52%	48%	**100%**
	Trips	59	30	**89**	34	59	**93**	69	59	**128**

It is noted that the subject site contains a proportion of residents that are in memory care (56 units out of 492 units, 11%) who are not able to drive. The ITE Trip Generation Manual rates for Continuing Care Retirement Community uses may not accurately represent subject site traffic activity due to the broad range of continuing care housing sub-types surveyed for the ITE rates. To determine if this is the case, a proxy site trip generation survey was conducted at a site with similar characteristics to the proposed North Shore development.

2.3.3 Proxy Site Selection

To estimate the proposed development's trip generation, traffic surveys and parking utilization surveys were conducted at one proxy site of a similar nature to the proposed development. Amico provided unit statistics for several senior living centres across Southern Ontario, as displayed in **Exhibit 2-18**.

Exhibit 2-18: Potential Proxy Site Statistics

Unit Type	Subject Site		Barrie		Milton		Cambridge		Bayview Garden		Bayview	
	# of Units	% of Units	# of Units	% of Units	# of Units	% of Units	# of Units	% of Units	# of Units	% of Units	# of Units	% of Units
Independent Living	**330**	**67%**	68	51%	-	-	-	-	122	83%	111	79%
Assisted Living	**106**	**22%**	49	37%	131	86%	120	89%	25	17%	29	21%
Memory Care	**56**	**11%**	16	12%	21	14%	15	11%	-	-	-	-
Total	**492**	**100%**	133	100%	152	100%	135	100%	147	100%	140	100%
Distance to Highway	**170 m**		960 m		5,000 m		-		730 m		660 m	

When comparing the subject site's unit type breakdown and the distance to the nearest major highway, the Amico senior care centre in Barrie is considered most comparable. Both sites contain all three unit types (independent living, assisted living, and memory care) with similar unit percentages, and both sites are within a kilometre of a major highway.

On-site trip generation data was collected on July 19, 2018 from 7:30 AM to 10:00 AM, from 5:30 PM to 7:00 PM, and on July 21, 2018 from 11:00 AM to 1:00 PM. The inbound and outbound peak hour trips observed at the Barrie proxy site (133 units) were used to develop trip generation rates, which were then applied to the subject site (492 units) to generate trips. The trip generation assessment is summarized in **Exhibit 2-19**.

Exhibit 2-19: Proposed Development Trip Generation – From Proxy Site

Site	Unit	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
Barrie Proxy Site (133 units)	Trips	32	14	46	10	11	21	13	12	25
	%	69%	31%	100%	50%	50%	100%	53%	47%	100%
	Trips/Unit	0.24	0.11	0.35	0.08	0.08	0.16	0.10	0.09	0.19
Subject Site (492 units)	Trips	118	54	172	39	39	78	49	44	93

The subject site's trip generation based on proxy site data ranges between 39 and 118 one-way (i.e. inbound or outbound) trips during the various peak hours.

The subject site trip estimates based on the ITE and proxy site methodologies were compared and summarized in **Exhibit 2-20**.

Exhibit 2-20: Subject Site Trip Generation (ITE and Proxy Site Methodology Comparison)

Trip Generation Methodology	Unit	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
ITE	Trips/Unit	0.11	0.06	0.17	0.07	0.11	0.19	0.13	0.13	0.26
	%	65%	35%	100%	39%	61%	100%	52%	48%	100%
	Trips	56	30	86	36	56	92	66	61	127
Proxy Site	Trips/Unit	0.24	0.11	0.35	0.08	0.08	0.16	0.10	0.09	0.19
	%	69%	31%	100%	50%	50%	100%	53%	47%	100%
	Trips	118	54	172	39	39	78	49	44	93
ITE - Proxy	**Trips**	**-62**	**-24**	**-86**	**-3**	**17**	**14**	**17**	**17**	**34**

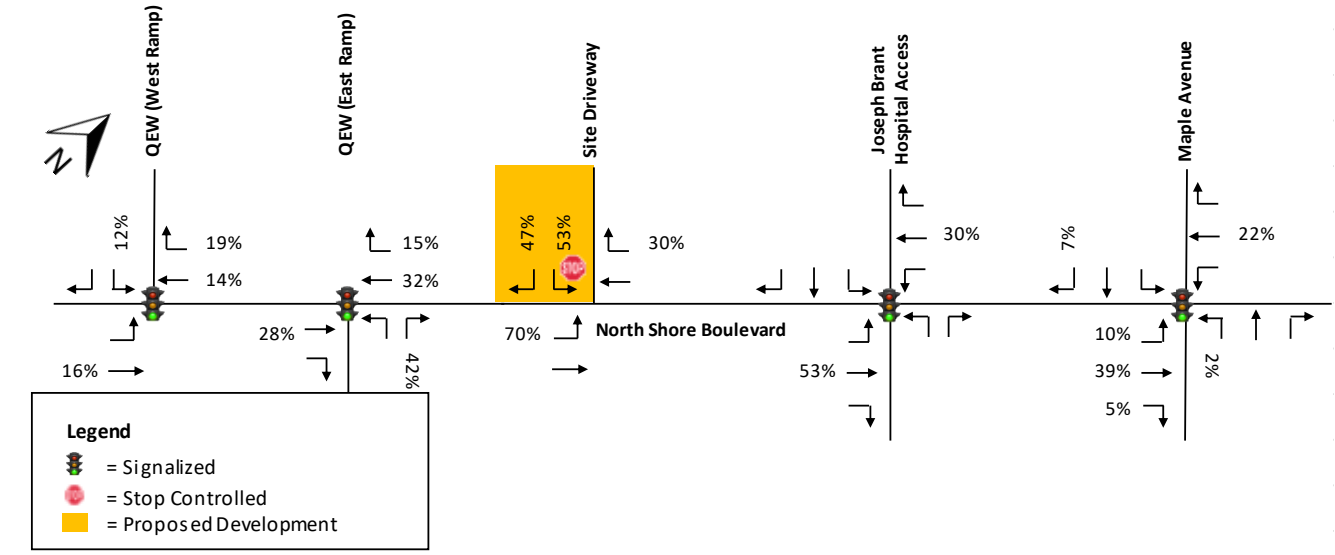
Based on the comparison, trips estimated using the proxy site method resulted in 86 more two-way trips (i.e. inbound and outbound) during the weekday AM peak hour, 17 less during the weekday PM peak hour, and 34 less during the Saturday peak hour. For this report's traffic assessment, proxy site trip rates were used to estimate subject site trips.

2.3.4 Trip Distribution and Assignment

Trips distribution was based on an assessment of traffic patterns at the intersection east of the subject site, containing the Chartwell Brant Centre Long Term Care Residence, Joseph Brant Hospital, and other facilities. This method was preferred over the use of Transportation Tomorrow Survey (TTS) travel pattern data, since locally sourced specific trip traffic patterns relating to the study area and similar long term care land uses was deemed more accurate and applicable.

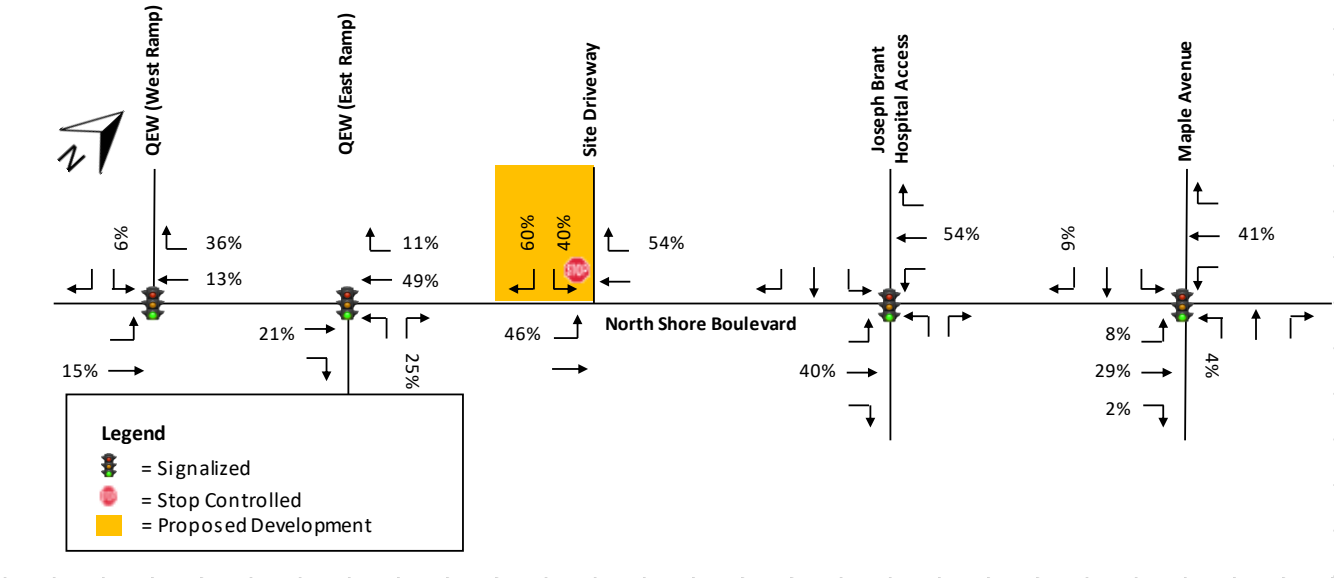
Trip assignment and distribution during the weekday AM, PM, and Saturday peak periods are displayed in **Exhibit 2-21**, **Exhibit 2-22**, and **Exhibit 2-23**, respectively.

Exhibit 2-21: Proposed Development Trip Distribution – AM Peak Hour



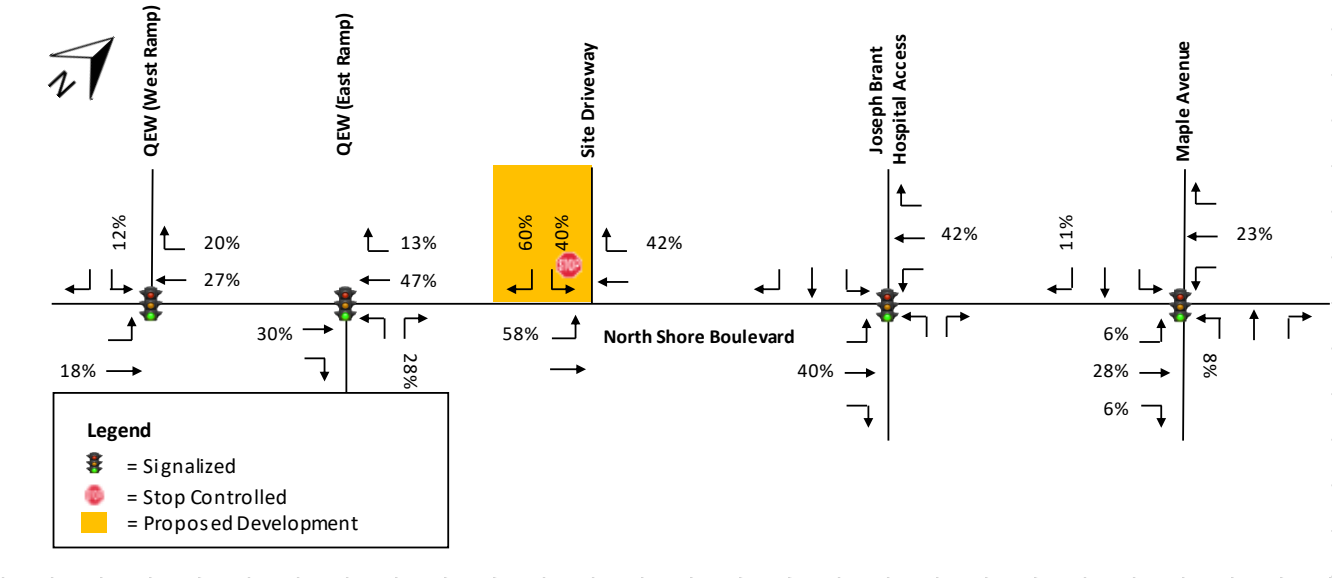
Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-22: Proposed Development Trip Distribution – PM Peak Hour



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-23: Proposed Development Trip Distribution – Saturday Peak Hour

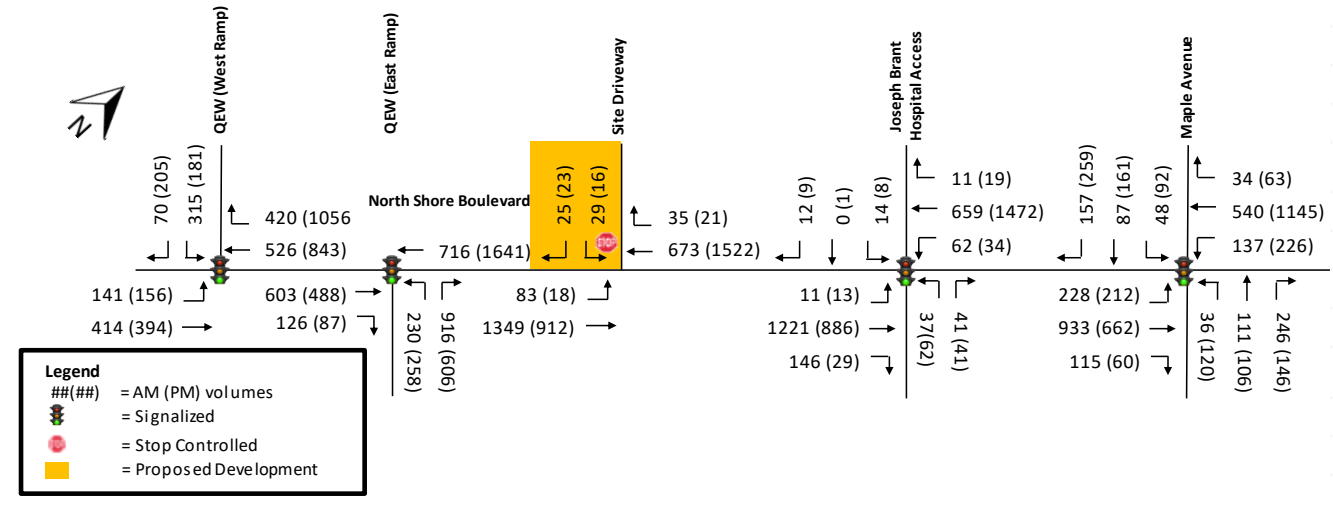


Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

2.3.5 2023 Future Total Traffic Analysis

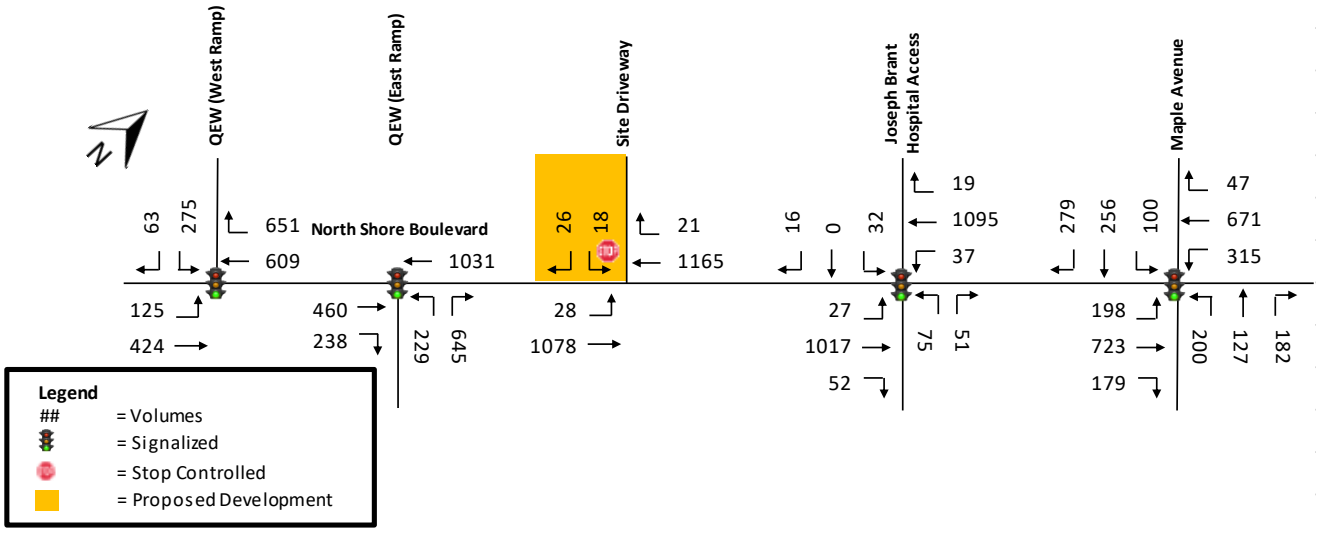
Future total traffic volumes for the 2023 horizon year were obtained by adding site generated trips to the 2023 future background volumes. **Exhibit 2-24** illustrates 2023 future total traffic volumes during the AM and PM peak hours, and **Exhibit 2-25** illustrates volumes during the Saturday peak hour.

Exhibit 2-24: 2023 Future Total Traffic Volumes (AM and PM Peak Hours)



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-25: 2023 Future Total Traffic Volumes (Saturday Peak Hour)



Note: *The arrows in this diagram do not represent the lane configuration and are meant to represent turning movements. Not to scale.*

Exhibit 2-26 and **Exhibit 2-27** summarize the signalized and unsignalized intersection operations, respectively during the AM, PM, and Saturday peak hours. Full future total Synchro and SimTraffic reports are provided in **Appendix H**.

Exhibit 2-26: 2023 Future Total Traffic Operations – Signalized Intersections

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
AM Peak Hour								
QEW West Ramp	C	0.87	WBT	E	> 1.0	143.2	95.2	-
			SBL	C	0.75	78.8	72.4	290
QEW East Ramp	B	> 1.0	NBL	D	0.84	81.7	68.6	700
			NBR	C	0.96	57.3	48.8	
Lakeshore Rd & Maple Ave	C	0.74	WBL	C	0.66	54.5	38.5	30
PM Peak Hour								
QEW West Ramp	C	0.80	EBL	C	0.43	13.4	50.8	40
			SBL	E	0.82	73.9	62.6	290
QEW East Ramp	B	0.77	NBL	F	> 1.0	123.4	178.4	700
JBH Access	A	0.60	NBL	E	0.58	28.9	26.0	30
Lakeshore Rd & Maple Ave	D	0.80	EBL	E	0.77	88.0	67.1	165
			WBL	B	0.59	45.6	40.0	30
			WBT	D	0.86	214.2	258.5	-
			NBT	E	0.79	72.9	73.0	-
Saturday Peak Hour								
QEW West Ramp	C	0.82	EBL	C	0.32	15.6	44.7	40

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
			WBT	C	0.90	166.8	92.5	-
			SBL	E	0.87	98.1	68.8	290
QEW East Ramp	B	0.86	NBL	E	0.92	75.6	62.2	700
			NBR	A	0.76	0.0	3.2	
Lakeshore Rd & Maple Ave	D	0.94	WBL	D	0.88	141.8	33.8	30
			NBL	F	1.00	58.4	64.7	105

Exhibit 2-27: 2023 Future Total Traffic Operations – Unsignalized Intersections

North Shore Blvd Intersection	Movement	LOS	Delay (s)	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)
AM Peak Hour						
Site Driveway	SBL/R	C	15.5	0.14	3.7	19.3
PM Peak Hour						
Site Driveway	SBL/R	C	21.3	0.17	4.4	17.0
Saturday Peak Hour						
Site Driveway	SBL/R	C	16.3	0.13	3.5	17.5

To evaluate the impact the proposed development has on the study area road network, the 2023 future total operations are compared to the 2023 future background operations. The following operational changes are observed:

- In general, traffic operations marginally deteriorate due to the additional trips generated by the proposed development;
- The southbound left turn movement at the North Shore Boulevard / QEW West Ramp intersection becomes critical during the AM peak period with a V/C ratio of 0.75. Note that the movement operates with a LOS C; and
- The northbound right turn movement at the North Shore Boulevard / QEW East Ramp intersection becomes critical during the Saturday peak period with a V/C ratio of 0.76. However, LOS and queues remain acceptable.
- The shared southbound left and right turn movement at the subject site driveway is projected to continue to operate well, with a LOS of C during all peak periods.

2.3.6 2028 Future Total Traffic Analysis

2028 future total volumes were obtained by adding site generated trips to the 2028 future background volumes. **Exhibit 2-28** and **Exhibit 2-29** summarize the signalized and unsignalized intersection operations, respectively during the AM, PM, and Saturday peak hours.

Exhibit 2-28: 2028 Future Total Traffic Operations – Signalized Intersections

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
AM Peak Hour								
QEW West Ramp	D	0.95	EBL	B	0.60	20.4	42.9	40
			WBT	F	> 1.0	156.9	114.6	-
			SBL	D	0.82	90.2	86.7	290
QEW East Ramp	D	> 1.0	NBL	E	0.89	93.2	404.9	700
			NBR	F	> 1.0	96.9	476.8	
Lakeshore Rd & Maple Ave	C	0.80	EBT	C	0.89	198.8	128.8	-
			WBL	C	0.66	54.0	39.4	30
PM Peak Hour								
QEW West Ramp	C	0.90	EBL	C	0.53	17.9	49.8	40
			WBT	B	0.85	160.9	98.8	-
			WBR	B	0.89	212.1	103.9	-
			SBL	F	0.90	85.7	63.8	290
QEW East Ramp	B	0.84	NBL	F	> 1.0	139.5	270.3	700
JBH Access	A	0.66	NBL	E	0.58	28.9	26.9	30
Lakeshore Rd & Maple Ave	D	0.87	EBL	E	0.78	89.4	61.3	165
			WBL	C	0.64	46.2	39.7	30
			WBT	E	0.99	265.3	244.1	-
			NBT	E	0.80	75.2	84.4	-
Saturday Peak Hour								
QEW West Ramp	C	0.89	EBL	C	0.39	17.0	45.1	40
			WBT	D	0.96	178.0	110.6	-
			SBL	E	0.96	112.0	78.6	290
QEW East Ramp	B	0.94	NBL	F	1.00	87.1	66.7	700
			NBR	A	0.83	0.0	36.5	
Lakeshore Rd & Maple Ave	D	> 1.0	WBL	E	0.98	156.4	32.4	30
			NBL	F	0.99	56.6	77.7	105

Exhibit 2-29: 2028 Future Total Traffic Operations – Unsignalized Intersections

North Shore Blvd Intersection	Movement	LOS	Delay (s)	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)
AM Peak Hour						
Site Driveway	SBL/R	C	16.5	0.15	4.0	36.1
PM Peak Hour						
Site Driveway	SBL/R	C	24.8	0.19	5.4	18.6
Saturday Peak Hour						
Site Driveway	SBL/R	C	17.4	0.14	3.8	21.2

To evaluate the impact the proposed development has on the study area road network, the 2028 future total operations are compared to the 2028 future background operations. The following operational changes are observed:

- In general, traffic operations deteriorate due to the additional five years of background traffic growth at the QEW ramps and study area North Shore Boulevard and Maple Avenue corridors; and
- The eastbound left movement at the North Shore Boulevard / QEW West Ramp intersection becomes critical during the AM peak period due to SimTraffic 95th percentile queues exceeding the available storage.
- Site driveway southbound outbound delays increase due to higher North Shore Boulevard westbound volumes, however continues to operate well, with a LOS of C during all peak periods.

2.3.7 2033 Future Total Traffic Analysis

2033 future total volumes were obtained by adding site generated trips to the 2033 future background volumes. **Exhibit 2-30** and

Exhibit 2-31 summarize the signalized and unsignalized intersection operations, respectively, for the weekday AM, PM, and Saturday peak hours.

Exhibit 2-30: 2033 Future Total Traffic Operations – Signalized Intersections

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
AM Peak Hour								
QEW West Ramp	D	> 1.0	EBL	C	0.71	35.4	44.2	40
			WBT	F	> 1.0	170.3	151.5	-
			SBL	D	0.91	103.0	98.4	290
QEW East Ramp	F	> 1.0	NBL	E	0.96	106.3	448.9	700
			NBR	F	> 1.0	139.9	500.7	
Lakeshore Rd & Maple Ave	D	0.87	EBL	B	0.58	40.6	182.1	165
			EBT	D	> 1.0	238.7	281.4	-
			WBL	C	0.67	53.5	38.8	30
PM Peak Hour								
QEW West Ramp	C	> 1.0	EBL	D	0.70	42.7	47.7	40
			WBT	B	0.91	243.4	96.1	-

Intersection			Critical Movement					Storage (m)
North Shore Blvd Intersection	Overall LOS	Overall V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	
			WBR	C	1.00	383.5	114.7	-
			SBL	F	1.00	98.4	84.5	290
			SBR	E	0.68	50.2	48.6	-
QEW East Ramp	C	0.92	NBL	F	> 1.0	158.1	448.7	700
JBH Access	A	0.73	NBL	E	0.58	28.9	27.3	30
Lakeshore Rd & Maple Ave	E	0.95	EBL	E	0.78	88.9	69.1	165
			WBL	C	0.67	73.2	40.1	30
			WBT	F	> 1.0	319.7	233.7	-
			NBT	E	0.80	77.5	74.8	-
Saturday Peak Hour								
QEW West Ramp	D	0.96	EBL	C	0.48	18.5	48.8	40
			WBT	D	> 1.0	194.1	122.4	-
			SBL	F	> 1.0	127.0	92.9	290
QEW East Ramp	C	> 1.0	NBL	F	> 1.0	99.8	79.9	700
			NBR	B	0.92	0.0	9.8	
Lakeshore Rd & Maple Ave	D	> 1.0	EBT	D	0.93	173.1	133.3	-
			WBL	F	> 1.0	157.2	32.3	30
			NBL	F	1.00	57.6	65.9	105

Exhibit 2-31: 2033 Future Total Traffic Operations – Unsignalized Intersections

North Shore Blvd Intersection	Movement	LOS	Delay (s)	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)
AM Peak Hour						
Site Driveway	SBL/R	C	17.8	0.17	4.5	63.3
PM Peak Hour						
Site Driveway	SBL/R	D	28.1	0.22	6.2	18.1
Saturday Peak Hour						
Site Driveway	SBL/R	C	19.3	0.16	4.4	24.0

To evaluate the impact the proposed development has on the study area road network, the 2033 future total operations are compared to the 2033 future background operations. The following operational changes are observed:

- In general, traffic operations in the study area deteriorate primarily due to continued traffic growth at the QEW ramp terminals, North Shore Boulevard, and Maple Avenue corridors; and
- The eastbound left movement at the North Shore Boulevard / QEW West Ramp intersection becomes critical during the AM peak period due to SimTraffic 95th percentile queues exceeding the available storage.

Site driveway southbound outbound delays increase due to higher North Shore Boulevard westbound volumes; however, the shared southbound left and right turn movement at the subject site driveway is projected to continue to operate well, with a LOS of D during the PM Peak Hour, and LOS of C during the AM Peak and Saturday peak periods.

2.4 Traffic Operations Summary

2.4.1 Future Background and Future Total Traffic Comparison

In the previous future background (**Section 2.2**) and future total (**Section 2.3**) discussions, V/C ratios obtained through Synchro Analysis were analyzed. By comparing these two scenarios, it was observed that the redevelopment of the subject site is anticipated to result in minimal additional impacts to future background traffic operations. The majority of traffic operational issues in the future are observed to result from background traffic growth. To illustrate this observations,

Exhibit 2-32 compares the change in LOS and V/C ratios for the 2033 future background and 2033 future total scenarios at the major signalized intersections.

Exhibit 2-32: Comparison Between 2033 Future Background and 2033 Future Total Traffic Conditions – Overall intersection Operations

Intersection with North Shore Blvd	2033 Future Background Traffic Conditions		2033 Future Total Traffic Conditions		**% Change for V/C Ratio (%)**
	LOS	V/C Ratio	LOS	V/C Ratio	
AM Peak Hour					
QEW West Ramp	D	1.02	D	1.04	**1.9%**
QEW East Ramp	D	1.24	E	1.30	**4.6%**
Lakeshore Rd & Maple Ave	D	0.86	D	0.87	**1.1%**
PM Peak Hour					
QEW West Ramp	C	1.01	C	1.02	**1.0%**
QEW East Ramp	C	0.91	C	0.92	**1.1%**
Lakeshore Road & Maple Avenue	E	0.94	E	0.95	**1.1%**
Saturday Peak Hour					
QEW West Ramp	C	0.95	D	0.96	**1.0%**
QEW East Ramp	C	1.03	C	1.04	**1.0%**
Lakeshore Road & Maple Avenue	D	1.02	D	1.03	**1.0%**

Based on the comparison, it is observed that the addition of site traffic to the future background scenario incurs minimal impact to the overall intersection V/C ratios (as high 4.6%, but typically 1%). This demonstrates the minimal impact the proposed development is anticipated to have on future traffic operations.

A further detailed comparison of key critical movement operations in the study area was also undertaken for the 2033 future background and 2033 future total traffic scenarios, provided in **Exhibit 2-33**.

Exhibit 2-33: Comparison between 2033 Future Background and 2033 Future Total Traffic Conditions – Critical Movement Operations

North Shore Boulevard Intersection	Mvmt	2033 Future Background				2033 Future Total				% Change		
		LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	**V/C Ratio**	**95th %tile Synchro Queue (m)**	**95th %tile SimTraffic Queue (m)**
AM Peak Hour												
QEW West Ramp	EBL	C	0.71	35.4	41.1	C	0.71	35.4	44.2	**0%**	**0%**	**7.5%**
	WBT	F	> 1.0	168.5	177.2	F	>1.0	170.3	151.5	**N/A**	**1.1%**	**-14.5%**
	SBL	D	0.87	98.1	101.0	D	0.91	103.0	98.4	**4.6%**	**5.0%**	**-2.6%**
QEW East Ramp	NBL	E	0.96	106.3	152.7	E	0.96	106.3	448.9	**0%**	**0%**	**194.0%**
	NBR	F	> 1.0	118.4	231.6	F	> 1.0	139.9	500.7	**N/A**	**18.2%**	**116.2%**
Lakeshore Rd & Maple Ave	EBL	B	0.56	40.0	139.2	B	0.58	40.6	182.1	**3.6%**	**1.5%**	**30.8%**
	EBT	D	0.99	232.6	225.4	D	> 1.0	238.7	182.1	**N/A**	**2.6%**	**-19.2%**
	WBL	C	0.67	53.5	38.8	C	0.67	53.5	281.4	**0%**	**0%**	**625.3%**
PM Peak Hour												
QEW West Ramp	EBL	D	0.69	41.0	49.9	D	0.70	42.7	47.7	**1.4%**	**4.1%**	**-4.4%**
	WBT	B	0.91	232.2	100.0	B	0.91	243.4	96.1	**0%**	**4.8%**	**-3.9%**
	WBR	C	0.99	375.3	113.2	C	1.00	383.5	114.7	**1.0%**	**2.2%**	**1.3%**
	SBL	F	0.99	97.9	93.2	F	1.00	98.4	84.5	**1.0%**	**0.5%**	**-9.3%**
	SBR	E	0.67	49.5	53.5	E	0.68	50.2	48.6	**1.5%**	**1.4%**	**-9.2%**
QEW East Ramp	NBL	F	> 1.0	158.1	456.6	F	> 1.0	158.1	448.7	**N/A**	**0%**	**-1.7%**
JBH Access	NBL	E	0.58	28.9	27.9	E	0.58	28.9	27.3	**0%**	**0%**	**-2.2%**
Lakeshore Rd & Maple Ave	EBL	E	0.78	87.4	65.9	E	0.78	88.9	69.1	**0%**	**1.7%**	**4.9%**
	WBL	C	0.67	71.2	40.8	C	0.67	73.2	40.1	**0%**	**2.8%**	**-1.7%**
	WBT	F	> 1.0	317.6	234.9	F	> 1.0	319.7	233.7	**N/A**	**0.7%**	**-0.5%**
	NBT	E	0.80	77.5	79.6	E	0.80	77.5	74.8	**0%**	**0%**	**-6.0%**
Saturday Peak Hour												
QEW West Ramp	EBL	C	0.47	18.5	46.8	C	0.48	18.5	48.8	**2.0%**	**0%**	**4.3%**
	WBT	D	> 1.0	188.6	128.5	D	> 1.0	194.1	122.4	**N/A**	**2.9%**	**-4.7%**
	SBL	F	> 1.0	124.7	86.8	F	> 1.0	127.0	92.9	**N/A**	**1.8%**	**7.0%**
QEW East Ramp	NBL	F	> 1.0	99.8	79.9	F	> 1.0	99.8	79.9	**N/A**	**0%**	**0.0%**
	NBR	B	0.90	0.0	15.1	B	0.92	0.0	9.8	**2.2%**	**0%**	**-35.1%**
Lakeshore Rd & Maple Ave	EBT	D	0.92	170.0	131.5	D	0.93	173.1	133.3	**1.1%**	**1.8%**	**1.4%**
	WBL	F	> 1.0	157.2	32.4	F	> 1.0	157.2	32.3	**N/A**	**0%**	**-0.3%**
	NBL	F	0.97	54.6	72.0	F	1.00	57.6	65.9	**3.1%**	**5.5%**	**-8.5%**

In this comparison, minimal impacts to V/C ratios (less than a 5% increase) are observed when comparing 2033 future total and 2033 future background volumes.

Similarly, minimal impacts to Synchro queues are observed, with increases of approximately up to 5%. A larger impact is noted during the weekday AM peak hour at the QEW east ramp terminal intersection for the northbound right movement (18.2%); however, this reflects approximately an additional two car lengths, which is also regarded as minimal. The change in SimTraffic queues is much more pronounced, where some future total queues are expected to lengthen and others are expected to shorten compared to future background conditions.

To further illustrate off-ramp queues at the QEW ramp intersections, an illustration of distances between ramp elements and terminal spacing is provided in **Exhibit 2-34**.

Ramp terminal queues for all future background and future total traffic scenario years are provided in **Exhibit 2-35**. The queues were derived from the previously discussed exhibits that documented study area intersection operations.

Exhibit 2-34: Distances between QEW Ramp Terminal Elements

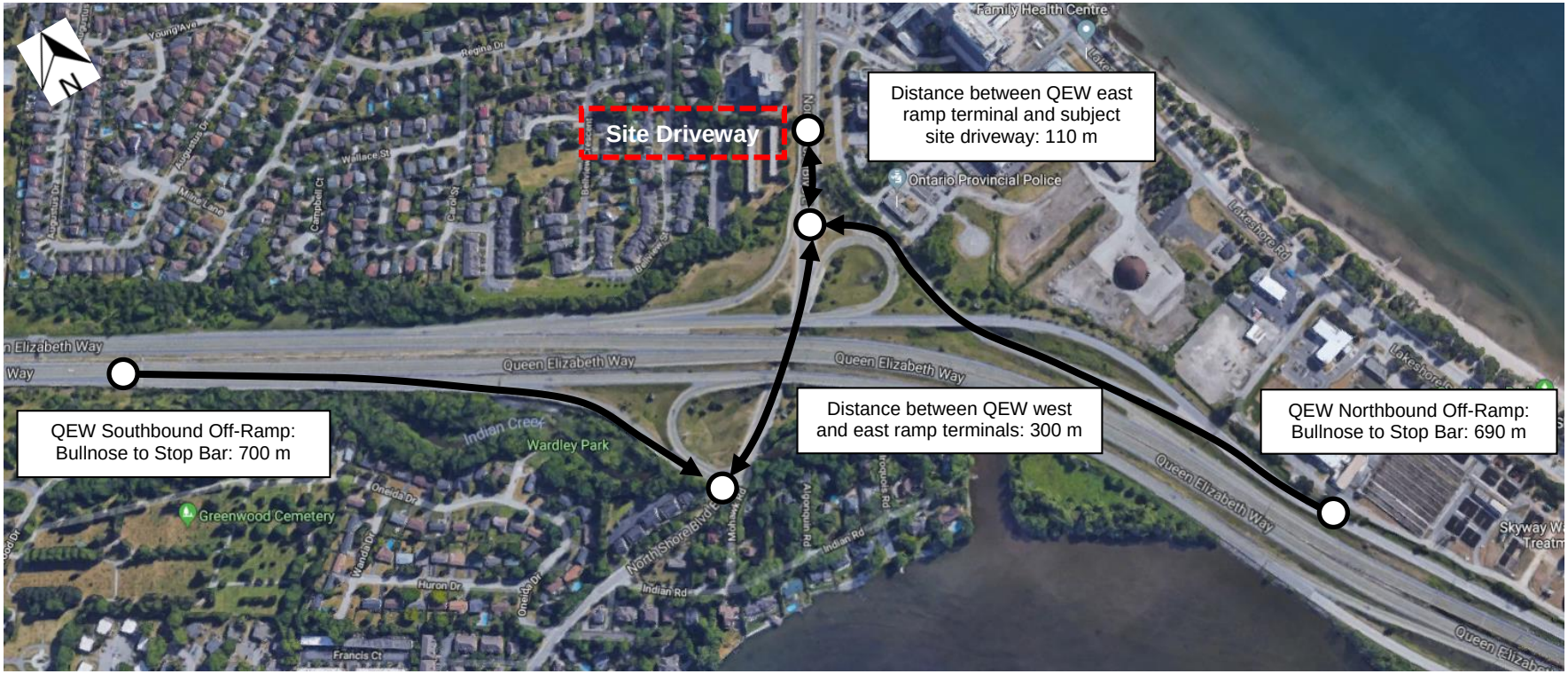


Exhibit 2-35: QEW Ramp Terminal Synchro Queue Comparison by Scenario Year

Location and Queue Direction	Existing (m)	2023 Future Background (m)	2023 Future Total (m)	2028 Future Background (m)	2028 Future Total (m)	2033 Future Background (m)	2033 Future Total (m)	**Queue Limits (to Hwy Bullnose / to upstream intersection) (m)**
AM Peak Hour								
QEW West Ramp – SB	-	-	78.8	85.3	90.2	98.1	103.0	**700**
QEW East Ramp – NB	70.5	81.7	81.7	93.2	93.2	118.4	139.9	**690**
QEW West Ramp - WB	127.4	141.4	143.2	154.8	156.9	168.5	170.3	**300**
QEW East Ramp - EB	-	-	-	-	-	-	-	**300**
PM Peak Hour								
QEW West Ramp – SB	61.7	72.9	73.9	84.2	85.7	97.9	98.4	**700**
QEW East Ramp – NB	108.2	123.4	123.4	139.5	139.5	158.1	158.1	**690**
QEW West Ramp - WB	-	-	-	204.3	212.1	**375.3**	**383.5**	**300**
QEW East Ramp - EB	-	-	-	-	-	-	-	**300**
Saturday Peak Hour								
QEW West Ramp – SB	82.4	95.1	98.1	109.3	112.0	124.7	127.0	**700**
QEW East Ramp – NB	61.7	75.6	75.6	87.1	87.1	99.8	99.8	**690**
QEW West Ramp - WB	-	162.9	166.8	172.6	178.0	188.6	194.1	**300**
QEW East Ramp - EB	-	-	-	-	-	-	-	**300**

Note: " - " refers to queues associated with non-critical movements, documented only in the Synchro output appendices

Exhibit 2-36: QEW Ramp Terminal SimTraffic Queue Comparison by Scenario Year

Location and Queue Direction	Existing (m)	2023 Future Background (m)	2023 Future Total (m)	2028 Future Background (m)	2028 Future Total (m)	2033 Future Background (m)	2033 Future Total (m)	**Queue Limits (to Hwy Bullnose / to upstream intersection) (m)**
AM Peak Hour								
QEW West Ramp – SB	-	-	72.4	73.1	86.7	101.0	98.4	**700**
QEW East Ramp – NB	62.1	69.2	68.6	81.4	476.8	231.6	500.7	**690**
QEW West Ramp - WB	89.9	94.3	95.2	124.0	114.6	177.2	151.5	**300**
QEW East Ramp - EB	-	-	-	-	-	-	-	**300**
PM Peak Hour								
QEW West Ramp – SB	51.6	63.4	62.6	67.2	63.8	93.2	84.5	**700**
QEW East Ramp – NB	103.8	155.2	178.4	276.8	270.3	456.6	448.7	**690**
QEW West Ramp - WB	-	-	-	103.3	98.8	113.2	114.7	**300**
QEW East Ramp - EB	-	-	-	-	-	-	-	**300**
Saturday Peak Hour								
QEW West Ramp – SB	59.0	68.8	68.8	81.2	78.6	86.8	92.9	**700**
QEW East Ramp – NB	59.7	69.0	62.2	78.1	66.7	79.9	79.9	**690**
QEW West Ramp - WB	-	91.3	92.5	94.3	110.6	128.5	122.4	**300**
QEW East Ramp - EB	-	-	-	-	-	-	-	**300**

Note: " - " refers to queues associated with non-critical movements, documented only in the SimTraffic output appendices

During all studied horizon years, QEW off-ramp queues associated with the west ramp's southbound movement and east ramp's northbound movement are both not expected to spill towards the bullnose of the QEW mainline.

By comparing queue increases for the observed critical movements, it is evident that the increases are primarily caused by background growth from the 2023 to 2033 horizon years.

During the weekday PM peak hour, based on Synchro queue results, westbound queues at the QEW west ramp intersection might spill past the east ramp intersection during the PM peak hour starting from the 2028 horizon year due to background traffic growth, with queues increasing for the 2033 horizon year. By the 2033 horizon year, the westbound spillover will extend east 84 metres upstream of the QEW east ramp intersection, but will not interfere with subject site operations, which is located 110 metres east.

With regards to future total traffic conditions, the comparison reveals that subject site traffic activity adds minimal additional queuing to the critical movements when comparing future total and future background traffic conditions per studied horizon year.

2.4.2 Mitigating Measures

Based on the 2033 future background traffic conditions, there is potential for operational improvements by making adjustments to signal timings at the two North Shore Boulevard / QEW ramp terminal intersections and the North Shore Boulevard / Maple Avenue intersections.

Specifically, during the weekday AM peak hour:

- The QEW west ramp terminal intersection cycle length can be lengthened to 95 seconds with the additional time distributed to all movements.
- The QEW east ramp terminal timings can be optimized by reallocating east-west green time to the northbound phase.
- The Maple Avenue intersection timings can be optimized by reallocating north-south green time to the east-west phases.

During the weekday PM peak hour:

- The QEW east ramp terminal timings can be optimized by reallocating east-west green time to the northbound phase.
- The Maple Avenue intersection timings can be optimized by reallocating north-south green time to the east-west phases.

During the Saturday peak hour:

- The QEW east ramp terminal timings can be optimized by reallocating east-west green time to the northbound phase.

The Synchro and SimTraffic reports summarizing these improvements are provided in **Appendix I**. **Exhibit 2-37** summarizes the signalized intersection operations during the weekday AM, PM, and Saturday peak hours.

Exhibit 2-37: 2033 Future Total Traffic Conditions –Signalized Intersection (Optimized Timings)

2033 Future Total Conditions - Optimized (Signalized Intersections)								
Intersection			Critical Movement					Storage Capacity (m)
North Shore Blvd Intersection	LOS	V/C Ratio	Movement	LOS	V/C Ratio	95th %tile Synchro Queue	95th %tile SimTraffic Queue	
AM Peak Hour								
QEW West Ramp	C	0.95	WBT	D	1.0	197.5	126.5	-
			SBL	D	0.89	124.1	104.6	290
QEW East Ramp	E	> 1.0	NBL	D	0.80	77.8	386.3	700
			NBR	F	> 1.0	139.9	501.8	
Lakeshore Road & Maple Avenue	D	0.87	EBT	D	0.99	231.1	263.5	-
			WBL	D	0.68	52.3	38.2	30
PM Peak Hour								
QEW West Ramp	C	> 1.0	EBL	D	0.70	42.7	43.0	40
			WBT	B	0.91	199.5	252.5	-
			WBR	C	1.0	393.5	293.2	-
			SBL	F	1.0	98.4	100.0	-
			SBR	E	0.68	50.2	70.4	-
QEW East Ramp	B	0.92	WBT	B	0.92	98.8	92.5	-
			NBL	E	0.93	135.1	131.5	700
JBH Access	A	0.73	NBL	E	0.58	28.9	29.3	30
Lakeshore Road & Maple Avenue	E	0.94	EBL	E	0.76	107.0	162.2	165
			WBL	C	0.69	47.8	39.1	30
			WBT	F	> 1.0	284.6	233.8	-
			NBT	E	0.83	80.8	224.7	-
Saturday Peak Hour								
QEW West Ramp	D	0.96	WBT	D	> 1.0	215.0	107.5	-
			SBL	F	> 1.0	127.0	94.8	-
QEW East Ramp	B	> 1.0	NBL	D	0.86	73.3	76.5	700
			NBR	B	0.92	0.0	7.8	
Lakeshore Road & Maple Avenue	D	> 1.0	EBT	D	0.93	173.1	129.5	-
			WBL	F	> 1.0	157.2	32.4	30
			NBL	F	> 1.0	57.6	70.3	105

To compare the operational improvements gained via the aforementioned signal optimisation methods for the 2033 future total traffic scenario, **Exhibit 2-38** compares LOS and V/C ratios for the critical movements.

Exhibit 2-38: 2033 Future Total Traffic Conditions – V/C Ratio Comparison between Existing and Optimized Signal Timings

North Shore Blvd Intersection	Critical Movement – 2033 Future Total Traffic Conditions											
	Mvmt	Existing Signal Timings				Optimized Signal Timings				% Change		
		LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	LOS	V/C Ratio	95th %tile Synchro Queue (m)	95th %tile SimTraffic Queue (m)	**V/C Ratio**	**95th %tile Synchro Queue (m)**	**95th %tile SimTraffic Queue (m)**
AM Peak Hour												
QEW West Ramp	EBL	C	0.71	35.4	44.2	C	0.70	26.0	47.9	**-1%**	**-27%**	**8%**
	WBT	F	1.18	170.3	151.5	D	1.0	197.5	126.5	**-15%**	**16%**	**-17%**
	SBL	D	0.91	103.0	98.4	D	0.89	124.1	104.6	**-2%**	**20%**	**6%**
QEW East Ramp	NBL	E	0.96	106.3	448.9	D	0.80	77.8	386.3	**-17%**	**-27%**	**-14%**
	NBR	F	1.16	139.9	500.7	F	1.16	139.9	501.8	**0%**	**0%**	**0%**
Lakeshore Rd & Maple Ave	EBL	B	0.58	40.6	182.1	B	0.58	38.3	183.8	**0%**	**-6%**	**1%**
	EBT	D	1.01	238.7	182.1	D	0.99	231.1	263.5	**-2%**	**-3%**	**45%**
	WBL	C	0.67	53.5	281.4	D	0.68	52.3	38.2	**1%**	**-2%**	**-86%**
PM Peak Hour												
QEW West Ramp	EBL	D	0.70	42.7	47.7	D	0.70	42.7	43.0	**0%**	**0%**	**-10%**
	WBT	B	0.91	243.4	96.1	B	0.91	199.5	252.5	**0%**	**-18%**	**163%**
	WBR	C	1.00	383.5	114.7	C	1.0	393.5	293.2	**0%**	**3%**	**156%**
	SBL	F	1.00	98.4	84.5	F	1.0	98.4	100.0	**0%**	**0%**	**18%**
	SBR	E	0.68	50.2	48.6	E	0.68	50.2	70.4	**0%**	**0%**	**45%**
QEW East Ramp	WBT	A	0.84	110.8	50.4	B	0.92	98.8	92.5	**10%**	**-11%**	**84%**
	NBL	F	1.24	158.1	448.7	E	0.93	135.1	131.5	**-25%**	**-15%**	**-71%**
JBH Access	NBL	E	0.58	28.9	27.3	E	0.58	28.9	29.3	**0%**	**0%**	**7%**
Lakeshore Rd & Maple Ave	EBL	E	0.78	88.9	69.1	E	0.76	107.0	162.2	**-3%**	**20%**	**135%**
	WBL	C	0.67	73.2	40.1	C	0.69	47.8	39.1	**3%**	**-35%**	**-2%**
	WBT	F	1.14	319.7	233.7	F	1.11	284.6	233.8	**-3%**	**-11%**	**0%**
	NBT	E	0.80	77.5	74.8	E	0.83	80.8	224.7	**4%**	**4%**	**200%**
Saturday Peak Hour												
QEW West Ramp	EBL	C	0.48	18.5	48.8	C	0.48	18.5	46.9	**0%**	**0%**	**-4%**
	WBT	D	1.03	194.1	122.4	D	1.03	215.0	107.5	**0%**	**11%**	**-12%**
	SBL	F	1.06	127.0	92.9	F	1.06	127.0	94.8	**0%**	**0%**	**2%**
QEW East Ramp	NBL	F	1.11	99.8	79.9	D	0.86	73.3	76.5	**-23%**	**-27%**	**-4%**
	NBR	B	0.92	0.0	9.8	B	0.92	0.0	7.8	**0%**	**0%**	**-20%**
Lakeshore Rd & Maple Ave	EBT	D	0.93	173.1	133.3	D	0.93	173.1	129.5	**0%**	**0%**	**-3%**
	WBL	F	1.01	157.2	32.3	F	1.01	157.2	32.4	**0%**	**0%**	**0%**
	NBL	F	1.00	57.6	65.9	F	1.0	57.6	70.3	**0%**	**0%**	**7%**

By optimizing signal timings at the congested major intersections, it is demonstrated that the 2033 future total traffic operations can be improved.

Based on the operations comparison for the weekday AM peak hour after signal timing improvements:

- At the QEW west ramp terminal, LOS and capacity is improved for the westbound direction, while southbound left queues increase by approximately two car lengths.
- At the QEW east ramp terminal, northbound left turn queues are shortened.
- At the Lakeshore Road and Maple Avenue intersection, eastbound congestion is improved.

For the weekday PM peak hour:

- At the QEW east ramp terminal, northbound left congestion is improved.
- At the Lakeshore and Maple Avenue intersection, westbound congestion is reduced while incurring minimal impacts to the northbound operations.

For the Saturday peak hour:

- Northbound left congestion is noticeably improved.

2.5 Traffic Signal Warrant

To assess signalization feasibility, a signal warrant was conducted using the OTM Book 12 Section 4.10 Justification 7 (Projected Volumes) methodology. Via this method, the warrant calculations required in Table 19 of the Book are summarized in **Exhibit 2-39**.

Exhibit 2-39: Signal Warrant for Subject Site Driveway Intersection

Traffic Signal Justification for Future Development

OTM Book 12 (November, 2007) Section 4.10 - Table 19 - Justification 7 - Projected Volumes

Justification 1:	120% met? (Existing Intersection) [Y/N]	N	Warranted only if Justification 1 & 2 are
Justification 2:	120% met? (Existing Intersection) [Y/N]	N	fullfilled to % criteria.

Restr flow = urban conditions, < 70km/hr posted speed
Free Flow = rural case, 70km/hr or greater posted speed

Justification	Description	Minimum Requirement 1 Lane Highways		Minimum Requirement 2 or more lanes		Compliance Sectional		Entire %
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%	
1. Minimum Vehicular Volume	A. Vehichle volume, all approaches (avg hour)	480	720	600	900	1438	160%	87%
	B. Vehicle volume, along minor streets (avg hour)	120	170	120	170	23	14%	
2. Delay to cross traffic	A. Vehicle volume, major street (avg hour)	480	720	600	900	1415	157%	82%
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (avg hour)	50	75	120	170	11	6%	

Average Hourly Volume Formula:
AHV = (AmPHV+PmPHV)/4

	Vol AM+PM	Vol AHV
All Mvt	5752	1438
All Minor	93	23
All Major	5659	1415
Cross Traffic	44	11

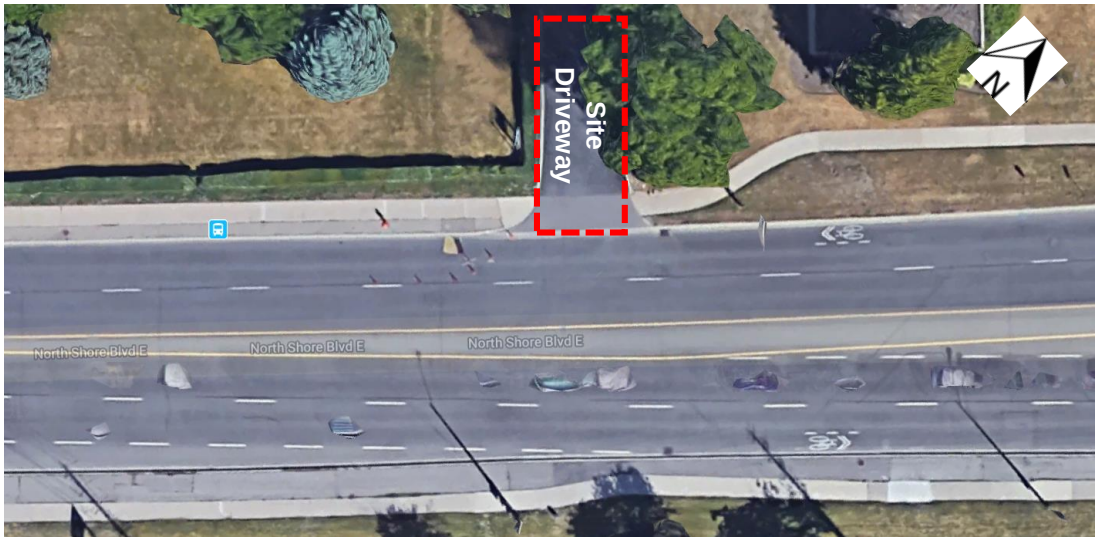
Where:
AHV = Average Hourly Volume
AmPHV = AM Peak Hourly Volume
PmPHV = PM Peak Hourly Volume

Based on the results of the signal warrant, neither Justification 1 (87% compliance) or Justification 2 (82% compliance) meet the 120% fulfillment criteria. Therefore, signalizing the subject site driveway is not warranted.

2.6 Left Turn Assessment

Based on the lane configuration of the subject site's existing driveway intersection with North Shore Boulevard, eastbound left turning traffic may attempt to use the centre median as storage while waiting to turn into the site. It is noted that the centre median narrows towards the west, and does not fully accommodate the width of a passenger vehicle until east of the site's driveway, where a formalized eastbound left turn storage lane is provided at the signalized Joseph Brant Hospital intersection. This is illustrated in **Exhibit 2-40**.

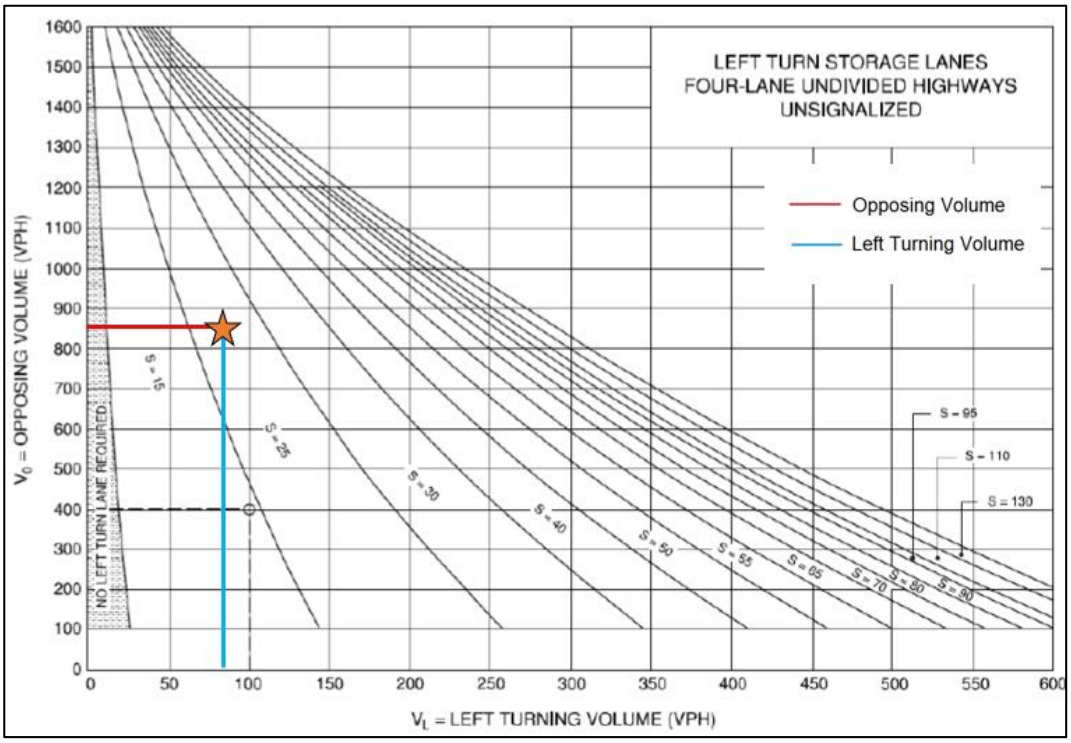
Exhibit 2-40: Centre Median at Site Driveway



It is also noted left turn storage requirements can be facilitated by means of a dedicated left turn lane with a deceleration taper, or with a two-way centre left turn lane. To assess potential left turn storage requirements associated with the proposed redevelopment of the subject site, the MTO Design Supplement for the TAC Geometric Design Guide for Canadian Roads (June 2017) was reviewed. Specifically, Exhibit 9A-30 (Left turn storage lane at a four lane undivided highway, unsignalized) was used.

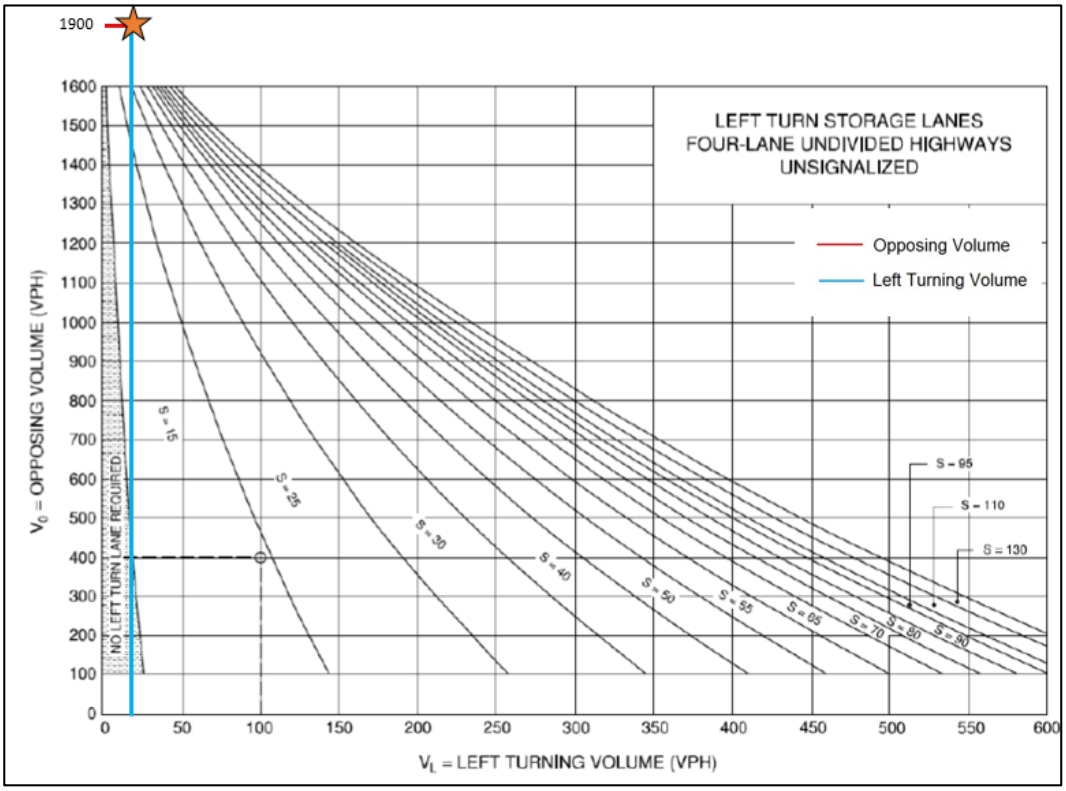
Inbound left turning site volumes during the AM, PM, and Saturday peak hours during the 2033 horizon year were compared with opposing through (i.e. westbound) traffic, as illustrated in **Exhibit 2-41**, **Exhibit 2-42**, and **Exhibit 2-43**, respectively.

Exhibit 2-41: Left Turn Storage Lane Assessment: 2033 AM Peak Hour



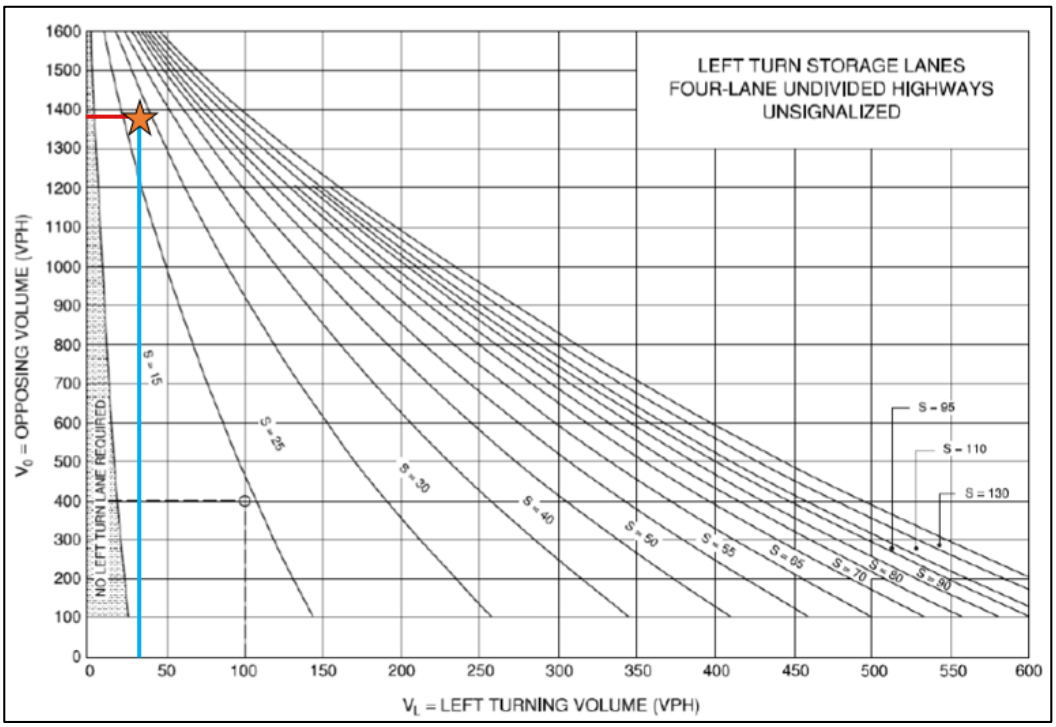
For the 2033 AM peak hour, a left turn storage lane length of 25 metres is recommended.

Exhibit 2-42: Left Turn Storage Lane Assessment: 2033 PM Peak Hour



For the 2033 PM peak hour, the exhibit indicates that permitted left turn movements at unsignalized intersections with such high opposing volumes is not typical for four lane undivided highways.

Exhibit 2-43: Left Turn Storage Lane Assessment: 2033 Saturday Peak Hour



Similar to the AM peak hour, a left turn storage lane length of 25 metres is recommended during the Saturday peak hour.

Regarding potential concerns for high opposing westbound through traffic, it should be noted that there is a signalized intersection located approximately 100 metres downstream, which will meter westbound traffic flow during red phases, thereby creating gaps in traffic for left turning vehicles. This is illustrated in **Exhibit 2-44.**

Exhibit 2-44: Signalized Intersection Adjacent to Subject Site Driveway



Overall, based on 2033 AM and Saturday peak hour traffic volumes, a left turn storage lane length of 25 metres by means of a dedicated left turn lane or a two-way centre left turn lane is recommended.

If roadway improvements are carried out to provide the recommended left turn storage length (e.g. via a cross section width increase or a width reduction of the general purpose lanes), the space will also serve to accommodate two-stage left-turn manoeuvers for outbound southbound left site traffic.

2.7 As-Of-Right Comparison

The subject site is currently designated as part of the *Downtown High Density Residential* (DRH) zone, which permits up to 185 residential units per hectare. Given then subject site's approximate size of 1.2 hectares, 222 residential units are permitted. The trip generation for the as-of-right 222 residential units is compared to the proposed development's trip generation in **Exhibit 2-45**. The apartment land use (code 220) was used to generate the trips for the as-of-right development.

Exhibit 2-45: Trip Generation Comparison

Land Use	AM Peak		PM Peak	
	Rate (trips/unit)	Trips	Rate (trips/unit)	Trips
Apartment (222 units)	0.51	113	0.62	138
Continuing Care Retirement Community (492 units)	0.18	89	0.19	93

As shown in **Exhibit 2-45**, the as-of-right development is projected to generate a significantly higher number of trips (48% higher) than the proposed development. In other words, the proposed development is anticipated to have a smaller impact on the study area's traffic operations than the as-of-right development.

3 Parking Assessment

The parking assessment reviews the proposed development's projected parking demand and proposes a Zoning By-law parking requirement variance, if warranted. The parking assessment consists of a City of Burlington zoning by-law review, a proxy site parking utilization survey, and parking demand projection for the subject site.

Note that the parking assessment has been updated to reflect the latest designs. A total of 475 dwelling units and 200 parking spaces are proposed at the subject site.

3.1 City of Burlington Zoning By-law Review

3.1.1 General Parking Requirements

Parking requirements for proposed developments in the City of Burlington are defined in *Part 1 – General Conditions and Provisions* of Zoning By-law 2020. When determining the zoning by-law parking requirement, the *retirement home* land use was considered most applicable to the proposed senior living centre. As per Zoning By-law 2020, retirement homes require:

- 0.85 spaces per employee; plus
- 0.50 resident spaces per unit; plus
- 0.25 visitor spaces per unit.

Considering the proposed development's 475 units, 238 resident and 119 visitor parking spaces are required. Through discussion with AMICO staff, the projected maximum number of staff on-site at any given time is estimated to be 180 individuals, resulting in an employee parking requirement of 153 spaces. In total, 510 parking spaces are required for the subject site based on Zoning By-law 2020.

Burlington is currently in the process of completing a city wide parking standards review. For comparison purposes, the parking requirements under the draft parking standards were also determined. Based on the July 21, 2017 Burlington City-Wide Parking Standards Review report and Burlington staff report PB-65-17, the parking requirement for the retirement home land use is recommended to be 0.6 spaces per unit for residents and employees, plus 0.25 visitor spaces per unit. Considering these requirements, the proposed development would require 404 parking spaces, 285 of which would be reserved for residents and employees, and 119 dedicated to visitors. Note that the recommended parking requirements have not yet been approved.

3.1.2 Accessible Parking Requirements

Based on Zoning By-law 2020, when over 90 general parking spaces are required, 3% of the required parking spaces must be reserved for users with accessible needs. Considering the 510 general parking requirement, 15 spaces are required to serve users with accessible needs. Each accessible parking space must be located adjacent to a 2m delineated accessible parking aisle.

When considering the Accessibility for Ontarians with Disability Act (AODA), two parking spaces plus an addition 2% of the parking spaces is required to serve users when accessible needs when between 201 and 1,000 parking spaces are required. Considering the 510 general parking requirement, 13 spaces are required to serve users with accessible needs.

AODA specifies two types of accessible parking spaces. Half of the required accessible parking supply must be Type A, while the other half Type B. Type A spaces are wider parking spaces intended to accommodate mobility friendly vans and have a minimum width of 3.4m, while Type B spaces have a standard minimum width of 2.4m. Where an odd number of accessible parking

spaces are required, the additional parking space may be Type B. Each space must be served by a 1.5m wide access aisle. Two adjacent spaces may share one access aisle.

3.2 Parking Utilization Survey

To estimate the proposed development's parking demand, parking utilization surveys were completed at the Barrie proxy site. As approved by Burlington and MTO staff, the parking utilization surveys were conducted on:

- One Tuesday, Wednesday, or Thursday from 8:00 AM to 6:00 PM; and
- One Saturday from 9:00 AM to 6:00 PM.

Based on the above criteria, Thursday, July 19, 2018 and Saturday, July 21, 2018 were selected to conduct the surveys. These survey times represent the anticipated peak conditions at the proposed seniors living campus development. The parking surveys recorded parking demand on the site every 30 minutes. The observed weekday and weekend parking utilization survey results are displayed in **Exhibit 3-1** and **Exhibit 3-2**, respectively.

Exhibit 3-1: Observed Weekday Parking Demand

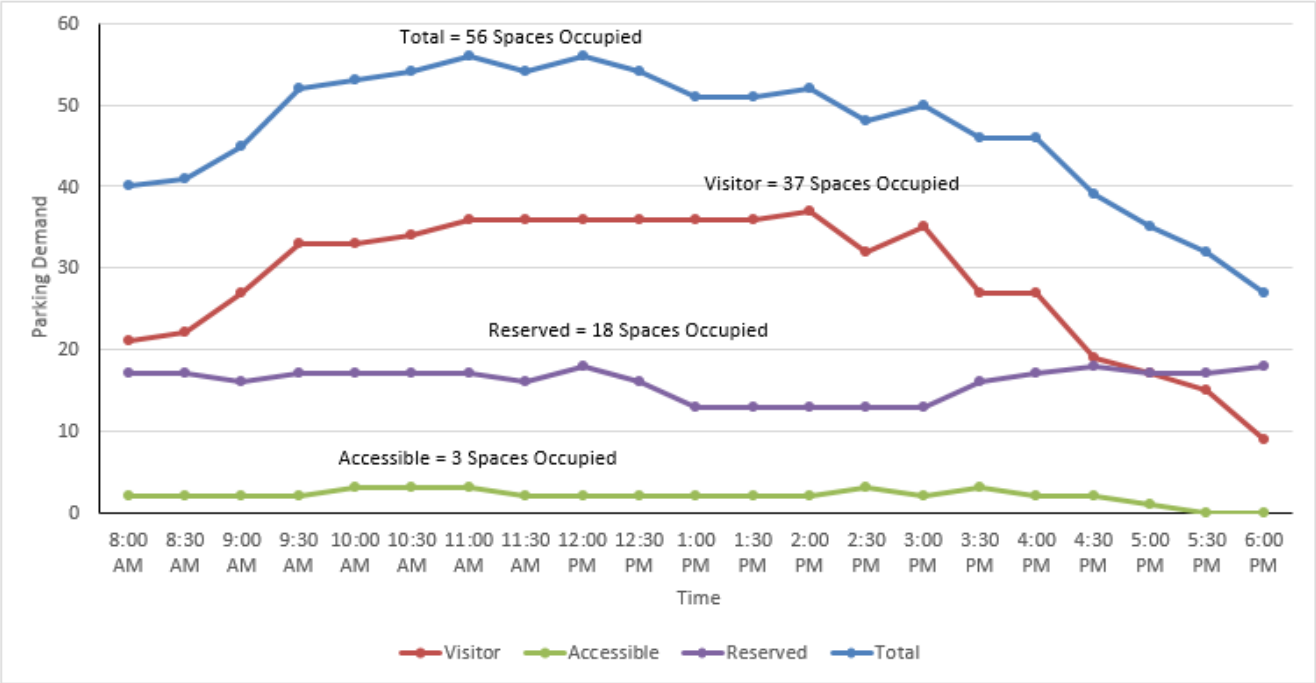
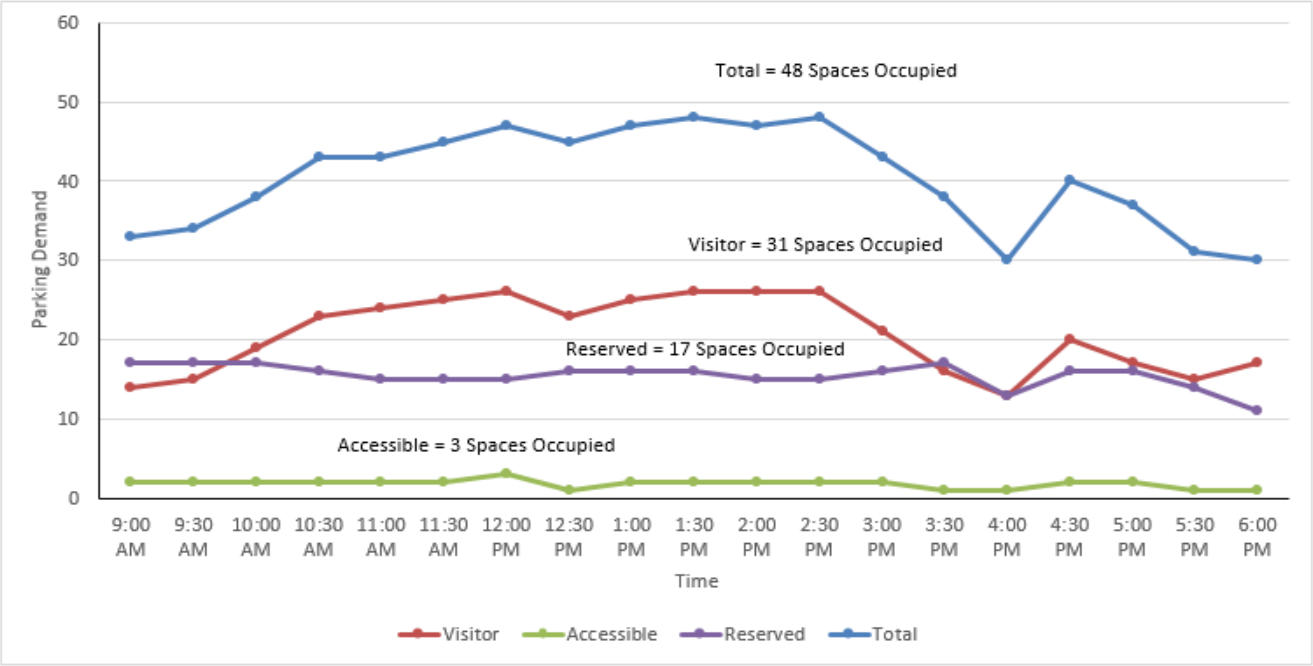


Exhibit 3-2: Observed Weekend Parking Demand



As shown in **Exhibit 3-1** and **Exhibit 3-2**, a maximum of 56 spaces were occupied on a weekday while a maximum of 48 spaces were occupied on the weekend. Given that the Barrie proxy site contains 133 units, the peak parking rate observed during the parking surveys was 0.42 spaces occupied per unit, which occurred at 12:00 PM (noon) on a weekday. The 0.42 spaces per unit includes resident, visitor, and accessible parking demand.

With respect to accessible parking, a peak parking demand of 3 spaces occupied was observed, resulting in a rate of 0.02 spaces occupied per unit.

3.3 Parking Demand Review

Using the proposed development's known unit count (475 units) and the peak parking rate obtained from the proxy site survey data (0.42 spaces/unit), the proposed development's peak parking demand is estimated to be 200 spaces occupied. The proposed development's parking requirements are summarized in **Exhibit 3-3**.

Exhibit 3-3: Parking Requirement Summary

Source	Parking Requirement	Parking Provided	Deficiency
Zoning By-law 2020	510 spaces	200 spaces	310 spaces
Parking Standards Review	404 spaces		204 spaces
Parking Utilization Survey	200 spaces		0 spaces

According to the Burlington Zoning By-law 2020 and the ongoing parking standards review, the site is projected to be deficient by 310 and 204 spaces, respectively. Based on the peak parking rate obtained from the proxy site survey, the subject site is proposed to provide exactly the number of parking spaces that meets the projected peak parking demand. An additional 20 parking spaces (+10% parking supply) are recommended to provide a parking supply buffer to

accommodate daily demand fluctuations. The recommended parking supply is intended to be shared between residents, visitors, and employees.

Note that the recommended parking supply (220 spaces) is significantly lower than the by-law parking requirements. This difference is anticipated to predominantly be a result of the proxy site and the proposed development providing assisted living and memory care units. These residents are not permitted to drive and therefore generate lower parking demand than independent living residents. The zoning by-law defines a retirement home as a residential facility which may be a rest home but does not include a nursing home, home for the aged, or group home. The by-law parking requirement is not anticipated to account for the lower parking demand generated by assisted living and memory care residents. Therefore, the parking demand observed during the proxy site survey is considered to be more representative of the proposed development's projected parking demand than the by-law requirements. In other words, the recommended parking supply is anticipated to be sufficient to accommodate the proposed development's parking demand.

Applying the 0.02 spaces per unit parking rate for accessible parking, a peak accessible parking demand of 11 vehicles is projected for the proposed development. To remain consistent with AODA, 13 accessible parking spaces are recommended with six being Type A and seven being Type B.

4 Conclusions and Recommendations

This section summarizes the key findings of this transportation impact study and parking analysis.

4.1 Transportation Impact Study

Note that the analysis was completed with 492 units, but the final site plan dated September 5th, 2018 references 475 units, including 95 memory care units, 71 assisted living units, and 309 independent living units. As the analysis was completed with more units than ultimately proposed, the analysis is considered slightly conservative.

4.1.1 Existing Traffic Conditions

Under existing conditions, the following operations are observed:

- The QEW west ramp terminal is operating with acceptable overall operations. There is some congestion noted mainly for the westbound direction during the AM peak hour;
- The QEW east ramp terminal is operating with some congestion due to northbound traffic volumes during the studied AM, PM, and Saturday peak hours; and
- The Lakeshore Road & Maple Avenue / North Shore Boulevard is operating with an acceptable overall LOS C during all three studied peak hours. However, the northbound left movement operating near capacity, and the westbound left movement's 95th percentile queue length exceeds the storage capacity.

4.1.2 Future Background Traffic Conditions

Under future background traffic conditions, the following operations are observed:

- The two background developments that generate traffic into the subject site's study area were provided by City staff. The associated traffic volumes generated are regarded as minimal;
- Background traffic growth rates were provided by MTO and City staff, regarding ramp terminal intersections, North Shore Boulevard, and Maple Avenue – Lakeshore Road corridors. Specifically, a 2.0% and 1.1% annual growth rate was respectively applied to the traffic analysis pertaining to the subject site's full build-out horizon year (i.e. 2023), and 5 (i.e. 2028) and 10 (i.e. 2033) years post-development; and
- Based on the Synchro analysis for the 2023, 2028, and 2033 horizon years, it was observed that increases in study area traffic congestion was primarily attributed to annual traffic growth.

4.1.3 Site Trip Generation

- Amico is proposing to construct a seniors living campus, consisting of four buildings of varying height up to 17 storeys. These include 56 memory care units, 106 assisted living units, and 330 independent living units, for a total of 492 units.
- Based on the comparison of ITE and proxy site derived trip rates, trips estimated using the proxy site method resulted in more two-way trips during the AM peak hour, fewer trips during the PM peak hour, and fewer trips during the Saturday peak hour.

- For this report's traffic assessment, proxy site trip rates were used to estimate subject site trips based on the relevance to the subject site's land use; and
- The forecasted trips generated by the subject site are 172 trips (118 in, 54 out) during the AM peak hour, 78 trips (39 in, 39 out) during the PM peak hour, and 93 trips (49 in, 44 out) during the Saturday peak hour.

4.1.4 Future Total Traffic Conditions

To evaluate the impact the proposed development has on the study area road network, the 2033 future total operations are compared to the 2033 future background operations. The following operational impacts were observed:

- In general, traffic operations marginally deteriorate in comparison to the background traffic, due to the additional trips generated by the proposed development;
- The eastbound left movement at the North Shore Boulevard / QEW West Ramp intersection becomes critical during the AM peak period due to SimTraffic 95th percentile queues exceeding the available storage. This is attributed to background traffic growth in the study area.
- The shared southbound left and right turn movement at the site access is projected to continue to operate well, with a LOS of D during the PM Peak Hour, and LOS of C during the AM Peak and Saturday peak periods.

4.1.5 Mitigating Measures

- Based on the 2033 future background traffic conditions, there is potential for operational improvements gained via adjustments to signal timings at the two QEW ramp terminals and the North Shore / Maple Avenue intersections.
    - By optimizing signal timings at the congested major intersections, it is demonstrated that the 2033 future total traffic operations scenario can be comparable to 2033 future background traffic conditions.
    - To assess signalization feasibility at the site driveway, a signal warrant was conducted using the OTM Book 12 Section 4.10 Justification 7 (Projected Volumes) methodology. Via this method, signalizing the site driveway was found to be not warranted.
- Based on the lane configuration of the subject site's existing driveway intersection with North Shore Boulevard, eastbound left turning traffic may attempt to use the centre median as storage while waiting to turn into the site, which does not fully accommodate the width of a passenger vehicle until east of the site driveway.
    - To assess left turn storage requirements associated with the proposed redevelopment of the subject site lands and the resulting traffic volumes, the MTO Design Supplement for the TAC Geometric Design Guide for Canadian Roads (June 2017) was reviewed. A 25m eastbound left turn storage lane by means of a dedicated left turn lane or two-way centre left turn lane was determined to be justified.
    - If roadway improvements are carried out to provide left turn storage (e.g. via a cross section width increase or a width reduction of the general purpose lanes), the space will also serve to accommodate two-stage left-turn manoeuvers for outbound southbound left site traffic. Overall, providing a dedicated left turn storage lane is recommended from a safety standpoint to

avoid disrupting eastbound through traffic. However, it should be noted that existing site traffic is currently making eastbound left turns using the existing lane configuration and road layout.

4.1.6 As-Of-Right Comparison

- The proposed development is anticipated to have a smaller impact on the study area's traffic operations than the as-of-right development.

4.1.7 Transportation Impact Summary

The TIS, based on Synchro and SimTraffic analysis, shows that for the 2033 horizon year, future traffic congestion in the study area is primarily attributed to background traffic growth. Trips generated by the proposed development marginally contribute to additional congestion. The proposed development's driveway is expected to operate well during the weekday and Saturday peak hours.

Mitigation measures undertaken by IBI Group demonstrate that signal timing optimization at the congested intersections can mitigate impacts caused by the proposed development. An eastbound left turn storage needs assessment was carried out for the development's driveway, and a 25 metre storage was determined to be justified. If roadway improvements are carried out to provide a left turn storage lane (e.g. via a cross section width increase or a width reduction of the general purpose lanes), the space will also serve to accommodate two-stage left-turn manoeuvers for outbound southbound left site traffic. Overall, providing a dedicated left turn storage lane is recommended from a safety standpoint to avoid disrupting eastbound through traffic. However, it should be noted that existing site traffic is currently making eastbound left turns using the existing lane configuration and road layout.

4.2 Parking Assessment

The parking assessment has been updated to reflect the latest designs.

- A total of 475 dwelling units and 200 parking spaces are proposed at the subject site.
- Based on the City of Burlington Zoning By-law 2020, the subject site requires 510 parking spaces resulting in a deficiency of 310 spaces.
- Burlington is currently in the process of updating its city wide parking standards. Based on the recommended requirements, the subject site requires 404 parking spaces resulting in a deficiency of 204 spaces.
- To approximate the proposed development's peak parking demand, a parking demand survey was completed at a site of similar nature. Considering the peak parking demand observed during the proxy site survey (56 spaces occupied), and the 133 units contained at the proxy site, the peak parking rate was determined to be 0.42 spaces occupied per unit.
- A peak parking demand of 200 spaces occupied is projected for the subject site, which is exactly the number of spaces proposed. An additional 20 parking spaces (+10% parking supply) are recommended to provide a parking supply buffer to accommodate daily demand fluctuations. The recommended parking supply is intended to be shared between residents, visitors, and employees.
    - The recommended parking supply (220 spaces) is significantly lower than the by-law parking requirements. This difference is anticipated to predominantly be a result of the assisted living and memory care units. These residents are

not permitted to drive and therefore generate lower parking demand than independent living residents.

- A peak accessible parking demand of 11 vehicles is projected for the proposed development. To remain consistent with AODA, 13 accessible parking spaces are recommended with six being Type A and seven being Type B.