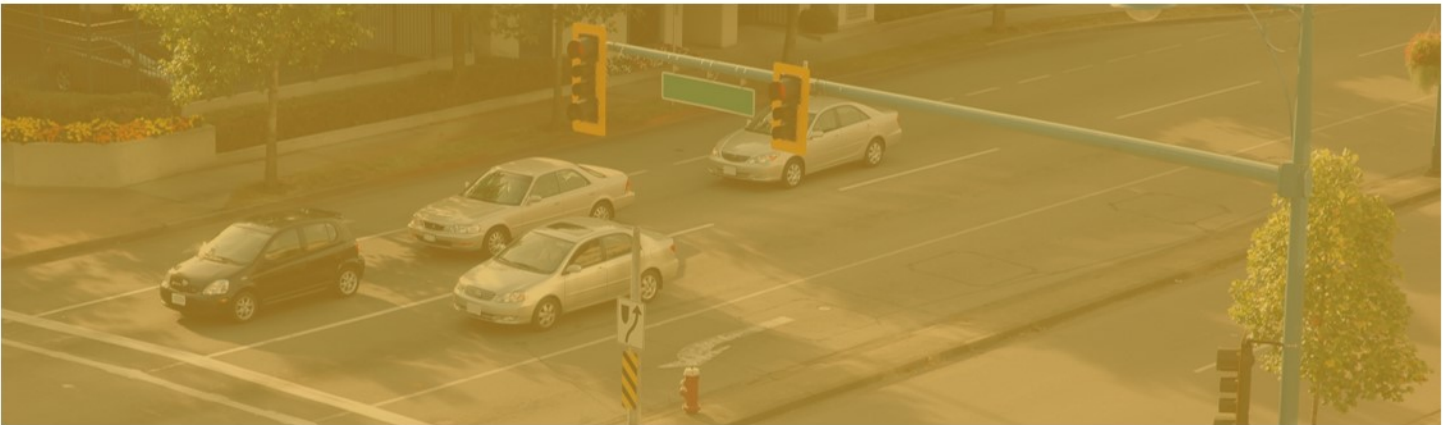




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447-455 Yonge Street

TRAFFIC IMPACT STUDY

Barrie Yonge Development South LP

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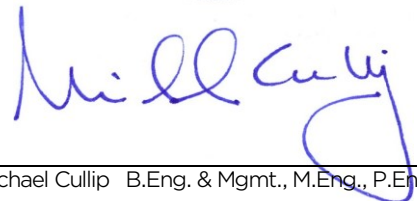
September
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Issue	Date	Description
1	September 8, 2022	Final Report

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1 Introduction

Tatham Engineering Limited was retained by Barrie Yonge Development South LP to address the traffic impacts associated with the proposed residential development to be located at 447-455 Yonge Street in the City of Barrie. The location of the development site is illustrated in Figure 1.

1.1 STUDY PURPOSE

The purpose of this study is to address the requirements of the City of Barrie with respect to the potential transportation impacts of the development on the local road network. In particular, the following will be discussed:

- the operations of the road system through the study area prior to the proposed development;
- the growth in the traffic volumes not otherwise attributed to the development (i.e. from overall growth in the area and/or other developments);
- the number of new trips the proposed development is likely to generate;
- the operations of the study area road system upon completion of the development; and
- the resulting impacts and need for mitigating measures (if required) to ensure acceptable overall road operations.

1.2 STUDY STRUCTURE

The report is structured as follows:

- Chapter 1: introduction and study purpose;
- Chapter 2: existing conditions, detailing the road system and corresponding traffic operations;
- Chapter 3: future conditions, prior to the completion of the proposed development (referred to as future background conditions), and the expected growth in traffic levels and the resulting operating conditions;
- Chapter 4: proposed development and associated details including land use, access, traffic volumes and parking;
- Chapter 5: future conditions, with completion of the proposed development (referred to as future total conditions); and
- Chapter 6: summary of the report and key findings.



2 Existing Conditions

This chapter will describe the road network, traffic volumes and operations for the existing conditions.

2.1 ROAD NETWORK

The road network to be addressed by this study consists of Yonge Street, Little Avenue, MacLaren Avenue and the following intersections;

- Yonge Street with Little Avenue; and
- Yonge Street with MacLaren Avenue

Aerial mapping and photographs of the road system are provided in Figure 2.

2.1.1 Road Network

A brief description of the road network is provided in Table 1. The functional classification for each road is based on the *City of Barrie Transportation Master Plan*¹.

Table 1: Road Network

ROAD	CLASSIFICATION	CROSS SECTION	SPEED (KM/H)	CAPACITY ¹ (VPHPL)	DIRECTION
Yonge Street	arterial	5-lane	50	900	N-S
Little Avenue	arterial	2-lane	50	900	E-W
MacLaren Avenue	local	2-lane	50	400	E-W

¹ capacity is denoted as vehicles per hour per lane

2.1.2 Key Intersections

Yonge Street and Little Avenue

The intersection of Yonge Street with Little Avenue is a 4-leg signalized intersection. The north and south approaches consist of an exclusive left turn lane, a through lane and a shared through-right turn lane. The east and west approaches consist of an exclusive left turn lane and a shared through-right turn lane.

¹ The City of Barrie Transportation Master Plan. WSP. June 2019



Yonge Street and MacLaren Avenue

The intersection of Yonge Street with MacLaren is a 3-leg intersection with stop control on the minor approach (MacLaren Avenue). The north approach consists of an exclusive left turn lane and two through lanes, whereas the south approach consists of a through lane and a shared through-right turn lane. The east approach consists of a single shared left-right turn lane.

2.2 EXISTING TRAFFIC VOLUMES

To determine existing traffic volumes on the road network, traffic the following traffic counts were obtained:

- Little Avenue and Yonge Street – Thursday April 11, 2019; and
- MacLaren Avenue and Yonge Street – Tuesday February 8, 2022.

The corresponding traffic count details are provided in Appendix A.

To reflect 2022 conditions at the intersection of Little Avenue and Yonge Street, the 2019 volumes were adjusted based on projected annual growth in the area (as identified by the City and further discussed in Section 3.3.1) with additional consideration given to achieving balance with the 2022 volumes on Yonge Street at MacLaren Avenue.

The traffic count volumes are illustrated in Figure 3, whereas the resulting 2022 peak hour volumes are illustrated in Figure 4.

2.3 EXISTING TRAFFIC OPERATIONS

The assessment of existing conditions provides the baseline from which the future traffic operations (both with and without the subject development) can be assessed from. The capacity, and hence operations, of a road system is effectively governed by its intersections. The analysis is based on the 2022 traffic volumes, the existing intersection configuration and control (including signal timings as provide by the City), and procedures outlined in the *2000 Highway Capacity Manual*² (using Synchro v.11 software).

For signalized intersections, the analysis considers:

- the average delay (measured in seconds);
- level of service (LOS); and
- volume to capacity (v/c) for each signalized movement

² *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2000.



For unsignalized intersections, the analysis considers the same metrics but focuses on critical movements only, namely stop controlled movements on the minor road.

A summary of the analysis is provided in Table 2, whereas detailed operations worksheets are provided in Appendix B.

Table 2: Intersection Operations – 2022 Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	55	E	0.77	28	C	0.33
	EB TR	signal	29	C	0.46	37	D	0.75
	WB L	signal	26	C	0.04	27	C	0.18
	WB TR	signal	39	D	0.77	28	C	0.40
	SB L	signal	7	A	0.26	8	A	0.28
	SB TR	signal	11	B	0.25	12	B	0.34
	NB L	signal	9	A	0.10	8	A	0.19
	NB TR	signal	12	B	0.23	13	B	0.37
overall			21	C	0.41	18	B	0.47
Yonge Street & MacLaren Avenue	WB TR	stop	11	B	0.03	11	B	0.01

L - left T - through R - right LT - left-through TR - through-right LTR - left-through-right

Based on the existing volumes and intersection configuration and control, the study area intersections provide a good overall level of service (LOS C or better) with average delays during both peak hours. It is further noted that the individual movements provide acceptable operations (LOS E or better) and operate below capacity. As such, no intersection improvements are required to support the existing conditions.

2.4 EXISTING TRANSIT & ACTIVE TRANSPORTATION

2.4.1 Transit Service

Barrie Transit currently operates two routes along Yonge Street across the frontage of the site:

- 8A - RVH/Yonge (southbound); and



- 8B – Crosstown/Essa (northbound).

The routes operate on a 30-minute schedule during weekdays and Saturdays, and on a 60 minute service during the evening hours and Sundays. The routes provide connectivity to most of the City through connections with the Barrie Downtown Terminal, the Allandale Waterfront Station and the Barrie South GO Station.

Barrie Transit also operates routes 3A Bayview, 3B Painswick, 4A East Bayfield and 4B South GO which have stops along Big Bay Point Road in the vicinity of Yonge Street.

2.4.2 Active Transportation

Sidewalks are provided on both sides of Yonge Street with controlled pedestrian crossings provided at all of the signalized intersections within the study area. A sidewalk is also provided on the north side of MacLaren Avenue which connects to the existing sidewalks on Yonge Street and Little Avenue.

It is noted that there are currently no on-street cycling facilities in the study area.



3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2025, 2030 and 2035. The 2025 horizon year has been adopted to reflect full build-out of the proposed development, whereas the 2030 and 2035 horizons will address the longer-term impacts (5 and 10 years beyond build-out).

3.1 FUTURE ROAD NETWORK

The *City of Barrie Transportation Master Plan* (TMP) recommends that Little Avenue be widened from a 2-lane cross-section to a 3-lane cross-section with a continuous two-way left turn lane by 2031. This improvement will not have any impact to the intersection operation at the study area intersection of Little Avenue with Yonge Street recognizing that the Little Avenue approaches already provide exclusive left turn lanes.

There are no other road improvements identified for the study area. As such, the road network as described in Section 2.1 has been maintained.

3.2 FUTURE TRANSIT & ACTIVE TRANSPORTATION

3.2.1 Transit

As identified in the City's TMP, a new transit strategy has been identified for implementation by 2041 which includes a core transit route along Yonge Street, connecting south, central and north Barrie. In conjunction with the new transit strategy, high occupancy vehicle (HOV) lanes are proposed for Yonge Street by 2041 to support improved transit service delivery. The proposed HOV lanes are to be provide via conversion of the existing curb lane from general purpose to HOV (rather than widening the road).

The transit strategy also proposed transit support routes along Little Avenue and Big Bay Point Road that will support the core service routes.

It is noted that the transit improvements and implementation of HOV lanes on Yonge Street are proposed by the 2041 horizon, which is beyond the study horizon considered herein.

3.2.2 Active Transportation

With respect to active transportation improvements, the following have been recommended in the City's TMP:

- Yonge Street – cycle track (separated facility);
- Big Bay Point Road – cycle track (separated facility);



- Little Avenue – buffered bicycle lanes;
- Cox Mill Road – bicycle lanes; and
- D'Ambrosio Drive – signed bicycle route.

The timing of the noted active transportation improvements are not identified other than being proposed by the 2041 horizon.

3.3 FUTURE BACKGROUND TRAFFIC VOLUMES

Background traffic volumes expected for the 2025, 2030 and 2035 horizon years have been determined based on the existing traffic volumes and historical and projected growth.

3.3.1 Background Growth

Based on traffic projections from the City's Transportation Model, City staff have indicated that the following growth rates should be applied:

- Yonge Street – 3%
- Little Avenue – 1%

No growth has been applied MacLaren Avenue recognizing that it is a local road serving a built-out area and not subject to year over year growth.

3.3.2 Development Growth

343 Little Avenue/410 Yonge Street

The proposed development to be located at 343 Little Avenue/410 Yonge Street will consist of 153 townhouse units with full build-out assumed by 2025.

The trip estimates and distribution for the development are based on those provided in the *Traffic Impact Study - Yonge Street & Little Avenue Residential Development*³. The development is estimated to generate 71 new trips during AM peak hour and 86 trips during the PM peak hour. The distribution and assignment of trips to the road network are illustrated Figure 5, with excerpts from the noted report provided in Appendix C.

481 Yonge Street

The proposed residential development to be located at 481 Yonge Street is to consist of 67 apartment units. For the purpose of this study, full build-out has been assumed by 2025.

³ *Traffic Impact Study - Yonge Street & Little Avenue Residential Development*. C.F. Crozier & Associates Inc. July 2018



The trip estimates and distribution are based on the information provided in the *481 Yonge Street Traffic Brief*⁴ prepared in support of the development. It is noted that the development is estimated to generate 25 new trips during AM peak hour and 31 trips during the PM peak hour. The distribution and assignment of trips to the road network are illustrated in Figure 6, whereas excerpts from the study are provided in Appendix C.

505-533 Yonge Street

The proposed development to be located at 505-533 Yonge Street is to consist of 400 residential units and 1,076 m² of ground floor commercial space contained in 4 residential apartment/condominium buildings. Full build-out has been assumed by 2025.

The trip estimates and distribution are based on the information provided in the *505-533 Yonge Street Traffic Impact Study*⁵. The development is estimated to generate 146 new trips during AM peak hour and 206 trips during the PM peak hour. The distribution and assignment of trips to the road network are illustrated in Figure 7, with relevant excerpts from the traffic study provided in Appendix C.

427-437 Yonge Street

The proposed residential development to be located at 427-437 Yonge Street will consist of a 7-storey 196-unit condominium apartment building with 717 m² (7,721 ft²) of ground floor commercial space. For the purpose of this study, full build-out has been assumed by 2025.

The trip estimates and distribution are based on the information provided in the *427-437 Yonge Street Traffic Impact Study*⁶. The development is estimated to generate 91 new trips during AM peak hour and 127 new trips during the PM peak hour. The distribution and assignment of trips to the road network are illustrated in Figure 8, whereas excerpts from the respective study are provided in Appendix C.

3.3.3 Background Traffic Volumes

The resulting 2025, 2030 and 2035 background traffic volumes are illustrated in Figure 10 through Figure 12 respectively. The background volumes reflect the 2022 volumes, the noted annual background growth rates and the additional traffic volumes associated with the identified background developments.

⁴ *481 Yonge Street Traffic Brief*. JD Northcote Engineering Inc. May 16, 2021.

⁵ *505-533 Yonge Street Traffic Impact Study*. Tatham Engineering Ltd. December 17, 2021.

⁶ *427-437 Yonge Street Traffic Impact Study*. Tatham Engineering Ltd. September 8, 2022.



3.4 BACKGROUND TRAFFIC OPERATIONS

The key intersections were again analyzed for each horizon year given the projected background volumes and the existing intersection configurations. The signal timings have been optimized where appropriate to ensure optimal intersection operations are maintained – this includes implementation of an advance green phase for the eastbound left turn movement on Little Avenue during the AM peak hour under the 2025 conditions. The results of the assessment are summarized in Table 3 through Table 5 (detailed worksheets are provided in Appendix D).

Table 3: Intersection Operations - 2025 Background Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	26	C	0.50	26	C	0.32
	EB TR	signal	25	C	0.39	42	D	0.83
	WB L	signal	29	C	0.04	26	C	0.25
	WB TR	signal	48	D	0.82	26	C	0.36
	SB L	signal	13	B	0.47	11	B	0.49
	SB TR	signal	18	B	0.36	15	B	0.41
	NB L	signal	14	B	0.13	11	B	0.23
	NB TR	signal	19	B	0.31	16	B	0.46
overall			24	C	0.59	21	C	0.61
Yonge Street & MacLaren Avenue	WB TR	stop	13	B	0.16	14	B	0.14
L - left	T - through	R - right	LT - left-through	TR - through-right	LTR - left-through-right			



Table 4: Intersection Operations - 2030 Background Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	32	C	0.64	27	C	0.38
	EB TR	signal	25	C	0.42	46	D	0.87
	WB L	signal	29	C	0.04	28	C	0.32
	WB TR	signal	50	D	0.85	27	C	0.38
	SB L	signal	15	B	0.53	13	B	0.58
	SB TR	signal	19	B	0.41	16	B	0.47
	NB L	signal	14	B	0.16	11	B	0.28
	NB TR	signal	19	B	0.34	18	B	0.53
overall			26	C	0.65	22	C	0.69
Yonge Street & MacLaren Avenue	WB TR	stop	14	B	0.17	15	C	0.15
L - left T - through R - right LT - left-through TR - through-right LTR - left-through-right								



Table 5: Intersection Operations - 2035 Background Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	38	D	0.73	27	C	0.43
	EB TR	signal	25	C	0.44	50	D	0.90
	WB L	signal	28	C	0.05	30	C	0.43
	WB TR	signal	54	D	0.89	26	C	0.40
	SB L	signal	20	C	0.63	17	B	0.66
	SB TR	signal	22	C	0.49	18	B	0.56
	NB L	signal	16	B	0.19	13	B	0.35
	NB TR	signal	23	C	0.41	22	C	0.64
overall			28	C	0.73	25	C	0.77
Yonge Street & MacLaren Avenue	WB TR	stop	15	C	0.19	17	C	0.17

L - left T - through R - right LT - left-through TR - through-right LTR - left-through-right

As indicated, the key intersections are expected to continue to provide good overall operating conditions (LOS C or better) with average delays through the considered horizon periods given the assumed background traffic volumes. It is also noted that all individual movements will provide acceptable levels of service (LOS D or better) and operate below capacity.



4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 SITE LOCATION

As illustrated in Figure 1, the proposed development is to be located at 447-455 Yonge Street within the City of Barrie.

4.2 PROPOSED LAND-USE & PHASING

The proposed development will consist of a 7-storey 177-unit condominium apartment building with 572 m² (6,159 ft²) of ground floor commercial space.

A site plan is provided in Figure 13. A single 3-year phase has been considered with full build-out and occupancy by 2025.

4.3 PARKING

The development will provide 64 surface parking spaces and 142 underground parking spaces for a total of 206 spaces.

As per the City's *Zoning By-Law*, a residential development must provide 1.5 parking spaces per unit; however, it is noted that the site is located along an intensification corridor as identified by the City. To support intensification efforts, lower parking rates are being considered for mixed use developments located along primary corridors (of which Yonge Street is considered). As per *Staff Report PLN029-13*, a reduced rate of 1 space per residential unit is recommended along the targeted intensification corridors. As such, a parking rate of 1 space per unit has been considered for the residential units. With respect to the ground floor commercial space, the City's parking rate for retail (1 space per 30 m²) has been applied.

In consideration of the above, the development is required to provide 177 spaces to support the residential component, and 20 spaces to support the commercial space ($572 \text{ m}^2 \div 30 = 20$ spaces), for a total parking requirement of 197 spaces. As previously noted, the site will provide 206 spaces, thus satisfying the City's parking supply requirements.

For barrier free spaces, the City's by-law states that a development whose overall parking requirements is greater than 100 spaces must provide 1 space plus 3% of the overall parking required parking spaces as barrier free spaces. Thus, the site must provide 7 barrier free spaces



($197 \times 3\% = 6 \text{ spaces} + 1 \text{ space} = 7 \text{ spaces}$). As noted on the site plan, the development will provide 8 barrier free spaces.

4.4 SITE ACCESS & ON-SITE CIRCULATION

As per the site plan, the development will be served by a single access on MacLaren Avenue. The access point will accommodate two-way operations, providing one lane of travel per direction. It is noted that the access will ultimately be aligned with the future access to the mixed-use development at 427-437 Yonge Street.

In terms of corner clearance, the Transportation Association of Canada's (TAC) *Geometric Design Guide for Canadian Roads* recommends a minimum corner clearance (i.e. distance from an intersection to the nearest access) of 15 metres for a local road (measured edge of road to edge of access). The proposed access will be located approximately 50 metres east of the intersection of MacLaren Avenue with Yonge Street (measured edge of Yonge Street to edge of access), thus satisfying the noted minimum corner clearance.

The City's zoning by-law requires that an aisle providing access to parking spaces have a minimum width of 6.4 metres. As per the site plan, a minimum aisle width of 6.4 metres will be maintained throughout the site, satisfying the City's requirements. A swept path turning assessment has been completed for the loading area/waste collection area, the results of which area provided in Appendix E.

The internal aisle layout as proposed is considered sufficient with respect to the circulation of site generated traffic and the maneuvering requirements of typical design vehicles.

4.5 SITE TRAFFIC

4.5.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM and PM peak hours has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual, 11th Edition*. Based on the proposed development, trip rates for the *multifamily housing - mid-rise* (ITE code 221) and *strip retail plaza* (ITE code 822) land-uses have been applied. The associated trip rates and trip estimates are provided in Table 6 and Table 7.

As indicated, the proposed development is expected to generate 80 trips during the AM peak hour and 109 trips during the PM peak hour. While the site is expected to generate internal trips (i.e. residents accessing the retail/commercial uses) and pass-by trips (i.e. trips already on the road network for other purposes that visit the retail uses before continuing to their initial



destination), adjustments to account for such trips have not been considered in order to ensure a conservative approach.

Table 6: Trip Generation Rates

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
multifamily housing - mid-rise (ITE 221)	units	0.09	0.28	0.37	0.24	0.15	0.39
strip retail plaza (ITE 822)	1,000 ft² GFA	1.42	0.94	2.36	3.30	3.30	6.60

Table 7: Trip Estimates – 447-455 Yonge Street

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
multifamily housing	177 units	15	50	65	42	27	69
ground floor retail	6,159 ft²	9	6	15	20	20	40
Total		24	56	80	62	47	109

4.5.2 Trip Distribution & Assignment

The distribution of trips has been based on trip distribution data provided in the 2016 *Transportation Tomorrow Survey*. The TTS is a comprehensive travel survey conducted in the Greater Golden Horseshoe Area once every five years. As per the *TTS 2016 Data Guide*, development site resides in Traffic Boundary Zone 8528. As such, the trip data was filtered to show all trips to/from the respective traffic zone. The following distribution was established:

- to/from locations within Barrie – 78%;
- to/from the south of Barrie – 18%;
- to/from the north of Barrie – 4%;
- to/from the east of Barrie – <1%; and
- to/from the west of Barrie – <1%.

As indicated, 78% of the trips remain wholly within Barrie whereas only 22% originate from, or are destined to, areas outside of the City. The trips that remain within Barrie were distributed based



on additional TTS trip data for the traffic zone within which the development is located. When considering the distribution of trips that remain within the City, the ultimate trip distribution for the site is as follows:

- to/from the north via Yonge Street – 20%;
- to/from the north via Little Ave/Fairview/Hwy 400 – 20%;
- to/from the south via Yonge Street – 30%;
- to/from the west via Little Avenue – 20%;
- to/from the east via MacLaren Avenue/Little Avenue – 5%; and
- to/from the east via Big Bay Point Road – 5%.

The assignment of the trips generated by the development to the area road network and site access points has been based on the trip distribution noted above with consideration given to the expected travel routes.

The assignment of residential trips to the road network based on the above is illustrated in Figure 14.



5 Transportation Impacts

This chapter will address the resulting impacts of the proposed residential development on the adjacent road system. Three areas are to be addressed:

- operations of the key intersections, including the site access point;
- available sight lines at the proposed access point; and
- potential improvements to the study area road network, if necessary.

5.1 FUTURE TRAFFIC VOLUMES

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site generated traffic was combined with the 2025, 2030 and 2035 background traffic volumes. The resulting total traffic volumes are presented in Figure 15 through Figure 17.

5.1.1 Intersection Operations

The operations of the key intersections were again investigated considering the total traffic volumes for each horizon year. In addition to this, the site access operations have also been reviewed. As previously noted, the site access will ultimately be aligned opposite the access to the proposed mixed-use development to be located at 427-437 Yonge Street. As such, the access has been assessed as a 4-leg intersection with stop control on the respective access points. The results of the operational review are provided in Table 8 through Table 10 (detailed worksheets are provided in Appendix F).

It is noted that the subject intersections will continue to provide good levels of service (LOS C or better) through the 2035 horizon year and will operate with comparable conditions to those experienced under background conditions (i.e. the proposed development has minimal impact on the intersection operations). It is further noted that all individual movements will provide acceptable levels of service (LOS D or better) and operate below capacity.

The site access point will operate well below capacity during the noted peak hour conditions and provide excellent operations (LOS B or better) with minimal delays.

In consideration of the operational assessment, no intersection improvements are required to accommodate the future total conditions.



Table 8: Intersection Operations – 2025 Total Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	28	C	0.55	26	C	0.32
	EB TR	signal	26	C	0.41	46	D	0.86
	WB L	signal	29	C	0.04	27	C	0.29
	WB TR	signal	48	D	0.82	27	C	0.36
	SB L	signal	13	B	0.51	12	B	0.55
	SB TR	signal	18	B	0.36	15	B	0.42
	NB L	signal	14	B	0.13	11	B	0.24
	NB TR	signal	19	B	0.31	17	B	0.47
overall		signal	24	C	0.62	22	C	0.67
Yonge Street & MacLaren Avenue	WB TR	stop	14	B	0.28	16	C	0.26
Site Access & MacLaren Avenue	NB LR	stop	10	B	0.08	11	B	0.08
	SB LR	stop	8	A	0.06	8	A	0.06
L - left	T - through	R - right	LT - left-through	TR - through-right	LTR - left-through-right			



Table 9: Intersection Operations – 2030 Total Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	34	C	0.67	26	C	0.36
	EB TR	signal	26	C	0.44	48	D	0.88
	WB L	signal	29	C	0.04	28	C	0.35
	WB TR	signal	50	D	0.85	26	C	0.37
	SB L	signal	17	B	0.59	15	B	0.63
	SB TR	signal	19	B	0.42	17	B	0.49
	NB L	signal	14	B	0.16	12	B	0.29
	NB TR	signal	19	B	0.35	20	C	0.57
overall		signal	26	C	0.69	24	C	0.74
Yonge Street & MacLaren Avenue	WB TR	stop	15	C	0.30	18	C	0.29
Site Access & MacLaren Avenue	NB LR	stop	10	B	0.08	11	B	0.08
	SB LR	stop	8	A	0.06	8	A	0.06
L - left	T - through	R - right	LT - left-through	TR - through-right	LTR - left-through-right			



Table 10: Intersection Operations – 2035 Total Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Yonge Street & Little Ave	EB L	signal	41	D	0.67	26	C	0.41
	EB TR	signal	25	C	0.44	50	D	0.91
	WB L	signal	28	C	0.04	29	C	0.44
	WB TR	signal	54	D	0.85	26	C	0.39
	SB L	signal	21	C	0.59	26	C	0.78
	SB TR	signal	22	C	0.42	19	B	0.58
	NB L	signal	16	B	0.16	14	B	0.36
	NB TR	signal	23	C	0.35	22	C	0.65
overall		signal	29	C	0.69	26	C	0.85
Yonge Street & MacLaren Avenue	WB TR	stop	17	C	0.33	20	C	0.32
Site Access & MacLaren Avenue	NB LR	stop	10	B	0.08	11	B	0.08
	SB LR	stop	8	A	0.06	8	A	0.06

L - left T - through R - right LT - left-through TR - through-right LTR - left-through-right

5.2 TURN LANE REQUIREMENTS

In considering the limited volumes on MacLaren Avenue, the relatively low volumes entering the site during the PM peak hours and the otherwise excellent operations anticipated at the site access, exclusive turn lanes on MacLaren Avenue at the site access are not considered necessary (nor would they be warranted).

5.3 SIGHT LINE ANALYSIS

The sight line assessment has considered the minimum stopping sight distance guidelines as provided in the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*. The minimum stopping sight distance provides sufficient distance for an approaching motorist to observe a stationary hazard in the road and bring their vehicle to a complete stop prior to the hazard. The minimum stopping sight for a design speed of 60 km/h



(reflective of the 50 km/h speed limit + 10 km/h) is 85 metres, whereas the minimum stopping sight distance for a design speed of 50 km/h (reflective of the speed limit) is 65 metres.

Based on field measurements, the available sight lines along MacLaren Avenue at the site access are 165 metres to/from the east and 58 metres to/from the west. While the sight lines to/from the east satisfy the TAC guidelines for minimum stopping distance, the sight lines to/from the west do not as they are limited by the termination of the road at Yonge Street. The limited sight lines to/from the west are not considered problematic recognizing that vehicles approaching from the west will be doing so at a reduced operating speed having just completed a turning movement from Yonge Street to MacLaren Avenue, and further noting that the site access will be readily observed from Yonge Street (i.e. there are no visual obstructions for motorists turning onto MacLaren Avenue that would prevent them from observing traffic turning to/from the site access).

In considering the above, the sight lines are considered appropriate.



6 Summary

Proposed Development

This study has addressed the transportation impacts associated with the proposed residential development located at 447-455 Yonge Street within the City of Barrie. The proposed development will consist of a 196-unit condominium apartment building with 717 m² of ground floor commercial area. Upon build-out, the development is expected to generate 91 new trips during the AM peak hour and 127 new trips during the PM peak hour.

Traffic Operations

In addressing the study area traffic operations, the intersections of Yonge Street with Little Avenue and Yonge Street with MacLaren Avenue were analysed under existing (2022) and future (2025, 2030 and 2035) horizon periods. The site access point was also reviewed under the noted future horizons.

The results of the operational analyses indicate that the subject intersections will provide acceptable (LOS C or better) overall conditions at site access points through the 2035 horizon under the future total conditions. The site access will provide excellent operations (LOS B or better). As such, no intersection improvements are required to support the proposed development.

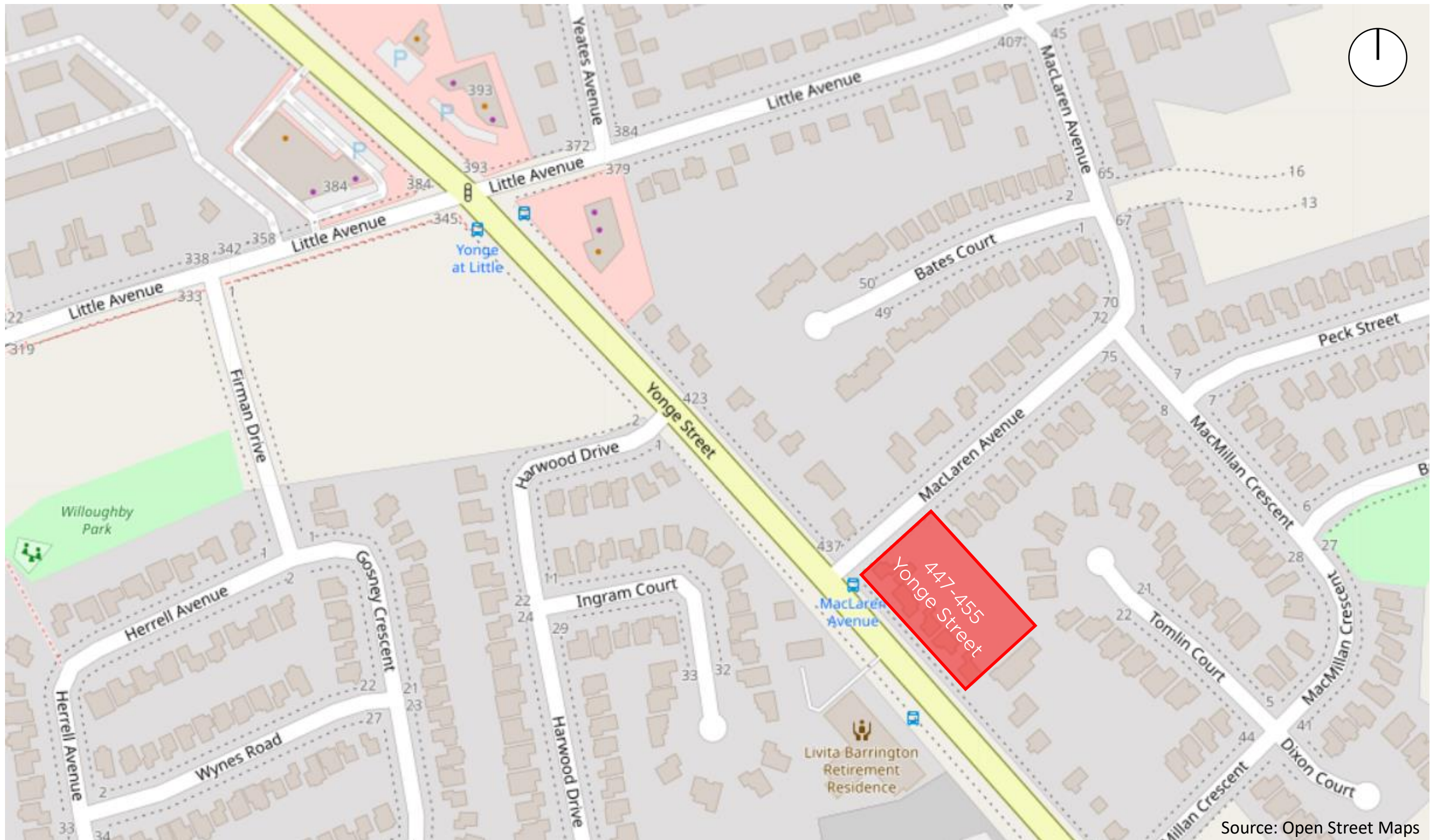
Turn Lane Requirements

Based on the limited volumes on MacLaren Avenue, the projected volume of right and left turning vehicles accessing the site and the otherwise excellent operations provide by the site access, exclusive turn lanes are not considered necessary, nor are they warranted.

Sight Lines

The available sight lines along MacLaren Avenue at the proposed site access were reviewed and are considered appropriate in consideration of TAC design guidelines for minimum stopping sight distance.



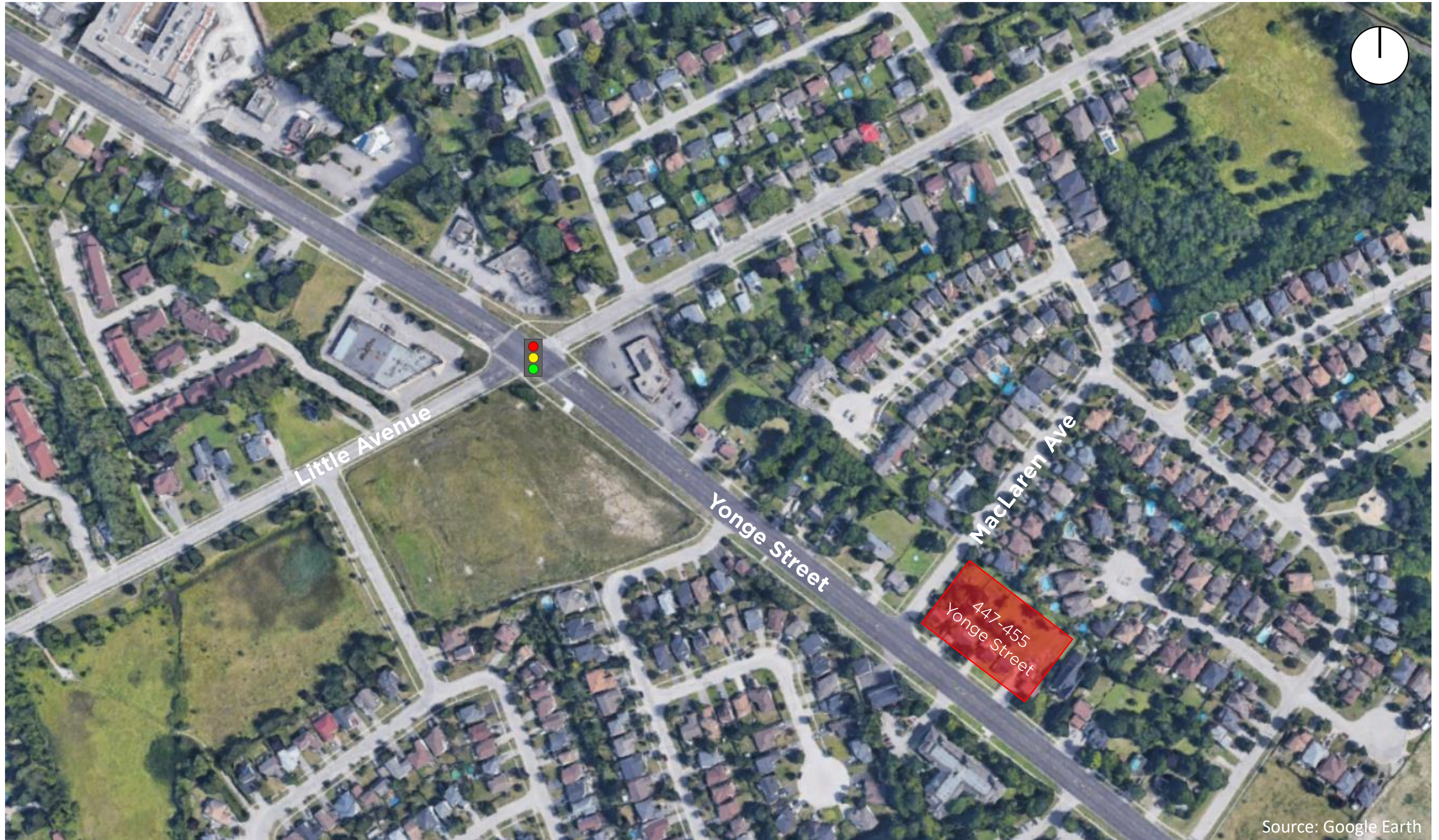


Source: Open Street Maps

447-455 Yonge Street

Figure 1: Site Location





Source: Google Earth

447-455 Yonge Street

Figure 2A: Area Road Network





Looking west on MacLaren Avenue from the proposed site access

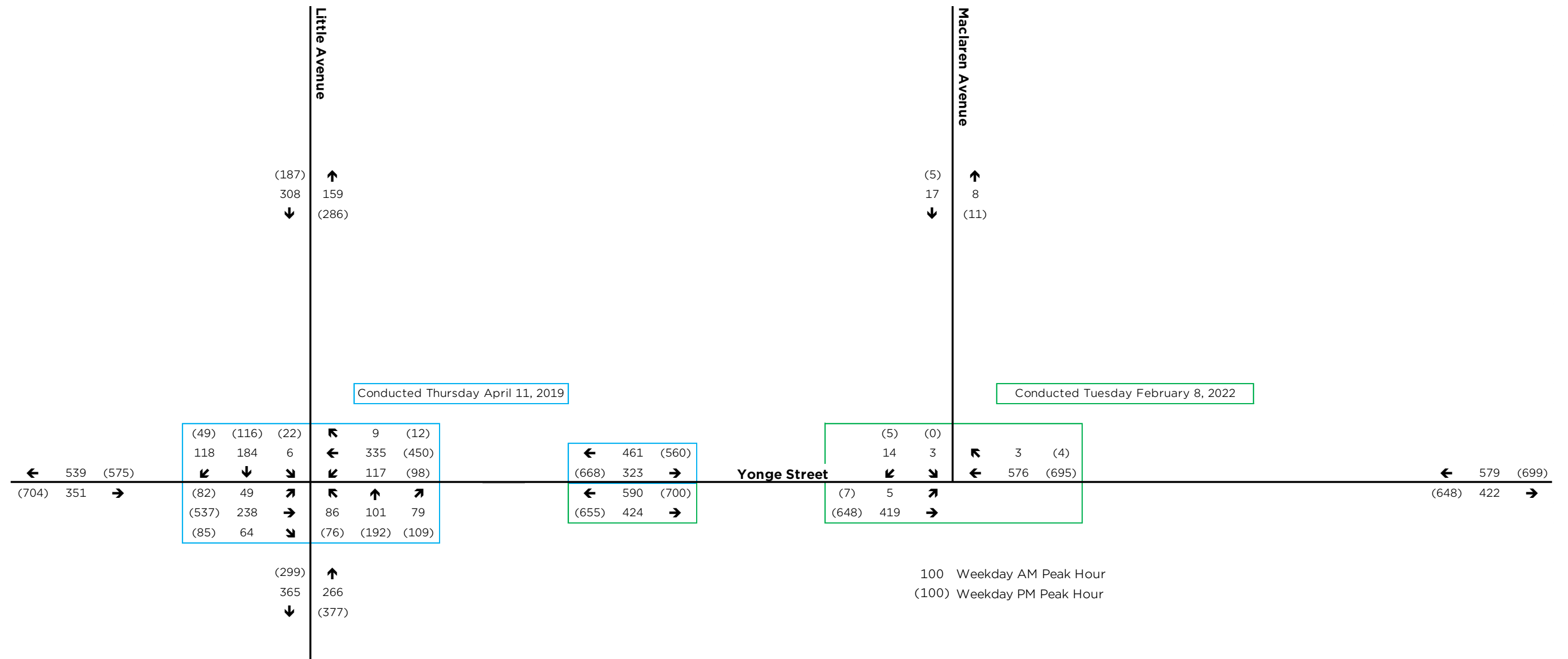
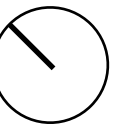


Looking east on MacLaren Avenue from the proposed site access

447-455 Yonge Street

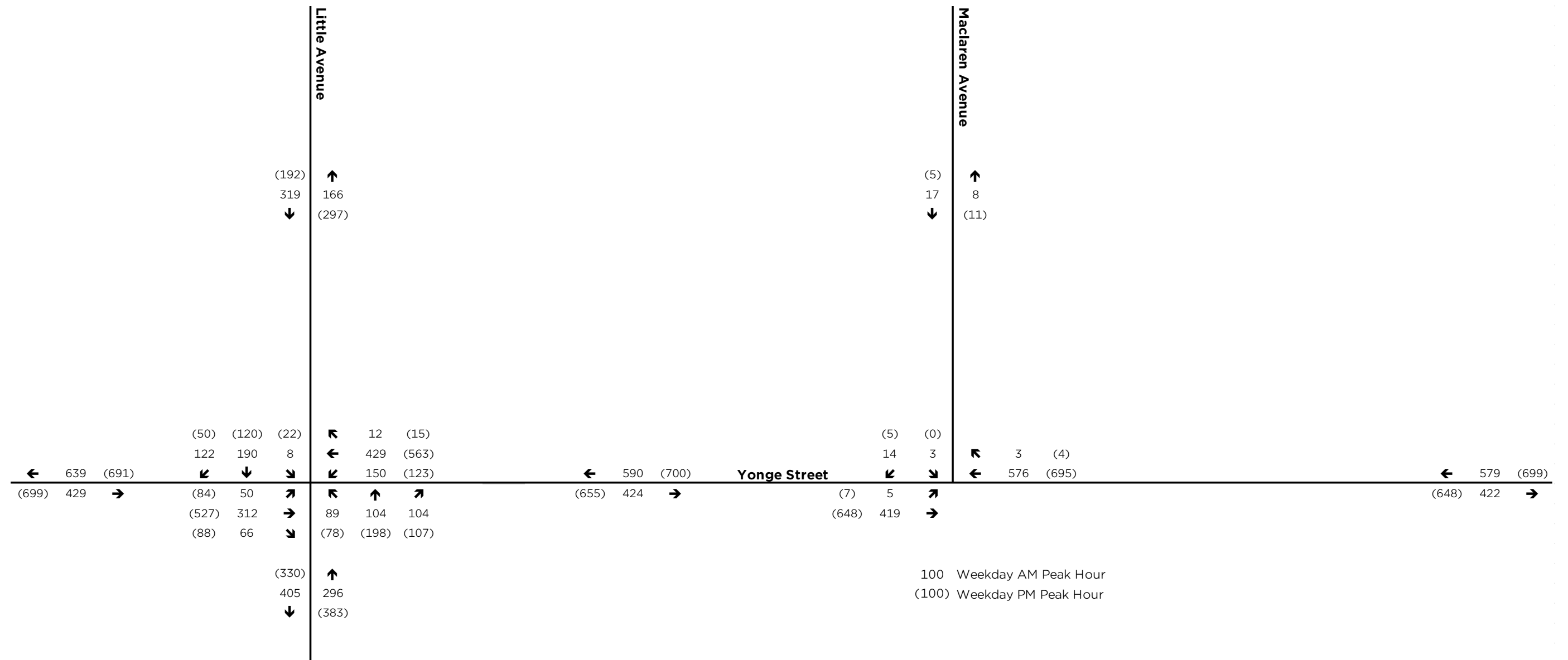
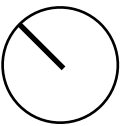
Figure 2B: Area Road Network





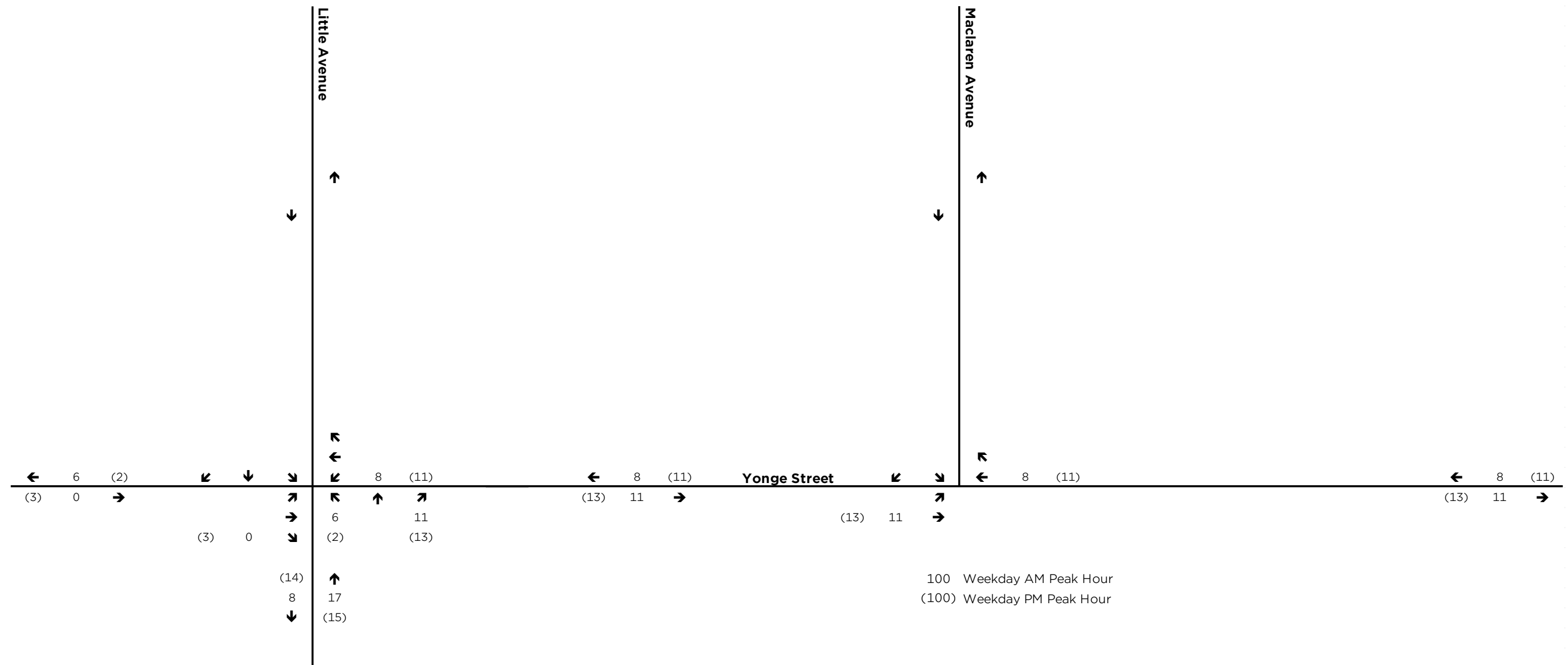
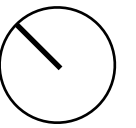
447-455 Yonge Street
Figure 3: Traffic Counts - 2019 & 2022





447-455 Yonge Street
Figure 4: Existing Traffic Volumes - 2022

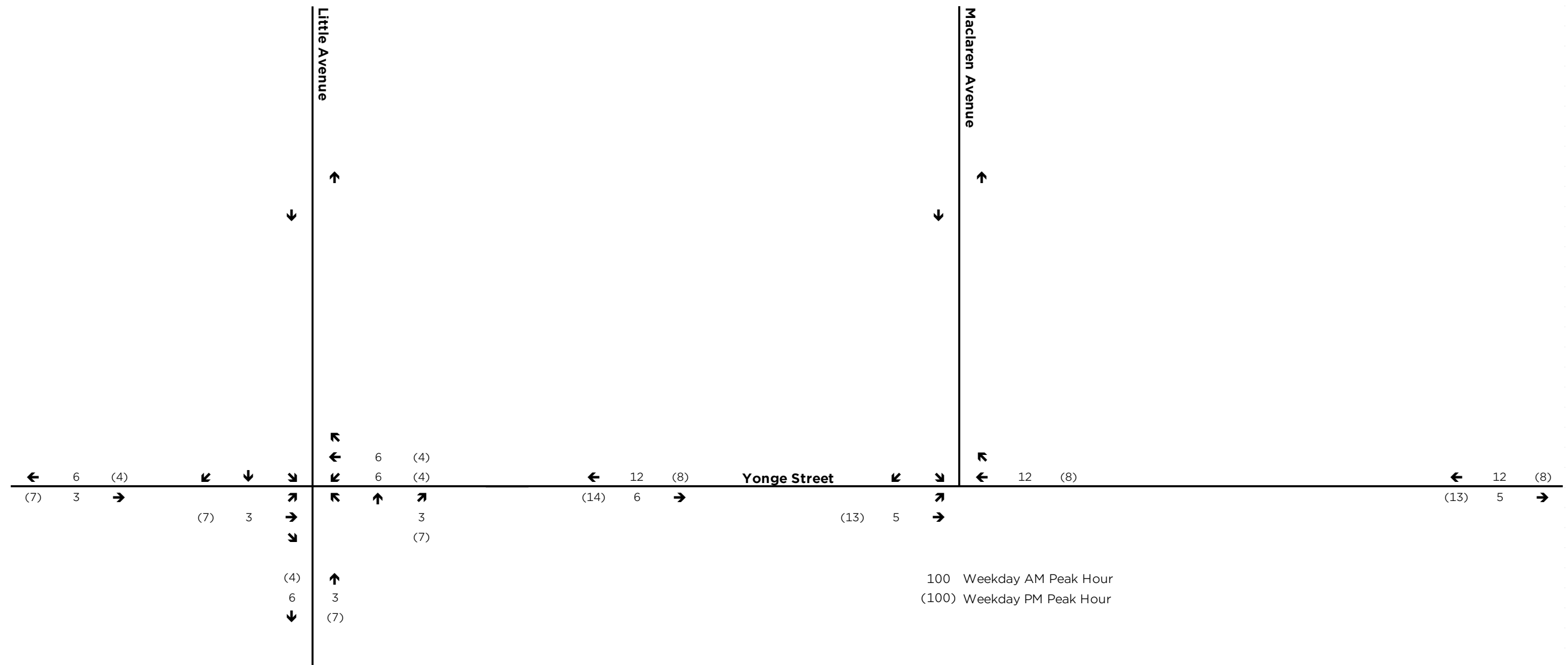
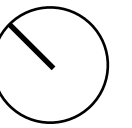




447-455 Yonge Street

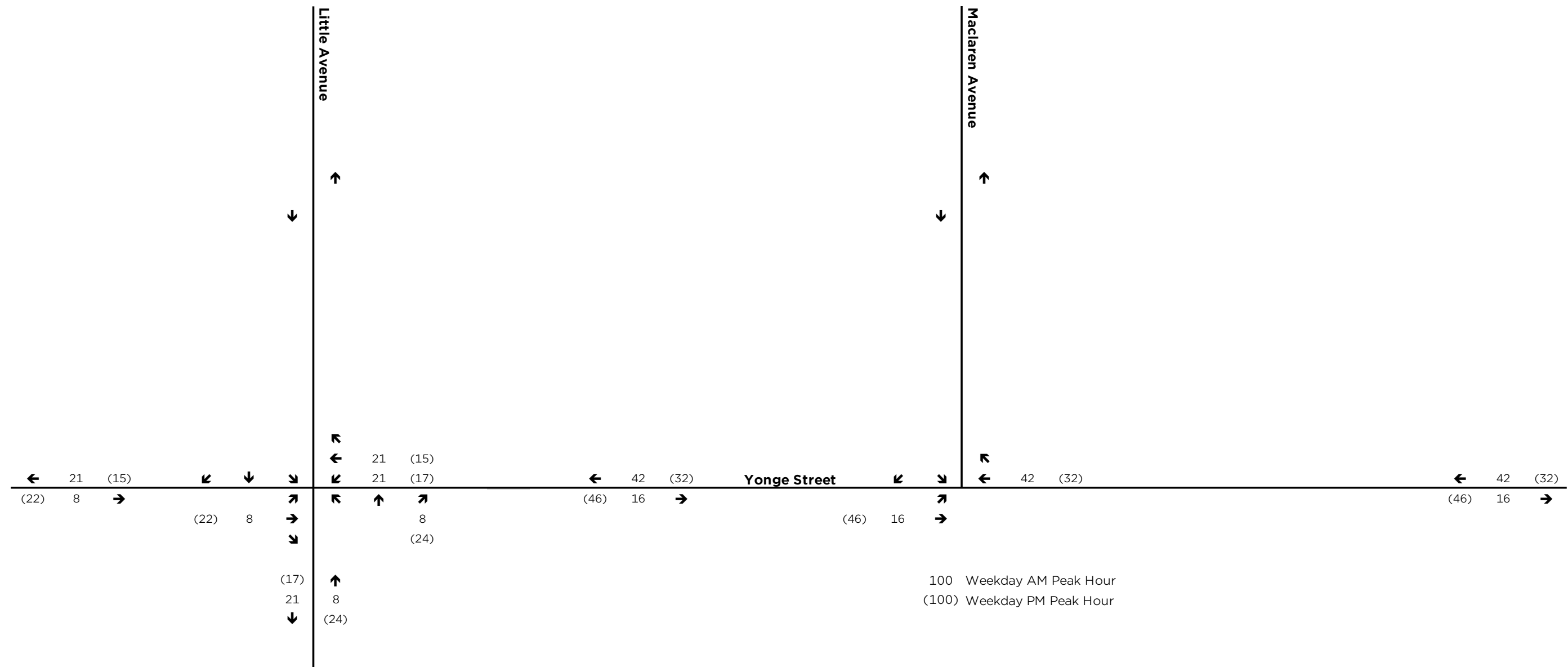
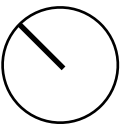
Figure 5: Background Development Volumes – 343 Little Ave/410 Yonge St





447-455 Yonge Street
Figure 6: Background Development Volumes – 481 Yonge Street

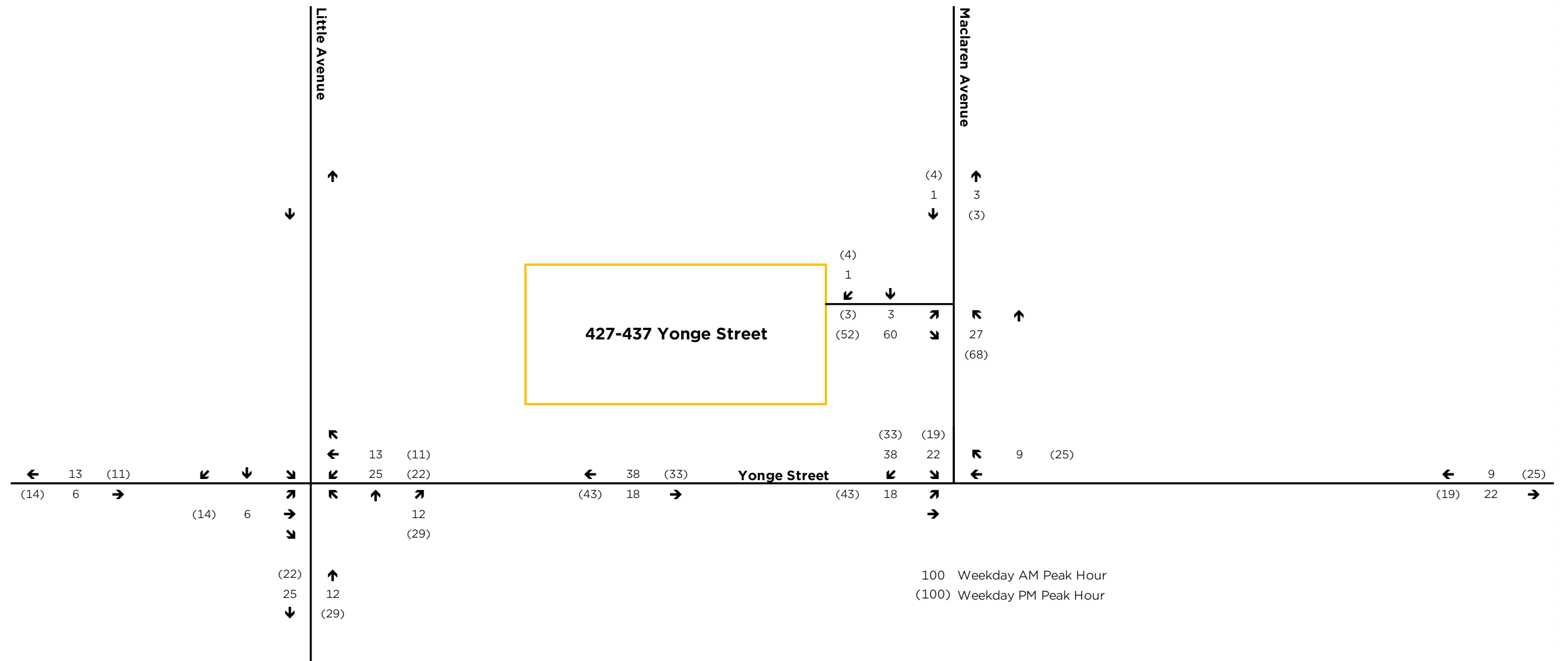
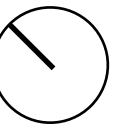




447-455 Yonge Street

Figure 7: Background Development Volumes – 505-533 Yonge Street

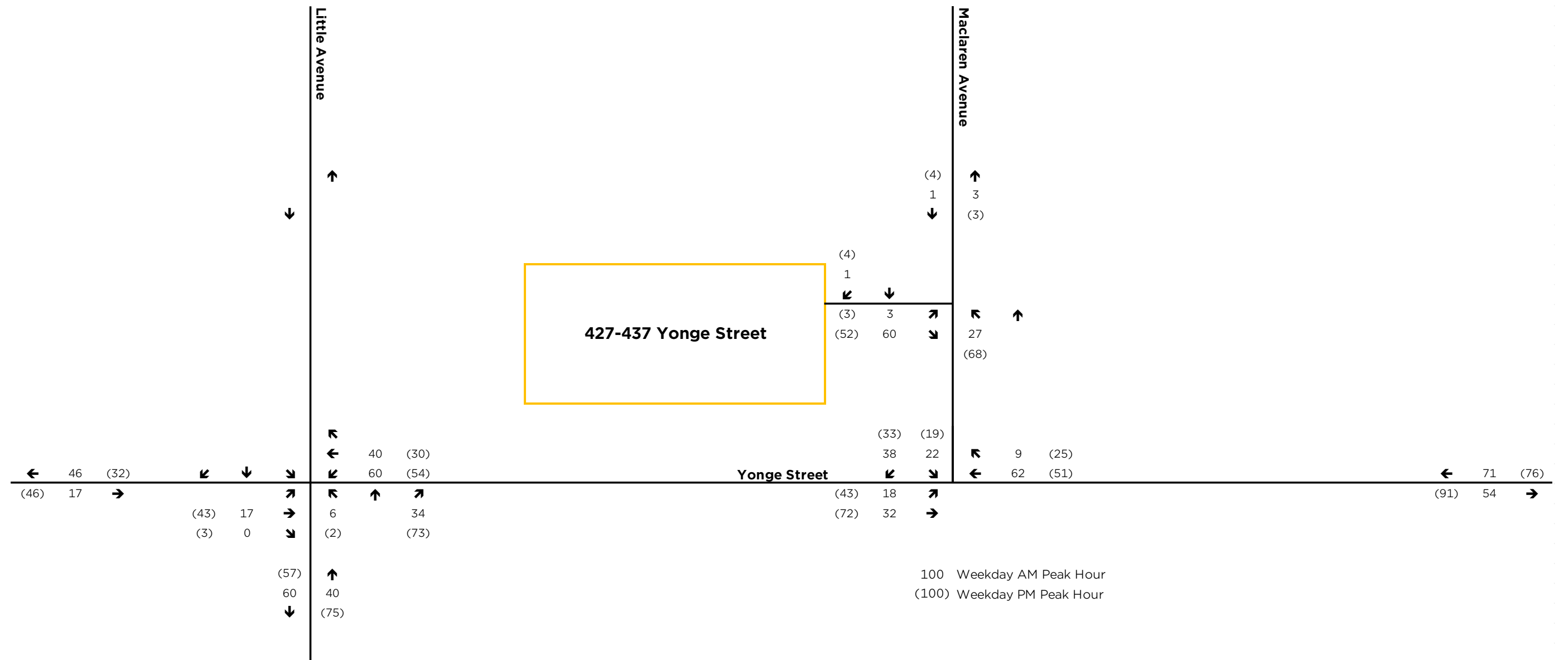
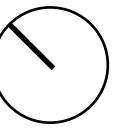




447-455 Yonge Street

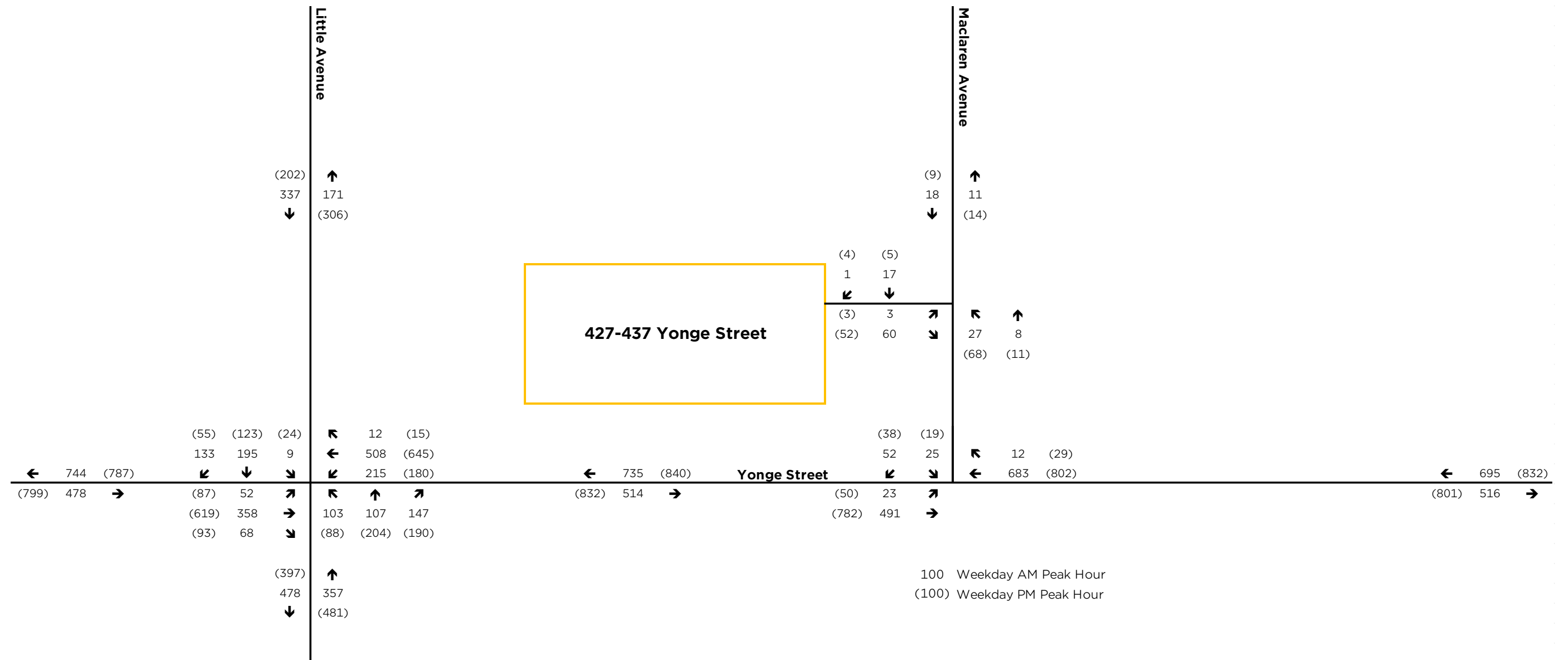
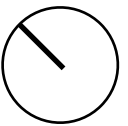
Figure 8: Background Development Volumes – 427-437 Yonge Street





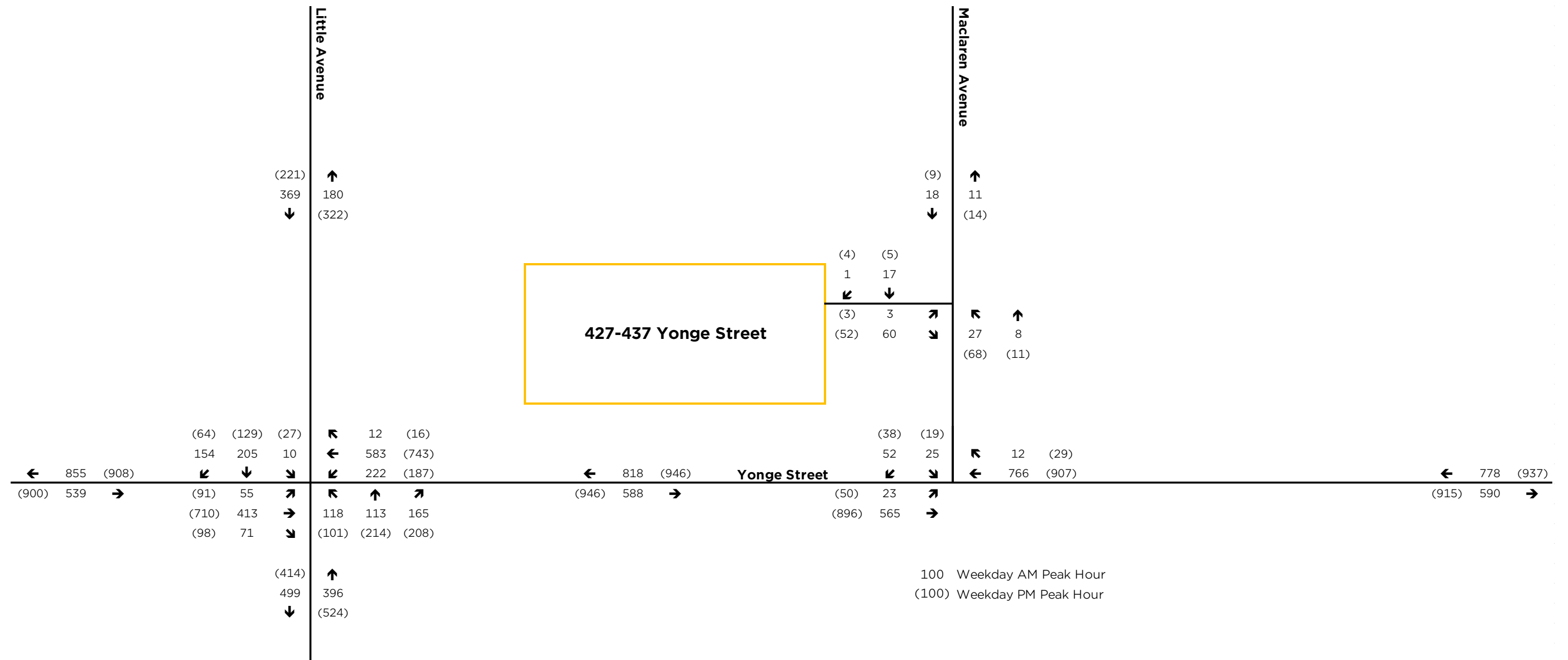
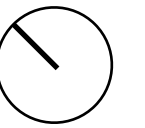
447-455 Yonge Street
Figure 9: Background Development Volumes – Total





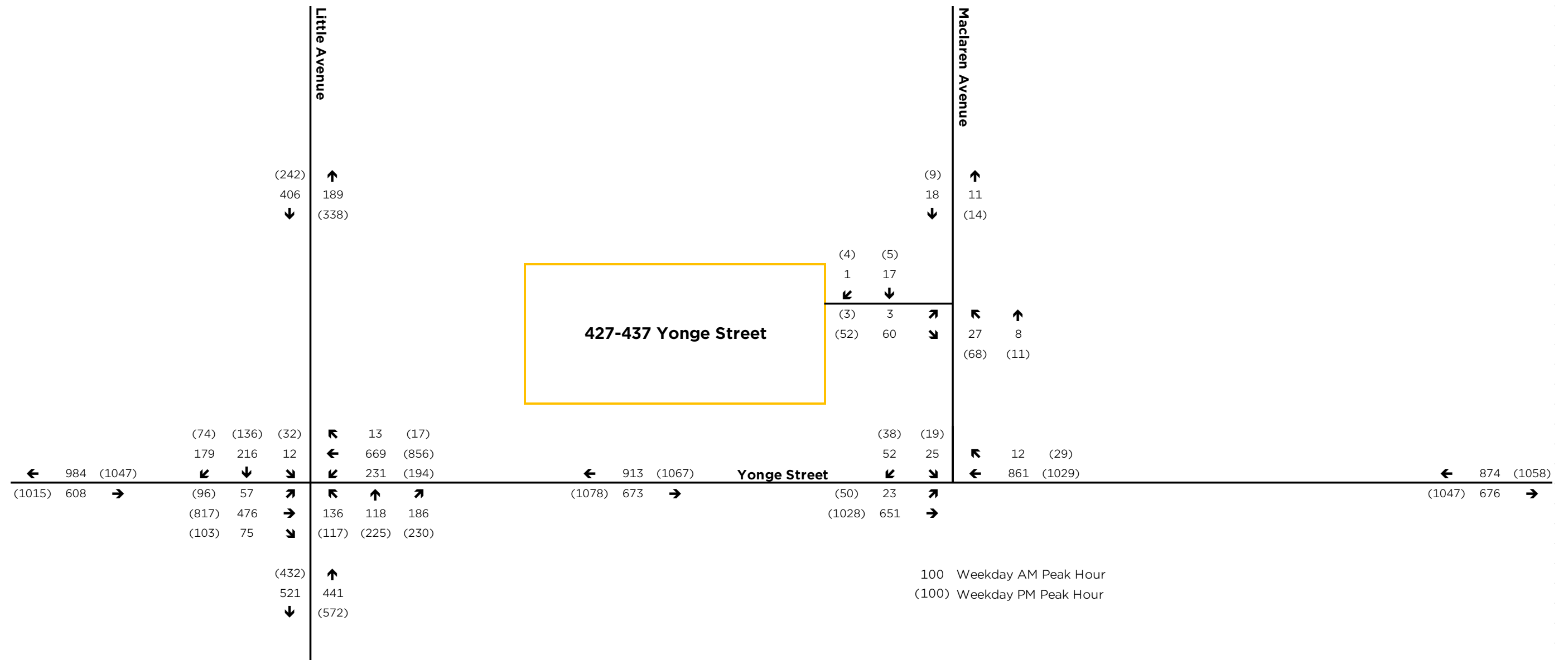
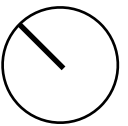
447-455 Yonge Street
Figure 10: Background Traffic Volumes - 2025





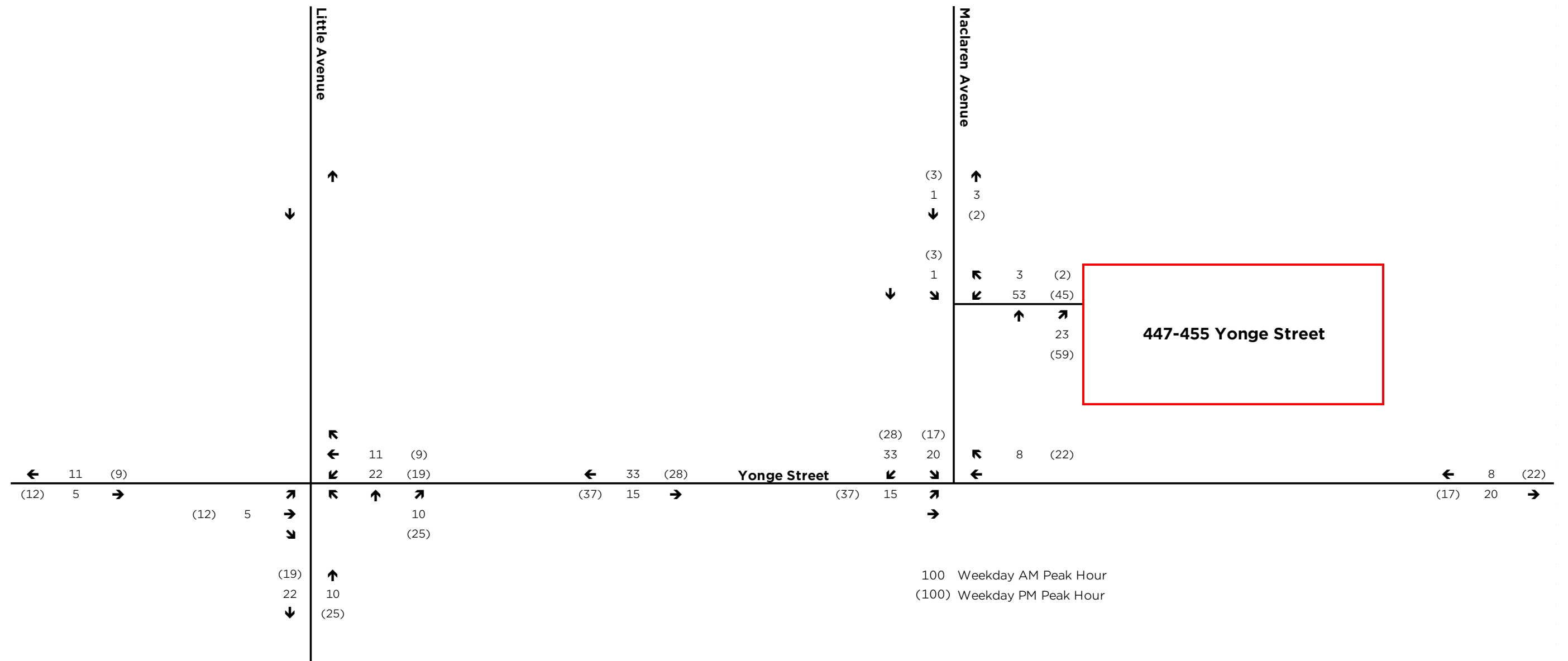
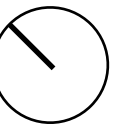
447-455 Yonge Street
Figure 11: Background Traffic Volumes - 2030





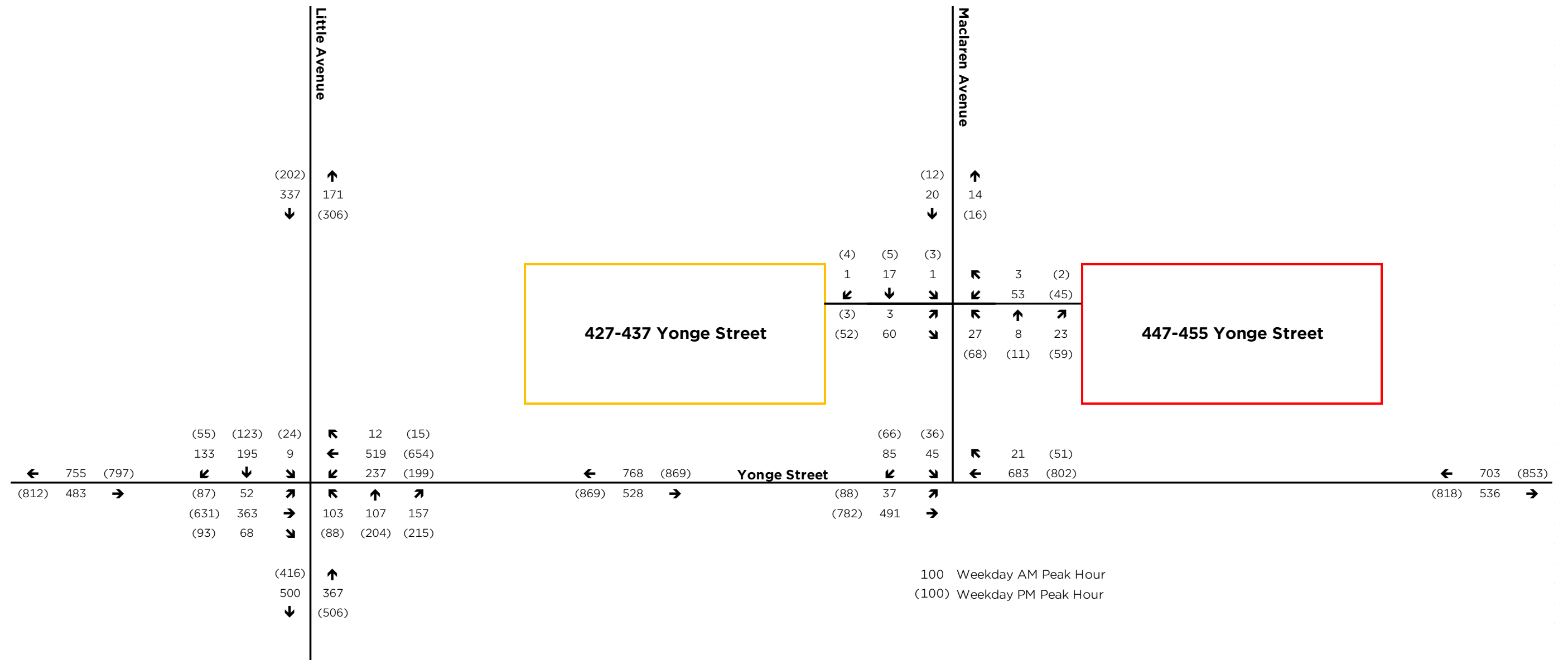
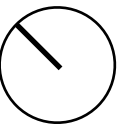
447-455 Yonge Street
Figure 12: Background Traffic Volumes - 2035





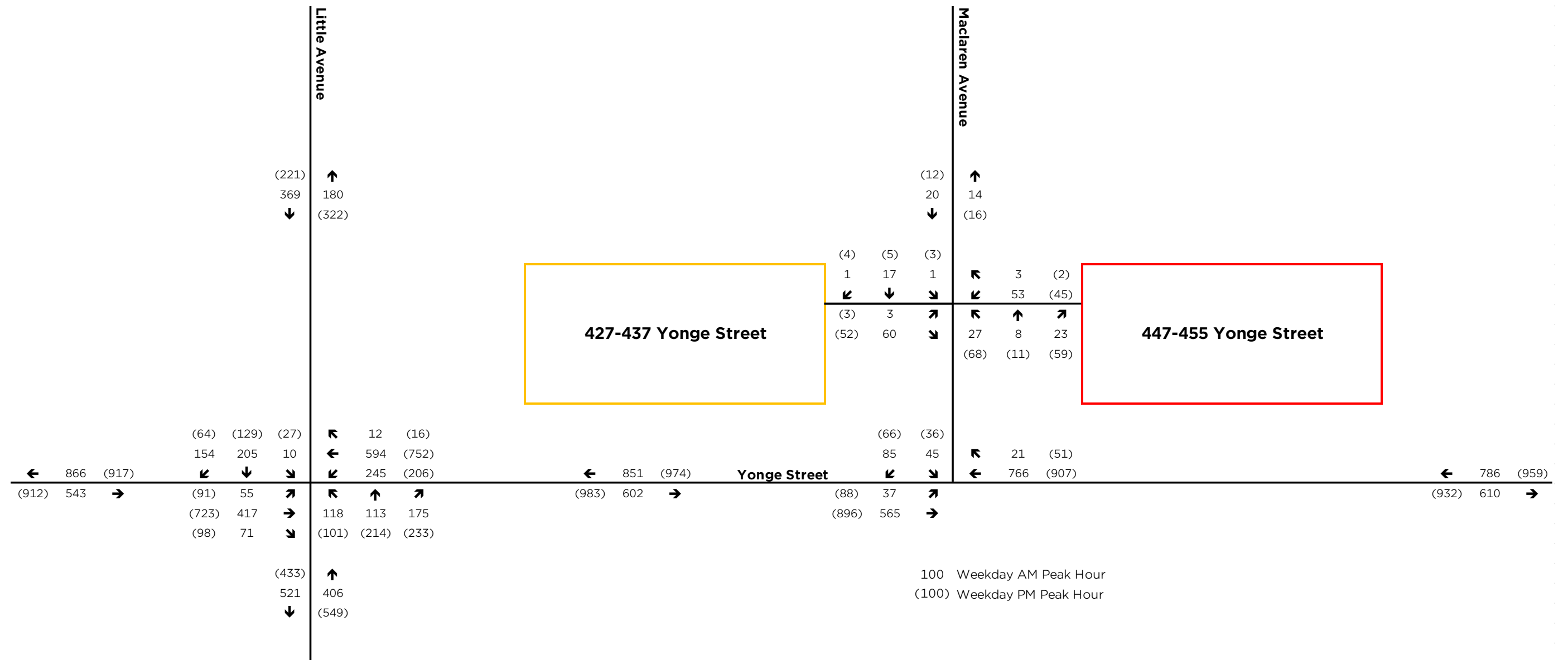
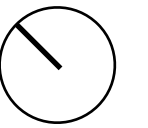
447-455 Yonge Street
Figure 14: Site Traffic





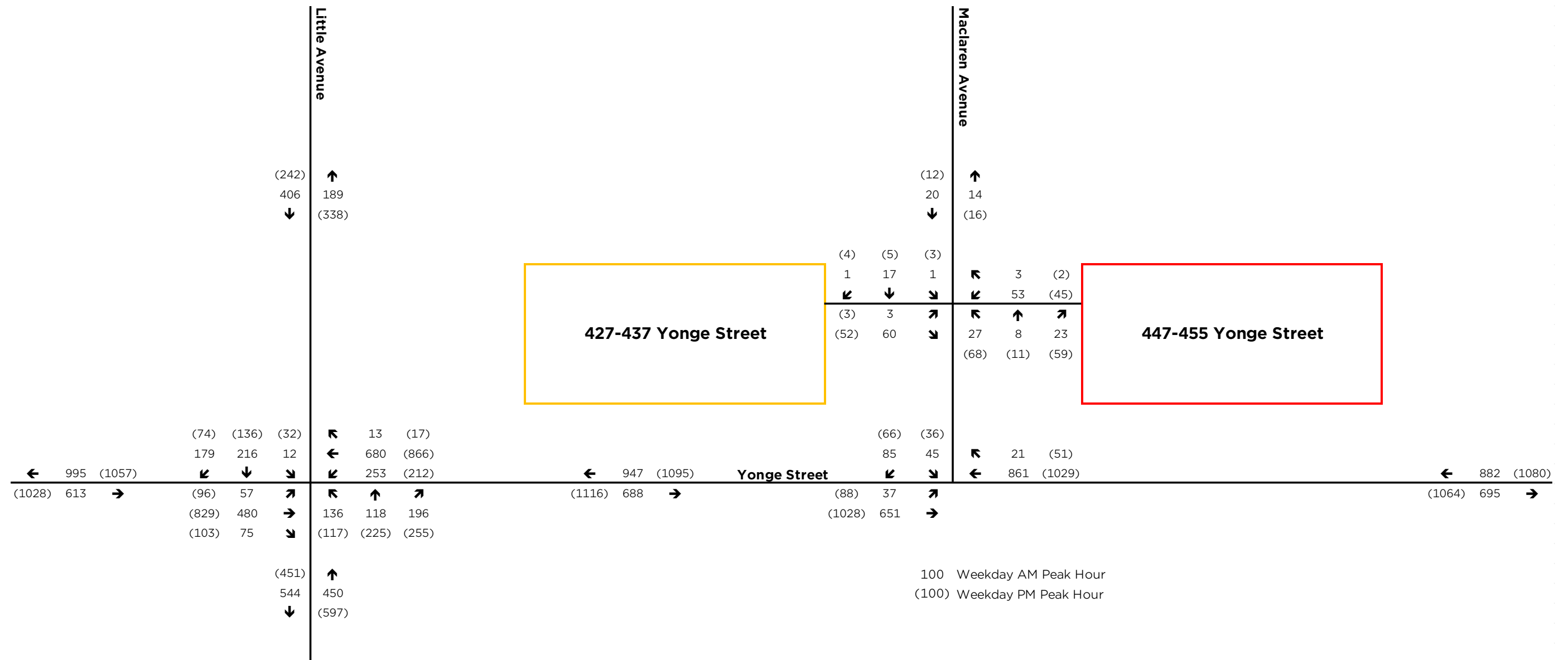
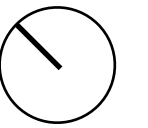
447-455 Yonge Street
Figure 15: Total Traffic Volumes - 2025





447-455 Yonge Street
Figure 16: Total Traffic Volumes - 2030





447-455 Yonge Street
Figure 17: Total Traffic Volumes - 2035



Appendix A: Traffic Counts

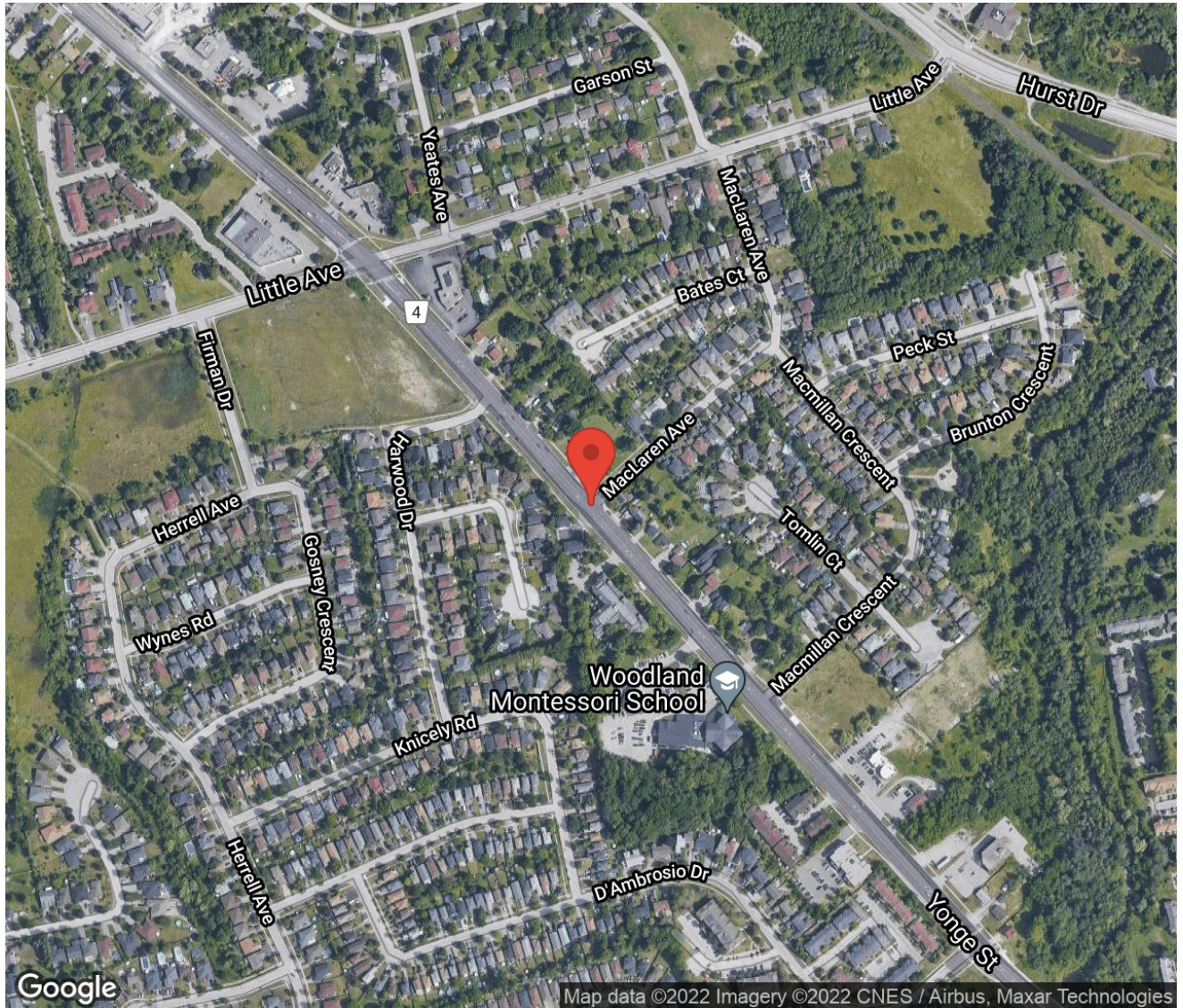
Project #22-033 - Tatham Engineering Ltd

Intersection Count Report

Intersection:	Yonge St & MacLaren Ave
Municipality:	Barrie
Count Date:	Feb 08, 2022
Site Code:	2203300001
Count Categories:	Cars, Trucks, Bicycles, Pedestrians
Count Period:	07:00-10:00, 15:00-18:00
Weather:	Clear

Traffic Count Map

Intersection:	Yonge St & MacLaren Ave
Site Code:	2203300001
Municipality:	Barrie
Count Date:	Feb 08, 2022



Traffic Count Summary

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Municipality: Barrie
Count Date: Feb 08, 2022

Yonge St - Traffic Summary

Hour	North Approach Totals						South Approach Totals						Total
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	
07:00 - 08:00	4	316	0	0	320	0	0	450	1	0	451	0	771
08:00 - 09:00	5	439	0	0	444	0	0	558	4	0	562	0	1006
09:00 - 10:00	6	377	0	0	383	0	0	468	0	0	468	0	851
BREAK													
15:00 - 16:00	6	661	0	0	667	0	0	591	2	0	593	0	1260
16:00 - 17:00	5	621	0	0	626	0	0	707	3	0	710	0	1336
17:00 - 18:00	13	627	0	0	640	1	0	534	5	0	539	0	1179
GRAND TOTAL	39	3041	0	0	3080	1	0	3308	15	0	3323	0	6403

Traffic Count Data

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Municipality: Barrie
Count Date: Feb 08, 2022

North Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
07:00	0	72	0	0	72	0	2	0	0	2	0	0	0	0	0	0
07:15	1	61	0	0	62	0	5	0	0	5	0	0	0	0	0	0
07:30	1	76	0	0	77	0	5	0	0	5	0	0	0	0	0	0
07:45	2	92	0	0	94	0	3	0	0	3	0	0	0	0	0	0
08:00	2	98	0	0	100	0	5	0	0	5	0	0	0	0	0	0
08:15	0	109	0	0	109	0	4	0	0	4	0	0	0	0	0	0
08:30	1	101	0	0	102	0	7	0	0	7	0	0	0	0	0	0
08:45	2	106	0	0	108	0	9	0	0	9	0	0	0	0	0	0
09:00	2	93	0	0	95	1	7	0	0	8	0	0	0	0	0	0
09:15	1	85	0	0	86	0	3	0	0	3	0	0	0	0	0	0
09:30	1	96	0	0	97	0	1	0	0	1	0	0	0	0	0	0
09:45	1	88	0	0	89	0	4	0	0	4	0	0	0	0	0	0
SUBTOTAL	14	1077	0	0	1091	1	55	0	0	56	0	0	0	0	0	0

Traffic Count Data

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Municipality: Barrie
Count Date: Feb 08, 2022

North Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
15:00	1	149	0	0	150	0	6	0	0	6	0	0	0	0	0	0
15:15	2	158	0	0	160	0	5	0	0	5	0	0	0	0	0	0
15:30	0	164	0	0	164	1	4	0	0	5	0	0	0	0	0	0
15:45	2	169	0	0	171	0	6	0	0	6	0	0	0	0	0	0
16:00	0	152	0	0	152	0	3	0	0	3	0	0	0	0	0	0
16:15	5	149	0	0	154	0	0	0	0	0	0	0	0	0	0	0
16:30	0	168	0	0	168	0	1	0	0	1	0	0	0	0	0	0
16:45	0	147	0	0	147	0	1	0	0	1	0	0	0	0	0	0
17:00	2	182	0	0	184	0	1	0	0	1	0	0	0	0	0	0
17:15	4	180	0	0	184	0	0	0	0	0	0	0	0	0	0	0
17:30	5	139	0	0	144	0	3	0	0	3	0	0	0	0	0	1
17:45	2	119	0	0	121	0	3	0	0	3	0	0	0	0	0	0
SUBTOTAL	23	1876	0	0	1899	1	33	0	0	34	0	0	0	0	0	1
GRAND TOTAL	37	2953	0	0	2990	2	88	0	0	90	0	0	0	0	0	1

Traffic Count Data

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Municipality: Barrie
Count Date: Feb 08, 2022

South Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	0	65	0	0	65	0	4	0	0	4	0	0	0	0	0	0
07:15	0	82	0	0	82	0	2	0	0	2	0	0	0	0	0	0
07:30	0	131	0	0	131	0	14	0	0	14	0	0	0	0	0	0
07:45	0	143	1	0	144	0	9	0	0	9	0	0	0	0	0	0
08:00	0	146	1	0	147	0	7	0	0	7	0	0	0	0	0	0
08:15	0	127	0	0	127	0	4	0	0	4	0	0	0	0	0	0
08:30	0	136	0	0	136	0	4	1	0	5	0	0	0	0	0	0
08:45	0	133	2	0	135	0	1	0	0	1	0	0	0	0	0	0
09:00	0	122	0	0	122	0	6	0	0	6	0	0	0	0	0	0
09:15	0	114	0	0	114	0	4	0	0	4	0	0	0	0	0	0
09:30	0	102	0	0	102	0	5	0	0	5	0	0	0	0	0	0
09:45	0	110	0	0	110	0	5	0	0	5	0	0	0	0	0	0
SUBTOTAL	0	1411	4	0	1415	0	65	1	0	66	0	0	0	0	0	0

Traffic Count Data

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Municipality: Barrie
Count Date: Feb 08, 2022

South Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	0	116	0	0	116	0	4	0	0	4	0	0	0	0	0	0
15:15	0	163	1	0	164	0	3	0	0	3	0	1	0	0	1	0
15:30	0	148	0	0	148	0	2	0	0	2	0	0	0	0	0	0
15:45	0	149	1	0	150	0	5	0	0	5	0	0	0	0	0	0
16:00	0	169	0	0	169	0	5	0	0	5	0	0	0	0	0	0
16:15	0	190	0	0	190	0	7	0	0	7	0	0	0	0	0	0
16:30	0	167	3	0	170	0	3	0	0	3	0	0	0	0	0	0
16:45	0	166	0	0	166	0	0	0	0	0	0	0	0	0	0	0
17:00	0	138	0	0	138	0	4	0	0	4	0	0	0	0	0	0
17:15	0	165	3	0	168	0	2	0	0	2	0	0	0	0	0	0
17:30	0	117	1	0	118	0	1	0	0	1	0	0	0	0	0	0
17:45	0	105	1	0	106	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	0	1793	10	0	1803	0	38	0	0	38	0	1	0	0	1	0
GRAND TOTAL	0	3204	14	0	3218	0	103	1	0	104	0	1	0	0	1	0

[illegible]

[illegible]

Peak Hour Diagram

Specified Period

From: 07:00:00
To: 10:00:00

One Hour Peak

From: 07:45:00
To: 08:45:00

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Count Date: Feb 08, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Yonge St runs N/S

North Approach

	Out	In	Total
	405	566	971
	19	24	43
	0	0	0
Totals	424	590	1014

Yonge St

	0	0	0
	19	0	0
	400	5	0
Totals	419	5	0

↓ ↘ ↻

East Approach

	Out	In	Total
	17	7	24
	0	1	1
	0	0	0
Totals	17	8	25

Peds: 0



MacLaren Ave

Totals			
0	0	0	0
14	14	0	0
3	3	0	0

↻ ↗ ↓

Peds: 0

	576	3	0
	552	2	0
	24	1	0
	0	0	0
Totals	576	3	0

↑ ↘ ↻

Yonge St

South Approach

	Out	In	Total
	554	403	957
	25	19	44
	0	0	0
Totals	579	422	1001

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Count Date: Feb 08, 2022
Period: 07:00 - 10:00

Peak Hour Data (07:45 - 08:45)

Start Time	North Approach Yonge St						South Approach Yonge St						East Approach MacLaren Ave						West Approach						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
07:45	2	95		0	0	97		152	1	0	0	153	2		6	0	0	8					0		258
08:00	2	103		0	0	105		153	1	0	0	154	0		1	0	0	1					0		260
08:15	0	113		0	0	113		131	0	0	0	131	0		3	0	0	3					0		247
08:30	1	108		0	0	109		140	1	0	0	141	1		4	0	0	5					0		255
Grand Total	5	419		0	0	424		576	3	0	0	579	3		14	0	0	17					0	0	1020
Approach %	1.2	98.8		0		-		99.5	0.5	0		-	17.6		82.4	0		-							-
Totals %	0.5	41.1		0		41.6		56.5	0.3	0		56.8	0.3		1.4	0		1.7					0		
PHF	0.63	0.93		0		0.94		0.94	0.75	0		0.94	0.38		0.58	0		0.53					0		0.98
Cars	5	400		0		405		552	2	0		554	3		14	0		17					0		976
% Cars	100	95.5		0		95.5		95.8	66.7	0		95.7	100		100	0		100					0		95.7
Trucks	0	19		0		19		24	1	0		25	0		0	0		0					0		44
% Trucks	0	4.5		0		4.5		4.2	33.3	0		4.3	0		0	0		0					0		4.3
Bicycles	0	0		0		0		0	0	0		0	0		0	0		0					0		0
% Bicycles	0	0		0		0		0	0	0		0	0		0	0		0					0		0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 15:45:00
To: 16:45:00

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Count Date: Feb 08, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Yonge St runs N/S

North Approach

	Out	In	Total
	645	680	1325
	10	20	30
	0	0	0
Totals	655	700	1355

Yonge St

	0	0	0
	10	0	0
	638	7	0
Totals	648	7	0

↓ ↘ ↻

East Approach

	Out	In	Total
	5	11	16
	0	0	0
	0	0	0
Totals	5	11	16

Peds: 0

Peds: 0



Peds: 0

Peds: 0

MacLaren Ave

Totals			
0	0	0	0
5	5	0	0
0	0	0	0

↻ ↗ ↓

South Approach

	Out	In	Total
	679	638	1317
	20	10	30
	0	0	0
Totals	699	648	1347

Yonge St

Totals	695	4	0
	675	4	0
	20	0	0
	0	0	0

↑ ↘ ↻

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Yonge St & MacLaren Ave
Site Code: 2203300001
Count Date: Feb 08, 2022
Period: 15:00 - 18:00

Peak Hour Data (15:45 - 16:45)

Start Time	North Approach Yonge St						South Approach Yonge St						East Approach MacLaren Ave						West Approach						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
15:45	2	175		0	0	177		154	1	0	0	155	0		1	0	0	1					0		333
16:00	0	155		0	0	155		174	0	0	0	174	0		2	0	0	2					0		331
16:15	5	149		0	0	154		197	0	0	0	197	0		2	0	0	2					0		353
16:30	0	169		0	0	169		170	3	0	0	173	0		0	0	0	0					0		342
Grand Total	7	648		0	0	655		695	4	0	0	699	0		5	0	0	5					0	0	1359
Approach %	1.1	98.9		0	-	-		99.4	0.6	0	-	-	0		100	0	-	-					-	-	-
Totals %	0.5	47.7		0	-	48.2		51.1	0.3	0	-	51.4	0		0.4	0	-	0.4					0	-	-
PHF	0.35	0.93		0	-	0.93		0.88	0.33	0	-	0.89	0		0.63	0	-	0.63					0	-	0.96
Cars	7	638		0	-	645		675	4	0	-	679	0		5	0	-	5					0	-	1329
% Cars	100	98.5		0	-	98.5		97.1	100	0	-	97.1	0		100	0	-	100					0	-	97.8
Trucks	0	10		0	-	10		20	0	0	-	20	0		0	0	-	0					0	-	30
% Trucks	0	1.5		0	-	1.5		2.9	0	0	-	2.9	0		0	0	-	0					0	-	2.2
Bicycles	0	0		0	-	0		0	0	0	-	0	0		0	0	-	0					0	-	0
% Bicycles	0	0		0	-	0		0	0	0	-	0	0		0	0	-	0					0	-	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	-

Site ID Code:
Intersection Location:
Municipality:
Count Date:
Weather and Temperature:
Surveyor:

Site ID Code:
Intersection Location:
Municipality:
Count Date:
Weather and Temperature:
Surveyor:

AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total	
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds														
	L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R															
7:00	9	42	16	1	2	1	0	0	0	0	71	1	36	20	0	0	0	0	0	0	1	58	12	52	0	0	4	0	0	0	0	0	68	9	9	11	1	2	0	0	0	0	1	33	230	
7:15	8	44	14	0	2	0	0	0	0	2	70	2	46	26	2	0	0	0	0	0	1	77	17	62	1	0	3	0	0	0	0	2	85	9	16	9	0	0	11	0	0	0	0	45	277	
7:30	9	56	14	0	2	0	0	0	0	1	82	2	59	38	0	1	0	0	0	0	0	100	34	82	0	11	4	1	0	0	0	0	132	16	10	6	0	1	3	0	0	0	0	36	350	
7:45	11	58	23	0	0	0	0	0	0	0	92	3	53	52	0	1	0	0	0	0	0	109	30	81	0	1	2	0	0	0	0	1	115	20	27	19	0	0	2	0	0	0	1	69	385	
8:00	16	50	14	0	4	0	0	0	0	1	85	2	48	28	0	0	1	0	0	0	0	79	28	87	1	1	2	1	0	0	0	0	120	20	39	18	0	2	0	0	0	0	1	80	364	
8:15	7	53	20	0	1	1	0	0	0	0	82	3	42	29	0	2	0	0	0	0	0	76	29	76	4	0	2	0	0	0	0	6	117	17	16	13	0	0	0	0	0	2	48	323		
8:30	7	63	16	1	2	0	0	0	0	2	91	1	48	29	0	1	0	0	0	0	1	80	33	84	3	2	2	0	0	0	0	0	124	25	16	13	0	3	0	0	0	0	0	57	352	
8:45	19	72	14	0	2	3	0	0	0	2	112	0	46	32	0	0	0	0	0	0	1	79	27	88	1	0	2	0	0	0	0	1	119	24	30	35	0	0	3	0	0	0	1	93	403	
MD																																														
11:00	17	92	13	0	2	1	0	0	0	0	125	2	29	14	0	3	0	0	0	0	1	49	19	72	3	0	5	0	0	0	0	1	100	15	24	17	0	1	0	0	0	0	1	58	332	
11:15	25	69	21	0	0	1	0	0	0	1	117	1	21	19	0	0	1	0	0	0	0	42	20	61	1	0	0	0	0	0	0	0	82	7	26	16	0	0	0	0	0	0	1	50	291	
11:30	15	79	21	0	3	0	0	0	0	0	118	4	26	17	0	0	1	0	0	0	0	48	23	69	1	0	1	0	0	0	0	0	94	16	24	17	0	0	0	0	0	0	0	57	317	
11:45	10	85	27	0	4	0	0	0	0	0	126	4	41	9	0	0	0	0	0	0	1	55	15	53	1	0	2	0	0	0	0	0	71	24	35	24	0	1	0	0	0	0	0	84	336	
12:00	13	94	18	0	3	0	0	0	0	0	128	2	41	16	0	1	0	0	0	0	1	61	22	73	2	1	1	0	0	0	0	2	101	15	60	18	0	0	0	0	0	0	1	94	384	
12:15	18	106	20	0	1	1	0	0	0	0	146	1	35	21	0	1	0	0	0	0	2	60	31	75	1	1	0	0	0	0	0	1	109	11	32	20	0	0	0	0	0	0	0	63	378	
12:30	16	96	17	0	5	1	0	0	0	0	135	4	21	21	0	1	2	0	0	0	1	50	27	90	0	1	2	1	0	0	0	0	121	13	35	13	0	0	0	0	0	0	0	61	367	
12:45	8	91	26	0	1	2	0	0	0	0	128	3	36	30	0	2	1	0	0	0	4	76	23	57	3	0	1	0	0	0	0	4	88	24	26	21	1	1	0	0	0	0	2	75	367	
13:00	15	81	19	0	4	0	0	0	0	0	119	1	27	14	0	0	0	0	0	0	3	45	13	69	2	1	3	0	0	0	0	2	90	28	34	22	0	0	1	0	0	0	1	86	340	
13:15	20	93	21	1	4	0	0	0	0	0	139	6	24	17	0	0	0	0	0	0	1	48	19	70	3	0	2	0	0	0	0	0	94	21	47	18	0	0	0	0	0	0	0	86	367	
13:30	13	84	24	0	2	0	0	0	0	2	125	6	29	7	0	0	0	0	0	0	2	44	26	75	2	1	1	0	0	0	0	4	109	24	32	30	0	0	0	0	0	0	2	88	366	
13:45	20	87	14	0	2	1	0	0	0	2	126	4	26	16	0	0	0	0	0	0	2	48	17	76	4	0	1	0	0	0	0	0	98	24	26	11	0	0	0	0	0	0	0	61	333	
PM																																														
15:00	17	93	21	1	1	1	0	0	0	4	138	4	31	14	0	0	0	0	0	0	0	49	24	89	3	1	1	0	0	0	0	4	122	14	46	20	0	0	0	0	0	0	2	82	391	
15:15	18	115	23	0	0	0	0	0	0	4	160	3	29	11	0	0	0	0	0	0	1	44	26	78	0	0	0	0	0	0	0	0	104	18	56	23	0	1	1	0	0	0	0	1	100	408
15:30	12	108	29	0	3	0	0	0	0	0	152	1	36	22	2	0	1	0	0	0	0	62	18	96	5	0	4	0	0	0	0	0	123	18	41	27	0	0	1	0	0	0	0	0	87	424
15:45	19	111	22	0	1	2	0	0	0	0	155	5	38	9	0	0	0	0	0	0	0	52	22	92	1	0	2	0	0	0	0	0	117	17	45	22	0	3	0	0	0	0	1	88	412	
16:00	28	102	18	0	2	0	0	0	0	2	152	6	31	11	0	0	0	0	0	0	0	48	14	98	4	0	4	0	0	0	0	0	120	10	47	30	0	0	0	0	0	0	0	87	407	
16:15	14	131	18	0	4	0	0	0	0	0	167	3	34	15	0	0	0	0	0	0	0	52	26	114	4	0	2	0	0	0	0	0	146	21	44	24	0	0	1	0	0	0	0	1	91	456
16:30	18	138	25	0	2	0	0	0	0	0	183	6	30	14	0	0	0	0	0	0	0	50	19	121	2	1	5	0	0	0	0	1	149	23	58	32	0	0	1	0	0	0	0	114	496	
16:45	19	145	25	0	1	1	0	0	0	0	191	7	31	9	0	0	0	0	0	0	0	47	20	112	3	0	2	0	0	0	0	1	138	18	39	26	0	0	0	0	0	0	0	83	459	
17:00	31	123	17	0	2	0	0	0	0	1	174	6	21	11	0	0	0	0	0	0	1	39	33	103	3	0	2	0	0	0	0	1	142	14	51	27	0	1	0	0	0	0	0	93	448	
17:15	21	138	25	0	1	0	0	0	0	1	186	2	17	7	0	0	0	0	0	0	0	26	18	119	4	0	2	0	0	0	0	0	143	13	40	27	0	0	0	0	0	0	0	80	435	
17:30	17	129	23	0	1	0	0	0	0	1	171	4	32	9	0	0	0	0	0	0	1	46	26	106	6	0	1	0	0	0	0	1	140	18	50	25	0	0	1	0	0	0	2	96	453	
17:45	19	92	22	0	0	1	0	0	0	0	134	4	31	18	0	0	0	0	0	0	0	53	21	83	3	0	0	0	0	0	0	0	107	13	51	28	0	0	0	0	0	0	0	92	386	



Turning Movement Count Diagram

Intersection: Yonge Street & Little Avenue

Municipality: Barrie, Ontario

Intersection ID:

Date: Thursday April 11, 2019

AM Peak Hour: 8:00 to 9:00

MD Peak Hour: 12:00 to 13:00

Yonge Street													
North Total 913				East Total 478									
North Entering 365		Cyclists	0	0	0	East Entering 312							
North Receiving 548		Truck	4	9	1	East Receiving 166							
North Peds 5		Cars	64	238	49	East Peds 2							
			⬅	⬇	➡								
Little Avenue	0	0	86	⬆						⬆	118	1	0
	0	5	101	➡						⬅	184	3	0
	0	3	79	⬇						⬇	6	0	0
			⬅	⬆	➡								
West Total 649				117	335	9	South Total 808						
West Entering 274				3	8	1	South Entering 473						
West Receiving 375				0	0	0	South Receiving 335						
West Peds 4				South Peds 7									

Yonge Street									
North Total 991						East Total 455			
North Entering 537	Cyclists	0 0 0				East Entering 239			
North Receiving 454	Truck	4 10 0				East Receiving 216			
North Peds 0	Cars	81 387 55				East Peds 8			
			←	↓	↘				
Little Avenue	0 1 63	↗				↗ 88 3 0			
	0 1 153	→				← 133 5 0			
	0 0 72	↘				↘ 10 0 0			
			←	↑	↗				
West Total 619			103	295	6	South Total 891			
West Entering 290		3 4 1				South Entering 412			
West Receiving 329		0 0 0				South Receiving 479			
West Peds 3						South Peds 7			

PM Peak Hour: 16:15 to 17:15

Total 8-Hour Count

Yonge Street										
North Total 1300				East Total 474						
North Entering 714		Cyclists	0	0	0	East Entering 187				
North Receiving 586		Truck	1	9	0	East Receiving 287				
North Peds 1		Cars	85	537	82	East Peds 1				
			⬅	⬇	➡					
Little Avenue	0	0	76	⬆		⬆		49	0	0
	0	1	192	➡		⬅		116	0	0
	0	2	109	⬇		⬇		22	0	0
			⬅	⬆	➡					
West Total 681				98		450	12	South Total 1251		
West Entering 380				1		11	0	South Entering 572		
West Receiving 301				0		0	0	South Receiving 679		
West Peds 1								South Peds 3		

Yonge Street									
North Total 8055						East Total 3562			
North Entering 4154		Cyclists	0	0	0	East Entering 1827			
North Receiving 3901		Truck	17	64	4	East Receiving 1735			
North Peds 26		Cars	640	2920	509	East Peds 25			
			⬅	⬇	➡				
Little Avenue	0	2	559	↗	↖ 605 7 0				
	0	16	1132	➡	⬅ 1095 13 0				
	0	25	662	⬇	↙ 103 4 0				
			↖	⬆	↗				
West Total 4915				732	2663	71	South Total 7334		
West Entering 2396				22	65	3	South Entering 3556		
West Receiving 2519				0	0	0	South Receiving 3778		
West Peds 21							South Peds 32		

Appendix B: Existing Operations

HCM Signalized Intersection Capacity Analysis

3: Yonge St & Little Ave

Baseline

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	104	104	8	190	122	150	429	12	50	312	66
Future Volume (vph)	89	104	104	8	190	122	150	429	12	50	312	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.93		1.00	0.94		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1742		1789	1773		1789	3564		1789	3485	
Flt Permitted	0.29	1.00		0.51	1.00		0.48	1.00		0.48	1.00	
Satd. Flow (perm)	548	1742		954	1773		901	3564		901	3485	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	113	113	9	207	133	163	466	13	54	339	72
RTOR Reduction (vph)	0	42	0	0	28	0	0	2	0	0	17	0
Lane Group Flow (vph)	97	184	0	9	312	0	163	477	0	54	394	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.1	20.1		20.1	20.1		53.9	46.9		47.9	43.9	
Effective Green, g (s)	20.1	20.1		20.1	20.1		53.9	46.9		47.9	43.9	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.62	0.54		0.55	0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	402		220	409		629	1921		536	1758	
v/s Ratio Prot		0.11			0.18		c0.02	0.13		0.00	0.11	
v/s Ratio Perm	c0.18			0.01			c0.14			0.05		
v/c Ratio	0.77	0.46		0.04	0.76		0.26	0.25		0.10	0.22	
Uniform Delay, d1	31.3	28.8		26.0	31.2		7.0	10.7		9.1	12.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.2	0.8		0.1	8.2		0.2	0.3		0.1	0.3	
Delay (s)	55.5	29.6		26.0	39.5		7.2	11.0		9.1	12.3	
Level of Service	E	C		C	D		A	B		A	B	
Approach Delay (s)		37.4			39.1			10.0			12.0	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay	21.2			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.41											
Actuated Cycle Length (s)	87.0			Sum of lost time (s)			16.0					
Intersection Capacity Utilization	85.8%			ICU Level of Service			E					
Analysis Period (min)	15											

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge St

Baseline

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	14	576	3	5	419
Future Volume (Veh/h)	3	14	576	3	5	419
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	15	626	3	5	455
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh						2
Upstream signal (m)						316
pX, platoon unblocked						
vC, conflicting volume	865	314			629	
vC1, stage 1 conf vol	628					
vC2, stage 2 conf vol	238					
vCu, unblocked vol	865	314			629	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	98			99	
cM capacity (veh/h)	461	681			949	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	18	417	212	5	228	228
Volume Left	3	0	0	5	0	0
Volume Right	15	0	3	0	0	0
cSH	631	1700	1700	949	1700	1700
Volume to Capacity	0.03	0.25	0.12	0.01	0.13	0.13
Queue Length 95th (m)	0.7	0.0	0.0	0.1	0.0	0.0
Control Delay (s)	10.9	0.0	0.0	8.8	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	10.9	0.0		0.1		
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			26.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2022 Existing Conditions

3: Yonge St & Little Ave

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	198	107	22	120	50	123	563	15	84	527	88
Future Volume (vph)	78	198	107	22	120	50	123	563	15	84	527	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.96		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1784		1789	1801		1789	3565		1789	3502	
Flt Permitted	0.59	1.00		0.31	1.00		0.34	1.00		0.40	1.00	
Satd. Flow (perm)	1115	1784		585	1801		649	3565		746	3502	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	85	215	116	24	130	54	134	612	16	91	573	96
RTOR Reduction (vph)	0	23	0	0	18	0	0	1	0	0	12	0
Lane Group Flow (vph)	85	308	0	24	166	0	134	627	0	91	657	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.0	20.0		20.0	20.0		51.7	44.7		48.7	43.2	
Effective Green, g (s)	20.0	20.0		20.0	20.0		51.7	44.7		48.7	43.2	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.60	0.52		0.56	0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	258	413		135	417		481	1848		488	1755	
v/s Ratio Prot		c0.17			0.09		c0.02	0.18		0.01	c0.19	
v/s Ratio Perm	0.08			0.04			0.14			0.09		
v/c Ratio	0.33	0.75		0.18	0.40		0.28	0.34		0.19	0.37	
Uniform Delay, d1	27.5	30.7		26.5	28.0		7.7	12.1		8.6	13.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	7.2		0.6	0.6		0.3	0.5		0.2	0.6	
Delay (s)	28.3	37.9		27.1	28.6		8.0	12.6		8.8	13.8	
Level of Service	C	D		C	C		A	B		A	B	
Approach Delay (s)		35.9			28.5			11.8			13.2	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay	18.6			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.47											
Actuated Cycle Length (s)	86.2			Sum of lost time (s)			16.0					
Intersection Capacity Utilization	83.8%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge St

2022 Existing Conditions

PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	5	695	4	7	648
Future Volume (Veh/h)	0	5	695	4	7	648
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	5	755	4	8	704
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		TWLT	TL
Median storage veh						2
Upstream signal (m)						316
pX, platoon unblocked	0.95					
vC, conflicting volume	1125	380			759	
vC1, stage 1 conf vol	757					
vC2, stage 2 conf vol	368					
vCu, unblocked vol	1033	380			759	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			99	
cM capacity (veh/h)	393	618			848	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	5	503	256	8	352	352
Volume Left	0	0	0	8	0	0
Volume Right	5	0	4	0	0	0
cSH	618	1700	1700	848	1700	1700
Volume to Capacity	0.01	0.30	0.15	0.01	0.21	0.21
Queue Length 95th (m)	0.2	0.0	0.0	0.2	0.0	0.0
Control Delay (s)	10.9	0.0	0.0	9.3	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	10.9	0.0		0.1		
Approach LOS	B					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			29.3%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C: Background Developments

TRAFFIC IMPACT STUDY
YONGE STREET AND LITTLE AVENUE
RESIDENTIAL DEVELOPMENT
CITY OF BARRIE

PREPARED FOR:
MASON HOMES INC.

PREPARED BY:
C.F. CROZIER & ASSOCIATES INC.
40 HURON STREET, SUITE 301
COLLINGWOOD, ONTARIO
L9Y 4R3

JULY 2018

CFCA FILE NO. 1509-4851

The material in this report reflects best judgment in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. C.F. Crozier & Associates Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



5 SITE GENERATED TRAFFIC

The proposed development will result in additional vehicles on the boundary road network that previously did not exist. The proposed development will also result in additional turning movements at the boundary road intersections.

5.1 Trip Generation

The trip generation of the townhouse residential lots was forecasted using the fitted curve equations provided in the ITE Trip Generation Manual, 10th Edition, under the Land Use Category 220 "Multifamily Housing (Low-Rise)" and is displayed in **Table 8**.

Table 8: Trip Generation

Use	Trip Type	Peak Hour	Number of Trips		
			Inbound	Outbound	Total
L.U. 220: Multifamily Housing (Low-Rise) (153 Units)	Primary	Weekday A.M.	16	55	71
	Primary	Weekday P.M.	54	32	86

5.2 Trip Distribution and Assignment

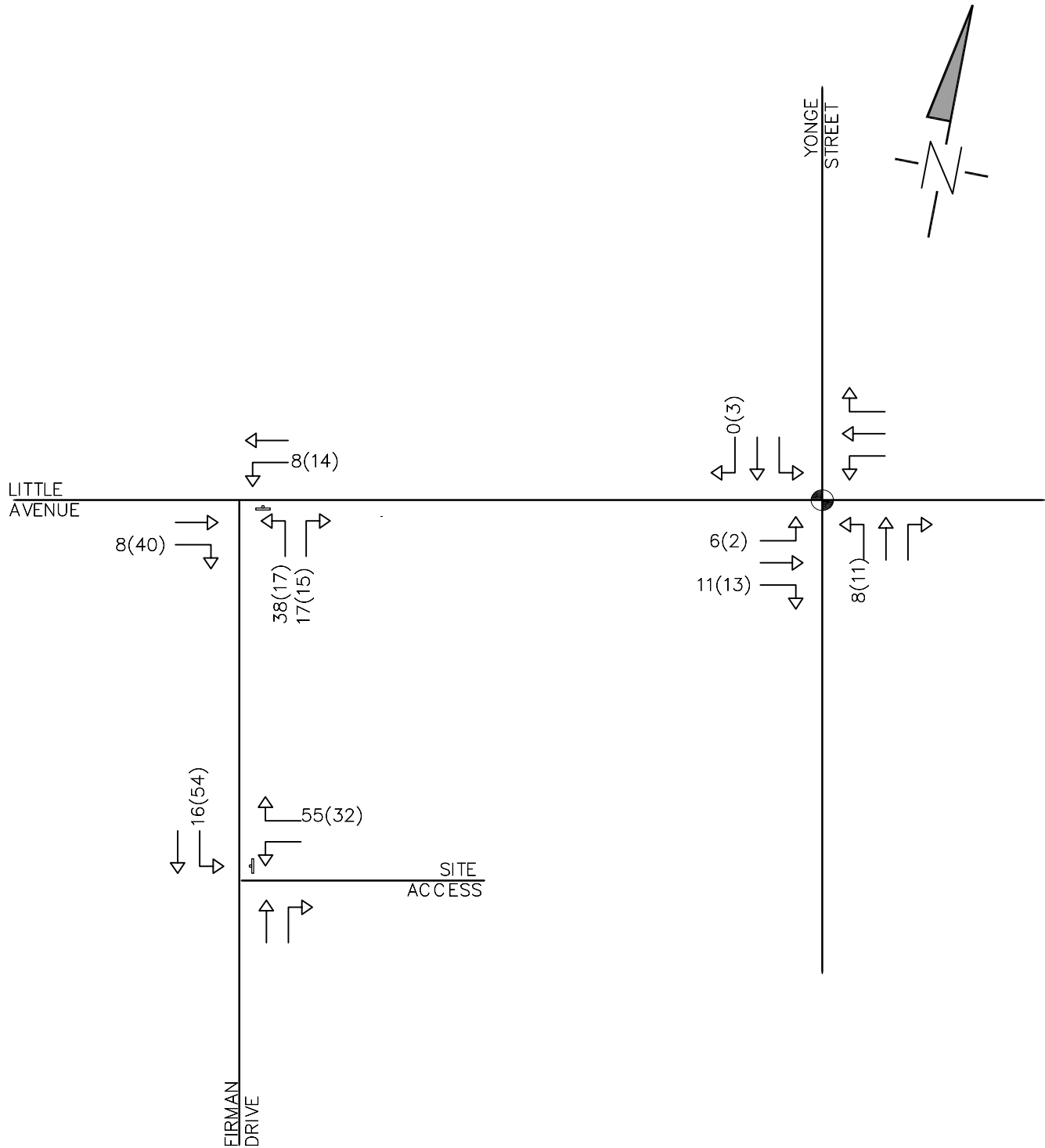
The trips generated by the proposed development were distributed to the boundary road network based on Transportation Tomorrow Survey data, with the trip purpose of "home" selected to represent the residential nature of this development. The trip distribution is described in Table 9 below.

Transportation Tomorrow Survey data did not indicate that trips would travel to or from the east on Little Avenue during the peak hours, accordingly, trips were only distributed to the north, south and west. For most parts of Barrie, outside of the downtown, navigational software directed traffic west on Little Avenue to Highway 400. Furthermore, trips were not expected to travel south on Firman Drive during the weekday a.m. and p.m. peak hours, accordingly all inbound and outbound trips are left and right-turns at the site access, respectively.

Table 9: Trip Distribution

Direction of Travel	Peak Hour	Inbound	Outbound
North (Yonge Street)	Weekday A.M.	48%	10%
	Weekday P.M.	21%	6%
South (Yonge Street)	Weekday A.M.	0%	20%
	Weekday P.M.	6%	40%
West (Little Avenue)	Weekday A.M.	0%	70%
	Weekday P.M.	0%	54%
East (Little Avenue)	Weekday A.M.	52%	0%
	Weekday P.M.	73%	0%

The trips generated by the proposed development were assigned to the boundary road network per the distribution illustrated in **Figure 8**. The corresponding trip assignment is illustrated in **Figure 9**. Transportation Tomorrow Survey data has been included in **Appendix D**.



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend SIGNAL CONTROL STOP CONTROL WEEKDAY AM (WEEKDAY PM)	Project YONGE STREET AND LITTLE AVENUE CITY OF BARRIE	CROZIER & ASSOCIATES Consulting Engineers The HarbourEdge Building, 40 Huron Street, Suite 301, Collingwood, ON L9Y 4R3 705-446-3510 T 705-446-3520 F www.cfcrozier.ca info@cfcrozier.ca Drawn By Design By Project Scale N.T.S. Date JUNE 13, 2018 Check By M.F. Drawing FIG. 9
	Drawing TRIP ASSIGNMENT	

481 Yonge Street

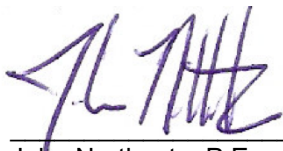
City of Barrie

Traffic Brief for 481 Yonge Developments Inc.

Type of Document:
Final Report

Project Number:
JDE – 19040

Date Submitted:
May 16th, 2019



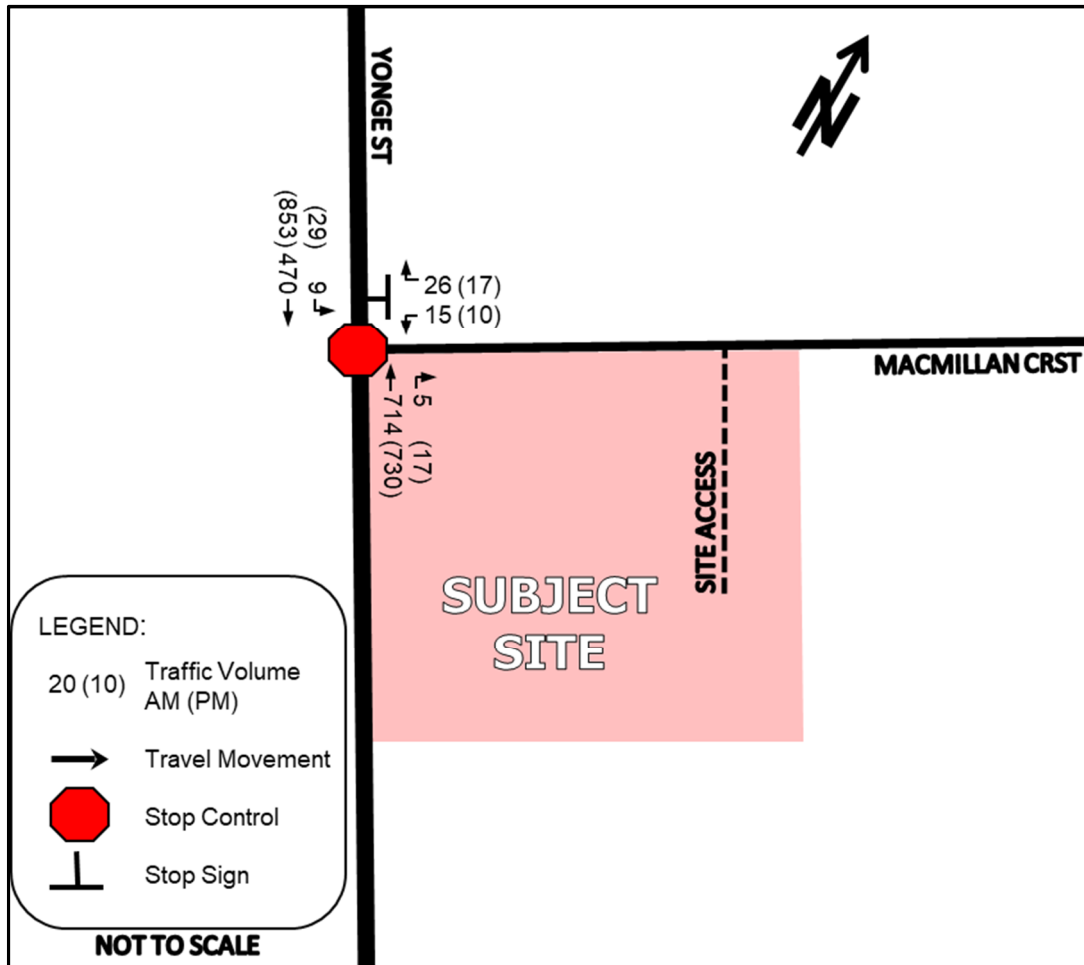
John Northcote, P.Eng.
Professional License #: 100124071



JD Northcote Engineering Inc.
86 Cumberland Street
Barrie, ON
705.725.4035
www.JDEngineering.ca

Figure 3 illustrates the existing (2019) AM and PM peak hour traffic volumes at the site access development.

Figure 3 – Existing (2019) Traffic Volumes



3 Proposed Development Traffic Generation and Assignment

3.1 Traffic Generation

The traffic generation for the subject site has been based on the ITE *Trip Generation* data. The following ITE land uses have been applied to estimate the traffic from the proposed:

- ITE land use #221 (Multifamily Housing (Mid-Rise)) – General Urban/Suburban

The estimated trip generation of the proposed development is illustrated below in **Table 2**.

Table 2 – Estimated Traffic Generation of Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Mid-Rise) ITE Land Use: 221	67 units	7	18	25	19	12	31

In order to be conservative, no transportation modal split reduction has been applied to the above-noted traffic generation calculation.

3.2 Traffic Assignment

For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

Beyond the local area the distribution of traffic from the subject site has been estimated based on the 2016 TTS data for the area (excerpt attached as **Appendix E**). TTS data provides historical data for home-based trip origins with a destination in the 2006 GTA Zone – 8582.

The above-noted methodology provides an estimate of the distribution of ingress trips. We have assumed that the distribution of egress trips will follow the inverse of the ingress traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

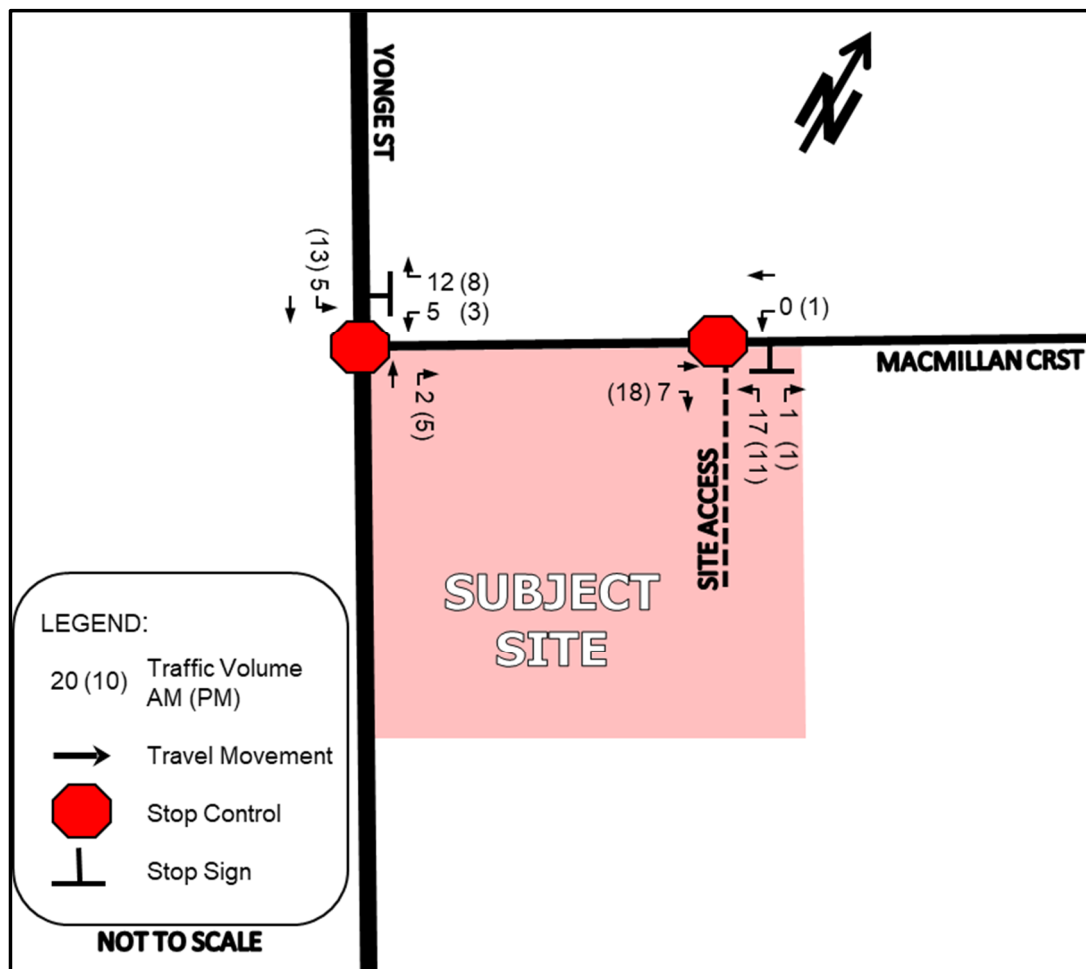
Table 3 summarizes the trip distribution for the proposed development.

Table 3 – Proposed Development Traffic Distribution Summary

Travel Direction (to/from)	Percent of Total Traffic Generation
North via Yonge Street	69%
South via Yonge Street	26%
East via Macmillan Crescent	4%
Total	100%

Figure 4 illustrates the traffic assignment for the proposed development.

Figure 4 – Site Traffic Assignment



4 Intersection Operation with Proposed Development

4.1 Traffic Impact Analysis

The proposed development will add approximately 25 AM and 31 PM peak hour trips on Macmillan Crescent. The additional traffic generated by the proposed development will not adversely affect the traffic capacity on Macmillan Crescent and Yonge Street or result in any traffic safety issues with the study area. The existing road network can accommodate the additional traffic generated by the proposed development.

4.2 Site Access

The Site Access will operate efficiently as a full-movement access, with one-way stop control for northbound movements. A single northbound and southbound lane for the Site Access will provide the necessary capacity to service the proposed development.



Enhancing our communities



505-533 Yonge Street

TRAFFIC IMPACT STUDY

Renaissance Barrie Retirement Trust

4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 SITE LOCATION

As illustrated in Figure 1, the proposed development is to be located at 505-533 Yonge Street within the City of Barrie.

4.2 PROPOSED LAND-USE & PHASING

The proposed development will consist of 400 residential units and 1,076 m² of ground floor commercial space contained in 4 residential apartment/condominium buildings. The development details are as follows:

- Building 1 – 8 storeys with 56 condominium apartment units;
- Building 2 – 10 storeys with 117 market rental apartment units and 1,076 m² (11,582 ft²) of ground floor commercial space;
- Building 3 – 8 storeys with 56 condominium apartment units; and
- Building 4 – 12 storeys with 171 condominium apartment units.

A site plan is provided in Figure 11. A single 5-year phase has been considered with full build-out and occupancy by 2026.

4.3 PARKING

The development will provide 38 surface parking spaces and 431 underground parking spaces for a total of 469 spaces.

As per the City's *Zoning By-Law*, a residential development must provide 1.5 parking spaces per unit; however, it is noted that the site is located along an intensification corridor as identified by the City. To support intensification efforts, lower parking rates are being considered along primary corridors (of which Yonge Street is considered). As per *Staff Report PLN029-13*, a reduced rate of 1 space per residential unit is recommended along the targeted intensification corridors. As such, a parking rate of 1 space per unit has been considered for the residential units. With respect to the ground floor commercial space, the City's parking rate for retail (1 space per 30 m²) has been applied.



In consideration of the above, the development is required to provide 400 spaces to support the residential component, and 36 spaces to support the commercial space ($1,076 \text{ m}^2 \div 30 = 36$ spaces), for a total parking requirement of 436 spaces. As previously noted, the site will provide 469 spaces, thus satisfying the City's parking supply requirements.

4.4 SITE ACCESS & ON-SITE CIRCULATION

As per the site plan, the development will be served by two access points. The south access will be located opposite D'Ambrosio Drive, creating a 4-leg intersection with D'Ambrosio Drive and Yonge Street. The north access will be located approximately 90 metres north of D'Ambrosio Drive and will operate under stop control. Both access points will accommodate two-way operations, providing one lane of travel per direction.

The City's zoning by-law requires that an aisle providing access to a parking area have a minimum width of 6.4 metres. As per the site plan, a minimum aisle width of 6.9 metres will be maintained throughout the site, thus satisfying the City's requirements.

With respect to emergency vehicle operations, the Ontario Building Code requires a fire access route to provide a minimum clear width of 6.0 metres with a minimum centre turn radius of 12.0 metres. The fire access route, as identified on the site plan, satisfies the building code requirements.

Waste collection and loading areas are provided at each building. A truck turning assessment illustrating waste collection can be readily accommodated is provided in Appendix E.

In consideration of the above, the internal aisle layout as proposed is considered sufficient with respect to the circulation of site generated traffic and the manoeuvring requirements of typical design vehicles (i.e. passenger vehicles, fire truck, etc.).

4.5 SITE TRAFFIC

4.5.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM and PM peak hours has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual, 10th Edition*. Based on the proposed development, trip rates for the following ITE land use categories have been employed:

- *multifamily housing - mid-rise* (ITE code 221);
- *multifamily housing - high-rise* (ITE code 222); and
- *shopping centre* (ITE code 820).



The associated trip rates and trip estimates are provided in Table 7 and Table 8 respectively. It is noted that the *multifamily housing - midrise* rates have been applied to Building 1, 2 and 3 (10 storeys or less), whereas the *multifamily housing - high-rise* rates have been applied to Building 4 (greater than 10 storeys).

Table 7: Trip Rates – 505-533 Yonge Street

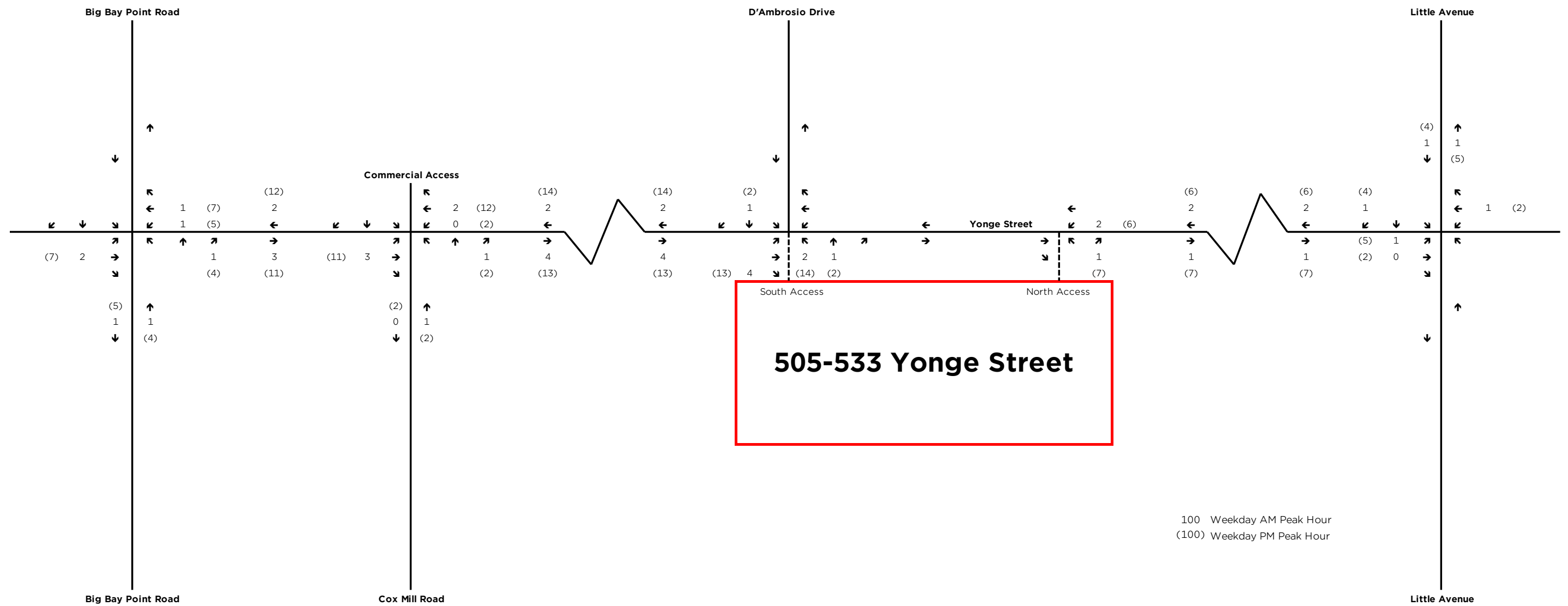
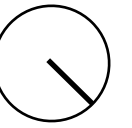
LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
multifamily housing - mid-rise (ITE 221)	units	0.09	0.27	0.36	0.27	0.17	0.44
multifamily housing - high-rise (ITE 222)	units	0.07	0.24	0.31	0.22	0.14	0.36
shopping centre (ITE 820)	1,000 ft ² GFA	0.58	0.36	0.94	1.83	1.98	3.81

Table 8: Trip Estimates - 505-533 Yonge Street

LAND USE	UNITS/ SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
Buildings 1, 2 & 3 (mid rise)	229 units	21	61	82	61	39	100
Building 4 (high rise)	171 units	13	40	53	38	24	62
retail	11,581 ft ²	7	4	11	21	23	44
Total		41	105	146	120	86	206

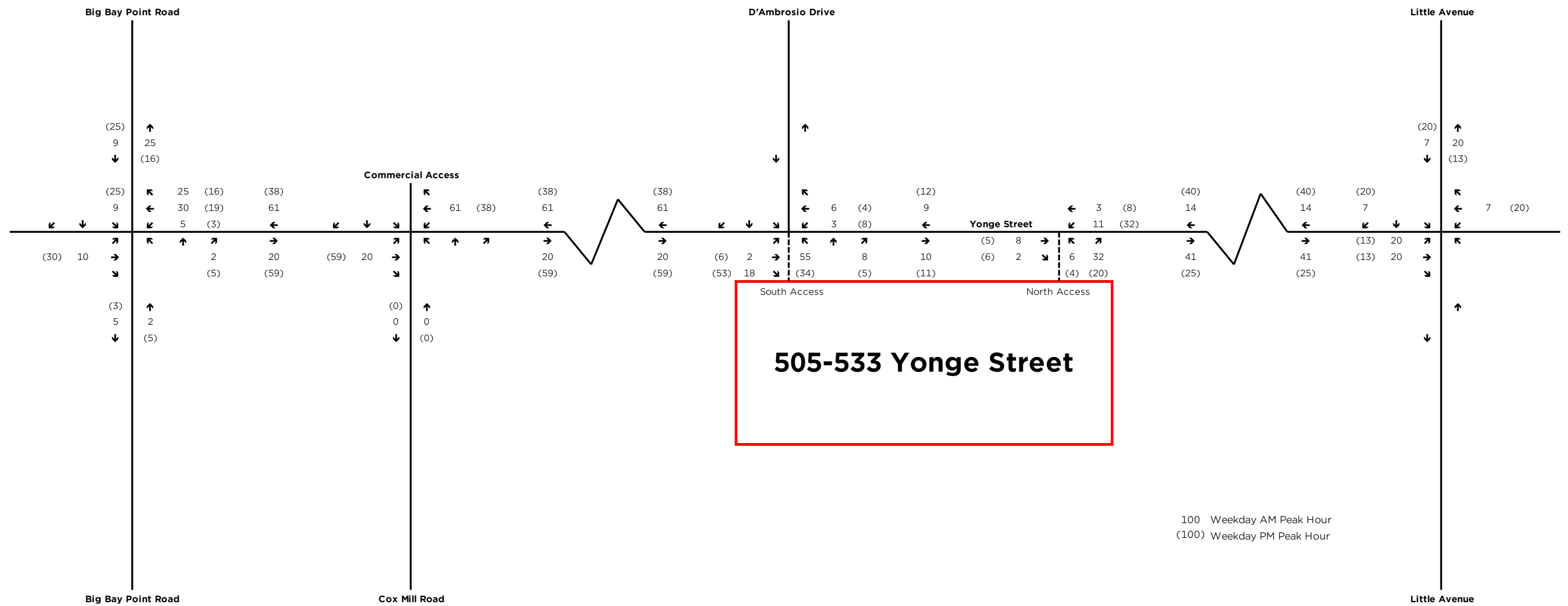
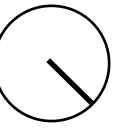
As indicated, the proposed development is expected to generate 146 trips during the AM peak hour and 206 trips during the PM peak hour. While the site is expected to generate internal trips (i.e. residents accessing the retail/commercial uses) and pass-by trips (i.e. trips already on the road network for other purposes that visit the retail uses before continuing to the initial origin/destination, adjustments have not been considered in order to ensure a conservative approach.





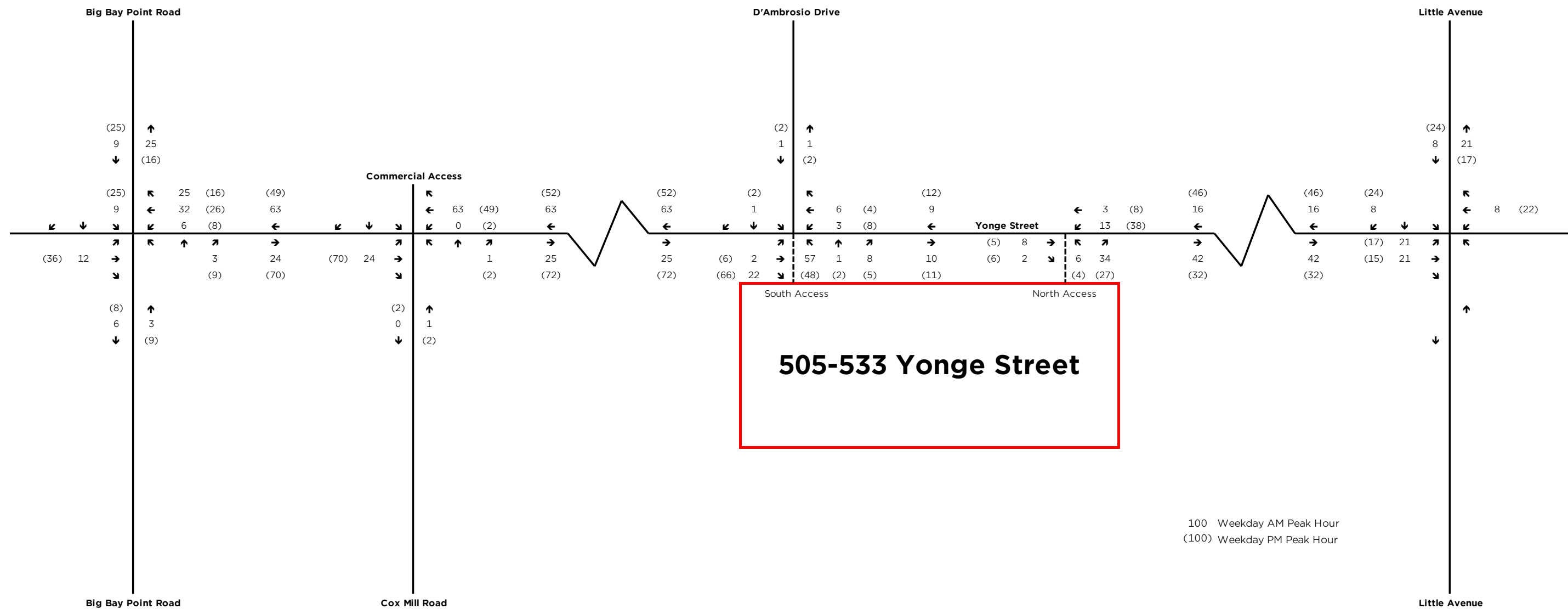
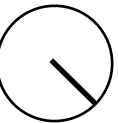
505-533 Yonge Street
Figure 12: Site Traffic - Commercial





505-533 Yonge Street
Figure 13: Site Traffic - Residential



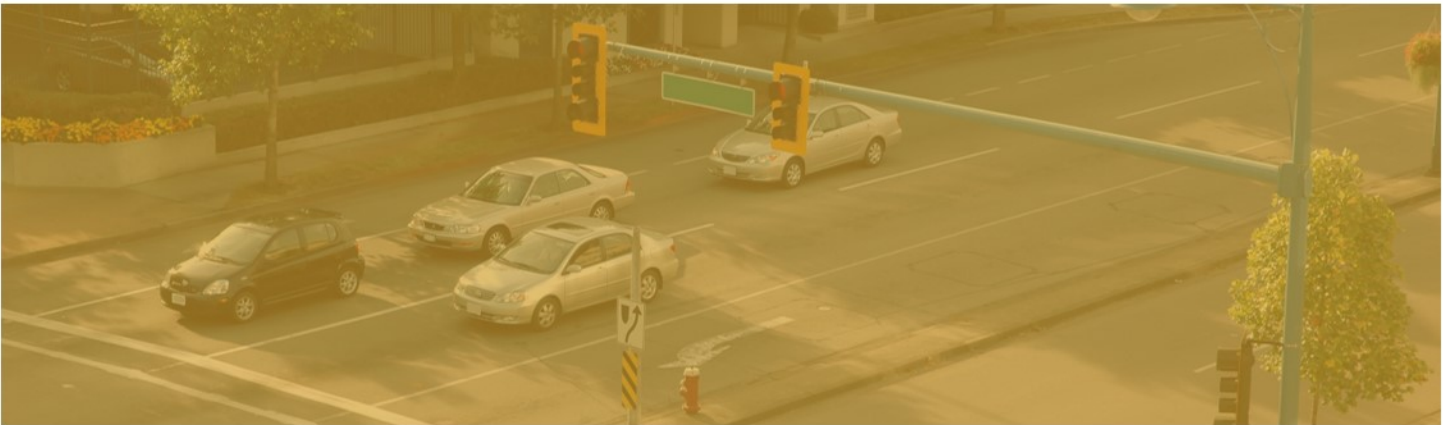


505-533 Yonge Street
Figure 14: Site Traffic - Total





Enhancing our communities



427-437 Yonge Street

TRAFFIC IMPACT STUDY

Barrie Yonge Development North LP

4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 SITE LOCATION

As illustrated in Figure 1, the proposed development is to be located at 427-437 Yonge Street within the City of Barrie.

4.2 PROPOSED LAND-USE & PHASING

The proposed development will consist of a 7-storey 196-unit condominium apartment building with 717 m² (7,721 ft²) of ground floor commercial space.

A site plan is provided in Figure 13. A single 3-year phase has been considered with full build-out and occupancy by 2025.

4.3 PARKING

The development will provide 87 surface parking spaces and 134 underground parking spaces for a total of 221 spaces.

As per the City's *Zoning By-Law*, a residential development must provide 1.5 parking spaces per unit; however, it is noted that the site is located along an intensification corridor as identified by the City. To support intensification efforts, lower parking rates are being considered for mixed use developments located along primary corridors (of which Yonge Street is considered). As per *Staff Report PLN029-13*, a reduced rate of 1 space per residential unit is recommended along the targeted intensification corridors. As such, a parking rate of 1 space per unit has been considered for the residential units. With respect to the ground floor commercial space, the City's parking rate for retail (1 space per 30 m²) has been applied.

In consideration of the above, the development is required to provide 196 spaces to support the residential component, and 24 spaces to support the commercial space ($717 \text{ m}^2 \div 30 = 24$ spaces), for a total parking requirement of 220 spaces. As previously noted, the site will provide 221 spaces, thus satisfying the City's parking supply requirements.

For barrier free spaces, the City's by-law states that a development whose overall parking requirements is greater than 100 spaces must provide 1 space plus 3% of the overall parking required parking spaces as barrier free spaces. Thus, the site must provide 8 barrier free spaces



($220 \times 3\% = 7 \text{ spaces} + 1 \text{ space} = 8 \text{ spaces}$). As noted on the site plan, the development will provide 8 barrier free spaces.

4.4 SITE ACCESS & ON-SITE CIRCULATION

As per the site plan, the development will be served by a single access on MacLaren Avenue. The access point will accommodate two-way operations, providing one lane of travel per direction. It is noted that the access will ultimately be aligned with the future access to the mixed use development at 447-455 Yonge Street.

In terms of corner clearance, the Transportation Association of Canada's (TAC) *Geometric Design Guide for Canadian Roads* recommends a minimum corner clearance (i.e. distance from an intersection to the nearest access) of 15 metres for a local road (measured edge of road to edge of access). The proposed access will be located approximately 50 metres east of the intersection of MacLaren Avenue with Yonge Street (measured edge of Yonge Street to edge of access), thus satisfying the noted minimum corner clearance.

The City's zoning by-law requires that an aisle providing access to parking spaces have a minimum width of 6.4 metres. As per the site plan, a minimum aisle width of 6.4 metres will be maintained throughout the site, satisfying the City's requirements. A swept path turning assessment has been completed for the loading area/waste collection area, the results of which area provided in Appendix E.

The internal aisle layout as proposed is considered sufficient with respect to the circulation of site generated traffic and the maneuvering requirements of typical design vehicles.

4.5 SITE TRAFFIC

4.5.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM and PM peak hours has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual, 11th Edition*. Based on the proposed development, trip rates for the *multifamily housing - mid-rise* (ITE code 221) and *strip retail plaza* (ITE code 822) land-uses have been applied. The associated trip rates and trip estimates are provided in Table 6 and Table 7.

As indicated, the proposed development is expected to generate 91 trips during the AM peak hour and 127 trips during the PM peak hour. While the site is expected to generate internal trips (i.e. residents accessing the retail/commercial uses) and pass-by trips (i.e. trips already on the road network for other purposes that visit the retail uses before continuing to their initial



destination), adjustments to account for such trips have not been considered in order to ensure a conservative approach.

Table 6: Trip Generation Rates

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
multifamily housing - mid-rise (ITE 221)	units	0.09	0.28	0.37	0.24	0.15	0.39
strip retail plaza (ITE 822)	1,000 ft ² GFA	1.42	0.94	2.36	3.30	3.30	6.60

Table 7: Trip Estimates – 427-437 Yonge Street

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
multifamily housing	196 units	17	56	73	47	30	77
ground floor retail	7,721 ft ²	11	7	18	25	25	50
Total		28	63	91	72	55	127

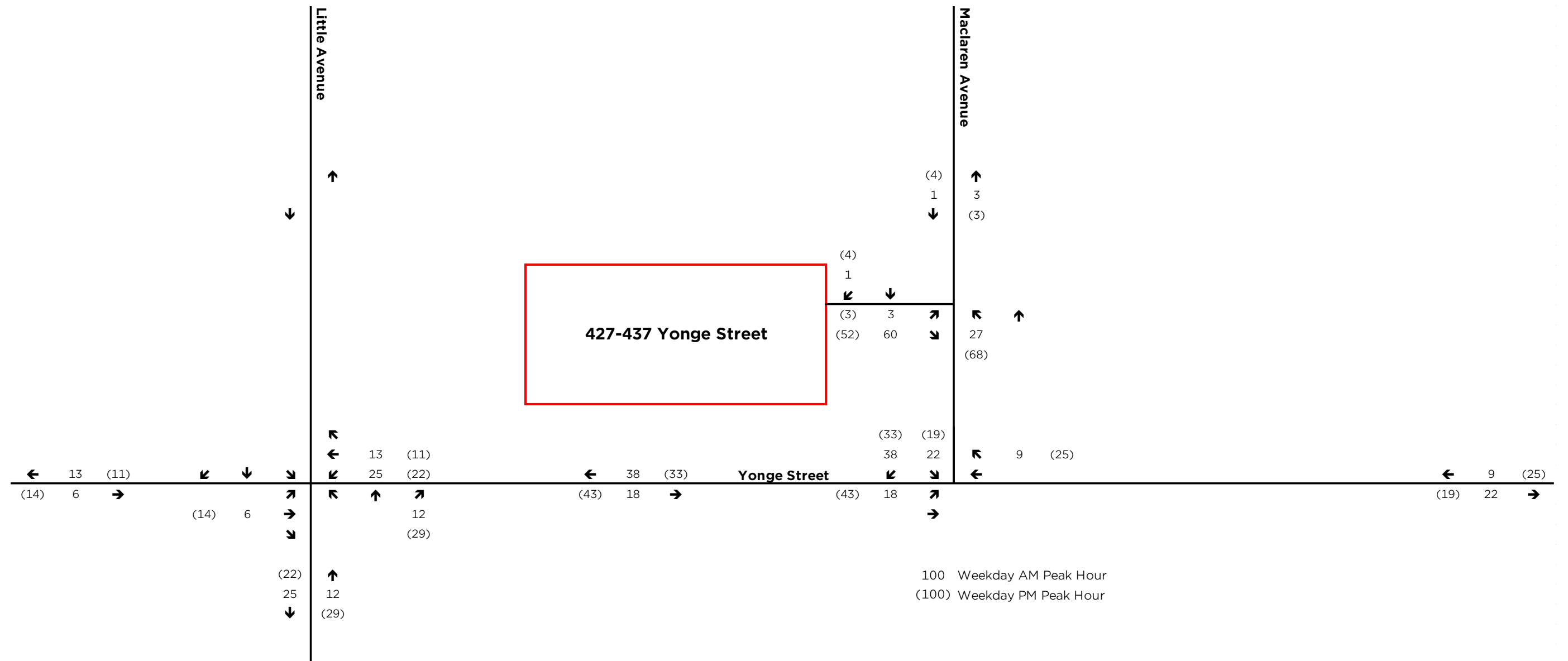
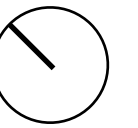
4.5.2 Trip Distribution & Assignment

The distribution of trips has been based on trip distribution data provided in the 2016 *Transportation Tomorrow Survey*. The TTS is a comprehensive travel survey conducted in the Greater Golden Horseshoe Area once every five years. As per the *TTS 2016 Data Guide*, development site resides in Traffic Boundary Zone 8528. As such, the trip data was filtered to show all trips to/from the respective traffic zone. The following distribution was established:

- to/from locations within Barrie – 78%;
- to/from the south of Barrie – 18%;
- to/from the north of Barrie – 4%;
- to/from the east of Barrie – <1%; and
- to/from the west of Barrie – <1%.

As indicated, 78% of the trips remain wholly within Barrie whereas only 22% originate from, or are destined to, areas outside of the City. The trips that remain within Barrie were distributed based





427-437 Yonge Street
Figure 14: Site Traffic



Appendix D: Future Background Operations

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2025 Background Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	107	147	9	195	133	215	508	12	52	358	68
Future Volume (vph)	103	107	147	9	195	133	215	508	12	52	358	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.94		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1720		1789	1769		1789	3566		1789	3493	
Flt Permitted	0.20	1.00		0.59	1.00		0.43	1.00		0.41	1.00	
Satd. Flow (perm)	382	1720		1111	1769		801	3566		782	3493	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	116	160	10	212	145	234	552	13	57	389	74
RTOR Reduction (vph)	0	51	0	0	25	0	0	2	0	0	14	0
Lane Group Flow (vph)	112	225	0	10	332	0	234	563	0	57	449	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	33.3	33.3		22.7	22.7		51.9	43.9		46.9	41.4	
Effective Green, g (s)	33.3	33.3		22.7	22.7		51.9	43.9		46.9	41.4	
Actuated g/C Ratio	0.34	0.34		0.23	0.23		0.53	0.44		0.48	0.42	
Clearance Time (s)	4.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	222	580		255	406		501	1586		427	1465	
v/s Ratio Prot	c0.03	0.13			c0.19		c0.04	0.16		0.01	0.13	
v/s Ratio Perm	0.14			0.01			c0.21			0.06		
v/c Ratio	0.50	0.39		0.04	0.82		0.47	0.36		0.13	0.31	
Uniform Delay, d1	24.7	24.9		29.5	36.0		13.0	18.1		14.1	19.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.4		0.1	12.0		0.7	0.6		0.1	0.5	
Delay (s)	26.5	25.4		29.6	48.0		13.7	18.7		14.2	19.6	
Level of Service	C	C		C	D		B	B		B	B	
Approach Delay (s)		25.7			47.5			17.2			19.0	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			24.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			98.7			Sum of lost time (s)				20.0		
Intersection Capacity Utilization			86.6%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2025 Background Conditions

AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	52	683	12	23	491
Future Volume (Veh/h)	25	52	683	12	23	491
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	57	742	13	25	534
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh						2
Upstream signal (m)						316
pX, platoon unblocked	0.99					
vC, conflicting volume	1066	378			755	
vC1, stage 1 conf vol	748					
vC2, stage 2 conf vol	317					
vCu, unblocked vol	1052	378			755	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	91			97	
cM capacity (veh/h)	393	620			851	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	84	495	260	25	267	267
Volume Left	27	0	0	25	0	0
Volume Right	57	0	13	0	0	0
cSH	523	1700	1700	851	1700	1700
Volume to Capacity	0.16	0.29	0.15	0.03	0.16	0.16
Queue Length 95th (m)	4.3	0.0	0.0	0.7	0.0	0.0
Control Delay (s)	13.2	0.0	0.0	9.4	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	13.2	0.0		0.4		
Approach LOS	B					
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			30.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2025 Background Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	204	190	24	123	55	180	645	15	87	619	93
Future Volume (vph)	88	204	190	24	123	55	180	645	15	87	619	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.93		1.00	0.95		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1747		1789	1796		1789	3567		1789	3508	
Flt Permitted	0.59	1.00		0.21	1.00		0.28	1.00		0.34	1.00	
Satd. Flow (perm)	1104	1747		389	1796		532	3567		636	3508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	96	222	207	26	134	60	196	701	16	95	673	101
RTOR Reduction (vph)	0	38	0	0	18	0	0	2	0	0	12	0
Lane Group Flow (vph)	96	391	0	26	176	0	196	715	0	95	762	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.1	24.1		24.1	24.1		50.7	43.7		47.7	42.2	
Effective Green, g (s)	24.1	24.1		24.1	24.1		50.7	43.7		47.7	42.2	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.57	0.49		0.53	0.47	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	297	471		104	484		400	1745		410	1657	
v/s Ratio Prot		c0.22			0.10		c0.04	0.20		0.01	0.22	
v/s Ratio Perm	0.09			0.07			c0.24			0.11		
v/c Ratio	0.32	0.83		0.25	0.36		0.49	0.41		0.23	0.46	
Uniform Delay, d1	26.1	30.7		25.5	26.4		10.0	14.6		10.4	15.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	11.8		1.3	0.5		0.9	0.7		0.3	0.9	
Delay (s)	26.7	42.5		26.8	26.9		11.0	15.3		10.7	16.8	
Level of Service	C	D		C	C		B	B		B	B	
Approach Delay (s)		39.6			26.8			14.4			16.1	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			21.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			89.3			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			92.3%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2025 Background Conditions

PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	19	38	802	29	50	782
Future Volume (Veh/h)	19	38	802	29	50	782
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	41	872	32	54	850
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLT
Median storage (veh)						2
Upstream signal (m)						316
pX, platoon unblocked	0.92					
vC, conflicting volume	1421	452			904	
vC1, stage 1 conf vol	888					
vC2, stage 2 conf vol	533					
vCu, unblocked vol	1279	452			904	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	93			93	
cM capacity (veh/h)	324	555			748	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	62	581	323	54	425	425
Volume Left	21	0	0	54	0	0
Volume Right	41	0	32	0	0	0
cSH	447	1700	1700	748	1700	1700
Volume to Capacity	0.14	0.34	0.19	0.07	0.25	0.25
Queue Length 95th (m)	3.6	0.0	0.0	1.8	0.0	0.0
Control Delay (s)	14.4	0.0	0.0	10.2	0.0	0.0
Lane LOS	B			B		
Approach Delay (s)	14.4	0.0		0.6		
Approach LOS	B					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			39.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2030 Background Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	113	165	10	205	154	222	583	12	55	413	71
Future Volume (vph)	118	113	165	10	205	154	222	583	12	55	413	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.94		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1716		1789	1762		1789	3568		1789	3500	
Flt Permitted	0.18	1.00		0.58	1.00		0.40	1.00		0.35	1.00	
Satd. Flow (perm)	330	1716		1085	1762		746	3568		666	3500	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	128	123	179	11	223	167	241	634	13	60	449	77
RTOR Reduction (vph)	0	53	0	0	27	0	0	1	0	0	13	0
Lane Group Flow (vph)	128	249	0	11	363	0	241	646	0	60	513	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.4	34.4		24.4	24.4		51.5	44.5		48.5	43.0	
Effective Green, g (s)	34.4	34.4		24.4	24.4		51.5	44.5		48.5	43.0	
Actuated g/C Ratio	0.34	0.34		0.24	0.24		0.51	0.44		0.48	0.43	
Clearance Time (s)	4.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	200	587		263	428		455	1581		383	1499	
v/s Ratio Prot	c0.04	0.14			c0.21		c0.04	0.18		0.01	0.15	
v/s Ratio Perm	0.18			0.01			c0.23			0.07		
v/c Ratio	0.64	0.42		0.04	0.85		0.53	0.41		0.16	0.34	
Uniform Delay, d1	25.4	25.4		29.1	36.2		14.3	19.0		14.0	19.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.8	0.5		0.1	14.4		1.1	0.8		0.2	0.6	
Delay (s)	32.2	25.9		29.1	50.6		15.5	19.8		14.2	19.9	
Level of Service	C	C		C	D		B	B		B	B	
Approach Delay (s)		27.8			50.0			18.6			19.3	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay	26.0			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.65											
Actuated Cycle Length (s)	100.4			Sum of lost time (s)			20.0					
Intersection Capacity Utilization	89.0%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2030 Background Conditions

AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	52	766	12	23	565
Future Volume (Veh/h)	25	52	766	12	23	565
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	57	833	13	25	614
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh						2
Upstream signal (m)						316
pX, platoon unblocked	0.97					
vC, conflicting volume	1196	423			846	
vC1, stage 1 conf vol	840					
vC2, stage 2 conf vol	357					
vCu, unblocked vol	1137	423			846	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	90			97	
cM capacity (veh/h)	356	579			787	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	84	555	291	25	307	307
Volume Left	27	0	0	25	0	0
Volume Right	57	0	13	0	0	0
cSH	482	1700	1700	787	1700	1700
Volume to Capacity	0.17	0.33	0.17	0.03	0.18	0.18
Queue Length 95th (m)	4.8	0.0	0.0	0.7	0.0	0.0
Control Delay (s)	14.0	0.0	0.0	9.7	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	14.0	0.0		0.4		
Approach LOS	B					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			32.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2030 Background Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	214	208	27	129	64	187	743	16	91	710	98
Future Volume (vph)	101	214	208	27	129	64	187	743	16	91	710	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.93		1.00	0.95		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1744		1789	1789		1789	3567		1789	3513	
Flt Permitted	0.56	1.00		0.17	1.00		0.23	1.00		0.28	1.00	
Satd. Flow (perm)	1054	1744		327	1789		441	3567		531	3513	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	110	233	226	29	140	70	203	808	17	99	772	107
RTOR Reduction (vph)	0	39	0	0	20	0	0	2	0	0	11	0
Lane Group Flow (vph)	110	420	0	29	190	0	203	823	0	99	868	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.5	25.5		25.5	25.5		51.6	44.6		48.6	43.1	
Effective Green, g (s)	25.5	25.5		25.5	25.5		51.6	44.6		48.6	43.1	
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.56	0.49		0.53	0.47	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	293	485		91	498		351	1736		357	1652	
v/s Ratio Prot		c0.24			0.11		c0.04	0.23		0.02	0.25	
v/s Ratio Perm	0.10			0.09			c0.28			0.13		
v/c Ratio	0.38	0.87		0.32	0.38		0.58	0.47		0.28	0.53	
Uniform Delay, d1	26.6	31.4		26.2	26.7		11.1	15.7		11.0	17.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	14.9		2.0	0.5		2.3	0.9		0.4	1.2	
Delay (s)	27.4	46.4		28.2	27.2		13.4	16.6		11.5	18.3	
Level of Service	C	D		C	C		B	B		B	B	
Approach Delay (s)		42.7			27.3			16.0			17.6	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			22.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			91.6			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			94.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2030 Background Conditions

PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	19	38	907	29	50	896
Future Volume (Veh/h)	19	38	907	29	50	896
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	41	986	32	54	974
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh						2
Upstream signal (m)						316
pX, platoon unblocked	0.88					
vC, conflicting volume	1597	509			1018	
vC1, stage 1 conf vol	1002					
vC2, stage 2 conf vol	595					
vCu, unblocked vol	1399	509			1018	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			92	
cM capacity (veh/h)	286	509			677	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	62	657	361	54	487	487
Volume Left	21	0	0	54	0	0
Volume Right	41	0	32	0	0	0
cSH	403	1700	1700	677	1700	1700
Volume to Capacity	0.15	0.39	0.21	0.08	0.29	0.29
Queue Length 95th (m)	4.1	0.0	0.0	2.0	0.0	0.0
Control Delay (s)	15.5	0.0	0.0	10.8	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	15.5	0.0		0.6		
Approach LOS	C					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			42.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2035 Background Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	118	186	12	216	179	231	669	13	57	476	75
Future Volume (vph)	136	118	186	12	216	179	231	669	13	57	476	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.93		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1711		1789	1755		1789	3568		1789	3505	
Flt Permitted	0.14	1.00		0.56	1.00		0.34	1.00		0.29	1.00	
Satd. Flow (perm)	271	1711		1057	1755		648	3568		551	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	148	128	202	13	235	195	251	727	14	62	517	82
RTOR Reduction (vph)	0	56	0	0	30	0	0	1	0	0	12	0
Lane Group Flow (vph)	148	274	0	13	400	0	251	740	0	62	587	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.4	37.4		26.4	26.4		50.5	43.5		47.5	42.0	
Effective Green, g (s)	37.4	37.4		26.4	26.4		50.5	43.5		47.5	42.0	
Actuated g/C Ratio	0.37	0.37		0.26	0.26		0.49	0.42		0.46	0.41	
Clearance Time (s)	4.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	624		272	452		397	1515		322	1437	
v/s Ratio Prot	c0.05	0.16			c0.23		c0.04	0.21		0.01	0.17	
v/s Ratio Perm	0.22			0.01			c0.27			0.08		
v/c Ratio	0.73	0.44		0.05	0.89		0.63	0.49		0.19	0.41	
Uniform Delay, d1	25.2	24.6		28.6	36.5		17.0	21.4		15.7	21.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.8	0.5		0.1	18.4		3.3	1.1		0.3	0.9	
Delay (s)	38.1	25.1		28.6	54.9		20.2	22.5		16.0	22.3	
Level of Service	D	C		C	D		C	C		B	C	
Approach Delay (s)		29.1			54.1			21.9			21.7	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.7			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			102.4			Sum of lost time (s)				20.0		
Intersection Capacity Utilization			92.6%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2035 Background Conditions

AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	52	861	12	23	651
Future Volume (Veh/h)	25	52	861	12	23	651
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	57	936	13	25	708
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		TWLTL	
Median storage veh					2	
Upstream signal (m)					316	
pX, platoon unblocked	0.94					
vC, conflicting volume	1346	474			949	
vC1, stage 1 conf vol	942					
vC2, stage 2 conf vol	404					
vCu, unblocked vol	1232	474			949	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	89			97	
cM capacity (veh/h)	317	536			719	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	84	624	325	25	354	354
Volume Left	27	0	0	25	0	0
Volume Right	57	0	13	0	0	0
cSH	439	1700	1700	719	1700	1700
Volume to Capacity	0.19	0.37	0.19	0.03	0.21	0.21
Queue Length 95th (m)	5.3	0.0	0.0	0.8	0.0	0.0
Control Delay (s)	15.1	0.0	0.0	10.2	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	15.1	0.0		0.3		
Approach LOS	C					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			35.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2035 Background Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	225	230	32	136	74	194	856	17	96	817	103
Future Volume (vph)	117	225	230	32	136	74	194	856	17	96	817	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.95		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1741		1789	1784		1789	3568		1789	3518	
Flt Permitted	0.54	1.00		0.15	1.00		0.17	1.00		0.23	1.00	
Satd. Flow (perm)	1008	1741		279	1784		312	3568		439	3518	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	245	250	35	148	80	211	930	18	104	888	112
RTOR Reduction (vph)	0	40	0	0	21	0	0	2	0	0	10	0
Lane Group Flow (vph)	127	455	0	35	207	0	211	946	0	104	990	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0		53.1	44.3		46.5	41.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0		53.1	44.3		46.5	41.0	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.57	0.48		0.50	0.44	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	293	506		81	519		318	1703		299	1554	
v/s Ratio Prot		c0.26			0.12		c0.06	0.27		0.02	0.28	
v/s Ratio Perm	0.13			0.13			c0.32			0.15		
v/c Ratio	0.43	0.90		0.43	0.40		0.66	0.56		0.35	0.64	
Uniform Delay, d1	26.7	31.6		26.7	26.4		12.7	17.3		12.8	20.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	18.5		3.7	0.5		5.1	1.3		0.7	2.0	
Delay (s)	27.7	50.0		30.3	26.9		17.9	18.6		13.5	22.1	
Level of Service	C	D		C	C		B	B		B	C	
Approach Delay (s)		45.5			27.4			18.4			21.3	
Approach LOS		D			C			B			C	
Intersection Summary												
HCM 2000 Control Delay	25.5			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.77											
Actuated Cycle Length (s)	92.8			Sum of lost time (s)			16.0					
Intersection Capacity Utilization	96.7%			ICU Level of Service			F					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

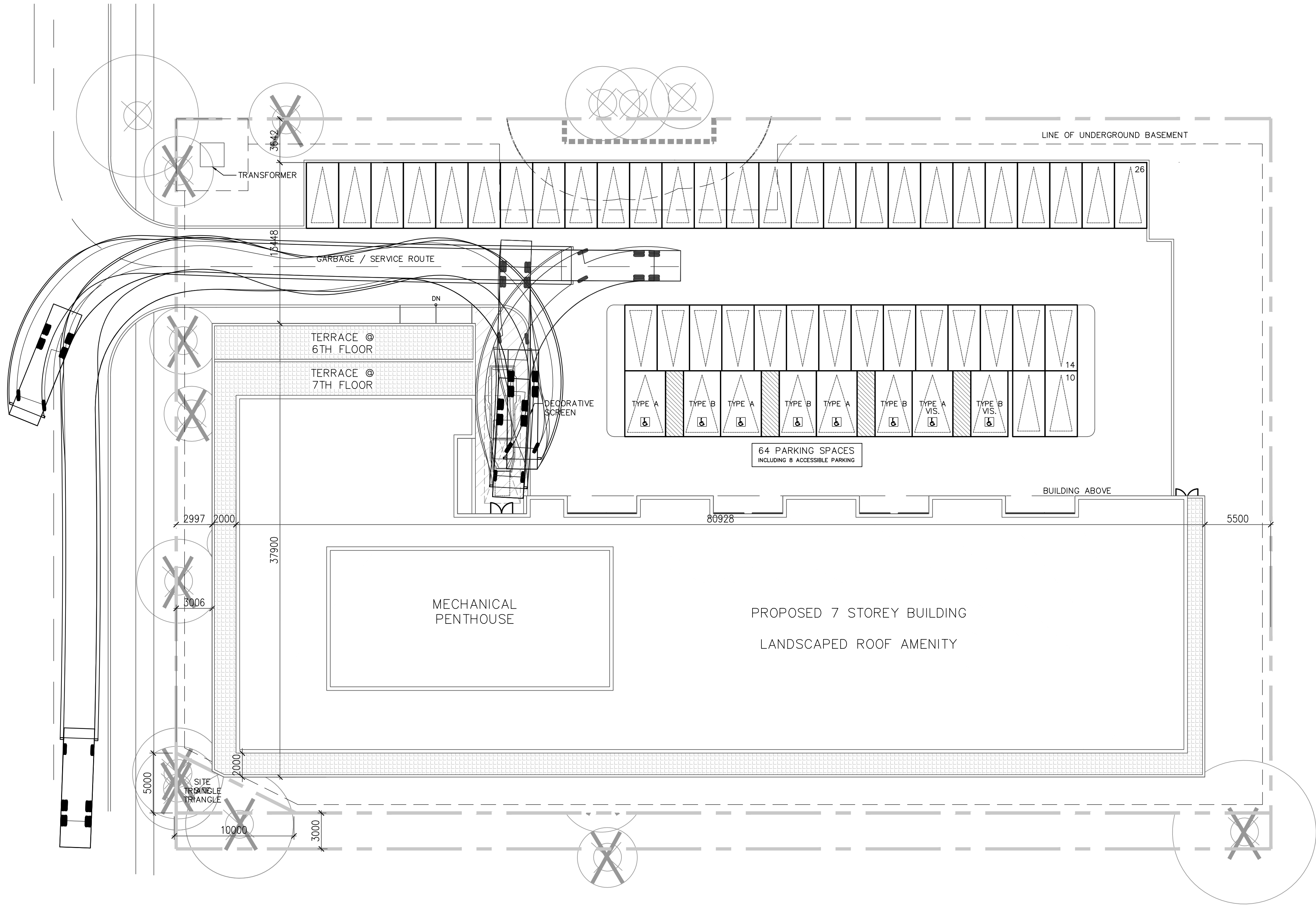
6: MacLaren Avenue & Yonge Street

2035 Background Conditions

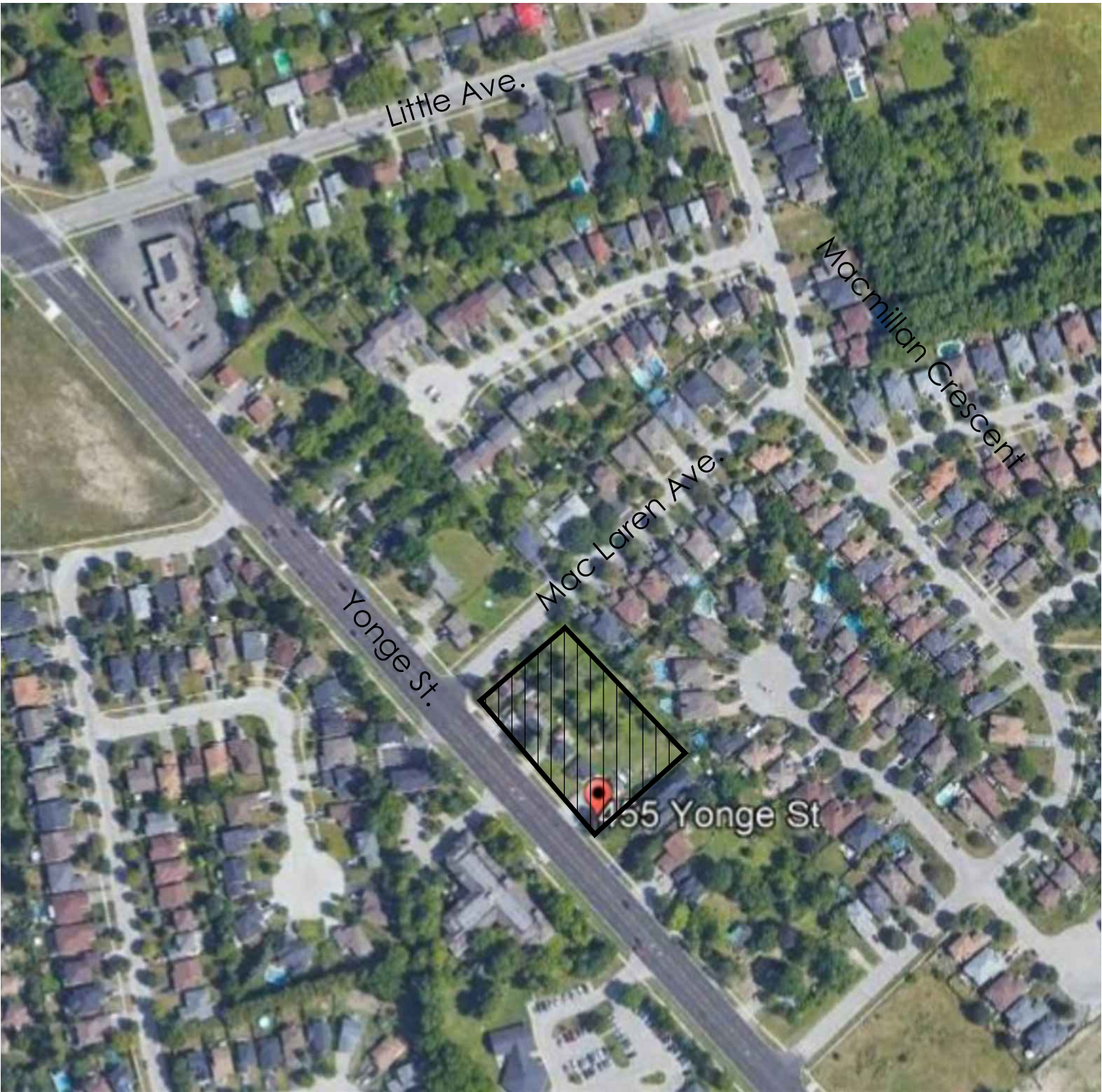
PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	19	38	1029	29	50	1028
Future Volume (Veh/h)	19	38	1029	29	50	1028
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	41	1118	32	54	1117
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		TWLT	TL
Median storage veh						2
Upstream signal (m)						316
pX, platoon unblocked	0.82					
vC, conflicting volume	1800	575			1150	
vC1, stage 1 conf vol	1134					
vC2, stage 2 conf vol	666					
vCu, unblocked vol	1535	575			1150	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	91			91	
cM capacity (veh/h)	248	461			603	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	62	745	405	54	558	558
Volume Left	21	0	0	54	0	0
Volume Right	41	0	32	0	0	0
cSH	357	1700	1700	603	1700	1700
Volume to Capacity	0.17	0.44	0.24	0.09	0.33	0.33
Queue Length 95th (m)	4.7	0.0	0.0	2.2	0.0	0.0
Control Delay (s)	17.2	0.0	0.0	11.6	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	17.2	0.0		0.5		
Approach LOS	C					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			46.1%		ICU Level of Service	A
Analysis Period (min)			15			

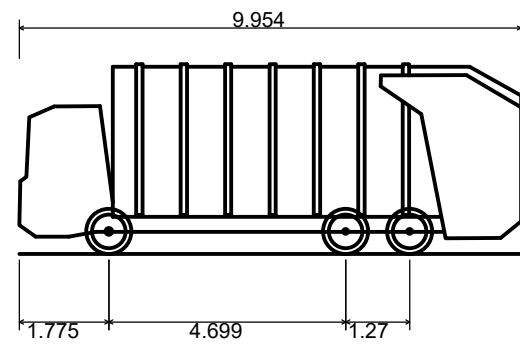
Appendix E: Truck Turning Assessment



context plan



statistics



Garbage Truck	9.954m
Overall Length	2.553m
Overall Width	3.760m
Overall Body Height	0.313m
Min Body Ground Clearance	2.553m
Track Width	6.00s
Lock-to-lock time	12.436m
Curb to Curb Turning Radius	

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notes:

revisions: m.d.yr

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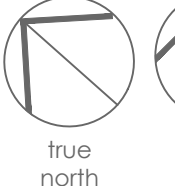
site plan

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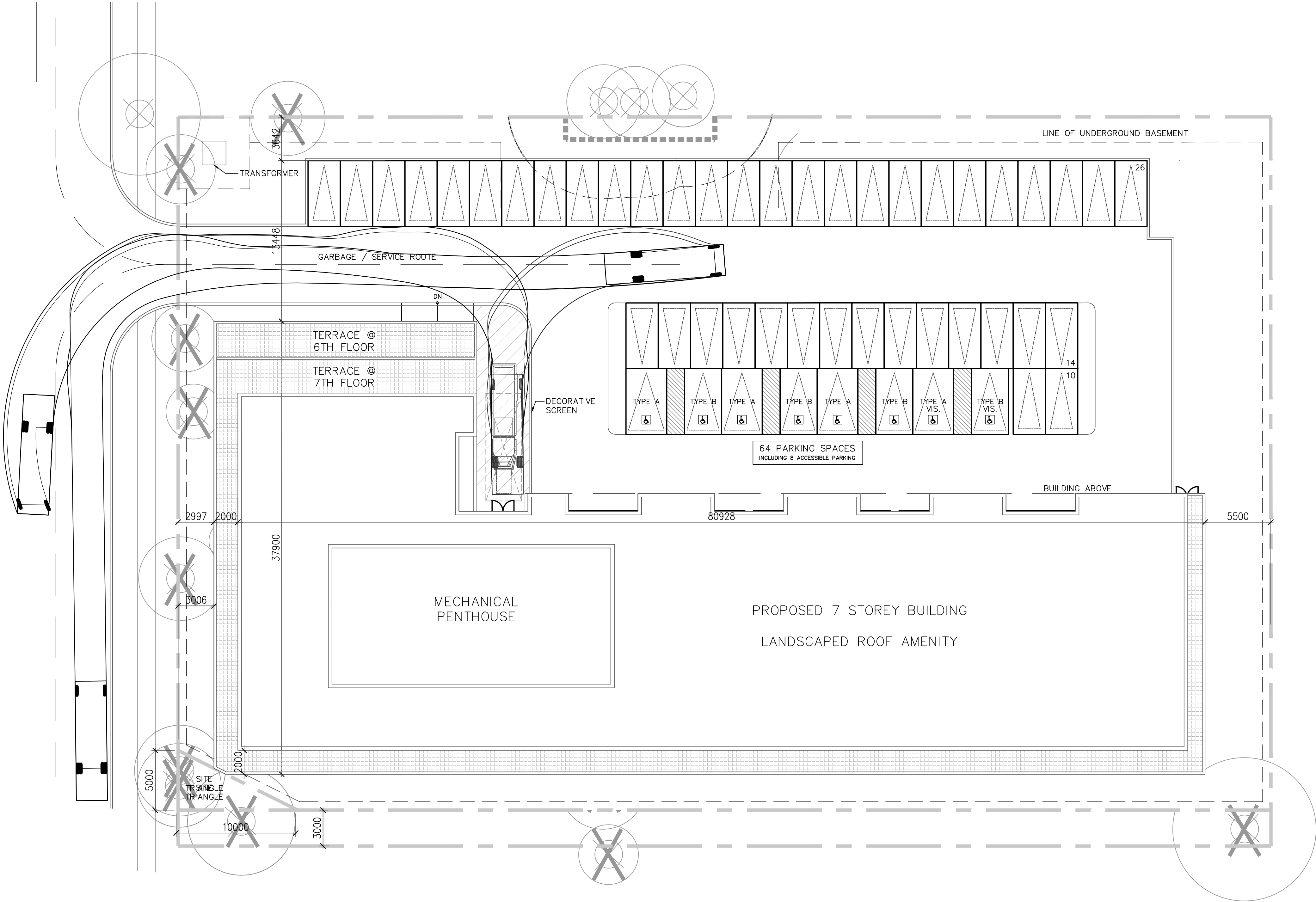
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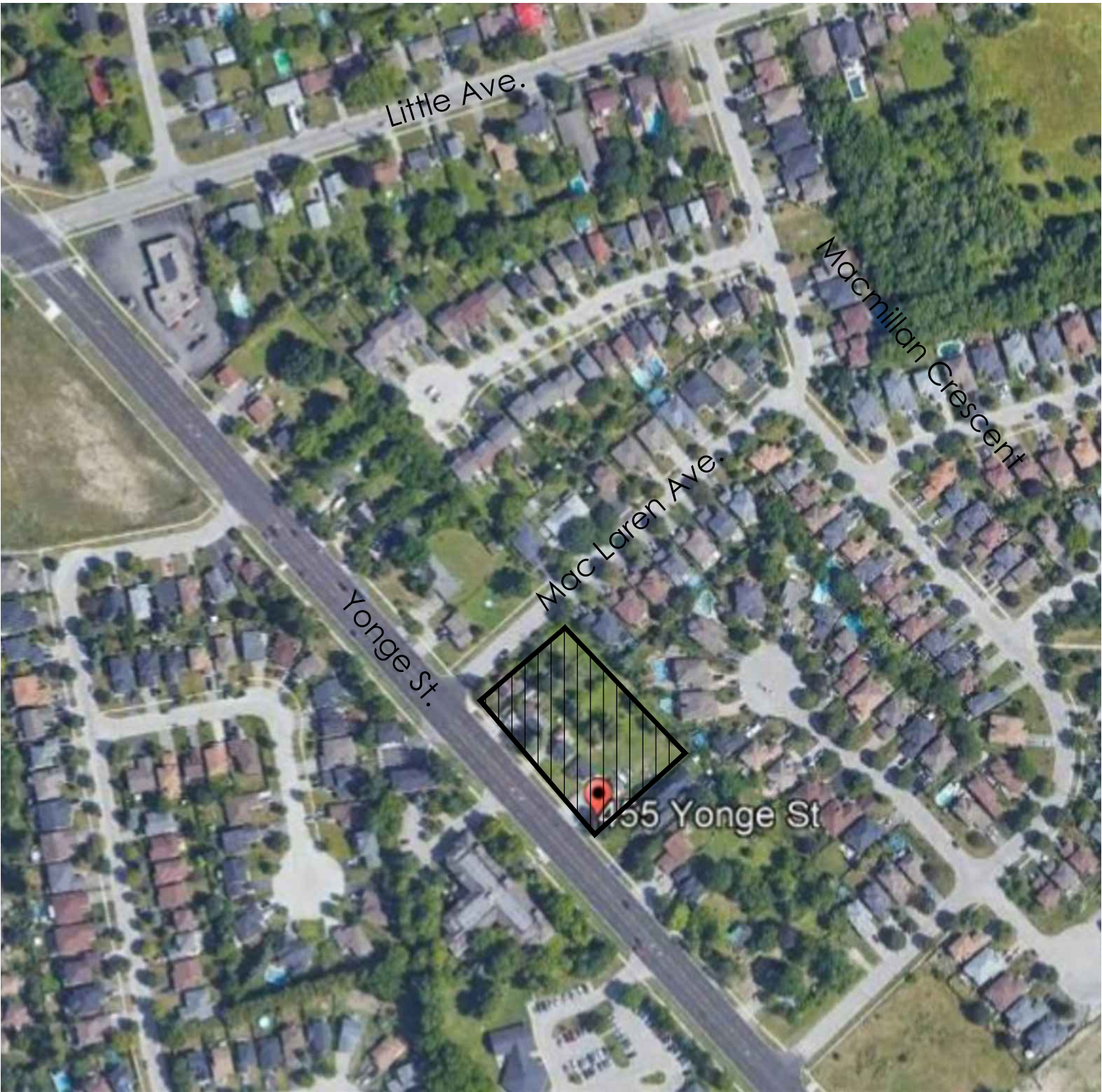
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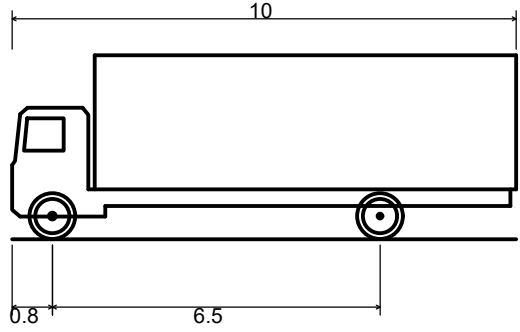
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context plan



statistics



MSU - Medium Single Unit Truck	10.000m
Overall Length	2.600m
Overall Width	3.650m
Overall Body Height	0.445m
Min Body Ground Clearance	2.600m
Track Width	4.00s
Lock-to-lock time	11.100m
Curb to Curb Turning Radius	

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notes:

revisions: m.d.yr

architectural team :

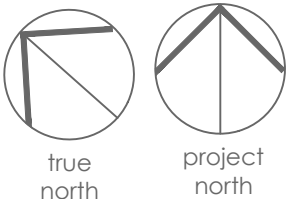
mark zwicker

project:
455 Yonge St
Barrie, ON L4N 4E1

site plan

Aug. 3, 22
1:200
21-48
hs

date:
scale:
project:
drawn by:



drawing number:
A101

Appendix F: Future Total Operations

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2025 Total Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	107	157	9	195	133	237	519	12	52	363	68
Future Volume (vph)	103	107	157	9	195	133	237	519	12	52	363	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.94		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1715		1789	1769		1789	3566		1789	3494	
Flt Permitted	0.20	1.00		0.58	1.00		0.42	1.00		0.41	1.00	
Satd. Flow (perm)	375	1715		1100	1769		797	3566		770	3494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	116	171	10	212	145	258	564	13	57	395	74
RTOR Reduction (vph)	0	55	0	0	25	0	0	2	0	0	14	0
Lane Group Flow (vph)	112	232	0	10	332	0	258	575	0	57	455	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	32.7	32.7		22.7	22.7		52.5	44.5		47.5	42.0	
Effective Green, g (s)	32.7	32.7		22.7	22.7		52.5	44.5		47.5	42.0	
Actuated g/C Ratio	0.33	0.33		0.23	0.23		0.53	0.45		0.48	0.43	
Clearance Time (s)	4.5	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	203	568		252	406		504	1607		427	1486	
v/s Ratio Prot	c0.03	0.14			c0.19		c0.04	0.16		0.01	0.13	
v/s Ratio Perm	0.15			0.01			c0.23			0.06		
v/c Ratio	0.55	0.41		0.04	0.82		0.51	0.36		0.13	0.31	
Uniform Delay, d1	25.2	25.5		29.5	36.0		12.8	17.7		13.8	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.2	0.5		0.1	12.0		0.9	0.6		0.1	0.5	
Delay (s)	28.5	26.0		29.6	48.0		13.7	18.4		13.9	19.3	
Level of Service	C	C		C	D		B	B		B	B	
Approach Delay (s)		26.7			47.5			16.9			18.7	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			24.5			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			98.7			Sum of lost time (s)				20.5		
Intersection Capacity Utilization			88.4%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2025 Total Conditions
AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	85	683	21	37	491
Future Volume (Veh/h)	45	85	683	21	37	491
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	92	742	23	40	534
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)					316	
pX, platoon unblocked	1.00					
vC, conflicting volume	1100	382			765	
vC1, stage 1 conf vol	754					
vC2, stage 2 conf vol	347					
vCu, unblocked vol	1100	382			765	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	87	85			95	
cM capacity (veh/h)	384	616			844	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	141	495	270	40	267	267
Volume Left	49	0	0	40	0	0
Volume Right	92	0	23	0	0	0
cSH	509	1700	1700	844	1700	1700
Volume to Capacity	0.28	0.29	0.16	0.05	0.16	0.16
Queue Length 95th (m)	8.5	0.0	0.0	1.1	0.0	0.0
Control Delay (s)	14.8	0.0	0.0	9.5	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	14.8	0.0		0.7		
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			40.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

8: MacLaren Avenue & Site Access

2025 Total Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	8	23	1	17	1	53	0	3	3	0	60
Future Volume (Veh/h)	27	8	23	1	17	1	53	0	3	3	0	60
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	9	25	1	18	1	58	0	3	3	0	65
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	19			34			165	100	22	103	112	18
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	19			34			165	100	22	103	112	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			92	100	100	100	100	94
cM capacity (veh/h)	1597			1578			740	775	1056	862	763	1060
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	63	20	61	68								
Volume Left	29	1	58	3								
Volume Right	25	1	3	65								
cSH	1597	1578	751	1049								
Volume to Capacity	0.02	0.00	0.08	0.06								
Queue Length 95th (m)	0.4	0.0	2.0	1.6								
Control Delay (s)	3.4	0.4	10.2	8.7								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.4	0.4	10.2	8.7								
Approach LOS			B	A								
Intersection Summary												
Average Delay				6.8								
Intersection Capacity Utilization				26.4%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2025 Total Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	204	215	24	123	55	199	654	15	87	631	93
Future Volume (vph)	88	204	215	24	123	55	199	654	15	87	631	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.95		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1738		1789	1796		1789	3567		1789	3510	
Flt Permitted	0.59	1.00		0.17	1.00		0.28	1.00		0.33	1.00	
Satd. Flow (perm)	1103	1738		328	1796		518	3567		623	3510	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	96	222	234	26	134	60	216	711	16	95	686	101
RTOR Reduction (vph)	0	42	0	0	18	0	0	2	0	0	12	0
Lane Group Flow (vph)	96	414	0	26	176	0	216	725	0	95	775	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.2	25.2		25.2	25.2		51.6	44.6		48.6	43.1	
Effective Green, g (s)	25.2	25.2		25.2	25.2		51.6	44.6		48.6	43.1	
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.57	0.49		0.53	0.47	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	304	479		90	495		390	1742		401	1656	
v/s Ratio Prot		c0.24			0.10		c0.04	0.20		0.01	0.22	
v/s Ratio Perm	0.09			0.08			c0.27			0.11		
v/c Ratio	0.32	0.86		0.29	0.36		0.55	0.42		0.24	0.47	
Uniform Delay, d1	26.2	31.4		26.0	26.5		10.6	15.0		10.7	16.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	14.9		1.8	0.4		1.7	0.7		0.3	1.0	
Delay (s)	26.8	46.4		27.8	27.0		12.3	15.7		11.0	17.3	
Level of Service	C	D		C	C		B	B		B	B	
Approach Delay (s)		43.0			27.1			14.9			16.6	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			22.5	HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			91.3	Sum of lost time (s)			16.0					
Intersection Capacity Utilization			94.9%	ICU Level of Service			F					
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2025 Total Conditions
PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	66	802	51	88	782
Future Volume (Veh/h)	36	66	802	51	88	782
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	72	872	55	96	850
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)					316	
pX, platoon unblocked	0.92					
vC, conflicting volume	1516	464			927	
vC1, stage 1 conf vol	900					
vC2, stage 2 conf vol	617					
vCu, unblocked vol	1393	464			927	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	87	87			87	
cM capacity (veh/h)	301	545			733	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	111	581	346	96	425	425
Volume Left	39	0	0	96	0	0
Volume Right	72	0	55	0	0	0
cSH	425	1700	1700	733	1700	1700
Volume to Capacity	0.26	0.34	0.20	0.13	0.25	0.25
Queue Length 95th (m)	7.9	0.0	0.0	3.4	0.0	0.0
Control Delay (s)	16.5	0.0	0.0	10.6	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	16.5	0.0		1.1		
Approach LOS	C					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			44.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

8: MacLaren Avenue & Site Access

2025 Total Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	11	59	3	5	4	45	0	2	3	0	52
Future Volume (Veh/h)	68	11	59	3	5	4	45	0	2	3	0	52
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	12	64	3	5	4	49	0	2	3	0	57
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	9			76			262	207	44	207	237	7
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	9			76			262	207	44	207	237	7
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			92	100	100	100	100	95
cM capacity (veh/h)	1611			1523			630	657	1026	722	632	1075
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	12	51	60								
Volume Left	74	3	49	3								
Volume Right	64	4	2	57								
cSH	1611	1523	640	1050								
Volume to Capacity	0.05	0.00	0.08	0.06								
Queue Length 95th (m)	1.1	0.0	2.0	1.4								
Control Delay (s)	3.8	1.9	11.1	8.6								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.8	1.9	11.1	8.6								
Approach LOS			B	A								
Intersection Summary												
Average Delay				6.1								
Intersection Capacity Utilization				30.6%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2030 Total Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	113	175	10	205	154	245	594	12	55	417	71
Future Volume (vph)	118	113	175	10	205	154	245	594	12	55	417	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.94		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1712		1789	1762		1789	3568		1789	3501	
Flt Permitted	0.17	1.00		0.57	1.00		0.39	1.00		0.35	1.00	
Satd. Flow (perm)	325	1712		1074	1762		741	3568		653	3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	128	123	190	11	223	167	266	646	13	60	453	77
RTOR Reduction (vph)	0	57	0	0	27	0	0	1	0	0	13	0
Lane Group Flow (vph)	128	256	0	11	363	0	266	658	0	60	517	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.4	34.4		24.4	24.4		51.5	44.5		48.5	43.0	
Effective Green, g (s)	34.4	34.4		24.4	24.4		51.5	44.5		48.5	43.0	
Actuated g/C Ratio	0.34	0.34		0.24	0.24		0.51	0.44		0.48	0.43	
Clearance Time (s)	4.5	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	191	586		261	428		453	1581		377	1499	
v/s Ratio Prot	c0.04	0.15			c0.21		c0.04	0.18		0.01	0.15	
v/s Ratio Perm	0.19			0.01			c0.26			0.07		
v/c Ratio	0.67	0.44		0.04	0.85		0.59	0.42		0.16	0.35	
Uniform Delay, d1	25.5	25.5		29.1	36.2		15.1	19.1		14.1	19.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.9	0.5		0.1	14.4		1.9	0.8		0.2	0.6	
Delay (s)	34.4	26.0		29.1	50.6		17.1	19.9		14.3	19.9	
Level of Service	C	C		C	D		B	B		B	B	
Approach Delay (s)		28.5			50.0			19.1			19.3	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			26.2			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			100.4			Sum of lost time (s)			20.5			
Intersection Capacity Utilization			90.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2030 Total Conditions
AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	85	766	21	37	565
Future Volume (Veh/h)	45	85	766	21	37	565
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	92	833	23	40	614
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)					316	
pX, platoon unblocked	0.97					
vC, conflicting volume	1232	428			856	
vC1, stage 1 conf vol	844					
vC2, stage 2 conf vol	387					
vCu, unblocked vol	1181	428			856	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	84			95	
cM capacity (veh/h)	349	575			780	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	141	555	301	40	307	307
Volume Left	49	0	0	40	0	0
Volume Right	92	0	23	0	0	0
cSH	469	1700	1700	780	1700	1700
Volume to Capacity	0.30	0.33	0.18	0.05	0.18	0.18
Queue Length 95th (m)	9.5	0.0	0.0	1.2	0.0	0.0
Control Delay (s)	15.9	0.0	0.0	9.9	0.0	0.0
Lane LOS	C			A		
Approach Delay (s)	15.9	0.0		0.6		
Approach LOS	C					
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			42.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

8: MacLaren Avenue & Site Access

2030 Total Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	8	23	1	17	1	53	0	3	3	0	60
Future Volume (Veh/h)	27	8	23	1	17	1	53	0	3	3	0	60
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	9	25	1	18	1	58	0	3	3	0	65
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	19			34			165	100	22	103	112	18
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	19			34			165	100	22	103	112	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			92	100	100	100	100	94
cM capacity (veh/h)	1597			1578			740	775	1056	862	763	1060
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	63	20	61	68								
Volume Left	29	1	58	3								
Volume Right	25	1	3	65								
cSH	1597	1578	751	1049								
Volume to Capacity	0.02	0.00	0.08	0.06								
Queue Length 95th (m)	0.4	0.0	2.0	1.6								
Control Delay (s)	3.4	0.4	10.2	8.7								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.4	0.4	10.2	8.7								
Approach LOS			B	A								
Intersection Summary												
Average Delay				6.8								
Intersection Capacity Utilization				26.4%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2030 Total Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	214	233	27	129	64	206	752	16	91	723	98
Future Volume (vph)	101	214	233	27	129	64	206	752	16	91	723	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.95		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1736		1789	1789		1789	3568		1789	3514	
Flt Permitted	0.56	1.00		0.15	1.00		0.21	1.00		0.29	1.00	
Satd. Flow (perm)	1061	1736		287	1789		390	3568		539	3514	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	110	233	253	29	140	70	224	817	17	99	786	107
RTOR Reduction (vph)	0	43	0	0	20	0	0	2	0	0	11	0
Lane Group Flow (vph)	110	443	0	29	190	0	224	832	0	99	882	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.7	26.7		26.7	26.7		53.1	44.3		46.5	41.0	
Effective Green, g (s)	26.7	26.7		26.7	26.7		53.1	44.3		46.5	41.0	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.57	0.48		0.50	0.44	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	306	501		82	516		356	1708		345	1557	
v/s Ratio Prot		c0.26			0.11		c0.06	0.23		0.02	0.25	
v/s Ratio Perm	0.10			0.10			c0.30			0.13		
v/c Ratio	0.36	0.88		0.35	0.37		0.63	0.49		0.29	0.57	
Uniform Delay, d1	26.1	31.4		26.1	26.2		11.7	16.4		12.4	19.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	16.8		2.6	0.4		3.5	1.0		0.5	1.5	
Delay (s)	26.8	48.3		28.7	26.6		15.1	17.4		12.8	20.6	
Level of Service	C	D		C	C		B	B		B	C	
Approach Delay (s)		44.3			26.9			16.9			19.9	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			24.4			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			92.5			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			96.9%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2030 Total Conditions
PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	66	907	51	88	896
Future Volume (Veh/h)	36	66	907	51	88	896
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	72	986	55	96	974
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)					316	
pX, platoon unblocked	0.87					
vC, conflicting volume	1692	520			1041	
vC1, stage 1 conf vol	1014					
vC2, stage 2 conf vol	679					
vCu, unblocked vol	1499	520			1041	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	86			86	
cM capacity (veh/h)	270	501			664	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	111	657	384	96	487	487
Volume Left	39	0	0	96	0	0
Volume Right	72	0	55	0	0	0
cSH	385	1700	1700	664	1700	1700
Volume to Capacity	0.29	0.39	0.23	0.14	0.29	0.29
Queue Length 95th (m)	8.9	0.0	0.0	3.8	0.0	0.0
Control Delay (s)	18.1	0.0	0.0	11.3	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	18.1	0.0		1.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			47.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

8: MacLaren Avenue & Site Access

2030 Total Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	11	59	3	5	4	45	0	2	3	0	52
Future Volume (Veh/h)	68	11	59	3	5	4	45	0	2	3	0	52
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	12	64	3	5	4	49	0	2	3	0	57
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	9			76			262	207	44	207	237	7
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	9			76			262	207	44	207	237	7
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			92	100	100	100	100	95
cM capacity (veh/h)	1611			1523			630	657	1026	722	632	1075
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	12	51	60								
Volume Left	74	3	49	3								
Volume Right	64	4	2	57								
cSH	1611	1523	640	1050								
Volume to Capacity	0.05	0.00	0.08	0.06								
Queue Length 95th (m)	1.1	0.0	2.0	1.4								
Control Delay (s)	3.8	1.9	11.1	8.6								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.8	1.9	11.1	8.6								
Approach LOS			B	A								
Intersection Summary												
Average Delay				6.1								
Intersection Capacity Utilization				30.6%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2035 Total Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	118	196	12	216	179	253	680	13	57	480	75
Future Volume (vph)	136	118	196	12	216	179	253	680	13	57	480	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.93		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1707		1789	1755		1789	3569		1789	3506	
Flt Permitted	0.14	1.00		0.56	1.00		0.33	1.00		0.29	1.00	
Satd. Flow (perm)	267	1707		1047	1755		620	3569		553	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	148	128	213	13	235	195	275	739	14	62	522	82
RTOR Reduction (vph)	0	60	0	0	30	0	0	1	0	0	11	0
Lane Group Flow (vph)	148	281	0	13	400	0	275	752	0	62	593	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.4	37.4		26.4	26.4		51.5	43.5		46.5	41.0	
Effective Green, g (s)	37.4	37.4		26.4	26.4		51.5	43.5		46.5	41.0	
Actuated g/C Ratio	0.37	0.37		0.26	0.26		0.50	0.42		0.45	0.40	
Clearance Time (s)	4.5	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	194	623		269	452		403	1516		317	1403	
v/s Ratio Prot	c0.05	0.16			c0.23		c0.05	0.21		0.01	0.17	
v/s Ratio Perm	0.23			0.01			c0.29			0.08		
v/c Ratio	0.76	0.45		0.05	0.89		0.68	0.50		0.20	0.42	
Uniform Delay, d1	25.4	24.7		28.6	36.5		16.7	21.5		16.2	22.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.2	0.5		0.1	18.4		4.7	1.2		0.3	0.9	
Delay (s)	41.5	25.2		28.6	54.9		21.4	22.6		16.5	23.1	
Level of Service	D	C		C	D		C	C		B	C	
Approach Delay (s)		30.2			54.1			22.3			22.5	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM 2000 Control Delay	29.2			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	102.4			Sum of lost time (s)			20.5					
Intersection Capacity Utilization	94.3%			ICU Level of Service			F					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2035 Total Conditions
AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	45	85	861	21	37	651
Future Volume (Veh/h)	45	85	861	21	37	651
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	92	936	23	40	708
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage (veh)			2		2	
Upstream signal (m)					316	
pX, platoon unblocked	0.94					
vC, conflicting volume	1382	480			959	
vC1, stage 1 conf vol	948					
vC2, stage 2 conf vol	434					
vCu, unblocked vol	1270	480			959	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	83			94	
cM capacity (veh/h)	312	532			713	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	141	624	335	40	354	354
Volume Left	49	0	0	40	0	0
Volume Right	92	0	23	0	0	0
cSH	427	1700	1700	713	1700	1700
Volume to Capacity	0.33	0.37	0.20	0.06	0.21	0.21
Queue Length 95th (m)	10.8	0.0	0.0	1.4	0.0	0.0
Control Delay (s)	17.5	0.0	0.0	10.3	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	17.5	0.0		0.6		
Approach LOS	C					
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization			45.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

8: MacLaren Avenue & Site Access

2035 Total Conditions

AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	8	23	1	17	1	53	0	3	3	0	60
Future Volume (Veh/h)	27	8	23	1	17	1	53	0	3	3	0	60
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	9	25	1	18	1	58	0	3	3	0	65
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	19			34			165	100	22	103	112	18
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	19			34			165	100	22	103	112	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			92	100	100	100	100	94
cM capacity (veh/h)	1597			1578			740	775	1056	862	763	1060
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	63	20	61	68								
Volume Left	29	1	58	3								
Volume Right	25	1	3	65								
cSH	1597	1578	751	1049								
Volume to Capacity	0.02	0.00	0.08	0.06								
Queue Length 95th (m)	0.4	0.0	2.0	1.6								
Control Delay (s)	3.4	0.4	10.2	8.7								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.4	0.4	10.2	8.7								
Approach LOS			B	A								
Intersection Summary												
Average Delay				6.8								
Intersection Capacity Utilization				26.4%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Signalized Intersection Capacity Analysis

3: Yonge Street & Little Avenue

2035 Total Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	225	255	32	136	74	212	866	17	96	829	103
Future Volume (vph)	117	225	255	32	136	74	212	866	17	96	829	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.95		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1734		1789	1784		1789	3568		1789	3519	
Flt Permitted	0.54	1.00		0.14	1.00		0.16	1.00		0.22	1.00	
Satd. Flow (perm)	1020	1734		266	1784		306	3568		413	3519	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	245	277	35	148	80	230	941	18	104	901	112
RTOR Reduction (vph)	0	45	0	0	21	0	0	1	0	0	10	0
Lane Group Flow (vph)	127	477	0	35	207	0	230	958	0	104	1003	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	28.3	28.3		28.3	28.3		51.5	43.5		46.5	41.0	
Effective Green, g (s)	28.3	28.3		28.3	28.3		51.5	43.5		46.5	41.0	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.55	0.47		0.50	0.44	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	309	525		80	541		296	1663		286	1546	
v/s Ratio Prot		c0.28			0.12		c0.07	0.27		0.02	0.29	
v/s Ratio Perm	0.12			0.13			c0.36			0.16		
v/c Ratio	0.41	0.91		0.44	0.38		0.78	0.58		0.36	0.65	
Uniform Delay, d1	25.9	31.3		26.1	25.6		14.0	18.2		13.2	20.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	19.5		3.8	0.5		12.1	1.5		0.8	2.1	
Delay (s)	26.8	50.8		29.9	26.1		26.0	19.6		14.0	22.6	
Level of Service	C	D		C	C		C	B		B	C	
Approach Delay (s)		46.1			26.6			20.9			21.8	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		26.8					HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio		0.85										
Actuated Cycle Length (s)		93.3					Sum of lost time (s)			16.0		
Intersection Capacity Utilization		99.2%					ICU Level of Service			F		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

6: MacLaren Avenue & Yonge Street

2035 Total Conditions

PM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	66	1029	51	88	1028
Future Volume (Veh/h)	36	66	1029	51	88	1028
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	72	1118	55	96	1117
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage veh			2		2	
Upstream signal (m)					316	
pX, platoon unblocked	0.82					
vC, conflicting volume	1896	586			1173	
vC1, stage 1 conf vol	1146					
vC2, stage 2 conf vol	750					
vCu, unblocked vol	1657	586			1173	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	84			84	
cM capacity (veh/h)	235	453			591	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	111	745	428	96	558	558
Volume Left	39	0	0	96	0	0
Volume Right	72	0	55	0	0	0
cSH	342	1700	1700	591	1700	1700
Volume to Capacity	0.32	0.44	0.25	0.16	0.33	0.33
Queue Length 95th (m)	10.5	0.0	0.0	4.4	0.0	0.0
Control Delay (s)	20.5	0.0	0.0	12.3	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	20.5	0.0		1.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			51.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

8: MacLaren Avenue & Site Access

2035 Total Conditions

PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	11	59	3	5	4	45	0	2	3	0	52
Future Volume (Veh/h)	68	11	59	3	5	4	45	0	2	3	0	52
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	12	64	3	5	4	49	0	2	3	0	57
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	9			76			262	207	44	207	237	7
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	9			76			262	207	44	207	237	7
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			92	100	100	100	100	95
cM capacity (veh/h)	1611			1523			630	657	1026	722	632	1075
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	12	51	60								
Volume Left	74	3	49	3								
Volume Right	64	4	2	57								
cSH	1611	1523	640	1050								
Volume to Capacity	0.05	0.00	0.08	0.06								
Queue Length 95th (m)	1.1	0.0	2.0	1.4								
Control Delay (s)	3.8	1.9	11.1	8.6								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.8	1.9	11.1	8.6								
Approach LOS			B	A								
Intersection Summary												
Average Delay				6.1								
Intersection Capacity Utilization				30.6%	ICU Level of Service				A			
Analysis Period (min)				15								