



**17 Sophia Street East; 3, 5, 7 & 11
McDonald Street; 58 & 60
Clapperton Street**

**Proposed Mixed-Use Development
Transportation Impact and Parking
Study**

**City of Barrie File No.
D28-095-2023**

Paradigm Transportation Solutions Limited

June 2024
230701



Project Summary



Project Number
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June 2024

Client
Black Creek Group
4040 White Rock Street
Victoria BC V8N 2K4

c/o

PRISIM Partners Inc.
5515 North Service Road, Suite 305
Burlington ON L7L 6G4

Client Contact
Susan Conner, FCPA, FCA
Principal

Consultant Project Team
Adrian Soo, P.Eng.
Wenting Li, P.Eng.

Paradigm Transportation Solutions Limited

5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684

www.ptsl.com

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17 Sophia Street East; 3, 5, 7 & 11 McDonald Street; 58 & 60 Clapperton Street Proposed Mixed-Use Development Transportation Impact and Parking Study



Adrian Soo, P.Eng.

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Executive Summary

Content

This report is an update to the October 2022 study previously prepared in support of the sought Zoning By-law Amendment (ZBA). Since obtaining zoning approval (Site-Specific By-law 2023-030), the applicant is now seeking Site Plan approval. This report update reflects changes to the site plan and responds to pre-application comments received from City staff.

It is noted the latest development concept proposes a minor increase of eight (8) residential dwelling units, and the commercial-retail space proposed is now slightly larger increasing from 257 SM (2,761 SF) to 265 SM (2,850 SF), and a reduction in the overall parking supply.

In summary for this iteration of the study, the operational analysis and associated findings and conclusions remain unchanged; however, with the proposed change in parking supply, the associated parking review and justification has been updated accordingly.

Black Creek Group retained Paradigm Transportation Solutions Limited (Paradigm) to undertake a Transportation Impact and Parking Study for a proposed development at the municipal addresses of 17 Sophia Street East; 3,5,7, and 11 McDonald Street; 58-60 Clapperton Street in the City of Barrie, Ontario.

The purpose of this Transportation Impact and Parking Study is to determine the net impacts of the development site traffic on the surrounding road network, identify any remedial measures required to accommodate the traffic, document the parking needs of the development, determine the adequacy of the proposed parking supply, and assess potential Transportation Demand Management measures and initiatives for implementation.

Proposed Development

The subject site is located at the southwest corner of McDonald Street and Clapperton Street. It is noted the subject site is located within the City of Barrie's Urban Growth Centre limits.

Based on the latest site plan concept, the proposed development consists of a total of 260 residential units within a 26-storey building. The dwelling unit breakdown is as follows:

- ▶ One-bedroom: 147 units; and



- ▶ Two-bedroom: 113 units.

In addition to the residential dwelling component, 265 SM (2,850 SF) Gross Floor Area (GFA) of commercial-retail space is proposed on the ground floor of the building.

A total of 176 physical parking spaces would be provided on-site for the proposed development. Parking would be provided at-grade and within a five (5) level above-grade structure.

A total of 422 bicycle parking spaces are proposed. This includes 26 short-term spaces and 396 long-term spaces.

Vehicular access to the site is proposed via a single full-movement driveway connection with Clapperton Street located approximately 30 metres south of McDonald Street.

Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ Under existing conditions, the study area intersections are currently operating at acceptable levels of service and within capacity during the weekday AM and PM peak hours;
- ▶ Under future background traffic conditions (without the proposed development), the study area intersection operations would be slightly worse in comparison to existing conditions. All intersections and traffic movements are forecast to continue to operate at acceptable levels of service and within capacity up to the 2034 horizon.

The exception would be the westbound shared left/right movement at Bayfield Street and Worsley Street, which is reported to operate at LOS E and F under 2029 and 2034 horizons, respectively. However, it is noted the movement is forecast to operate within capacity and that this is not an unusual condition where a minor road operating under stop control intersects with a major road;

- ▶ With full development and occupancy of the subject site, it is forecast to generate 78 automobile trips during the weekday AM peak hour, and 99 automobile trips during the weekday PM peak hour;
- ▶ Under future total traffic conditions (with the proposed development), the operations at the study area intersections are noted to be slightly worse with the addition of the site generated traffic in comparison to background traffic conditions. The net



impact of the proposed development is found to be relatively minor. All intersections and traffic movements are forecast to continue to operate at acceptable levels of service and within capacity up to the 2034 horizon;

- ▶ Analysis of total traffic conditions indicate the site-generated traffic is not expected to materially impact operations on the adjacent transportation work.

No geometric improvements have been identified to be required, the existing transportation network will be able to accommodate the proposed development.

At the proposed site access intersection with Clapperton Street is it noted the forecast volumes and traffic operations would not warrant the provision of auxiliary turn lanes along Clapperton Street;

- ▶ A Transportation Demand Management (TDM) Plan for the proposed development has been prepared and applicable TDM measures/initiatives have been identified which would be implemented by the applicant. The implementation of the TDM Plan is a component in reducing single-occupant vehicle (SOV) travel, which in turn reduces the number of site generated trips, and the associated demand for parking;
- ▶ Rationale has been provided to demonstrate the proposed parking rate/proposed parking supply will adequately serve the anticipated parking demands. Justification is provided through smart planning goals/policies, direction the City is headed based upon the Draft Comprehensive Zoning By-law, policies of other municipalities having lower parking rates similar to the proposed rate, forecast parking demands based upon ITE parking data, and the implementation of the proposed TDM measures/initiatives which would further reduce the on-site parking demands; and
- ▶ A functional review of the proposed access and site plan was undertaken. No conflicts were identified, and it was confirmed the access driveway, loading space, and parking layout has been designed accordingly.

Recommendations

Based on the findings of this study, the following is recommended:

- ▶ From a transportation perspective, the planning applications sought should be approved as the development is determined to have a minimal impact on the adjacent transportation network,



and the proposed parking supply will adequately serve the development;

- ▶ The proposed TDM Plan should be implemented; and
- ▶ The City of Barrie should monitor the signalized intersection of Bayfield Street/Sophia Street in regard to background growth and changes in traffic patterns and adjust signal timing splits to best serve demand as necessary.



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1 Introduction

1.1 Overview

Black Creek Group retained Paradigm Transportation Solutions Limited (Paradigm) to undertake a Transportation Impact and Parking Study for a proposed development at the municipal addresses of 17 Sophia Street East; 3,5,7, and 11 McDonald Steet; 58-60 Clapperton Street in the City of Barrie, Ontario.

Figure 1.1 illustrates the location of the proposed development and associated study area.

The subject lands are proposed to be developed as a high-rise apartment building providing a total of 260 residential units within a twenty-one-storey building. In addition, approximately 265 SM (2,850 SF) of commercial space is proposed on the ground floor of the building along with an outdoor amenity space.

1.2 Purpose and Scope

The purpose of the study is to:

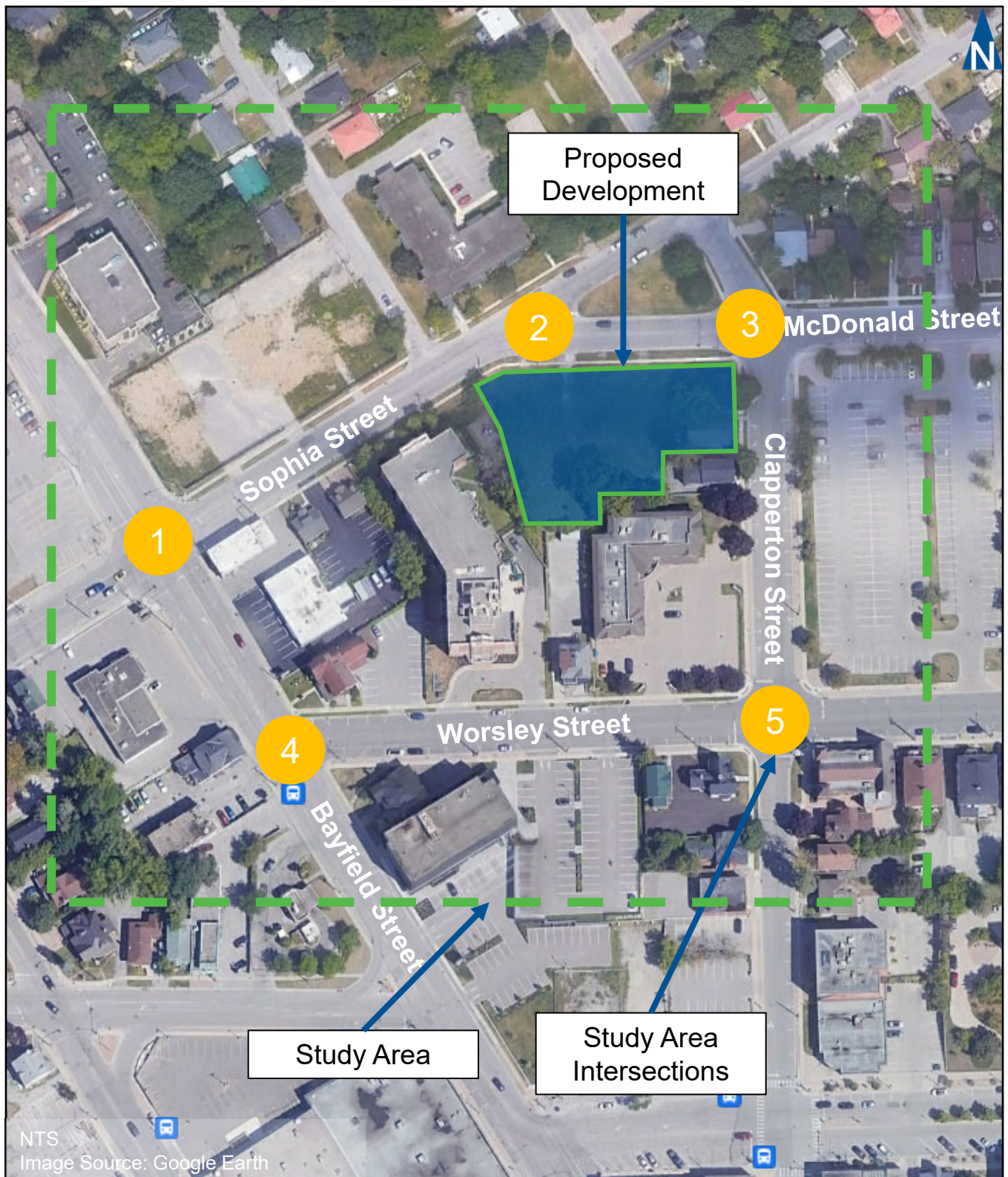
- ▶ Determine and assess the current study area traffic conditions;
- ▶ Forecast the traffic generated by the proposed development;
- ▶ Analyze the impacts of the additional traffic on the study area transportation network;
- ▶ Recommend remedial measures required to mitigate identified impacts, if any;
- ▶ Determine the adequacy of the proposed parking supply; and
- ▶ Assess potential Transportation Demand Management measures for implementation.

This report has been prepared in general accordance to the City of Barrie Traffic Impact Study (TIS) Guidelines¹. This report assesses the 2024, 2029 and 2034 horizon years representing the assumed full build-out year, five years, and ten years beyond full build-out, respectively.

This study also responds to the direction provided by the City of Barrie staff. **Appendix A** contains the pre-study consultation correspondence exchanged with City staff for reference.

¹ City of Barrie. *Transportation Impact Study Guidelines*. December 2021.





1.3 Study Area Intersections

The intersections assessed within this study include:

- ▶ Bayfield Street and Sophia Street East (signalized);
- ▶ Sophia Street and McDonald Street (unsignalized);
- ▶ McDonald Street and Clapperton Street (unsignalized);
- ▶ Bayfield Street and Worsley Street (unsignalized);
- ▶ Worsley Street and Clapperton Street (unsignalized); and
- ▶ The proposed site driveway connection with Clapperton Street (assumed unsignalized).



2 Background Reports

The following background reports/documents have been reviewed with key points and relevant information applicable to this study extracted. Specific planning policies and relevant studies include:

- ▶ 2019 City of Barrie Transportation Master Plan;
- ▶ 2018 City of Barrie Official Plan;
- ▶ 113 Bayfield Street, Proposed Residential Transportation Impact and Parking Study, Paradigm Transportation Solutions Limited (April 2020); and
- ▶ 136 Bayfield Street, Proposed Mixed-use Traffic Impact Study, JD Northcote Engineering Inc. (May 2020).



3 Existing Conditions

3.1 Roads and Traffic Control

The characteristics of the roadways in vicinity of the subject site are described below. Reference was made to the City of Barrie Official Plan². All study area roads operate under the City's jurisdiction.

- ▶ **Bayfield Street** is a four-lane north-south arterial road with a posted speed limit of 50 kilometres per hour. Bayfield Street has an urban cross-section with sidewalks provided along both sides of the roadway. On-street parking is not permitted on Bayfield Street within the study area, except for the short section on the east side of Bayfield Street, just south of Worsley Street.
- ▶ **Sophia Street East** is a two-lane east-west minor collector road. No posted speed limit signage is posted along the roadway; therefore, it is assumed the statutory limit of 50 kilometres per hour governs. Sophia Street has an urban cross-section with sidewalks provided along both sides of the roadway between Bayfield Street and McDonald Street. East of McDonald Street, the roadway is classified as a local one-way street without any sidewalks provided. On-street parking is restricted on Sophia Street within the study area, except for the segment between McDonald Street and Clapperton Street where on-street parking is only permitted on the north side for maximum three (3) hours from 8 AM to 5 PM from Monday to Friday.
- ▶ **McDonald Street** is a two-lane east-west minor collector road. No posted speed limit signage is posted along the roadway; therefore, it is assumed the statutory limit of 50 kilometres per hour governs. McDonald Street has an urban cross-section with sidewalks provided along both sides of the roadway. It is noted that sidewalk is provided on the southside of the roadway between Sophia Street E and Clapperton Street. On-street parking is restricted on McDonald Street between Sophia Street and Clapperton Street.
- ▶ **Clapperton Street** is a two-lane north-south local road. No posted speed limit signage is posted along the roadway; therefore, it is assumed the statutory limit of 50 kilometres per hour governs. Clapperton Street has an urban cross-section with sidewalks provided along both sides of the roadway. North of Sophia Street E, sidewalk is provided along the west side only. Paid on-street parking is permitted on both sides

² City of Barrie. *City of Barrie Official Plan – Schedule D Road Plan*. January 2018



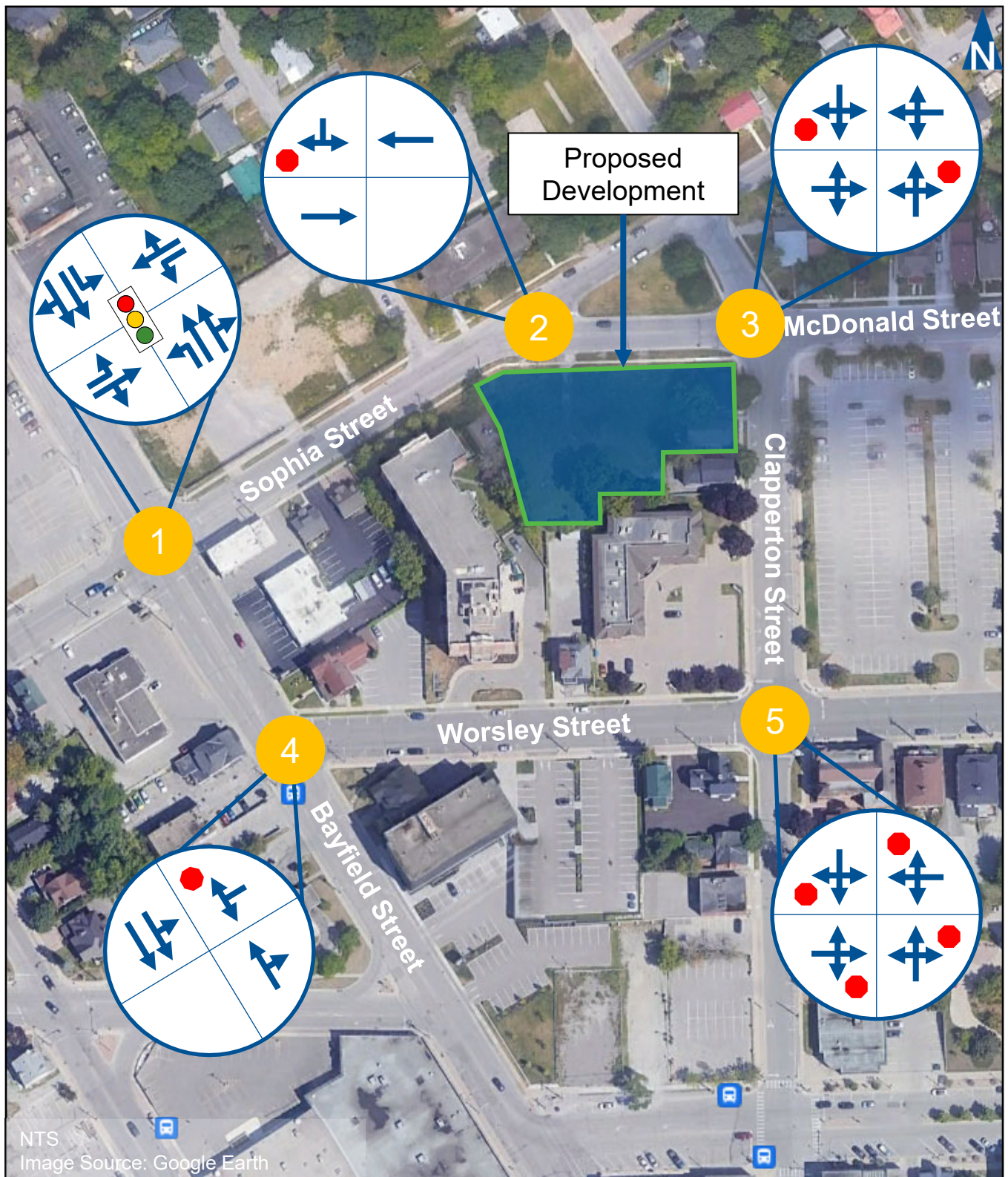
Clapperton Street within the study area (between McDonald Street and Worsley Street).

- ▶ **Worsley Street** is a two-lane east-west local road. No posted speed limit signage is posted along the roadway; therefore, it is assumed the statutory limit of 50 kilometres per hour governs. Worsley Street has an urban cross-section with sidewalks provided along both sides of the roadway. Paid on-street parking is permitted on Worsley Street within the study area.

It is noted that on-street parking is not permitted between December 1 and March 31 between 3:00 – 6:00 AM within the Downtown BIA and between 12:01 – 7:00 AM on other City-owned street to allow for necessary winter maintenance operations.

Figure 3.1 illustrates the existing lane arrangements and traffic control devices for the study area intersections.





3.2 Transit

Barrie Transit currently operates five routes in the study area. These routes provide service to key locations throughout the city including GO Transit train stations. The following is a summary of the transit services provided.

- ▶ **Route 1 Georgian Mall/Wellham** operates between Park Place and the Georgian Mall with major stops at Bayfield and Cundles, Downtown Barrie Terminal, Allandale Waterfront Station, Allandale Recreation Centre and Wellham at Big Bay Point.
- ▶ **Route 4 East Bayfield/South GO** operates between Barrie South GO and the Georgian Mall with major stops at Painswick Library, Hurst at Little, Allandale Waterfront Station, Downtown Barrie Terminal, Bayfield Mall, Bayfield at Livingstone, Ferris at Cundles and Sovereign's Gate.
- ▶ **Route 6 Letitia/College** operates in a loop originating at the Downtown Barrie Terminal with major stops at Cedar Pointe at Edgehill, Livingstone at Anne, and Georgian College.
- ▶ **Route 7 Grove/Bear Creek** travels between Park Place and Rose at Duckworth (Georgian College) with major stops at Holly Community Centre, Saint Joan of Arc High School, Ardagh at Ferndale, Allandale Waterfront Station, Downtown Barrie Terminal, Grove at St. Vincent, and Barrie View Drive (Wal-Mart).
- ▶ **Route 100 Red/Blue Express** operates in a loop originating at the Downtown Barrie Terminal with major stops at Georgian Mall, Georgian College, and Johnson at Grove.

Bus stops along Route 3 Georgian Drive/Painswick, Route 5 Blake/Edgehill, and Route 8 RVH/Yonge/Crosstown/Essa are all within a 500-metre walking distance from the proposed development. In addition, the Barrie Downtown Bus Terminal is located approximately 500 metres southwest of the site on Maple Avenue, equivalent to a 5–8-minute walk.

In summary the subject site is well served by transit, which also provides connections to larger transit hubs facilitating inter-regional travel by public transit.

Figure 3.2 shows the existing transit network serving the proposed development.





3.3 Active Transportation

Sidewalks are provided along the study area roadways of Bayfield Street, Sophia Street (between Bayfield Street and McDonald Street), McDonald Street (southside only between Sophia Street E and Clapperton Street), Clapperton Street and Worsley Street. The municipal network is relatively well-connected and relatively continuous.

No dedicated cycling facilities are provided within the study area; therefore, all cycling trips would be accommodated within the travelled roadway.



3.4 Data Collection and Base Year Traffic

Between the period of March 2020 and the end of February 2022, the Province of Ontario had implemented various restrictions for day-to-day activities in response to the COVID-19 global pandemic. At the onset of this assignment restrictions were still in place including, reduced gathering sizes (indoor and outdoor) which has resulted in limited operations at places of employment. As a result, typical travel volumes and travel patterns may have been impacted.

As pre-COVID-19 intersection turning movement counts (TMCs) were unavailable for the majority of study area intersections, Paradigm collected traffic data on October 26, 2021. Data was counted in 15-minute intervals and vehicles were classified by type. The count data was then reviewed and adjusted accordingly to develop representative pre-COVID conditions.

► Traffic Data:

- Historical 2017 count data for Bayfield Street/Sophia Street was obtained for review and use; and
- Paradigm undertook traffic counts at the study area intersections in October 2021 to determine and assess whether impacts due to the COVID-19 global pandemic were still evident.

► Analysis:

- The available historical 2017 count and the 2021 count for Bayfield Street/Sophia Street E was reviewed and compared. It was determined that the 2021 count displayed similar traffic patterns (i.e., magnitude of traffic volume) as the 2017 data. This effectively demonstrates and confirmed the 2021 traffic patterns are unaffected by COVID-19;
- Applicable growth rates for roadway corridors were provided by City staff. These rates were applied to the historical 2017 intersection count to factor to 2021 conditions for comparison with the October 2021 intersection count;
- The October 2021 intersection count was determined to be slightly lower than the 2021 count factored up from the 2017 data. Therefore, an adjustment factor of 1.50 was calculated and applied to the October 2021 count data to reflect non-COVID base year conditions.



Figure 3.3 summarizes the base year (2021) AM and PM peak hour traffic volumes. The mid-block traffic volumes are unbalanced between intersections due to the presence of access driveways.

Table 3.1 summarizes the location and date of the traffic data utilized in this study. **Appendix B** contains the raw count data for reference.

TABLE 3.1: TRAFFIC DATA

Intersection Count Data	Date
Bayfield Street & Sophia Street	6 December 2017
Bayfield Street & Sophia Street	26 October 2021
Sophia Street & McDonald Street	
McDonald Street & Clapperton Street	
Bayfield Street & Worsley Street	
Worsley Street & Clapperton Street	

3.5 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various turning movements. The delay is related to the number of vehicles desiring to make a movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows and intersection geometry.

Table 3.2 summarizes the level of service criteria for signalized and unsignalized intersections. The highest possible rating is LOS A, where the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.0, the movement is classed as LOS F and remedial measures are usually implemented, if feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for left-turn movements at peak times.



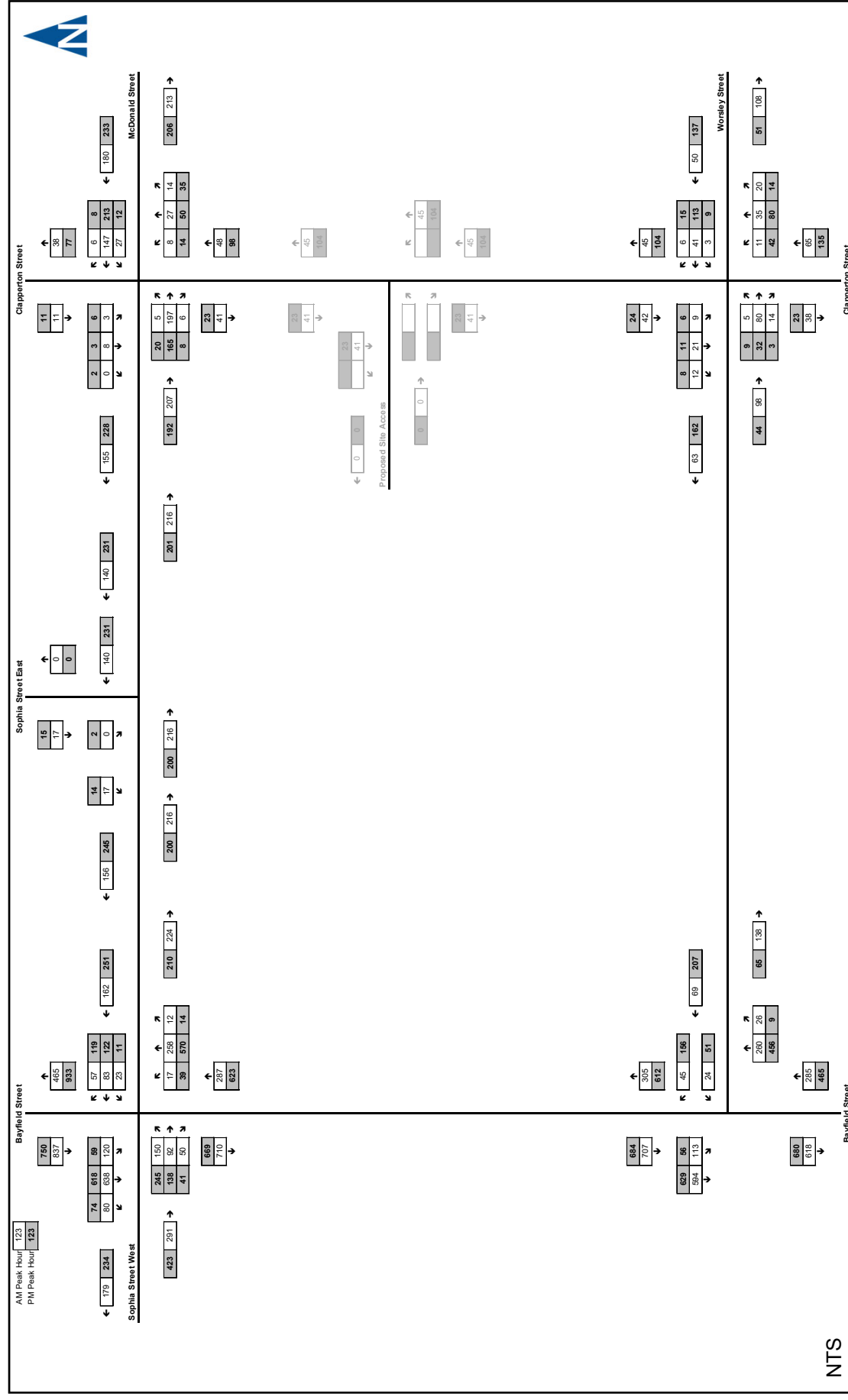


TABLE 3.2: VEHICLE LEVEL OF SERVICE DEFINITIONS

Level of Service	Signalized Intersections Average Total Delay (sec/veh)	Unsignalized Intersections Average Total Delay (sec/veh)
A	≤ 10	≤ 10
B	$> 10 \text{ \& } \leq 20$	$> 10 \text{ \& } \leq 15$
C	$> 20 \text{ \& } \leq 35$	$> 15 \text{ \& } \leq 25$
D	$> 35 \text{ \& } \leq 55$	$> 25 \text{ \& } \leq 35$
E	$> 55 \text{ \& } \leq 80$	$> 35 \text{ \& } \leq 50$
F	> 80	> 50

The City of Barrie Transportation Impact Study Guidelines defines critical movements at intersections as follows:

► Signalized intersections:

- LOS for overall intersection operations exceeds LOS D;
- V/C ratios for overall intersection operations, through movements, or shared through/turning movements increase to 0.85 or above;
- V/C ratios for exclusive movements increase to 0.85 or above;
- Where the 50th and 90th percentile queue length exceed available turning lane storage; and
- Queues for exclusive left and right turn lanes that are inaccessible due to the through lane queue length.

► Unsignalized intersections:

- LOS, based on average delay per vehicle, on individual movements exceeds LOS E; and
- The estimated 95th percentile queue length for an individual movement exceeds the lesser of five (5) vehicles or the available queue storage.

To assess the existing peak hour conditions, a level of service analysis was conducted using Synchro software, which implements the methods of the Highway Capacity Manual. The key parameters used in the analysis include:

- Existing lane configurations;



- ▶ Heavy vehicle percentages as derived from the collected traffic count data;
- ▶ Conflicting pedestrian volumes as derived from the collected traffic count data;
- ▶ Peak hour factors (PHFs) as derived from the collected traffic count data;
- ▶ Existing signal timing plans as obtained from the Transportation Impact and Parking Study report conducted for 113 Bayfield Street by Paradigm (April 2020);
- ▶ SimTraffic was utilized to output 95th percentile queue data at the all-way stop controlled intersection of Worsley Street/Clapperton Street; and
- ▶ Synchro default values for all other inputs.

Table 3.3 summarizes the base year AM and PM peak hour intersection operations including the LOS, average vehicle delay in seconds, v/c ratio, and 95th percentile queue length in metres. Any movements identified as critical movements are highlighted within the results table. **Appendix C** contains the detailed Synchro and SimTraffic reports for reference.

The existing conditions analyses indicate the study area intersections and movements are currently operating at acceptable levels of service and within capacity during the AM and PM peak hours.

The exception being a critical movement noted at Bayfield Street/Sophia Street. The eastbound left-turn movement operates with a v/c ratio of 0.95 under the PM peak hour.

In regard to vehicle queuing the 95th percentile back of queue for the eastbound left turn movement at Bayfield Street/Sophia Street under the PM peak hour is reported to exceed the storage provisions and may occasionally spillback to Maple Avenue.

It is noted that 95th percentile queues are estimates of the longest queue that could occur during the peak hour; however, this level of queuing only has a five (5) percent probability of occurring during the analysis period. It is not typical of what a motorist would experience on average. The 50th percentile average queue is estimated to be 40 metres which would be accommodated within the existing storage and taper. This average queue poses no operational concern.



TABLE 3.3: 2021 BASE YEAR PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	D	35	0.71	40	E	70	0.95	85
		Thru/Right	C	25	0.37	30	C	23	0.33	38
	WB	Left	C	23	0.10	9	C	21	0.03	5
		Thru/Right	C	25	0.35	28	C	24	0.42	46
	NB	Left	B	12	0.07	6	B	14	0.13	11
		Thru-Thru/Right	B	12	0.20	23	B	16	0.38	48
	SB	Left	A	6	0.22	16	A	8	0.14	9
		Thru-Thru/Right	A	8	0.42	47	B	10	0.36	42
	Overall Intersection		B	15	0.53	-	C	22	0.59	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.03	1	A	10	0.02	1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.01	<1
	WB	Left/Thru/Right	A	1	0.02	1	A	1	0.01	<1
	NB	Left/Thru/Right	B	13	0.10	3	B	13	0.18	5
	SB	Left/Thru/Right	B	13	0.03	1	B	13	0.02	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	B	14	0.17	5	C	22	0.52	24
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	4	0.11	3	A	2	0.06	2
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.18	16	A	8	0.06	14
	WB	Left/Thru/Right	A	8	0.09	13	A	8	0.19	16
	NB	Left/Thru/Right	A	8	0.12	16	A	9	0.19	16
	SB	Left/Thru/Right	A	8	0.08	13	A	8	0.04	12

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



4 Development Concept

4.1 Description

The subject site consists of properties located at the municipal addresses of 17 Sophia Street East, 3,5,7,11 McDonald Street, and 58-60 Clapperton Street in the City of Barrie. The site is generally situated in the southwest quadrant of the McDonald Street/Clapperton Street intersection.

The immediate land uses surrounding the subject site consist of low-density residential homes to the north, retail and commercial land uses to the south and west, and a municipal surface parking lot to the east. It is understood there are proposed plans to develop a YMCA community centre on the surface parking lot lands directly across the subject site.

Based on the latest site plan concept, the proposed development consists of a total of 260 residential units within a 26-storey building. The dwelling unit breakdown is as follows:

- ▶ One-bedroom: 147 units; and
- ▶ Two-bedroom: 113 units.

In addition to the residential dwelling component, 265 SM (2,850 SF) Gross Floor Area (GFA) of commercial-retail space is proposed on the ground floor of the building.

A total of 176 physical parking spaces would be provided on-site for the proposed development. Parking would be provided at-grade and within a five (5) level above-grade structure.

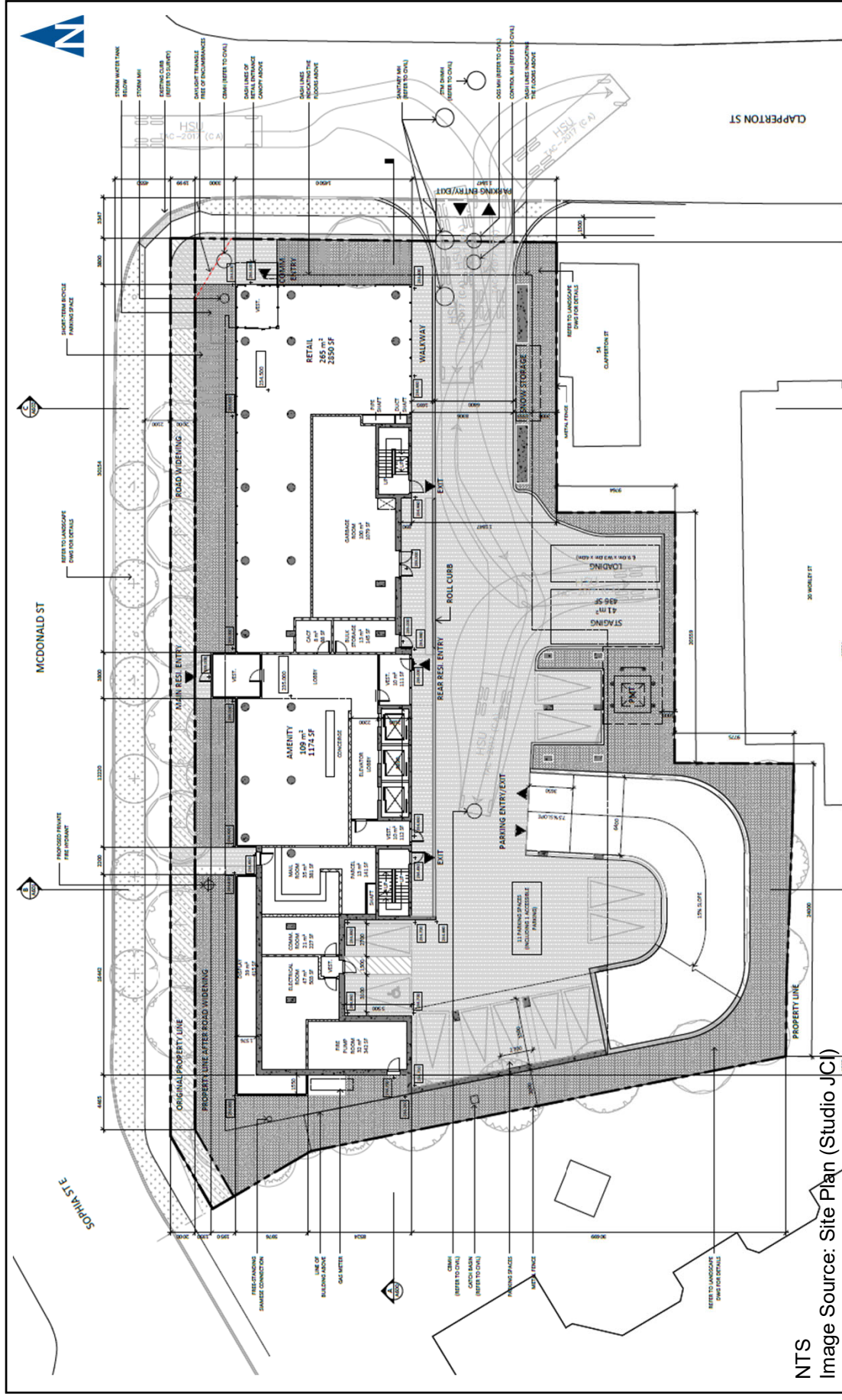
A total of 422 bicycle parking spaces are proposed. This includes 26 short-term spaces and 396 long-term spaces.

Vehicular access to the site is proposed via a single full-movement driveway connection with Clapperton Street located approximately 30 metres south of McDonald Street.

For the purposes of this assessment the proposed development is assumed to be constructed in a single phase with completion and occupancy anticipated by 2024.

Figure 4.1 illustrates the proposed development concept site plan.





Proposed Development Concept Site Plan

17 Sophia St E; 3, 5, 7, 11 McDonald St; 58-60 Clapperton St – Transportation Impact and Parking Study
230701

Figure 4.1

4.2 Trip Generation

4.2.1 Base Trip Generation

Trip generation data obtained from the Institute of Transportation Engineers (ITE) publication “Trip Generation Manual (11th Edition)”³ was used to forecast vehicle trips generated by the proposed development. Specifically, the trip equations for Land Use Code (LUC) 222 – Multifamily Housing (High-Rise), and trip rates for LUC 820 – Shopping Centre were used.

The specific land use for the ground floor commercial-retail space has not been confirmed; however, the applicant has indicated that it would likely serve as an ancillary service/amenity for the building residents and surrounding community.

The latest development plan proposes a slight increase in residential dwelling units, and a slight increase in ground floor commercial-retail size. Specifically, the residential dwelling unit count now totals 260 units increased by a total of eight (8) dwelling units, and the ground floor commercial-retail space is now proposed to be 8 SM (89 SF) larger in size increasing from 257 SM (2,761 SF) to 265 SM (2,850 SF). The minor increase in dwelling units and ground floor commercial-retail space results in an additional three (3) vehicle trips under both the AM and PM peak hours, respectively.

This minor increase in site traffic would be imperceptible within the analysis, and therefore can be concluded the previous operational analysis is still applicable.

Table 4.1 summarizes the forecast base trip generation and indicates the proposed development is expected to generate 80 AM peak hour trips and 101 PM peak hour trips at full build-out.

TABLE 4.1: BASE TRIP GENERATION

Land Use	Units/ GLA	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 222 – Multifamily Housing (High-Rise)	252	FCE ¹	25	50	75	FCE ²	50	39	89
LUC 820 – Shopping Centre	2,761 SF	R ₁	1	1	2	R ₂	4	5	9
Total Trips – Unadjusted (October 2022)			26	51	77		54	44	98

³ Institute of Transportation Engineers. *Trip Generation Manual, 11th Edition*. 2021.



LUC 222 – Multifamily Housing (High-Rise)	260	FCE ¹	26	51	77	FCE ²	51	40	91
LUC 820 – Shopping Centre	2,850 SF	R ₁	2	1	3	R ₂	5	5	10
Total Trips – Unadjusted (June 2024)			28	52	80		56	45	101

FCE¹: $T = 0.22 (X) + 18.85$ (34% In/66% Out); FCE²: $T = 0.26 (X) + 23.12$ (56% In/44% Out);
R₁ = 0.84 per 1,000 SF of GLA (62% In/38% Out); R₂ = 3.40 per 1,000 SF of GLA (48% In/52% Out)

4.2.2 Non-Automobile Mode Share

Given the proximity of the subject site to transit facilities and its central urban location in the city, a portion of site trips generated by the proposed development are likely to travel via modes other than the automobile (transit, walking, cycling). To determine the potential share of trips made by other modes, 2016 Transportation Tomorrow Survey (TTS) data was extracted.

The existing mode share for travel during the weekday AM and PM peak periods has been reviewed. Trips originating within and destined to the Traffic Analysis Zone (TAZ) for the subject site (8501) during the morning three-hour travel period (6:00 – 9:00 AM) and the afternoon three-hour travel period (4:00 – 7:00 PM) were assessed. **Table 4.2** summarizes the existing modal splits and **Figure 4.2** illustrates the location of TAZ 8501.

TABLE 4.2: EXISTING MODAL SPLIT

Mode	AM Inbound	AM Outbound	PM Inbound	PM Outbound
Auto Driver	86%	79%	74%	87%
Auto Passenger	11%	16%	18%	9%
Transit	1%	2%	2%	2%
Cycle	1%	0%	4%	2%
Walk	1%	0%	1%	0%
Other	0%	3%	1%	0%
TOTAL	100%	100%	100%	100%

As directed by the City staff, a 2% mode share reduction was applied to the base trip generation estimates to account for potential travel by transit. This reduces the trip generation by two trips under both the AM peak hour and PM peak hour.

Table 4.3 summarizes the resultant adjusted trip generation where the development is estimated to generate a total of 78 and 99 vehicle trips during the AM and PM peak hours, respectively.



TABLE 4.3: ADJUSTED TRIP GENERATION

Land Use	Units/ GLA	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 222 – Multifamily Housing (High-Rise)	252	FCE ¹	25	50	75	FCE ²	50	39	89
LUC 820 – Shopping Centre	2,761 SF	R ₁	1	1	2	R ₂	4	5	9
Total Trip Reduction		2%	-1	-1	-2	2%	-1	-1	-2
Total New Trips (October 2022)			25	50	75		53	43	96
LUC 222 – Multifamily Housing (High-Rise)	260	FCE ¹	26	51	77	FCE ²	51	40	91
LUC 820 – Shopping Centre	2,850 SF	R ₁	2	1	3	R ₂	5	5	10
Total Trip Reduction		2%	-1	-1	-2	2%	-1	-1	-2
Total New Trips (December 2023)			27	51	78		55	44	99

FCE¹: $T = 0.22 (X) + 18.85$ (34% In/66% Out); FCE²: $T = 0.26 (X) + 23.12$ (56% In/44% Out);

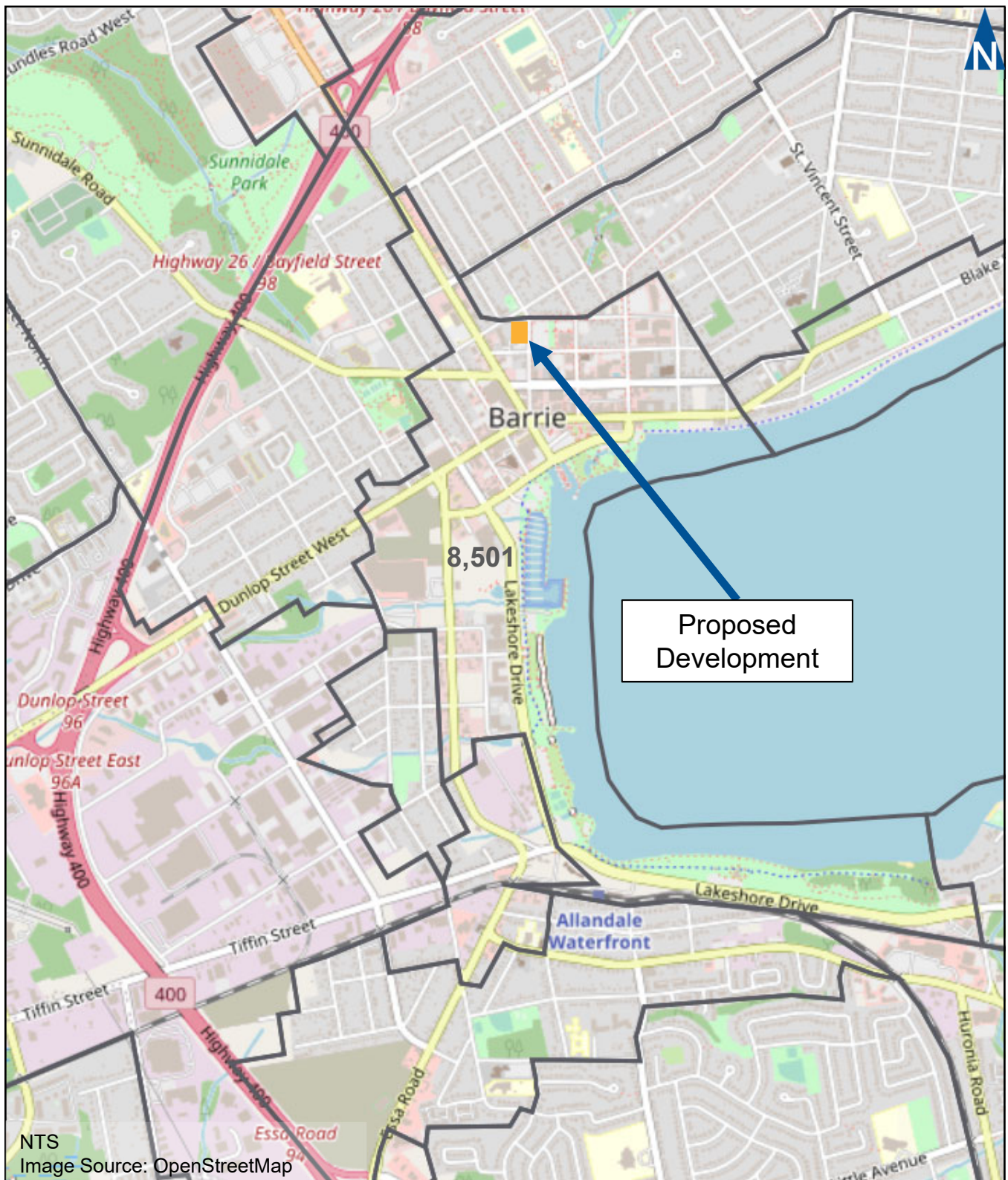
R₁ = 0.84 per 1,000 SF of GLA (62% In/38% Out); R₂ = 3.40 per 1,000 SF of GLA (48% In/52% Out).

In comparison to the previous development plan assessed and approved as part of the ZBA application, the additional eight (8) residential dwelling units and the minor increase of 8 SM (89 SF) GFA for the ground floor commercial-retail space, results in an additional three (3) under both the weekday AM and PM peak hours.

In terms of magnitude, the additional three (3) trips translates to approximately one additional vehicle every 20 minutes over the peak hour. This amount of additional site traffic is considered imperceptible on the network and is not anticipated to result in any adverse impact to the adjacent transportation network.

Given the low volume of additional site traffic generated by the latest development plan (less than five vehicle trips), the previous operational analysis remains applicable.





Subject Site Traffic Analysis Zone

17 Sophia St E; 3, 5, 7, 11 McDonald St; 58-60 Clapperton St – Transportation Impact and Parking Study
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Figure 4.2

4.3 Trip Distribution and Assignment

The 2016 TTS data was reviewed in combination with existing travel patterns to determine the distribution for the site-generated trips. TTS data was queried for all inbound and outbound trips between TAZ 8501 and the TTS defined regional municipalities between 6:00 – 9:00 AM and 4:00 – 7:00 PM. **Table 4.4** summarizes the estimated trip distribution.

TABLE 4.4: ESTIMATED PEAK HOUR TRIP DISTRIBUTION

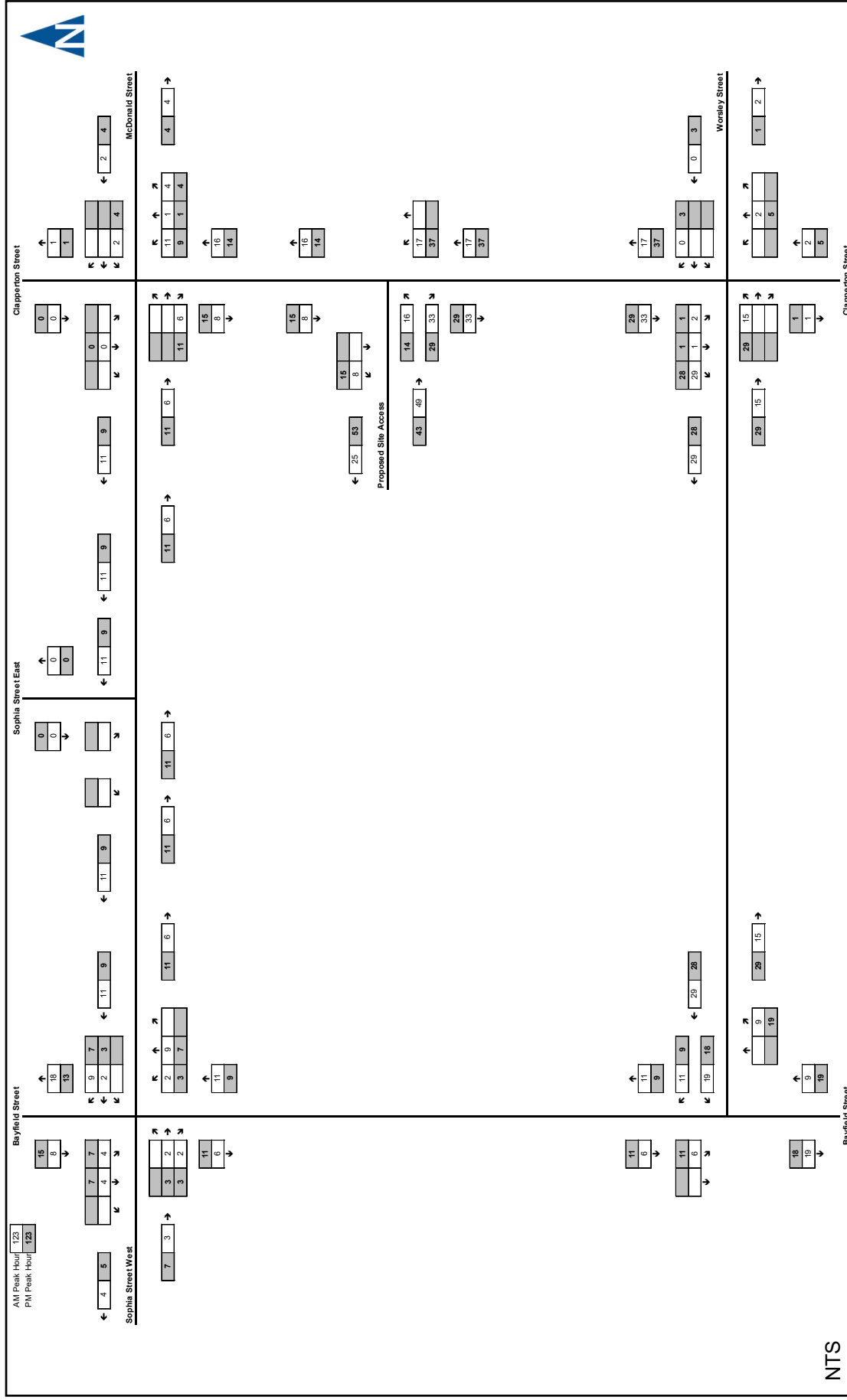
Direction	Route	AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
East	Sophia Street	1%	0%	1%	0%
	McDonald Street	6%	9%	8%	9%
	Worsley Street	2%	4%	5%	2%
West	Sophia Street	13%	8%	13%	12%
North	Bayfield Street	33%	36%	28%	31%
	Clapperton Street	1%	3%	0%	2%
South	Bayfield Street	36%	38%	35%	43%
	Clapperton Street	8%	2%	10%	1%
Total		100%	100%	100%	100%

The site trips were assigned to the transportation network in accordance with the trip distribution. The following is noted:

- ▶ Trips to/from the north via Bayfield Street assumed 50% would utilize Sophia Street and 50% would utilize Worsley Street; and
- ▶ Trips to/from the west via Sophia Street assumed 50% would utilize Sophia Street and 50% would be routed via Worsley Street.

Figure 4.3 illustrates the site trip assignments for the weekday AM and PM peak hours. Slight differences with respect to the trip generation estimates are due to rounding.





5 Future Forecasts

The assessment of future traffic conditions includes estimates of future background and total traffic volumes and the analyses for the 2024, 2029 and 2034 horizons, representing the assumed build-out year, and five and ten years beyond full build-out, respectively.

The future traffic volumes in the vicinity of the development will consist of increased non-site traffic volumes (background traffic), traffic generated by other developments, and the site traffic generated by the proposed development.

5.1 Future Background Traffic

5.1.1 General Background Growth

City staff advised compound growth rates of 3.0% per annum for Bayfield Street and 0.5% per annum for the rest of the study roadways to be applied to estimate background growth.

5.1.2 Other Area Developments

Per the direction of City staff, the following other area background developments within vicinity of the subject site have been accounted for as part of the background traffic forecasts:

- ▶ 113 & 117 Bayfield Street and 6, 8, & 12 Sophia Street East, City of Barrie (Proposed residential development);
- ▶ 136 & 112 Bayfield Street, 14 Sophia Street West, and 113 & 115 Maple Avenue, City of Barrie (Proposed mixed-use residential development);
- ▶ 55-57 McDonald Street, 61-67 Owen Street, and 70-78 Worsley Street, City of Barrie (Proposed mixed-use residential development); and
- ▶ 50 Worsley Street, City of Barrie (Proposed YMCA Community Centre).

Table 5.1 summarizes development statistics and information source for other area developments accounted for within the traffic forecasts.



TABLE 5.1: OTHER AREA DEVELOPMENTS

#	Site Location	# of Units	Commercial/ Retail GFA (SF)	YMCA GFA (SF)	Source
1	113 & 17 Bayfield Street	108	-	-	Transportation Impact and Parking Study, Paradigm, April 2020
2	136 & 112 Bayfield Street	480	10,915	-	Traffic Impact Study, JD Northcote Engineering Inc., May 2020
3	55-57 McDonald Street	278	10,226	-	City of Barrie Website
4	50 Worsley Street	-	-	4,521 ¹	Per City of Barrie Staff direction

¹ YMCA GFA (4,521 SF) was estimated based on GoogleMaps satellite aerial imagery.

It should be noted traffic impact study reports were not available for the developments of 55-57 McDonald Street and 50 Worsley Street (Proposed YMCA); therefore, vehicular trip generation for these other area background developments were estimated based on the development statistics using data from the ITE Trip Generation Manual, 11th Edition.

Appendix D contains the components of the background traffic forecasts for reference.

Figure 5.1, Figure 5.2, and Figure 5.3 illustrate the 2024, 2029 and 2034 background traffic forecasts for the AM and PM peak hours, respectively.

5.2 Future Total Traffic

The background traffic forecasts were summed with the site traffic assignments to develop the total traffic forecasts.

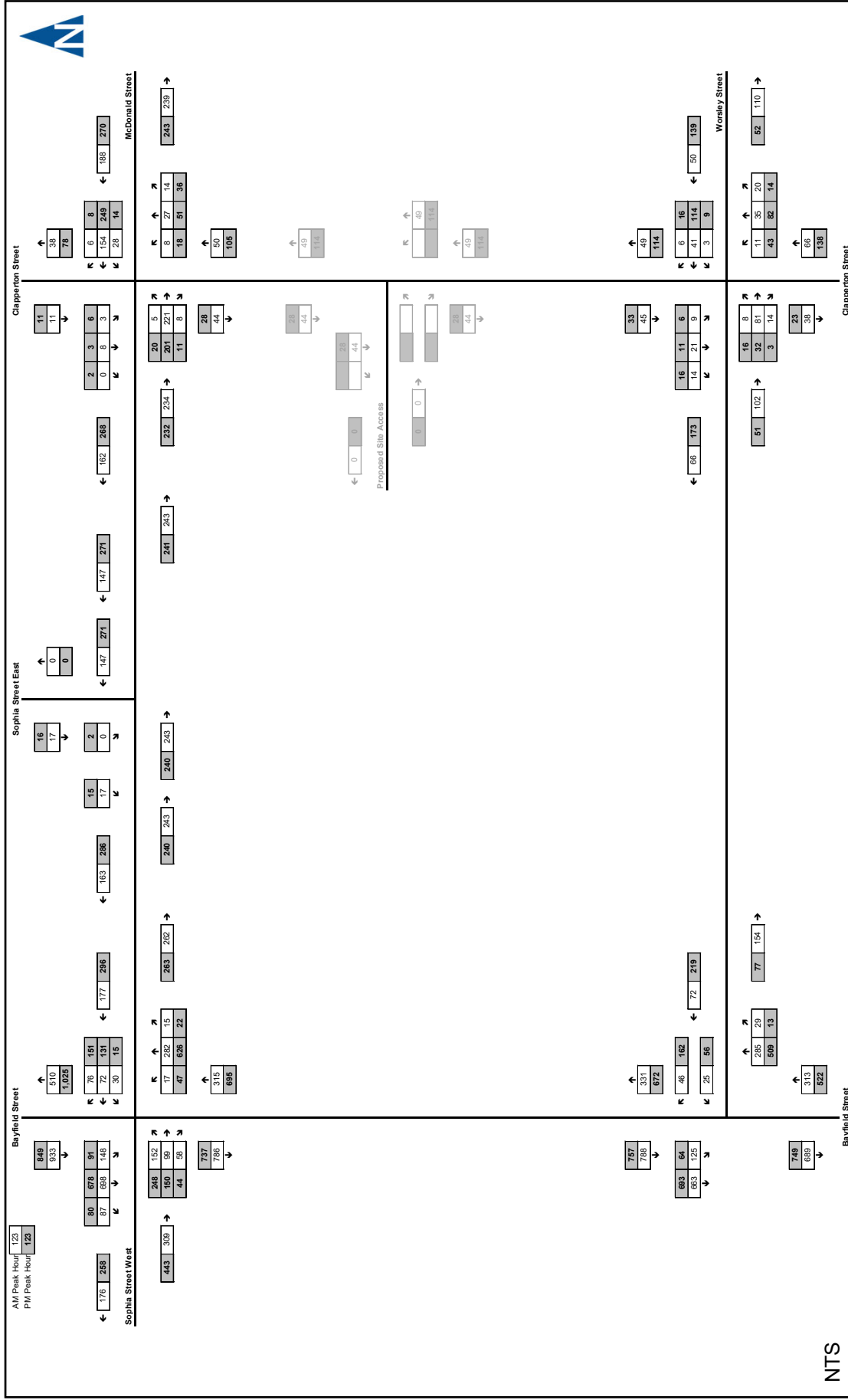
Figure 5.4, Figure 5.5, and Figure 5.6 illustrate the 2024, 2029 and 2034 total traffic forecasts for the AM and PM peak hours, respectively.



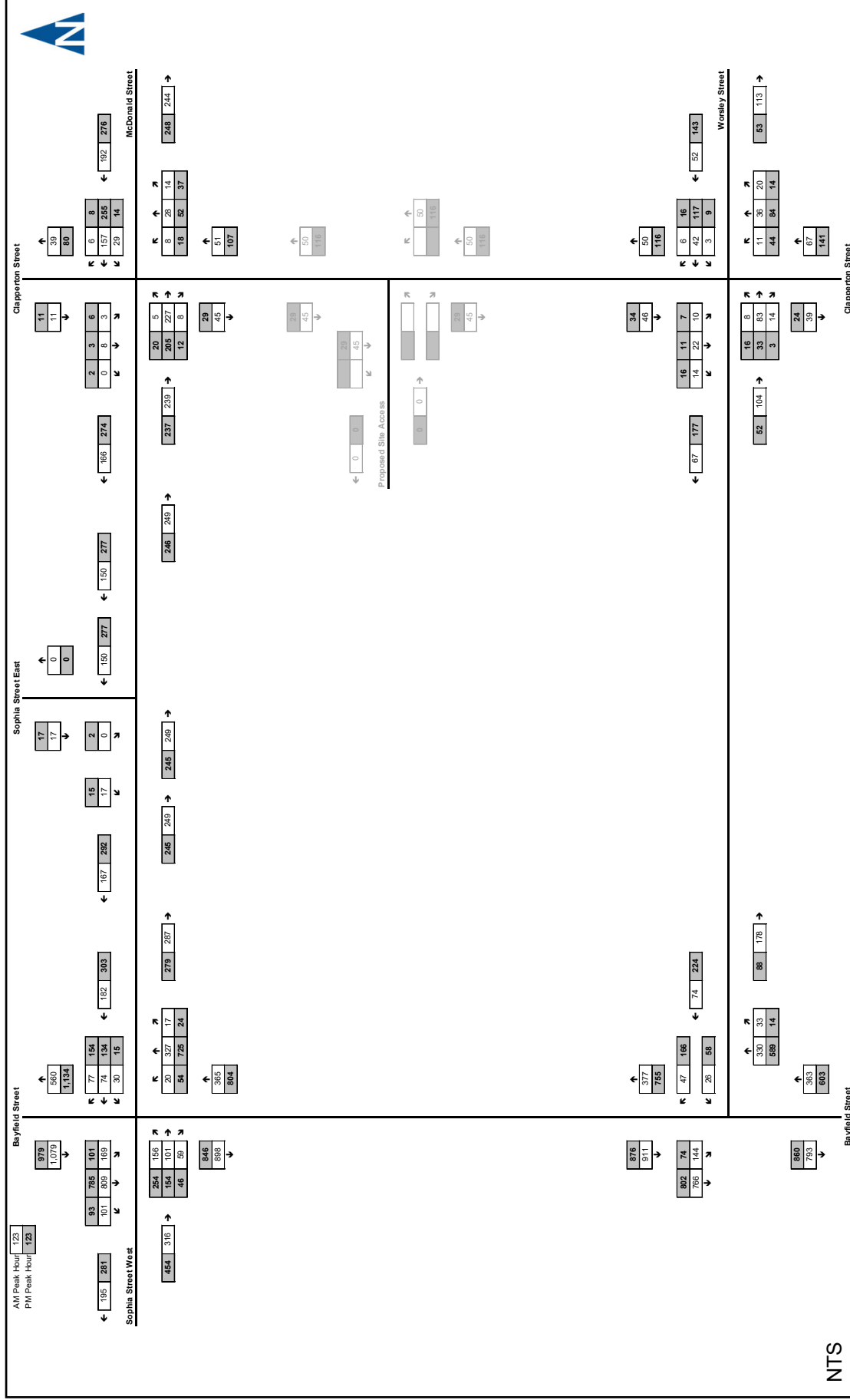
5.3 Future Transportation Network Improvement

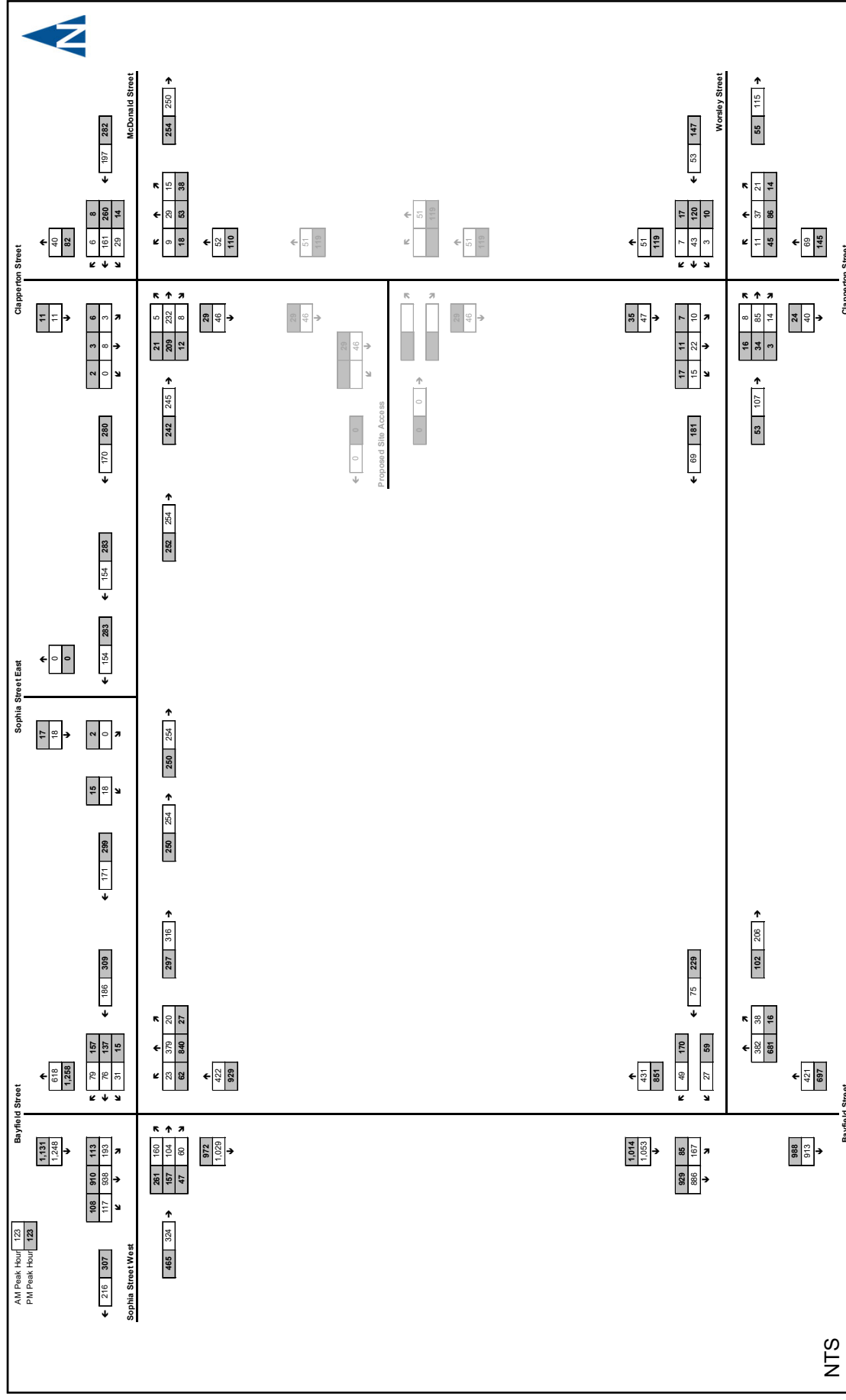
City staff confirmed at the onset of this study there are no future road network improvements proposed within the study area under the future horizon years; therefore, the existing road network and intersection lane configurations are utilized for all future traffic operational analyses.

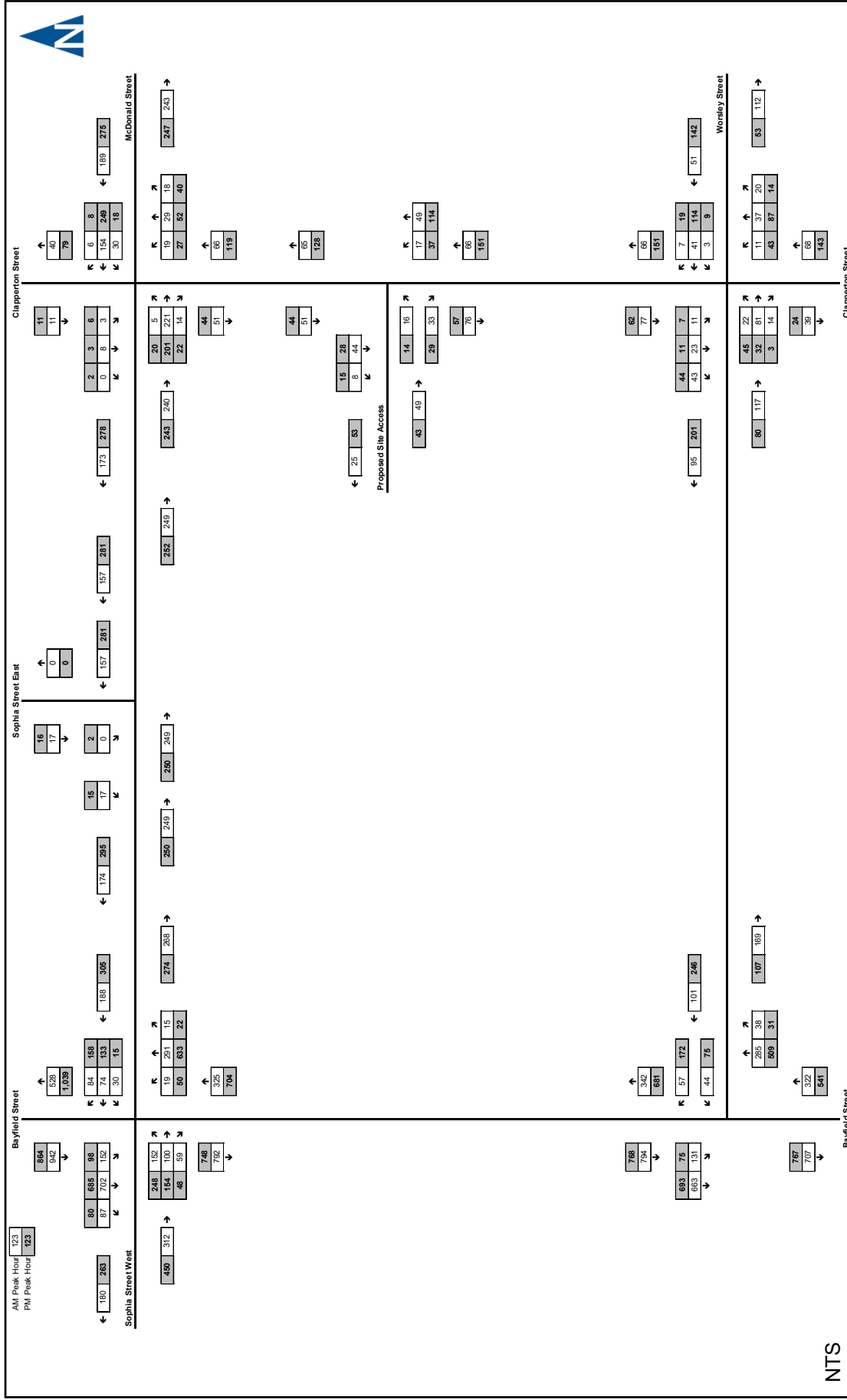




2024 Background Traffic Volumes

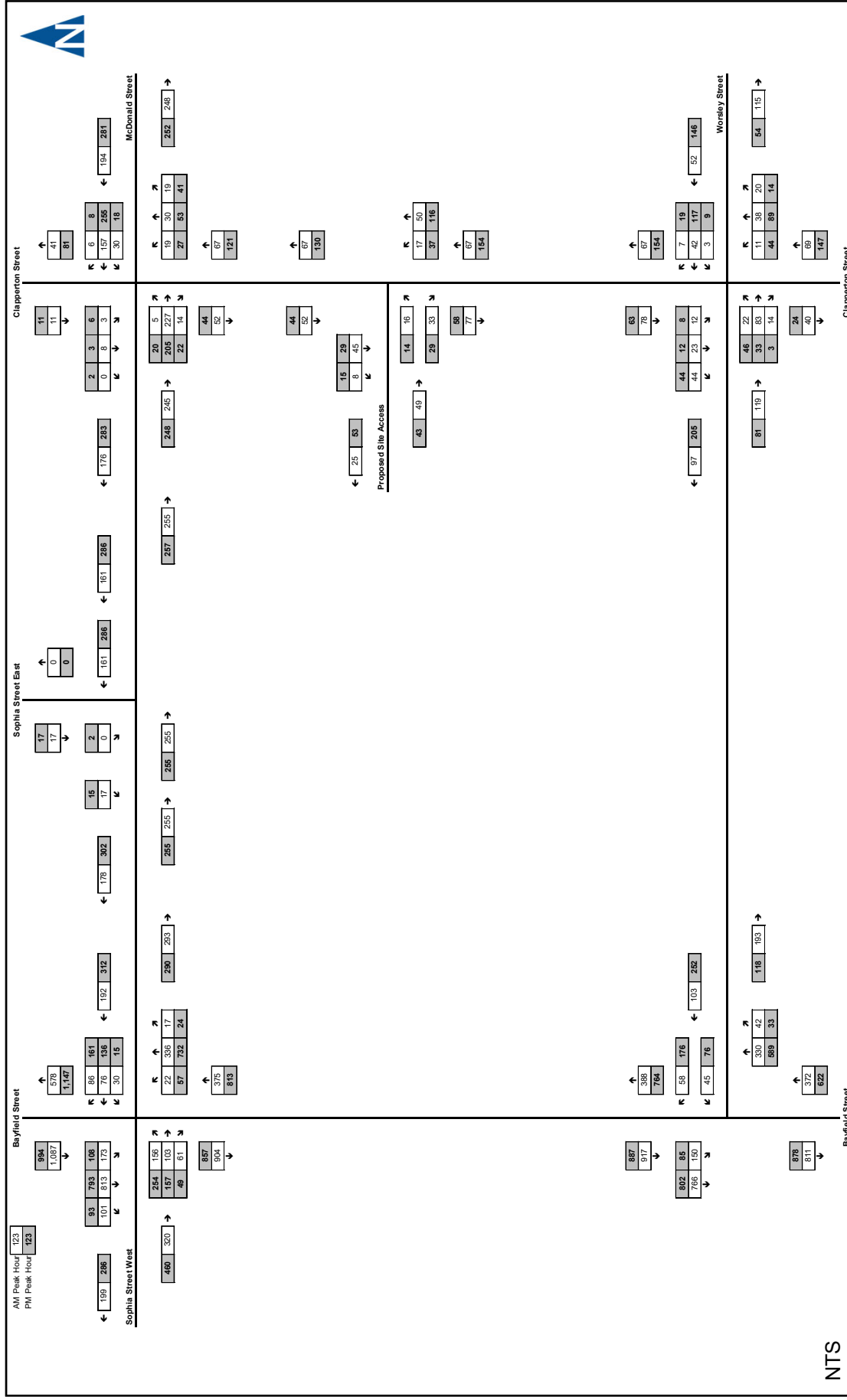




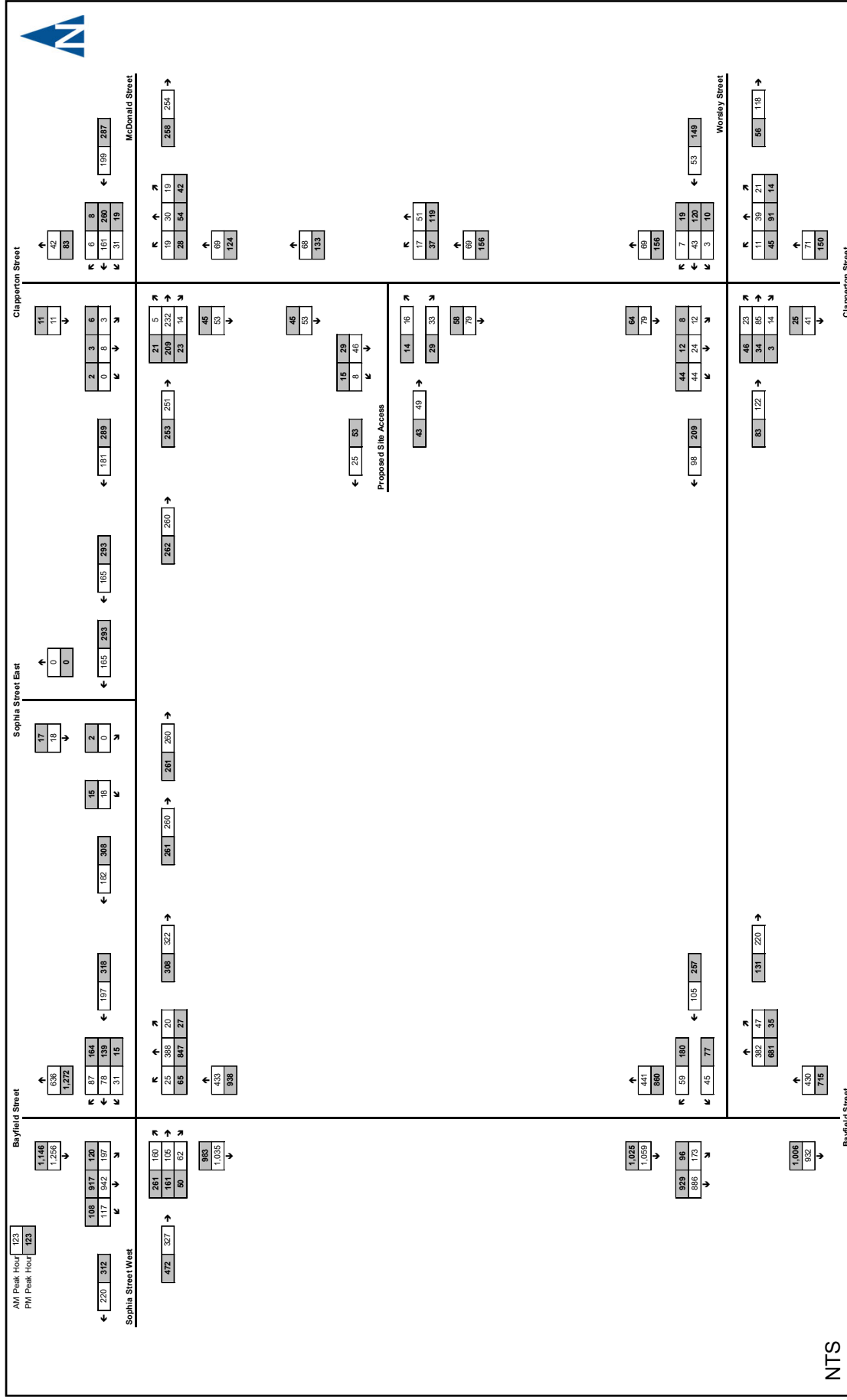


2024 Total Traffic Volumes

Figure 5.4



2029 Total Traffic Volumes



2034 Total Traffic Volumes

Figure 5.6

6 Transportation Impact Assessment

6.1 Future Background Traffic

The study area intersections under the 2024, 2029 and 2034 background traffic conditions (without subject development) were analyzed using Synchro following the same methodology as under existing conditions, with the exceptions of:

- ▶ Heavy vehicle percentages of 5.0% for through movements on arterial roads (i.e., Bayfield Street);
- ▶ Peak hour factors (PHFs) of 0.92 for all movements; and
- ▶ Optimization of signal timing splits and phasing within existing cycle lengths at signalized intersections to provide the best possible traffic operations for all movements.

Table 6.1, Table 6.2 and Table 6.3 summarize the background peak hour traffic intersection operations including the LOS, vehicle delays, v/c ratios and 95th percentile queue lengths for the 2024, 2029, and 2034 horizon years, respectively. Any movements identified as critical movements are highlighted within the results table. **Appendix E** contains the detailed analysis reports for reference.

The results indicate the study area intersections are forecast to operate at acceptable levels of service and within capacity under the AM and PM peak hours up to the 2034 horizon.

The exception would be the at the intersection of Bayfield Street and Worsley Street. The westbound shared left/right movement is forecast to operate at LOS E and F during the PM peak hour under the 2029 and 2034 horizons, respectively; however, this is not considered a critical issue as the movement is reported to be operating within capacity.

The 95th percentile queue lengths were checked for all turn lanes against provided storage, and queue lengths for through movements were also checked. Similar to the base year condition, a storage lane deficiency is identified for the eastbound left turn movement at the Bayfield Street and Sophia Street intersection during the PM peak hour under future horizons. The storage deficiency is approximately 6-15 metres which equates to 1-2 vehicles (assuming a vehicle length of 7.0 metres). This spillback issue is considered minor. Furthermore, all reported 50th percentile average queues would be accommodated within the existing storage and taper.



TABLE 6.1: 2024 BACKGROUND PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	C	33	0.66	41	D	37	0.83	63
		Thru/Right	C	25	0.37	33	B	19	0.29	39
	WB	Left	C	23	0.12	11	C	29	0.07	8
		Thru/Right	C	24	0.30	26	D	43	0.76	70
	NB	Left	B	11	0.06	6	B	19	0.20	16
		Thru-Thru/Right	B	12	0.20	26	C	21	0.52	73
	SB	Left	A	6	0.24	20	B	14	0.34	19
		Thru-Thru/Right	A	8	0.40	52	B	16	0.49	72
	Overall Intersection		B	14	0.50	-	C	23	0.70	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.02	1	B	10	0.03	1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.02	<1
	WB	Left/Thru/Right	A	1	0.02	1	A	1	0.01	<1
	NB	Left/Thru/Right	B	13	0.10	3	B	15	0.23	7
	SB	Left/Thru/Right	B	13	0.03	1	B	15	0.03	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	B	15	0.17	5	D	28	0.61	31
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	4	0.11	3	A	3	0.07	2
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.13	14	A	8	0.07	15
	WB	Left/Thru/Right	A	8	0.06	14	A	8	0.18	16
	NB	Left/Thru/Right	A	8	0.08	15	A	9	0.19	17
	SB	Left/Thru/Right	A	7	0.06	14	A	8	0.04	13

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



TABLE 6.2: 2029 BACKGROUND PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	C	33	0.68	43	D	37	0.83	68
		Thru/Right	C	25	0.38	33	B	19	0.29	40
	WB	Left	C	23	0.12	11	C	29	0.07	8
		Thru/Right	C	24	0.30	27	D	45	0.78	73
	NB	Left	B	12	0.09	7	C	22	0.30	20
		Thru-Thru/Right	B	12	0.23	29	C	23	0.60	88
	SB	Left	A	6	0.29	22	B	15	0.45	21
		Thru-Thru/Right	A	8	0.47	64	B	18	0.58	89
	Overall Intersection		B	14	0.56	-	C	25	0.76	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.02	1	B	10	0.03	1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.02	<1
	WB	Left/Thru/Right	A	1	0.02	1	A	1	0.01	<1
	NB	Left/Thru/Right	B	13	0.11	3	B	15	0.24	8
	SB	Left/Thru/Right	B	13	0.03	1	C	15	0.03	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	C	17	0.20	6	E	41	0.74	45
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	4	0.14	4	A	3	0.09	2
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.13	17	A	8	0.07	14
	WB	Left/Thru/Right	A	8	0.07	14	A	8	0.19	16
	NB	Left/Thru/Right	A	8	0.09	14	A	9	0.19	18
	SB	Left/Thru/Right	A	8	0.06	13	A	8	0.04	13

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



TABLE 6.3: 2034 BACKGROUND PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	C	34	0.69	44	D	37	0.83	72
		Thru/Right	C	25	0.38	34	B	19	0.29	41
	WB	Left	C	23	0.13	11	C	29	0.07	8
		Thru/Right	C	24	0.31	28	D	47	0.80	76
	NB	Left	B	12	0.12	8	C	31	0.47	27
		Thru-Thru/Right	B	12	0.27	34	C	26	0.71	108
	SB	Left	A	7	0.34	25	C	21	0.62	24
		Thru-Thru/Right	A	9	0.55	79	C	20	0.68	112
	Overall Intersection		B	14	0.62	-	C	27	0.82	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.02	1	B	10	0.03	1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.02	<1
	WB	Left/Thru/Right	A	1	0.02	1	A	1	0.01	<1
	NB	Left/Thru/Right	B	13	0.12	3	B	15	0.25	8
	SB	Left/Thru/Right	B	14	0.03	1	C	15	0.03	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	C	20	0.25	8	F	76	0.92	67
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	4	0.17	5	A	3	0.11	3
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.14	15	A	8	0.07	14
	WB	Left/Thru/Right	A	8	0.07	14	A	8	0.19	18
	NB	Left/Thru/Right	A	8	0.09	16	A	9	0.19	18
	SB	Left/Thru/Right	A	8	0.06	13	A	8	0.05	13

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



6.2 Future Total Traffic

To assess the traffic operating conditions for the future weekday AM and PM total traffic forecasts, an operational analysis was undertaken using the same methodology, parameters, lane arrangements, and traffic control devices as in the analysis of background conditions. The exception being the inclusion and assessment of the proposed site access connection at Clapperton Street.

Table 6.4, Table 6.5, and Table 6.6 summarize the peak hour total traffic intersection operations including the LOS, vehicle delays, v/c ratios and 95th percentile queue lengths for the 2024, 2029 and 2034 horizons, respectively. Any movements identified as critical movements are highlighted within the results table. **Appendix F** contains the detailed analysis reports for reference.

With the addition of the site generated traffic, the study area intersections are forecast to operate similar to background conditions up to the 2034 horizon with the proposed development, albeit slightly exacerbated. All intersections and traffic movements are forecast to operate within capacity.

The exception would be the westbound shared left/right movement at the Bayfield Street and Worsley Street intersection under the 2034 horizon where this movement is forecast to operate over-capacity. Further discussion and analysis is provided in the subsequent section.

The site access intersection on Clapperton Street is reported to operate at good levels of service and well within capacity during both the AM and PM peak hours under future horizons. Based upon reported traffic operations and forecast turning volumes, no auxiliary turn lanes along Clapperton Street are determined to be warranted.

The 95th percentile queue lengths were checked for all turn lanes against provided storage, and queue lengths for through movements were also checked. Similar to the future background condition, storage lane deficiency is identified for the eastbound left turn movement at the Bayfield Street and Sophia Street intersection during the PM peak hour. The storage deficiency is approximately 10-20 metres which equates to 2-3 vehicles (assuming a vehicle length of 7.0 metres). This spillback issue is considered minor. Furthermore, the reported 50th percentile average queues would be accommodated within the existing storage and taper.



TABLE 6.4: 2024 TOTAL PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	C	33	0.67	41	D	39	0.84	67
		Thru/Right	C	25	0.37	33	B	19	0.30	41
	WB	Left	C	23	0.12	11	C	29	0.07	8
		Thru/Right	C	25	0.31	28	D	44	0.78	73
	NB	Left	B	11	0.07	7	B	19	0.22	17
		Thru-Thru/Right	B	12	0.21	26	C	22	0.52	74
	SB	Left	A	6	0.25	20	B	14	0.37	20
		Thru-Thru/Right	A	8	0.41	53	B	16	0.50	73
	Overall Intersection		B	14	0.51	-	C	24	0.71	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.02	1	A	8	0.02	<1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.02	<1
	WB	Left/Thru/Right	A	1	0.03	1	A	1	0.02	<1
	NB	Left/Thru/Right	B	13	0.14	4	C	15	0.27	9
	SB	Left/Thru/Right	B	13	0.03	1	C	15	0.03	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	C	17	0.27	9	E	39	0.74	46
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	4	0.12	3	A	3	0.08	2
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.15	15	A	8	0.11	15
	WB	Left/Thru/Right	A	8	0.07	13	A	9	0.19	17
	NB	Left/Thru/Right	A	8	0.09	16	A	9	0.20	18
	SB	Left/Thru/Right	A	8	0.10	13	A	8	0.08	13
Proposed Site Access & Clapperton Street <i>Unsignalized</i>	EB	Left/Right	A	9	0.06	1	A	9	0.05	1
	NB	Left/Thru	A	2	0.01	<1	A	2	0.03	1
	SB	Thru/Right	Unopposed Movement				Unopposed Movement			

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



TABLE 6.5: 2029 TOTAL PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	C	35	0.69	43	D	39	0.84	71
		Thru/Right	C	25	0.39	34	B	19	0.30	41
	WB	Left	C	23	0.13	11	C	29	0.07	8
		Thru/Right	C	25	0.33	29	D	46	0.80	75
	NB	Left	B	12	0.09	7	C	23	0.32	21
		Thru-Thru/Right	B	12	0.24	30	C	24	0.61	89
	SB	Left	A	6	0.30	23	B	16	0.48	22
		Thru-Thru/Right	A	8	0.47	64	B	18	0.59	90
	Overall Intersection		B	14	0.57	-	C	25	0.77	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.02	1	A	8	0.02	<1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.02	<1
	WB	Left/Thru/Right	A	1	0.03	1	A	1	0.02	<1
	NB	Left/Thru/Right	B	13	0.15	4	C	16	0.28	9
	SB	Left/Thru/Right	B	14	0.03	1	C	16	0.03	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	C	20	0.32	11	F	65	0.89	66
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	4	0.14	4	A	3	0.10	3
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.15	16	A	8	0.12	15
	WB	Left/Thru/Right	A	8	0.07	14	A	9	0.20	16
	NB	Left/Thru/Right	A	8	0.09	15	A	9	0.20	17
	SB	Left/Thru/Right	A	8	0.10	13	A	8	0.08	14
Proposed Site Access & Clapperton Street <i>Unsignalized</i>	EB	Left/Right	A	9	0.06	1	A	9	0.05	1
	NB	Left/Thru	A	2	0.01	<1	A	2	0.03	1
	SB	Thru/Right	Unopposed Movement				Unopposed Movement			

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



TABLE 6.6: 2034 TOTAL PEAK HOUR TRAFFIC OPERATIONS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Sophia Street <i>Signalized</i>	EB	Left	D	36	0.71	44	D	41	0.86	76
		Thru/Right	C	25	0.39	35	B	20	0.31	43
	WB	Left	C	23	0.13	11	C	30	0.07	8
		Thru/Right	C	25	0.33	30	D	50	0.82	81
	NB	Left	B	12	0.12	8	C	33	0.50	29
		Thru-Thru/Right	B	13	0.28	35	C	28	0.73	109
	SB	Left	A	7	0.35	26	C	21	0.61	28
		Thru-Thru/Right	A	9	0.55	79	C	20	0.68	113
	Overall Intersection		B	14	0.63	-	C	28	0.83	-
Sophia Street & McDonald Street <i>Unsignalized</i>	EB	Thru	Unopposed Movement				Unopposed Movement			
	WB	Thru	Unopposed Movement				Unopposed Movement			
	SB	Left/Right	A	9	0.02	1	A	8	0.02	1
McDonald Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	<1	0.00	<1	A	1	0.02	<1
	WB	Left/Thru/Right	A	1	0.03	1	A	1	0.02	<1
	NB	Left/Thru/Right	B	14	0.15	4	C	16	0.29	10
	SB	Left/Thru/Right	B	14	0.03	1	C	16	0.03	1
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left/Right	D	25	0.39	14	F	135	1.12	98
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	5	0.17	5	A	4	0.13	3
Worsley Street & Clapperton Street <i>Unsignalized</i>	EB	Left/Thru/Right	A	8	0.16	16	A	8	0.12	14
	WB	Left/Thru/Right	A	8	0.07	14	A	9	0.20	49
	NB	Left/Thru/Right	A	8	0.09	15	A	9	0.21	49
	SB	Left/Thru/Right	A	8	0.10	13	A	8	0.08	19
Proposed Site Access & Clapperton Street <i>Unsignalized</i>	EB	Left/Right	A	9	0.06	1	A	9	0.05	1
	NB	Left/Thru	A	2	0.01	<1	A	2	0.03	1
	SB	Thru/Right	Unopposed Movement				Unopposed Movement			

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



6.3 Sensitivity Analysis

As noted in Section 6.2, a critical movement is identified under the 2034 total conditions. The westbound shared left/right movement at Bayfield Street and Worsley Street is reported to operate at LOS F with a v/c ratio of 1.12 during the PM peak hour.

Upon further investigation of the intersection operations, we believe the reported results represent a worst-case scenario based upon two items, the default critical gap parameter and the westbound approach modelled as a single shared left/right within the operational analysis.

The critical gap parameter (i.e., the minimum acceptable gap for a typical minor road vehicle to make a turn onto major roadways) used in the Synchro analysis is the default value of 6.8 seconds, which is noted to be conservative. Based upon our field investigation, drivers at this location were noted to be slightly aggressive in performing left-turn movements. Our critical gap assessment for field observations reported an acceptable critical gap time of 5.0 seconds by motorists.

Worsley Street provides on-street parking on both sides of the roadway. Based upon the configuration and limits of on-street parking, the westbound approach provides sufficient width to accommodate two vehicles, one left turning and one turning right. Effectively, a two-lane approach on Worsley Street at the T-intersection.

A sensitivity analysis has been conducted to examine the operational performance at Bayfield Street and Worsley Street with the reported critical gap time of 5.0 seconds based upon our field assessment (i.e., critical gap assessment) and with the westbound approach operating with both a left and right approach at Worsley Street.

Table 6.7 and **Table 6.8** summarize the results of the operational analysis at the intersection of Bayfield Street and Worsley Street under 2034 total traffic conditions coded with a critical gap parameter of 5.0 seconds, and the provision of a two-lane westbound approach (left and right turn lanes), respectively. **Appendix G** contains the Synchro analysis outputs for reference.

The results indicate that the intersection and all movements are forecast to operate at acceptable levels of service and within capacity during the AM and PM peak hours under the 2034 total horizon.



TABLE 6.7: 2034 TOTAL PEAK HOUR TRAFFIC OPERATIONS – CRITICAL GAP OF 5.0 SECONDS

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left	C	16	0.26	8	D	34	0.71	43
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	5	0.17	5	A	4	0.13	3

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres

TABLE 6.8: 2034 TOTAL PEAK HOUR TRAFFIC OPERATIONS – TWO-LANE WB APPROACH

Intersection	Approach/Movement		AM Peak Hour				PM Peak Hour			
			LOS ¹	Delay ²	V/C ³	Q ⁴	LOS ¹	Delay ²	V/C ³	Q ⁴
Bayfield Street & Worsley Street <i>Unsignalized</i>	WB	Left	C	21	0.28	9	E	40	0.76	49
		Right	Unopposed Movement				Unopposed Movement			
	NB	Thru/Right	Unopposed Movement				Unopposed Movement			
	SB	Left/Thru-Thru	A	5	0.17	5	A	4	0.13	3

¹ Level of Service; ² Average vehicle delay, seconds; ³ Volume to capacity ratio; ⁴ 95th percentile queue, metres



7 Transportation Demand Management Plan

7.1 Overview

Transportation Demand Management (TDM) refers to policies and programs designed to manage the demands of the transportation network. In North America, TDM is primarily geared towards encouraging alternative transportation modes to the single occupant vehicle (SOV), as opposed to the ongoing expansion of municipal roadway systems. Additionally, TDM also assists in reducing associated parking demands. TDM measures can include policy changes that support a balanced transportation network across all modes, as well as the development of infrastructure that encourages all modes of travel.

TDM policies and programs consider how people's choices of travel mode are affected by factors such as land use patterns, parking availability, parking costs, development design, and the relative cost, convenience, and availability of alternate modes of transportation. Using policies and programs to make active and sustainable transportation more convenient a TDM approach to transportation can deliver long-term environmental sustainability, improve public health, and build more human-scaled, livable cities.

However, TDM initiatives are not strictly confined to development design, and in many cases rely on the broader municipal transportation network to be successful. This means that TDM initiatives at the development level complement the municipal transportation network, and together provide meaningful transportation options for the end users of a development.

A comprehensive TDM plan has been developed for the proposed development.

7.2 Existing and Future TDM Opportunities

The built form and use of the lands surrounding the subject site are primarily oriented to automobile travel; however, a TDM Plan can assist in reducing SOV trips, which can in turn reduce the number of site-generated vehicle trips, and the demand for vehicle parking.

TDM includes programs, policies, and infrastructure that promote a shift in thinking towards a multi-faceted approach to transportation planning. With proper implementation, TDM initiatives can encourage



transit, cycling and walking modes as viable attractive alternatives to the private automobile.

The study area includes existing infrastructure which could be further enhanced or modified to support TDM for the subject site. The following subsections highlight existing and future infrastructure or programs to support TDM.

7.2.1 Cycling

As noted under existing conditions, no dedicated cycling facilities are provided within proximity of the study area.

Within proximity to the study area, the City's Transportation Master Plan Cycling and Multi-Use Trail Network Map (Figure ES-2) identifies proposed buffered bike lanes along Ross Street, Collier Street, and Mulcaster Street in proximity to the subject site.

7.2.2 Walking

As stated in Section 3.3, sidewalks are currently provided within the subject study area and the municipal network is relatively well-connect and continuous.

Within proximity to the study area, the City's Transportation Master Plan Sidewalk and Multi-Use Trail Network Map (Figure ES-3) identifies proposed sidewalk along Drury Lane, McDonald Street between Sophia Street E and Clapperton Street, and along Sophia Street E between Clapperton Street and Peel Street to complete the network.

7.2.3 Transit

As stated in Section 3.2, the subject site is currently served by five transit routes. The subject site provides local transit connections as well as opportunities for inter-regional travel via rail transit.

7.3 Proposed TDM Measures and Checklist

TDM strategies are aimed at influencing land use patterns, development design, parking availability and cost, and/or the relative cost, convenience and availability of other travel modes to reduce reliance on motor vehicles for travel. These strategies can be divided into two categories:

- ▶ Pre-occupancy: Measures implemented in the design and construction of the development; and



- **Post-occupancy:** Measures implemented once the development is occupied and operational.

Measures taken pre-occupancy can influence how attractive, convenient, and safe travel modes other than the SOV will be once the site is developed and occupied. At this stage, the site can be designed to better facilitate travel by walking, cycling, and transit, while ensuring sufficient vehicle parking is provided to meet but not exceed demand. The local municipality (City of Barrie) also has greater influence on their implementation of post-occupancy measures.

Offering incentives after the development is completed also influences travel behaviour. Measures in this category include subsidies to use transit, provision of trip-end facilities such as bicycle parking, and information about where and how to use different travel modes.

The following sections outline the TDM measures proposed and planned for the site and are categorized into pre-occupancy and post-occupancy initiatives. **Table 7.1** summarizes the measures and denotes responsibility. The TDM measures identified are focused on residents of the proposed development.

TABLE 7.1: PROPOSED TDM INITIATIVES

Measure	Description	Responsibility
Planning and Design	Locate building closer to the street and orient entrances toward the street.	Developer
Walking and Cycling	Connect building, multi-use trails and sidewalks with internal pathways. Provision of long-term and short-term bicycle parking on-site and bike repair stations. Install pedestrian and cyclist-oriented pavement markings and signing on site where applicable. Include lighting details on external pedestrian walkways.	Developer
Transit Infrastructure	Increase transit service frequency and coverage near the development	City of Barrie Transit
Transit Usage	Incentives to encourage transit usage through the provision of prepaid monthly transit passes.	Developer
Vehicle Parking	Unbundle parking spaces from units. Reduced parking supply and provide only an adequate amount.	Developer



Education/ Promotion and Incentives	Monitor emerging programs to educate and promote TDM, including provision of prepaid transit passes to purchasers of new units, and consultation with Smart Commute for a membership to provide TDM services. The Developer shall commit to a TDM communications strategy to effectively delivery transit incentives and information packages to new residents.	Developer
Informational/ Education Display Board	Install and regularly update an informational/educational display board in a common lobby area providing information for Barrie Transit and walking, cycling, and multi-use trail maps.	Developer

7.3.1 Planning and Design (Pre-Occupancy)

The development is a high-density residential land use providing a total of 260 dwelling units provided within a 26-storey building. Ground floor commercial retail space is also proposed.

The development is proposed to be located close to the street frontage with entrances oriented towards to the street to better support and promote TDM measures.

7.3.2 Walking and Cycling (Pre-Occupancy)

Pedestrian accessibility for a development is essential to ensure that those that can walk, have accessible pedestrian connections. Proper pedestrian connections from the surrounding community to the site should be available to ensure safety and to enhance the experience of those that choose to walk. Providing a safe and attractive environment for residents/visitors who choose to walk to/from the development will help reduce vehicle usage and parking requirements.

The site will provide direct sidewalk connections to the principal entrance of the building. With sufficient on-site pedestrian infrastructure planned, pedestrian connectivity to the public sidewalk network will be adequately provided. It is noted that provisions for a future pedestrian connection to the south has been provided and accounted for. With development of the site, existing pedestrian infrastructure along the site frontages will be maintained.



To further enhance the attractiveness of walking, proper lighting would be provided on site, and near all building entrances and exits. Weather protection at the proposed building's main entrance and adjacent sidewalk would be provided either by a building overhang, or a stand-alone structure as an additional pedestrian enhancement. The future landscaping plan also considers enhancing the common areas to include pedestrian amenities such as benches or seating areas.

The City's Zoning By-law currently does not state minimum requirements for bicycle parking. Regardless that there are not bicycle parking requirements, long-term and short-term bicycle parking provisions are provided recognizing their importance to promoting this travel mode.

Long-term and short-term bicycle parking is proposed to be provided at the rates of 1.52 and 0.10 spaces per dwelling unit, respectively. A total of 422 bicycle parking spaces are proposed. 26 short-term spaces will be provided with a portion at-grade located near building entrances and a portion indoors, and 396 long-term spaces will be provided within a secure area of the building interior.

In addition to the bicycle parking provisions, two bicycle repair stations will also be provided in proximity to where bicycle parking will be located. A repair station will offer cyclists a way to fix and maintain their equipment without relying on personal tools or a bike shop. Necessary tools would include the provision of screwdrivers, chain tools, and air pumps to keep cyclists moving. The provision of a repair station makes a strong statement about a 'cycle-friendly' community and further encourages this mode of transportation.

Given the recent surge and popularity in micro-mobility (i.e., electric bicycles and electric scooters), the over-provision of long-term bicycle parking supports and promotes micro-mobility as a viable alternative travel mode. That is, residents would be able to have both a traditional pedal bicycle for recreational use, and as well have the opportunity to store/park an electric bicycle/scooter for which they may utilize as their alternative to a car for longer distance travel.

7.3.3 Transit (Pre-Occupancy and Post-Occupancy)

The availability of convenient and desirable transit options can reduce the number of personal automobile trips. As previously discussed, public transportation is provided via five Barrie Transit routes, and additional connections at the Barrie Downtown Bus Terminal located approximately 500 metres southwest of the development on Maple Avenue. These routes and transit hub provide good connectivity to the broader transit network and key destinations within the City, including



recreational facilities and shopping. Residents can access any of these bus routes within a 200 metre radius of the site, or a two-minute walk.

To further enhance the bus stops near the site, it is recommended that seating (benches), shelter, illumination, and transit schedules be provided. Information about transit services could also be provided within the main lobby of the building for residents and visitors.

To encourage residents to utilize the transit infrastructure surrounding the development site, one pre-paid adult monthly transit pass shall be provided for each residential unit.

By providing transit incentives to purchases of new residential units through pre-loaded transit passes, in addition to supplemental information of available transit options, this will further encourage and promote a shift away and the reduction of the use of the personal automobile.

7.3.4 Vehicle Parking (Pre-Occupancy)

TDM measures aim to reduce automobile ownership and private vehicle trips, thereby reducing the need for an oversupply of parking with the intent of encouraging the use of other forms of transportation. However, a parking supply should not be reduced to a point in which significant parking issues are created.

Managing parking supply helps to reduce the undesirable impacts of parking demand on local and regional traffic levels and can result in positive impacts on community livability and design.

With this type of development, there are opportunities to reduce vehicular parking requirements. As previously noted, the subject site is well-served by transit options readily available and accessible for building residents and their visitors.

A reduced parking provision in comparison to the municipal Urban Growth Centre requirement is proposed. Further justification regarding the adequacy of the parking supply is discussed in the Parking Review section.

Parking spaces will be unbundled from residential units. That is, separating the cost of parking from the cost of each residential unit. This will make visible and often-overlooked cost of owning and driving a vehicle and will encourage residents to use more sustainable modes of transportation. Additionally, ownership of a dwelling unit will be more attractive to prospective residents who do not own or who plan not to own a vehicle.



7.3.5 Wayfinding and Travel Planning (Post-Occupancy)

The location and nature of the proposed development is favorable to the placement of wayfinding signs. The provision of proper directional signage and accompanying illumination will create and foster an environment attractive to pedestrians and cyclists. All pedestrian connections shall be clearly delineated and illuminated.

7.3.6 Education/Promotion and Incentives (Post-Occupancy)

The applicant/future property management company will provide information on available travel options including active transportation (cycling and walking) and transit to residents.

A communications strategy will be developed to effectively deliver the information and distribute pre-paid transit incentives to residents.

7.3.7 Informational/Education Display Board (Post-Occupancy)

The applicant/future property management company will provide an informational/education display board in a common area for residents and visitors to view, which could present information on Barrie Transit bus routes, walking distances to major destinations/sites in the City including the Downtown Barrie Bus Terminal, parks and trails, etc.

7.3.8 TDM Checklist

Table 7.2 summarizes the TDM initiatives and strategies applicable to this proposed development.

TABLE 7.2: TDM CHECKLIST

TDM Measure	17 Sophia Street E; 3, 5, 7, 11 McDonald Street; 58-60 Clapperton Street	
	Applicable	Responsibility
Transit Incentives (i.e., pre-paid monthly transit pass)	Yes	Applicant
Information Packages	Yes	
TDM Communication Strategy	Yes	
Pedestrian Connections	Yes	Applicant
Cycling Connections	Yes	
Pedestrian/Cycling Connections to Transit Facilities	Yes	



Internal Pedestrian Circulation	Yes	
Bicycle Parking	Yes	
Bicycle Repair Station	Yes	
Illumination of Pedestrian/Cycling Connections	Yes	
Parking Reduction	Yes	
Informational Display	Yes	
Membership with Smart Commute or similar organization	Yes	



8 Parking Review

8.1 Development Overview

Based on the latest site plan concept, the proposed development consists of a total of 260 residential units within a 26-storey building. The dwelling unit breakdown is as follows:

- ▶ One-bedroom: 147 units; and
- ▶ Two-bedroom: 113 units.

In addition to the residential dwelling component 265 SM (2,850 SF) Gross Floor Area (GFA) of commercial/retail is proposed on the ground floor of the building.

8.1.1 Parking Provisions

A total of 176 physical parking spaces would be provided on-site. Parking would be provided at-grade and within a five (5) level above-grade structure. **Table 8.1** details the parking provisions.

TABLE 8.1: PARKING PROVISIONS

Location	Space Type	Parking Supply
At-grade	Typical Parking Space (2.7m x 5.5m)	10
	Barrier-Free (Type B)	1
Above-grade	Typical Parking Space (2.7m x 5.5m)	156
	Barrier-Free (Type A)	6
	Barrier-Free (Type B)	3
Total Parking Supply		176
Effective Parking Rate		0.68 sp/unit

Via the site plan process, to accommodate various mechanical and electrical room requirements, parking provisions were adjusted accordingly. As a result, the overall parking supply has been reduced from 205 spaces to 176 spaces.



8.2 Zoning By-law Parking Requirements

8.2.1 Parking Stall Size

All parking spaces as proposed will meeting the minimum dimensional requirements of the City of Barrie Zoning By-law 2009-141, and Site-Specific By-law 2023-030.

Per Item #10 of the Site-Specific By-law, "...notwithstanding the provisions set out in Section 4.6.2.5 of By-law 2009-141, a maximum of 3 of the required residential parking spaces may have a minimum length of 5.2 metres in the "Transition Centre Commercial – 2 – Special Provision No. 627" (C2-2)(SP-627) zone".

The parking spaces detailed in Table 8.1 above would satisfy the municipal requirements.

8.2.2 Parking Supply

The parking requirements for the subject site have been verified against the Site-Specific By-law 2023-030.

Per Item #7, "...notwithstanding the provisions set out in Section 4.6.1 of By-law 2009-141, a minimum of 0.80 parking spaces per residential unit is required in the 'Transition Centre Commercial – 2 – Special Provision No. 627' (C2-2)(SP-627) zone".

Per Item #9, "...notwithstanding the provisions set out in Sections 4.6.1 and 4.6.2.3 of By-law 2009-141, parking is not required for commercial uses in the 'Transition Centre Commercial – 2 – Special Provision No. 627' (C2-2)(SP-627) zone".

As understood, City staff communicated to the applicant the sought parking reduction from the previously approved 0.80 space/unit rate would be addressed via a Minor-Variance application.

Table 8.2 compares the parking requirements to the proposed on-site supply. The proposed parking supply of 176 parking spaces results in a theoretical deficiency of 32 spaces.



TABLE 8.2: ZONING BY-LAW PARKING REQUIREMENTS

# of Units/Size	Zoning By-law Requirements	Spaces Required	Spaces Proposed	Surplus/ Deficit
260 Residential Dwelling Units	0.80 space per dwelling unit	208	176	-32
265 SM (2,850 SF) GFA	None Required	0	0	Nil
Total		208	176	-32

Based on the proposed use and the associated parking requirements noted in the City's Site-Specific By-law 2023-030, the proposed parking supply as related to the residential component result in a theoretical deficiency.

As understood, the sought parking reduction from the previously approved 0.80 space/unit rate is to be addressed via a Minor-Variance application.

8.3 Rationale and Justification for Residential Component Parking Supply

8.3.1 Approach and Methodology

The focus and intent of this parking review section is to review the proposed parking supply in the context of policies, available parking data for apartment buildings, establish the parking needs for the site and justify the proposed parking supply.

To justify and support the proposed residential parking supply components for the development, a comprehensive review was conducted and considered the following:

- ▶ City of Barrie Draft Comprehensive Zoning By-law;
- ▶ Residential and commercial/retail parking standards adopted by other municipalities;
- ▶ Parking demands per Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th Edition data; and
- ▶ Key findings from other parking studies.



8.3.2 Analysis

Draft Zoning By-law Parking Requirements

Based on the Draft Zoning By-law (June 2023) Appendix D – Parking District Map, the subject site is located within Parking District 1 – Urban Growth Centre/Major Transit Station Areas. The corresponding parking requirements are as follows.

- ▶ Residential dwelling units (resident component): a minimum 0.6 parking spaces per dwelling unit and a maximum 1.0 parking space per dwelling unit;
- ▶ Residential dwelling units (visitor component): a minimum of 0.1 parking spaces per dwelling unit and a maximum of 0.2 parking space per dwelling unit; and
- ▶ Commercial/retail use: no minimum requirement and a maximum 1.0 parking space per 50 SM of GFA.

It is noted the minimum parking requirements within the Draft Zoning By-law are significantly reduced in comparison to the current ZBL. This provides clear direction and the attitude and trends towards how parking within the City is viewed.

Based upon the reduced minimum parking requirements proposed within the Draft Zoning By-law, this provides clear direction the City of Barrie is headed towards how parking is handled, and steps it is taking towards a transportation mode shift.

The proposed on-site parking supply at a rate of 0.68 spaces per dwelling unit is slightly deficient in comparison to the proposed minimum parking requirements outlined in the Draft Zoning By-law ($0.70 \text{ spaces/unit} = 0.60 + 0.10$).

Based upon the proposed use and the associated parking requirements noted in the City's Draft ZBL, the proposed parking supply as related to the residential component results in a theoretical deficiency of six (6) spaces. In our opinion, the deficiency of six (6) spaces is not critical and can be mitigated via the implementation of the proposed Transportation Demand Management (TDM) plan as documented. Specifically, the unbundling of parking spaces from units will be a key parking measure for managing parking demands of the site.

Other Municipal Parking Standards

The current City of Barrie's Zoning By-law 2009-141 requires that a residential development provide parking at a minimum rate of 1.0



space per dwelling unit within the Urban Growth Centre. It is noted the by-law does not explicitly require a visitor parking requirement, as such it is expected that visitors would utilize on-street parking or adjacent municipal parking lots within the study area.

The City of Barrie's proposal for reduced minimum parking requirements is inline and follows suit with several other municipalities within the Greater Toronto and Hamilton Area (GTHA).

To verify the sufficiency of the proposed residential parking supply, a comparison of parking requirements has been undertaken based on the Zoning By-law rates of several other municipalities for residential units.

Table 8.3 summarizes parking standards adopted by municipalities for an apartment land use.

Based upon a review of other municipalities, minimum parking rates range between 0 – 0.70 spaces per dwelling unit. Recognizing development attributes, area demographics or population densities, several municipalities have adopted rates based on the site location and available/future transit and active transportation infrastructure. This typically includes lower parking rates in downtown area (i.e., higher density).

The lower rates within urban growth centres and downtown cores recognize these sites are typically better served by transit and are located in close proximity to amenities and services, thus leveraging these elements to promote smart growth and reduce the reliance on private automobile travel.

The City of Barrie currently employs this approach where development sites within the Urban Growth Centre require reduced parking requirements as opposed to other areas of the city. The City of Barrie is currently in the process of creating a new comprehensive Zoning By-law and it is our understanding the City is considering further reductions within its intensification nodes and corridors. Therefore, the proposed reduction from 0.80 space/unit to 0.68 spaces/unit is not uncommon when compared to other municipalities in the GTHA.



TABLE 8.3: OTHER MUNICIPALITY ZONING BY-LAW PARKING REQUIREMENTS

Municipality	Resident Parking Requirement	Visitor Parking Requirement	Total Requirement
City of Barrie (ZBL 2009-141) (Urban Growth Centre)	1.00 space/unit	N/A	1.00 space/unit
City of Barrie (Draft ZBL) (Urban Growth Centre)	0.60 spaces/unit	0.10 spaces/unit	0.70 space/unit
City of Peterborough (Draft Parking Zoning By-law review and Update)	0.50 spaces/unit	0.10 spaces/unit	0.60 spaces/unit
City of Hamilton (Downtown Zones)	0.30 – 0.70 space/unit	N/A	0.30 – 0.70 space/unit
City of Kitchner (ZBL 2019-051) (Urban Growth Centre Zones)	No minimum	0 space/unit	0 space/unit
City of Kingston (ZBL 2022-62) (PA1 and PA2)	0.40 spaces/unit	0.10 spaces/unit	0.50 spaces/unit
City of North Bay (Commercial Core)	0.50 space/unit	N/A	0.50 space/unit
City of Vaughan (ZBL 001-2021) (VMC)	0.40 spaces/unit	0.15 spaces/unit	0.55 spaces/unit



ITE Parking Generation Manual, 5th Edition Data

The Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th Edition provides data on surveys across the USA and Canada of peak parking demands for different land uses. Land use code (LUC) 222, Multifamily Housing (High-Rise) was reviewed.

Table 8.5 summarizes the ITE data for LUC 222. It is noted that the extracted ITE data reflects a “Dense Multi-Use Urban” setting that is not within a half mile (0.8 km) of rail transit. It is noted the Allandale GO Station is located approximately 2.0 km from the subject site.

TABLE 8.4: ITE PARKING DATA – LUC 222

Data Type	Parking Rate
Average Parking Supply	0.60 spaces/unit
Average Parking Demand	0.55 spaces/unit

Based upon the parking demand data (average), for the proposed 260 dwelling units, the estimated average parking demand is 143 parking spaces.

The proposed parking supply of 176 parking spaces in comparison to the estimated average parking demand for the proposed development indicates a surplus of 33 parking spaces would result.

Other Municipality Parking Study Reviews

City of Peterborough

The City of Peterborough retained Paradigm Transportation Solutions Limited to undertake a review and update of the current Parking Section of the Zoning By-law as part of the background work to update the entire Zoning By-law for the City following Council adoption of the new Official Plan in November 2021, and provincial approval of the Official Plan in April 2023.

Updating the parking requirements for new residential developments in the ZBL represent four key opportunities – the opportunity to “right-size” the supply of parking in the City; the opportunity to modernize the accessibility and design standards applied to parking lot design in site plans; the opportunity to incorporate standards for vehicle types that are increasing in popularity (such as bicycles, scooters, electric vehicles, etc.); and the opportunity to consider strategic use of parking related incentives to support the mode shift in goals in the Transportation Master Plan.



The updates to the Parking Section of the ZBL have been informed by best practices successfully used in other municipalities and an “evidence based” approach to assess and selecting the right standards for implementation in Peterborough.

City of Vaughan

The City of Vaughan commissioned a review of the City’s parking standards in 2010. It is noted that while this report is noted as draft, the recommendations of this report are endorsed by Council and are frequently referenced by staff. The report is specific to the City of Vaughan’s parking standards; however, the report is comprehensive in its review of parking standards for multiple land uses and provides valuable information regarding establishing appropriate parking rates.

Within the report it notes that parking rates should balance competing objectives which include ensuring sufficient parking supply while encouraging non-auto travel modes. Recognizing that development characteristics, site context, and available transit provisions can vary based upon location, the report established four different urban structure categories of high order transit hubs, primary centres/primary intensification corridors, local centres, and the rest of the City.

Additionally, the report also recommended that rates vary by the size of dwelling unit as determined by the number of bedrooms.

Town of Richmond Hill

The Town of Richmond Hill also conducted a similar Parking Strategy report dated June 2010. Similar to the City of Vaughan, parking requirements by location and also by size of dwelling units as determined by number of bedrooms.

City of Toronto

Recognizing that the City of Toronto is not a comparable municipality to the City of Barrie, it is worth noting that amendments to the City’s Zoning By-law, specifically the removal of minimum parking requirements.

Parking rate reductions, specifically the removal of parking minimums is a step towards smart growth and supports the reduction in proposed parking supply. Recognizing that the City of Barrie currently does not provide transit and active transportation infrastructure at the level of the City of Toronto; however, this is potentially a sign how parking requirements for other municipalities may transition to.



Off-Site Parking Availability

Reference was made to the City of Barrie Parking Strategy Update, March 2020 report.

The report notes within the defined Downtown study area, a total of 2,368 parking spaces are provided. Of those 1,598 spaces are provided within off-street municipal parking lots and 770 spaces are provided via on-street provisions.

Within a 500-metre radius of the subject site (3-8 minute walk) which would be considered an acceptable walking distance, there are ten (10) municipal off-street parking lots providing approximately 800 parking spaces. Additionally, within that radius approximately 300 on-street provisions.

8.3.3 Justification/Adequacy of Proposed Parking Supply

The following section outlines the adequacy of the proposed residential component parking supply for the proposed development. Residential parking standards outlined in the current City Zoning By-law 2009-141 are considered to overstate the parking needs of a residential apartment/condominium within the City. This has been recognized by various approvals and special provisions granted which have adopted lower parking standards.

The rationale for the approval of a reduced parking standard is considered appropriate based on the following considerations:

- ▶ The Province of Ontario's Five-Year Climate Change Action Plan;
- ▶ City of Barrie's current comprehensive Draft Zoning By-law;
- ▶ Parking rates of similar and comparable municipalities;
- ▶ Estimated parking demand per ITE data; and
- ▶ Site context and Transportation Demand Management (TDM) initiatives.

Ontario's Five-Year Climate Change Action Plan

A reduced minimum parking supply requirement for the proposed development would be in conformance with Ontario's Five-Year Climate Change Action Plan that was announced in June 2016. While this plan was released under a previous government, it is still important to take these policies into consideration. Some of the key transportation and land-use planning actions outlined are as noted:



- ▶ **Support Cycling and Walking:** Commuter cycling networks will be established across Ontario, targeting routes with high-commuting volumes such as between residential communities, major transit stations and employments areas. There will be more cycling facilities in urban areas, including grade separated routes and cycling signals. There will be more bike parking at transit stations and provincially owned, publicly accessible facilities. Ontario will revised provincial road and highway standards to require commuter cycling infrastructure to be considered for all road and highway construction projects where it is safe and feasible. Ontario will do the same for major transit corridors;
- ▶ **Reduce Single-Passenger Vehicle Trips:** Ontario would provide grants to municipalities and large private employers to implement Transportation Demand Management (TDM) Plans. The plans will be designed to help increase walking, cycling, carpooling, tele-commuting, and flex-work schedules. Thereby reducing overall fossil fuel consumption, traffic congestion, and transportation emissions; and
- ▶ **Eliminate Minimum Parking Requirements:** Minimum parking requirements would be eliminated over the next five years for municipal zoning by-law, especially in transit corridors and other high density, highly walkable communities. Minimum parking requirements are a barrier to creating complete, compact and mixed-use communities.

This shift away from providing excess residential parking, recognizing that parking absorbs a significant amount of land that could otherwise be used for additional land-development purposes, highlights a changing perspective toward auto-ownership, travel, and the cost of living.

Draft Zoning By-law Parking Requirements

Based upon the reduced minimum parking requirements proposed within the Draft Zoning By-law, this provides clear direction the City of Barrie is headed towards how parking is handled, and steps it is taking towards a transportation mode shift.

As demonstrated above, the proposed on-site parking supply would satisfy the proposed minimum parking requirements outlined in the Draft Zoning By-law.

Other Municipality Parking Standards

Based upon a review of parking standards for other municipalities, specifically, those that are similar to the City of Barrie and also provide



different rates for urban centres, growth corridors, downtown locales, etc. it was determined that the parking rates for residential dwelling units range from 0 – 0.70 spaces per dwelling unit.

A review of parking standards adopted by surrounding municipalities reveals a consistent approach to parking rates for the subject residential land use with these municipalities adopting lower parking requirements for development within urban growth centres and downtown cores. It is noted that the City of Kitchner removed the minimum parking requirement for residential, and the City of Peterborough, City of Kingston and City of Vaughan have adopted lower rates, 0.60, 0.50 and 0.55 spaces per unit, respectively, which are lower than the proposed rate sought (i.e., 0.68).

The City of Barrie currently employs this approach where development sites within the Urban Growth Centre require reduced parking requirements as opposed to other areas of the city. The City of Barrie is currently in the process of creating a new comprehensive Zoning By-law and it is our understanding the City is considering further reductions within its intensification nodes and corridors. Therefore, the proposed reduction from 0.80 space/unit to 0.68 spaces/unit is not uncommon when compared to other municipalities in the GTHA.

ITE Parking Demand

Based upon the parking demand data (average rate), for the proposed 260 dwelling units, the estimated average parking demand is 143 parking spaces.

The proposed resident parking supply in comparison to the estimated demand would result in a surplus of parking.

Site Context and TDM

Other factors that will assist in maintaining lower parking demands that have previously been described or discussed in this study, include the following:

- ▶ Proximity to on and off-site institutional and commercial-retail services and amenities;
- ▶ Availability of local transit service which provide connections to large transit terminals and rail transit, a continuous and well connected pedestrian network, and opportunities to encourage cycling as a viable alternative;
- ▶ Availability of on-street parking and municipal parking lots to accommodate any potential overflow or increased demands; and



- ▶ TDM measures as outlined in the TDM plan to encourage an reduce vehicle ownership, single-occupant vehicle travel, and parking demands.

The subject site is located within the City's Urban Growth Centre, which is well served by local transit with connections to larger transit hubs and rail transit providing opportunities for inter-regional travel. Additionally, the site is surrounding by various services, amenities and employment opportunities. Given the site context, residents will not have to be dependent on the private automobile when compared to areas outside of the city core/urban growth centre. Leveraging the existing other travel modes available it is not unreasonable to expect that a reduced residential parking rate could be support for the subject site.

Transportation Planning Context

The proposed reduced residential parking supply has been reviewed from a high level transportation planning context. The issues considered included:

- ▶ Residents can and currently do live in the City of Barrie without owning a private vehicle.
 - Based upon 2016 Transportation Tomorrow Survey (TTS) data 17% of the total apartment households within the subject zone are reported to be a zero car household;
 - A number of viable alternative transportation choices are available to residents, including public transit, taxis, ride-share services (i.e., Uber, Lyft), walking, and cycling. A reduction from the Zoning By-law merely increases the number of residents who will not have a private parking space.
- ▶ Providing less parking helps encourage sustainable transportation and reduced peak period automobile travel.
 - Providing parking encourages travel by private automobile. In layman's term, residents who have a choice between sustainable travel modes and a private automobile may choose to drive whereas residents without parking will travel by other modes.
- ▶ No risk to the City of Barrie or the surrounding neighbourhood.
 - An oft-cited rationale for providing more residential parking is the need to ensure residents and/or visitors will not infiltrate and park on area public street. This is not considered an issue given that the subject site is located within the



Downtown and there is sufficient on-street parking availability and municipal parking lots available. It is noted that the City offers monthly parking passes within the Downtown.

Summary of the Adequacy of the Proposed Parking Supply

Based upon the information presented above, the proposed parking supply should be sufficient in serving the proposed development.

The proposed parking supply of 176 spaces (0.68 spaces/unit) is determined to be appropriate. Main supporting factors are the ITE Parking Generation data, the City's draft Zoning By-law requirements, and other comparable municipality requirements (i.e., City of Peterborough).

The proposed parking supply must be evaluated with consideration given to the site's transportation context with access to nearby surface transit routes that connect to the broader City transit network, as well as providing opportunities for inter-regional travel (GO Transit and VIA Rail connections available). In addition, there are opportunities for other viable transportation modes available (walk, cycle, carshare, ride-sharing).

Future building residents will have several options to live, work, and travel without a car. As noted in previous sections currently 17% of apartment households within the City's Downtown zone are zero car households. The proposed reduced parking supply for the development will further encourage alternative modes of travel and will be supported by the existing transportation infrastructure available as well as future improvements.

Furthermore, as previously documented the site proposes an over-supply of bicycle parking provisions. By promoting/supporting alternative travel modes, this leads to a shift from automobile dependence. Given the recent surge and popularity in micro-mobility (i.e., electric bicycles and electric scooters), the over-provision of long-term bicycle parking supports and promotes micro-mobility as a viable alternative travel mode. That is, residents would be able to have both a traditional pedal bicycle for recreational use, and as well have the opportunity to store/park an electric bicycle/scooter for which they may utilize as their alternative to a car for longer distance travel.



9 Access Review

Vehicular access to the site is proposed via a full-movement access on Clapperton Street.

The proposed access driveway connection has been assessed to determine whether there are any design issues, operational and/or safety-related concerns that may be affected by the location, and whether an alternative arrangement would be preferred from a design perspective. The key design issues to consider with respect to the driveway location are discussed in the sections below.

9.1 Auxiliary Turn Lanes

Based upon the operational analyses conducted, it is determined auxiliary turn lanes are not required.

From a volume perspective, the forecast turning movements do not satisfy warrant threshold criteria for the implementation of auxiliary turn lanes.

9.2 Corner Clearance Requirements

The Transportation of Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR) recommends suggested spacing requirements for access management applications including corner clearance requirements to adjacent intersections. The TAC guide identifies, “Corner clearance is the distance from an intersection to the nearest access upstream or downstream of it. Corner clearance is measured from the near curb of the cross roadway to the near edge of the access throat. It consists of three components: the curb return radius or flare dimension at the driveway. Inadequate corner clearance between the accesses and intersections along a major road, such as a major arterial, can create operational issues”.

The suggested corner clearances identified by TAC are as follows:

- ▶ For Local Roadways:
 - 15 metres (curb radii to curb radii) downstream and upstream of a stop-controlled intersection.

The proposed access with Clapperton Street is located approximately 29 metres (curb radii to curb radii) from the unsignalized intersection of McDonald Street and Clapperton Street.

The proposed access location satisfies the TAC corner clearance requirement. The access will not be within the functional area of the



adjacent intersection and no operational or safety issues are anticipated with the proposed location.

9.3 Sight Distance

The proposed access driveway connection with Clapperton Street has been reviewed to confirm sight distance and sight line availability and provisions.

The assessment has been carried out based on the methodology contained in the TAC GDGCR. Sight distance requirements are considered for vehicles departing from the driveway (departure sight distance) and for vehicles approaching the driveway (approach sight distance). The following object heights were utilized in the field measurements:

- ▶ Driver Eye Height: 1.05 metres;
- ▶ Top of Car: 1.30 metres (for departure sight distance, height of approaching vehicle); and
- ▶ Vehicle Headlight or Tail/Brake Light: 0.60 metres (for approach stopping sight distance, height of vehicle/target object).

The main measurements for departing traffic were taken from 5.0 metres back from the existing edge of pavement for vehicles exiting at the proposed driveway, representing the position of a driver/vehicle performing a turning movement.

The main measurements for approaching traffic were taken from within the centre of either travel lane on Clapperton Street, assuming a vehicle position perpendicular to the proposed access driveway.

For this assessment, a design speed of 60 km/h (10 km/h over the assumed statutory limit of 50 km/h) has been considered for Clapperton Street.

Table 9.1 summarizes the required sight distances for the design speed of 60 km/h.

TABLE 9.1: REQUIRED SIGHT DISTANCE CRITERIA

Sight Distance Criteria	Sight Distance Requirement
	Design Speed (60 km/h)
Minimum Departure (Left Turn) Sight Distance ¹	130.0 m
Minimum Departure (Right Turn) Sight Distance ²	110.0 m
Minimum Stopping Sight Distance ³	85.0 m



Notes:¹ TAC GDGCR Guide. June 2017. Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop² TAC GDGCR Guide. June 2017. Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop³ TAC GDGCR Guide. June 2017. Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles

Departure Sight Distance Review

The departure sight distance represents the minimum distance required for a vehicle to safely enter the major roadway and complete a turning movement without significantly impeding traffic flow or providing the opportunity for conflict.

In design, the departure sight distance is measured from the standard driver eye height (1.05 metres) located on the proposed site access, from a position located 5.0 metres back from the travelled portion of the intersection roadway (i.e., edge of pavement) to a target top of car height of 1.30 metres above the roadway surface.

Table 9.2 summarizes the available and TAC GDGCR recommended sight distances for a departing left-turn and right-turn movement from the proposed site access.

TABLE 9.2: DEPARTURE SIGHT DISTANCE ANALYSIS SUMMARY

Departure Movement	Available Sight Distance (m)		TAC GDGCR Sight Distance Requirement (m)	Requirements Met?
	Direction	Distance		
Left-Turn Movement	Looking right	> 160	130.0 ¹	Yes
	Looking left	90	130.0 ¹	No
Right-Turn Movement	Looking right	-	N/A	N/A
	Looking left	90	110.0 ²	No

Notes:
¹ TAC GDGCR Guide. June 2017. Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop
² TAC GDGCR Guide. June 2017. Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop

For right-turn and left-turn movements departing the proposed site accesses on Clapperton Street, the required TAC departure sight distances are not met and satisfied for a design speed of 60 km/h under existing conditions. The existing available sight distance is currently constrained due to obstructions. That is, the existing home at 60 Clapperton Street and its fence.



Following redevelopment of the subject lands, the buildings and associated fencing for 58 and 60 Clapperton Street will be demolished. Additionally, in its place will be the provision of an outdoor amenity/urban square space.

With the aforementioned obstructions removed with redevelopment of the site, the available sight distance looking to the left (i.e., north) will be in the order of approximately 160 metres.

Furthermore, we note the adjacent unsignalized intersection of Clapperton Street/McDonald Street is within clear viewing distance. The northbound and southbound approaches at that intersection operate under stop-control and provide metering for a portion of the traffic flow.

Based upon the previous corner clearance assessment, eastbound right turn movements from McDonald Street to Clapperton Street will not pose any safety or operational issues.

Approach Sight Distance Review

For vehicles approaching the proposed site accesses, the minimum stopping sight distance is the distance required for the approaching vehicle to stop safely and avoid a collision. Stopping sight distance is the sum of the distance travelled by a motorist during the perception and reaction time and the braking distance. Stopping sight distance is measured from the standard driver eye height of 1.05 metres to a fixed object 0.60 metres off the surface of the roadway.

Table 9.3 summarizes the available and TAC GDGCR recommended sight distances along Clapperton Street for the proposed site access driveway.

TABLE 9.3: APPROACH SIGHT DISTANCE ANALYSIS SUMMARY

Approach Direction	Available Sight Distance (m)	TAC GDGCR Sight Distance Requirement (m)	Requirements Met?
Northbound	90	85.0 ¹	Yes
Southbound	90	85.0 ¹	Yes
<i>Notes:</i> ¹ TAC GDGCR Guide, June 2017, Table 2.5.2: Stopping Sight Distance on Level Roadways for Automobiles			

For northbound and southbound vehicles approaching the proposed site accesses on Clapperton Street, the required TAC approach sight distances are met and satisfied for a design speed of 60 km/h.



Sight Distance Summary

With Clapperton Street being relatively flat and straight, the available sight distance to the north and south of the subject access was found to be greater than 160 metres, and therefore exceeds the longest sight distance requirements for both departure and approach. We note that under existing conditions there are several obstructions which limit the available sight distance. However, following redevelopment of the subject lands these obstructions will be removed and sight distances of 160 metres in each direction will be available.

As part of the field assessment, sight triangles and sight line obstructions were assessed. Based upon our findings there are no significant sight line obstructions (following redevelopment) that would impact the available sight distances as clear sight lines within the immediate proximity of Clapperton Street and the proposed site access driveway are provided.

In summary, there are no sight line issues at the proposed access driveway location on Clapperton Street.



10 Vehicle Manoeuvring

AutoTURN software was used to review and confirm that the design of the site accesses, internal circulation, parking layout, and loading area will accommodate the design vehicles expected on-site. The analysis reviewed the following vehicles:

- ▶ Passenger car; and
- ▶ Medium single-unit (MSU) truck; and
- ▶ Heavy single-unit (HSU) truck

The MSU truck would be representative of typical delivery vehicles and the HSU truck would be representative of a waste collection truck and a larger delivery/service vehicle.

Within the above-grade structure all parking spaces and drive aisle widths meet the zoning requirements.

No conflicts have been identified for the design vehicles. All vehicles will be able to ingress/egress the site access and circulate the site in a forward motion.

Additionally, a Pavement Marking and Signage Plan (PMSP) has been prepared.

Appendix H contains the vehicle manoeuvring diagrams and the PMSP.



11 Conclusions and Recommendations

11.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ Under existing conditions, the study area intersections are currently operating at acceptable levels of service and within capacity during the weekday AM and PM peak hours;
- ▶ Under future background traffic conditions (without the proposed development), the study area intersection operations would be slightly worse in comparison to existing conditions. All intersections and traffic movements are forecast to continue to operate at acceptable levels of service and within capacity up to the 2034 horizon.

The exception would be the westbound shared left/right movement at Bayfield Street and Worsley Street, which is reported to operate at LOS E and F under 2029 and 2034 horizons, respectively. However, it is noted the movement is forecast to operate within capacity and that this is not an unusual condition where a minor road operating under stop control intersects with a major road;

- ▶ With full development and occupancy of the subject site, it is forecast to generate 78 automobile trips during the weekday AM peak hour, and 99 automobile trips during the weekday PM peak hour;
- ▶ Under future total traffic conditions (with the proposed development), the operations at the study area intersections are noted to be slightly worse with the addition of the site generated traffic in comparison to background traffic conditions. The net impact of the proposed development is found to be relatively minor. All intersections and traffic movements are forecast to continue to operate at acceptable levels of service and within capacity up to the 2034 horizon;
- ▶ Analysis of total traffic conditions indicate the site-generated traffic is not expected to materially impact operations on the adjacent transportation work.

No geometric improvements have been identified to be required, the existing transportation network will be able to accommodate the proposed development.

At the proposed site access intersection with Clapperton Street it is noted the forecast volumes and traffic operations would not warrant the provision of auxiliary turn lanes along Clapperton Street;



- ▶ A Transportation Demand Management (TDM) Plan for the proposed development has been prepared and applicable TDM measures/initiatives have been identified which would be implemented by the applicant. The implementation of the TDM Plan is a component in reducing single-occupant vehicle (SOV) travel, which in turn reduces the number of site generated trips, and the associated demand for parking;
- ▶ Rationale has been provided to demonstrate the proposed parking rate/proposed parking supply will adequately serve the anticipated parking demands. Justification is provided through smart planning goals/policies, direction the City is headed based upon the Draft Comprehensive Zoning By-law, policies of other municipalities having lower parking rates similar to the proposed rate, forecast parking demands based upon ITE parking data, and the implementation of the proposed TDM measures/initiatives which would further reduce the on-site parking demands; and
- ▶ A functional review of the proposed access and site plan was undertaken. No conflicts were identified, and it was confirmed the access driveway, loading space, and parking layout has been designed accordingly.

11.2 Recommendations

Based on the findings of this study, the following is recommended:

- ▶ From a transportation perspective, the planning applications sought should be approved as the development is determined to have a minimal impact on the adjacent transportation network, and the proposed parking supply will adequately serve the development;
- ▶ The proposed TDM Plan should be implemented; and
- ▶ The City of Barrie should monitor the signalized intersection of Bayfield Street/Sophia Street in regard to background growth and changes in traffic patterns and adjust signal timing splits to best serve demand as necessary.



Appendix A

Pre-Study Consultation



Adrian Soo

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: March 21, 2022 10:07 AM
To: Adrian Soo
Subject: RE: 17 Sophia St & 3, 5, 7 & 11 MacDonald St & 58-60 Clapperton St - Proposed 21-Storey Building - Transportation Impact Study ToR
Attachments: Zoning Matrix and Comments - Worsley Owen McDonald.pdf
Follow Up Flag: Follow up
Flag Status: Flagged

Good morning Adrian,

Please see my comments below.

#	Items – Proposed	City of Barrie Staff Commentary
1	Project Description: 252 Units – Residential Development 257 SM GFA – Ground floor commercial/retail space 21-storey tower. Proposed Parking Supply = 218 spaces (includes three compact spaces, and three car share spaces). Vehicular access to the site will be via a full movement connection with Clapperton Street.	Acknowledged.
2	Population & Employment: In reference to Appendix E of the City's TMP. The population and employment forecasts for Traffic Zone 133 were reviewed. The proposed development appears to be in line and would not appear to deviate from the future projections.	Acknowledged.
3	Study Area Limits and List of Intersections for Analysis: Study area to include the following intersections: - Sophia St. & Bayfield St. (signalized); - Sophia St. & McDonald Street (unsignalized); - McDonald St. & Clapperton St. (unsignalized);	Acknowledged.

	- Worsley St. & Bayfield St. (unsignalized); - Worsley St. & Clapperton St. (unsignalized); and - Proposed Site Access D/W & Clapperton St. (proposed unsignalized).	
4	Relevant Background Material: The following documents will be reviewed with relevant information extracted. - Official Plan Road Classification and Widening Plan Schedules; - Transportation Master Plan (active transportation, transit, future network improvements, future road widenings, macro modelling data);	Currently no improvements are planned within the study, please utilize existing configurations.
5	Turning Movement Counts and Signal Timing Data Paradigm collected intersection counts in October 2021. These counts will be factored/adjusted accordingly to account for COVID influence. Specifically, we compared a historical 2017 and newly collected 2021 count at the Sophia/Bayfield intersection. 2021 Traffic patterns were found to be similar and unaffected by COVID. Therefore confirms 2021 data applicable for use. The 2017 count was grown using a 0.5% per annum growth rate to estimate 2021 conditions and compared with the 2021 count. It was determined that the collected 2021 volumes were slightly lower. Therefore, a growth factor has been calculated and will be applied to the 2021 collected count data to reflect non-COVID base year conditions. Requesting the City advise and provide their most recent and all historical traffic count data for the study area intersections.	City staff to advise of available data and confirm whether proposed approach is acceptable. Available counts are: Bayfield and Sophia 2019 Please use a 0.5% growth rate for all local roadways and 3% for Bayfield Street.
6	Design Peak Hour of Analysis: Weekday AM and PM peak hours, representing typical commuter peak hours.	Acknowledged.
7	Horizon Years of Analysis: - Opening Year (full build-out/occupancy)	Please include a 10 year+ build out.

	- Five-Year horizon (five years following full build-out)	
8	Anticipated Future Developments: Per you e-mail dated 7 March 2022 the following four other area background developments will be accounted for within the traffic forecasts: - 55-57 McDonald Street, 61-67 Owen Street, 70-78 Worsley Street; - YMCA site (across from the subject site); - 113 & 117 Bayfield Street and 6, 8, & 12 Sophia Street E - 136 & 112 Bayfield Street, 14 Sophia Street W, and 113 & 115 Maple Avenue	Acknowledged.
9	Background Growth Rate: We have reviewed the TMP EMME forecasts (Appendix E), examining the 2016, 2031, and 2041 volume forecasts for applicable sections of Bayfield Street, Sophia Street, and McDonald Street. Between 2016 – 2041, negative growth is reported under both the AM and PM peak hours. Our Excel spreadsheet is attached for reference. Reviewing the transportation studies for the adjacent background developments. <u>We are proposing the conservative application of a 0.5% per annum growth rate to the study area roadways.</u>	Please use a 0.5% growth rate for all local roadways and 3% for Bayfield Street. These growth rates are in excess of the TMP, however, the City has undertaken new target densities for the UGC as part of the new OP.
10	Trip Generation Methodology: Vehicle trips generated by the proposed development will be forecast based on the data contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual 11th Edition. Forecast traffic volumes will be reduced to account for transit use, if applicable.	City staff to confirm acceptable. If reductions to site-generated traffic are allowed from your perspective, can you please recommend a % reduction factor. Alternatively, we proposed a 2% reduction as the TTS data for the zone indicates current transit usage reflects 2% of the mode split. I am agreeable with a 2% mode split reduction.
11	Trip Distribution and Traffic Assignment Parameters:	Acknowledged.

	The site generated trips will be distributed and assigned to the study area intersections based on a review of existing traffic patterns and Transportation Tomorrow Survey (TTS) data.	
12	Traffic Engineering Methodology for Analysis: Use of Trafficware Synchro Version 10. SimTraffic queuing analysis is noted not to be required as the development site is not situated within roadway corridors identified in Section 7.2.2 of the TIS guidelines.	Acknowledged.
13	Transit, Pedestrian, Cycling Infrastructure Evaluation: Will follow the TIS Guideline assessment criteria.	Acknowledged.
14	Pedestrian Circulation Plan: We will identify pedestrian connections and links to the adjacent municipal network.	Acknowledged.
15	Transportation Demand Management Plan: The proposed residential development meets the threshold criteria for development of a TDM Plan. A TDM plan for the proposed building will be developed identifying applicable TDM measures/initiatives for implementation to assist in reducing vehicle trips and parking demand.	Acknowledged.
16	Engineering Standards: Use of City standards and the Transportation Association of Canada Geometric Design Guidelines for Canadian Roads as noted within the TIS guidelines..	Acknowledged.
17	Number of Final Report Copies: City will be provided TWO hardcopies, and ONE digital version including analysis files as noted within the TIS guidelines.	Acknowledged.
18	Other Matters: Parking Study. Per the City of Barrie Comprehensive Zoning By-law 2009-141, the proposed residential development is noted to be located within the Urban Growth Centre. The municipal parking requirement is 1.000 space per dwelling unit. We note there are no visitor parking requirements per the ZBL.	Please also include a policy scan of other parking requirements for other municipalities. Review the feasibility of providing a breakdown per unit type to generate a blended rate. Review the City proposed development and Zoning by-laws for site specific parking reduction.

For the ground floor commercial area, the municipal parking requirement for multi-use commercial uses is 1.000 space/24 SM GFA. A total of 263 parking spaces are required. In comparison to the proposed parking supply of 218 spaces, this results in a theoretical deficiency of 45 parking spaces. We note that the proposed parking supply is a minor reduction from the municipal requirement; however, we are seeking relief from the City's Parking Study requirement of three proxy site surveys. The rationale is as follows: - The proposed parking supply rate is not a large reduction in comparison to the municipal requirement. The applicant has tried their best to meet and satisfy the municipal requirement through the use of parking stackers to increase the parking supply and provision of car-share services/spaces. Due to spatial constraints and issues restricting how deep the underground parking structure can go the applicant has maximized the potential parking provisions; - There are limited constructed/occupied high-density sites within the City of Barrie that are comparable or applicable proxy sites; - Difficulty to conduct proxy studies (gaining access and approval to enter properties); - COVID conditions reflected changes in commuter demands (i.e., WFH still effectively in place for majority of employees) To justify the proposed parking supply. We will provide rationale and justification based on the following: - Reference TTS average vehicle ownership within apartment dwellings within the City; - Reference the ITE publication, Parking Generation Manual, 5th Edition; - Development of a comprehensive TDM Plan with suitable initiatives which will manage the parking demand; - Per our discussion yesterday, we do have some proxy sites within our database that	Review the SP zoning for the subject site to demonstrate compliance. Please do not include the Toronto information as the municipality is not comparable to City of Barrie.
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	we would like to reference. The sites include: ○ 640 Guelph Line, Burlington (83 dwelling units, 118 parking spaces); ○ 2445 Woodware Avenue, Burlington (84 units, 112 parking spaces); ○ 15 Maple Avenue, Barrie (169 units, 242 parking spaces); ○ 835 & 885 Oxford Street, Oshawa (184 units, 225 parking spaces); - As well we would reference the following approved parking supply standards for several developments in the City of Toronto including: ○ 1021-1035 Markham Road, Scarborough (333 units, approved, resident rate of 0.45, and visitor rate of 0.15, blended rate of 0.60); ○ 1478-1496 Kingston Road (198 units, approved rate of 0.86); ○ 2135 Sheppard Ave E (1200 units, approved rate of 0.64)	
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Justin MacDonald, C.E.T., PTP
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020
Please consider the environment before printing this email.

From: Adrian Soo <asoo@ptsl.com>
Sent: Tuesday, March 8, 2022 1:21 PM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Subject: 17 Sophia St & 3, 5, 7 & 11 MacDonald St & 58-60 Clapperton St - Proposed 21-Storey Building - Transportation Impact Study ToR
Importance: High

Hi Justin,

As discussed yesterday, please see the enclosed formal Terms of Reference for the Transportation Impact Study. If you could kindly provide your comments/input at your earliest convenience that would be greatly appreciated.

My apologies in advance if I miss anything as I am following the latest version of the City's TIS guidelines in preparing the ToR.

If you'd like to discuss any items of the ToR in further detail, please do not hesitate to call or e-mail.

Project Address: 17 Sophia Street & 3, 5, 7, 11 McDonald Street & 58-60 Clapperton Street

#	Items – Proposed	City of Barrie Staff Commentary
1	Project Description: 252 Units – Residential Development 257 SM GFA – Ground floor commercial/retail space 21-storey tower. Proposed Parking Supply = 218 spaces (includes three compact spaces, and three car share spaces). Vehicular access to the site will be via a full movement connection with Clapperton Street.	
2	Population & Employment: In reference to Appendix E of the City's TMP. The population and employment forecasts for Traffic Zone 133 were reviewed. The proposed development appears to be in line and would not appear to deviate from the future projections.	
3	Study Area Limits and List of Intersections for Analysis: Study area to include the following intersections: - Sophia St. & Bayfield St. (signalized); - Sophia St. & McDonald Street (unsignalized); - McDonald St. & Clapperton St. (unsignalized); - Worsley St. & Bayfield St. (unsignalized); - Worsley St. & Clapperton St. (unsignalized); and - Proposed Site Access D/W & Clapperton St. (proposed unsignalized).	City staff to confirm Study Area.
4	Relevant Background Material: The following documents will be reviewed with relevant information extracted. - Official Plan Road Classification and Widening Plan Schedules; - Transportation Master Plan (active transportation, transit, future network improvements, future road widenings, macro modelling data);	City staff to confirm and/or advise of future network changes to account for within the study area.
5	Turning Movement Counts and Signal Timing Data Paradigm collected intersection counts in October 2021. These counts will be factored/adjusted accordingly to account for COVID influence. Specifically, we compared a historical 2017 and newly collected 2021 count at the Sophia/Bayfield intersection.	City staff to advise of available data and confirm whether proposed approach is acceptable.

	2021 Traffic patterns were found to be similar and unaffected by COVID. Therefore confirms 2021 data applicable for use. The 2017 count was grown using a 0.5% per annum growth rate to estimate 2021 conditions and compared with the 2021 count. It was determined that the collected 2021 volumes were slightly lower. Therefore, a growth factor has been calculated and will be applied to the 2021 collected count data to reflect non-COVID base year conditions. Requesting the City advise and provide their most recent and all historical traffic count data for the study area intersections.	
6	Design Peak Hour of Analysis: Weekday AM and PM peak hours, representing typical commuter peak hours.	City staff to confirm the proposed is acceptable.
7	Horizon Years of Analysis: - Opening Year (full build-out/occupancy) - Five-Year horizon (five years following full build-out)	City staff to confirm the proposed is acceptable.
8	Anticipated Future Developments: Per you e-mail dated 7 March 2022 the following four other area background developments will be accounted for within the traffic forecasts: - 55-57 McDonald Street, 61-67 Owen Street, 70-78 Worsley Street; - YMCA site (across from the subject site); - 113 & 117 Bayfield Street and 6, 8, & 12 Sophia Street E - 136 & 112 Bayfield Street, 14 Sophia Street W, and 113 & 115 Maple Avenue	
9	Background Growth Rate: We have reviewed the TMP EMME forecasts (Appendix E), examining the 2016, 2031, and 2041 volume forecasts for applicable sections of Bayfield Street, Sophia Street, and McDonald Street. Between 2016 – 2041, negative growth is reported under both the AM and PM peak hours. Our Excel spreadsheet is attached for reference. Reviewing the transportation studies for the adjacent background developments. <i>We are proposing the</i>	City staff to confirm or advise of applicable growth rate for application to estimate general background growth.

	<u>conservative application of a 0.5% per annum growth rate to the study area roadways.</u>	
10	Trip Generation Methodology: Vehicle trips generated by the proposed development will be forecast based on the data contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual 11 th Edition. Forecast traffic volumes will be reduced to account for transit use, if applicable.	City staff to confirm acceptable. If reductions to site-generated traffic are allowed from your perspective, can you please recommend a % reduction factor. Alternatively, we proposed a 2% reduction as the TTS data for the zone indicates current transit usage reflects 2% of the mode split.
11	Trip Distribution and Traffic Assignment Parameters: The site generated trips will be distributed and assigned to the study area intersections based on a review of existing traffic patterns and Transportation Tomorrow Survey (TTS) data.	City staff to confirm acceptable.
12	Traffic Engineering Methodology for Analysis: Use of Trafficware Synchro Version 10. SimTraffic queuing analysis is noted not to be required as the development site is not situated within roadway corridors identified in Section 7.2.2 of the TIS guidelines.	City staff to confirm acceptable.
13	Transit, Pedestrian, Cycling Infrastructure Evaluation: Will follow the TIS Guideline assessment criteria.	City staff to confirm acceptable.
14	Pedestrian Circulation Plan: We will identify pedestrian connections and links to the adjacent municipal network.	City staff to confirm acceptable.
15	Transportation Demand Management Plan: The proposed residential development meets the threshold criteria for development of a TDM Plan. A TDM plan for the proposed building will be developed identifying applicable TDM measures/initiatives for implementation to assist in reducing vehicle trips and parking demand.	City staff to confirm acceptable.
16	Engineering Standards: Use of City standards and the Transportation Association of Canada Geometric Design Guidelines for Canadian Roads as noted within the TIS guidelines..	
17	Number of Final Report Copies: City will be provided TWO hardcopies, and ONE digital version including analysis files as noted within the TIS guidelines.	
18	Other Matters: Parking Study.	City staff to confirm acceptable.

Per the City of Barrie Comprehensive Zoning By-law 2009-141, the proposed residential development is noted to be located within the Urban Growth Centre. The municipal parking requirement is 1.000 space per dwelling unit. We note there are no visitor parking requirements per the ZBL.

For the ground floor commercial area, the municipal parking requirement for multi-use commercial uses is 1.000 space/24 SM GFA.

A total of 263 parking spaces are required. In comparison to the proposed parking supply of 218 spaces, this results in a theoretical deficiency of 45 parking spaces.

We note that the proposed parking supply is a minor reduction from the municipal requirement; however, we are seeking relief from the City's Parking Study requirement of three proxy site surveys. The rationale is as follows:

- The proposed parking supply rate is not a large reduction in comparison to the municipal requirement. The applicant has tried their best to meet and satisfy the municipal requirement through the use of parking stackers to increase the parking supply and provision of car-share services/spaces. Due to spatial constraints and issues restricting how deep the underground parking structure can go the applicant has maximized the potential parking provisions;
- There are limited constructed/occupied high-density sites within the City of Barrie that are comparable or applicable proxy sites;
- Difficulty to conduct proxy studies (gaining access and approval to enter properties);
- COVID conditions reflected changes in commuter demands (i.e., WFH still effectively in place for majority of employees)

To justify the proposed parking supply. We will provide rationale and justification based on the following:

- Reference TTS average vehicle ownership within apartment dwellings within the City;
- Reference the ITE publication, Parking Generation Manual, 5th Edition;
- Development of a comprehensive TDM Plan with suitable initiatives which will manage the parking demand;
- Per our discussion yesterday, we do have some proxy sites within our database that we would like to reference. The sites include:

	○ 640 Guelph Line, Burlington (83 dwelling units, 118 parking spaces); ○ 2445 Woodward Avenue, Burlington (84 units, 112 parking spaces); ○ 15 Maple Avenue, Barrie (169 units, 242 parking spaces); ○ 835 & 885 Oxford Street, Oshawa (184 units, 225 parking spaces); - As well we would reference the following approved parking supply standards for several developments in the City of Toronto including: ○ 1021-1035 Markham Road, Scarborough (333 units, approved, resident rate of 0.45, and visitor rate of 0.15, blended rate of 0.60); ○ 1478-1496 Kingston Road (198 units, approved rate of 0.86); ○ 2135 Sheppard Ave E (1200 units, approved rate of 0.64)	
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Regards,

Adrian Soo, P.Eng.
Senior Project Manager



Paradigm Transportation Solutions Limited

p: 416.479.9684 x509
m: 647.637.4946
e: asoo@ptsl.com

From: Justin MacDonald <Justin.MacDonald@barrie.ca>

Sent: March 7, 2022 4:06 PM

To: Adrian Soo <asoo@ptsl.com>

Subject: Background Development

Good afternoon Adrian,

Please use the below links for background development.

[55–57 McDonald Street, 61–67 Owen Street, 70–78 Worsley Street \(barrie.ca\)](#)

[YMCA](#)

[136 & 112 Bayfield St, 14 Sophia St W, and 113 & 115 Maple Ave \(barrie.ca\)](#)

[113 & 117 Bayfield St and 6, 8 & 12 Sophia St E \(barrie.ca\)](#)

Justin MacDonald, C.E.T.
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020

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Appendix B

Traffic Data



Sophia Street & Bayfield Street

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 8:15:00

To: 9:15:00

Municipality: Barrie

Site #: 0000002801

Intersection: Bayfield Street & Sophia Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Bayfield Street runs N/S

North Leg Total: 868

North Entering: 558

North Peds: 7

Peds Cross: $\times$

	Heavys	Trucks	Cars	Totals
North	0	10	0	10
East	0	6	0	6
South	53	409	80	542
West	53	425	80	80



	Heavys	Trucks	Cars	Totals
North	9	4	297	310

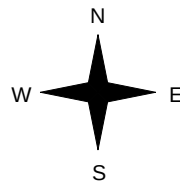
East Leg Total: 257
East Entering: 108
East Peds: 10
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
2	1	116	119



Sophia Street

Heavys	Trucks	Cars	Totals
7	1	92	100
0	0	61	61
0	1	32	33
7	2	185	185



Bayfield Street



Cars	Trucks	Heavys	Totals
38	0	0	38
52	1	2	55
15	0	0	15
105	1	2	108

Sophia Street



Cars	Trucks	Heavys	Totals
149	0	0	149

Peds Cross: $\times$

West Peds: 21

West Entering: 194

West Leg Total: 313

Cars	Trucks	Heavys	Totals
456	7	10	473



Cars	Trucks	Heavys	Totals
11	0	0	11
167	3	2	172
8	0	0	8
186	3	2	191

Peds Cross: $\times$
South Peds: 8
South Entering: 191
South Leg Total: 664

Comments

Sophia Street & Bayfield Street

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Barrie

Site #: 0000002801

Intersection: Bayfield Street & Sophia Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Bayfield Street runs N/S

North Leg Total: 1122

North Entering: 500

North Peds: 4

Peds Cross: $\times$

Heavys	0	6	0	6
Trucks	0	0	1	1
Cars	49	406	38	493
Totals	49	412	39	



Heavys	6
Trucks	1
Cars	615
Totals	622

East Leg Total: 307

East Entering: 167

East Peds: 14

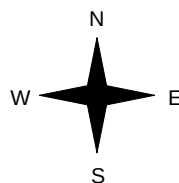
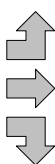
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
0	1	155	156



Sophia Street

Heavys	Trucks	Cars	Totals
6	0	157	163
0	0	92	92
0	0	27	27
6	0	276	



Bayfield Street

Cars	Trucks	Heavys	Totals
78	1	0	79
80	1	0	81
7	0	0	7
165	2	0	



Sophia Street



Cars	Trucks	Heavys	Totals
139	1	0	140

Peds Cross: $\times$

West Peds: 8

West Entering: 282

West Leg Total: 438

Cars	440	Cars	26	380	9	415
Trucks	0	Trucks	0	0	0	0
Heavys	6	Heavys	0	0	0	0
Totals	446	Totals	26	380	9	



Bayfield Street

Peds Cross: $\times$

South Peds: 8

South Entering: 415

South Leg Total: 861

Comments

Sophia Street & Bayfield Street

Total Count Diagram

Municipality: Barrie

Site #: 0000002801

Intersection: Bayfield Street & Sophia Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Bayfield Street runs N/S

North Leg Total: 6075

North Entering: 3173

North Peds: 31

Peds Cross: $\bowtie$

Heavys	3	58	1	62
Trucks	2	17	4	23
Cars	293	2495	300	3088
Totals	298	2570	305	



Heavys 63

Trucks 34

Cars 2805

Totals 2902

East Leg Total: 1624

East Entering: 865

East Peds: 63

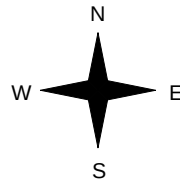
Peds Cross: $\bowtie$

Heavys	Trucks	Cars	Totals
6	8	817	831



Sophia Street

Heavys	Trucks	Cars	Totals
54	11	750	815
2	2	401	405
0	4	157	161
56	17	1308	



Bayfield Street



Cars	Trucks	Heavys	Totals
330	4	1	335
417	5	3	425
104	1	0	105
851	10	4	

Sophia Street



Cars	Trucks	Heavys	Totals
750	6	3	759

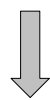
Peds Cross: $\bowtie$

West Peds: 102

West Entering: 1381

West Leg Total: 2212

Cars	2756
Trucks	22
Heavys	58
Totals	2836



Bayfield Street

Cars	107	1725	49	1881
Trucks	1	19	0	20
Heavys	0	8	0	8
Totals	108	1752	49	

Peds Cross: $\bowtie$

South Peds: 59

South Entering: 1909

South Leg Total: 4745

Comments

Sophia Street & Bayfield Street Traffic Count Summary

Intersection: Bayfield Street & Sophia Street						Count Date: 26-Oct-2021		Municipality: Barrie					
North Approach Totals						North/South Total Approaches	South Approach Totals						
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds	
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total		
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0	
7:00:00	8	145	10	163	0	244	7:00:00	1	80	0	81	2	
8:00:00	30	225	23	278	2	406	8:00:00	9	114	5	128	2	
9:00:00	77	398	46	521	3	703	9:00:00	10	166	6	182	10	
10:00:00	46	329	33	408	7	644	10:00:00	17	211	8	236	10	
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0	
16:00:00	40	407	55	502	4	829	16:00:00	12	308	7	327	8	
17:00:00	39	400	41	480	8	850	17:00:00	24	335	11	370	8	
18:00:00	41	375	55	471	3	823	18:00:00	20	324	8	352	15	
19:00:00	24	291	35	350	4	583	19:00:00	15	214	4	233	4	

Sophia Street & McDonald Street

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 8:15:00

To: 9:15:00

Municipality: Barrie

Site #: 0000002802

Intersection: Sophia Street & McDonald Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Sophia Street runs W/E

East Leg Total: 11

East Entering: 11

East Peds: 0

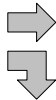
Peds Cross: X

Heavys	Trucks	Cars	Totals
2	1	101	104



Sophia Street

Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	144	144
0	0	144	



McDonald Street

Cars	144
Trucks	0
Heavys	0
Totals	144



Cars	91	0	91
Trucks	0	0	0
Heavys	2	0	2
Totals	93	0	

Cars	Trucks	Heavys	Totals
10	1	0	11
0	0	0	0
10	1	0	



Sophia Street



Cars	Trucks	Heavys	Totals
0	0	0	0

Peds Cross: X
West Peds: 1
West Entering: 144
West Leg Total: 248

Peds Cross: X
South Peds: 0
South Entering: 93
South Leg Total: 237

Comments

Sophia Street & McDonald Street

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Barrie

Site #: 0000002802

Intersection: Sophia Street & McDonald Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Sophia Street runs W/E

East Leg Total: 10

East Entering: 10

East Peds: 0

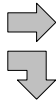
Peds Cross: X

Heavys	Trucks	Cars	Totals
0	2	161	163

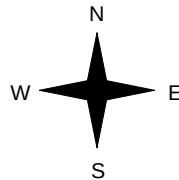


Sophia Street

Heavys	Trucks	Cars	Totals
0	0	0	0
0	1	132	133
0	1	132	



McDonald Street



Cars	Trucks	Heavys	Totals
9	0	0	9
1	0	0	1
10	0	0	



Sophia Street

Cars	Trucks	Heavys	Totals
0	0	0	0

Peds Cross: X
West Peds: 2
West Entering: 133
West Leg Total: 296

Cars	133
Trucks	1
Heavys	0
Totals	134



Cars	152	0	152
Trucks	2	0	2
Heavys	0	0	0
Totals	154	0	

Peds Cross: X
South Peds: 0
South Entering: 154
South Leg Total: 288

Comments

Sophia Street & McDonald Street

Total Count Diagram

Municipality: Barrie
Site #: 0000002802
Intersection: Sophia Street & McDonald Street
TFR File #: 1
Count date: 26-Oct-2021

Weather conditions:
 Rain
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Sophia Street runs W/E

East Leg Total: 91
 East Entering: 91
 East Peds: 4
 Peds Cross: 8

Heavys	Trucks	Cars	Totals
4	11	819	834

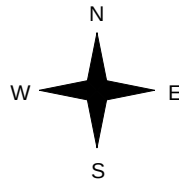


Sophia Street

Heavys	Trucks	Cars	Totals
0	0	0	0
2	7	726	735
2	7	726	



McDonald Street



Cars	Trucks	Heavys	Totals
85	1	0	86
5	0	0	5
90	1	0	



Sophia Street

Cars	Trucks	Heavys	Totals
0	0	0	0

Peds Cross: 8
 West Peds: 20
 West Entering: 735
 West Leg Total: 1569

Cars	Trucks	Heavys	Totals
731	7	2	740



Cars	Trucks	Heavys	Totals
734	10	4	748

Peds Cross: 4
 South Peds: 0
 South Entering: 748
 South Leg Total: 1488

Comments

Sophia Street & McDonald Street Traffic Count Summary

Intersection: Sophia Street & McDonald Street

Count Date: 26-Oct-2021

Municipality: Barrie

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	0	0	0	0	0	32	7:00:00	32	0	0	32	0
8:00:00	0	0	0	0	0	63	8:00:00	63	0	0	63	0
9:00:00	0	0	0	0	0	83	9:00:00	83	0	0	83	0
10:00:00	0	0	0	0	0	98	10:00:00	98	0	0	98	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0	131	16:00:00	131	0	0	131	0
17:00:00	0	0	0	0	0	143	17:00:00	143	0	0	143	0
18:00:00	0	0	0	0	0	126	18:00:00	126	0	0	126	0
19:00:00	0	0	0	0	0	72	19:00:00	72	0	0	72	0
Totals:	0	0	0	0	0	748		748	0	0	748	0
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	0	10	0	10	0	28	7:00:00	0	0	18	18	1
8:00:00	0	12	0	12	0	66	8:00:00	0	0	54	54	2
9:00:00	1	10	0	11	0	146	9:00:00	0	0	135	135	1
10:00:00	1	11	0	12	4	115	10:00:00	0	0	103	103	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	15	0	15	0	136	16:00:00	0	0	121	121	7
17:00:00	1	15	0	16	0	132	17:00:00	0	0	116	116	2
18:00:00	1	5	0	6	0	132	18:00:00	0	0	126	126	4
19:00:00	1	8	0	9	0	71	19:00:00	0	0	62	62	3
Totals:	5	86	0	91	4	826		0	0	735	735	20
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	7:00	8:00	9:00	10:00			16:00	17:00	18:00	19:00		
Crossing Values:	33	65	84	102			138	145	130	75		

McDonald Street & Clapperton Street

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 8:30:00

To: 9:30:00

Municipality: Barrie

Site #: 0000002803

Intersection: McDonald Street & Clapperton Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: McDonald Street runs W/E

North Leg Total: 32

North Entering: 7

North Peds: 1

Peds Cross: $\times$

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	0	5	2	7
Totals	0	5	2	



Heavys 1

Trucks 0

Cars 24

Totals 25

East Leg Total: 262

East Entering: 120

East Peds: 7

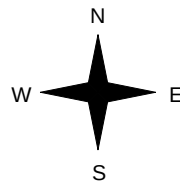
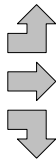
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
2	1	100	103



McDonald Street

Heavys	Trucks	Cars	Totals
0	0	3	3
0	1	130	131
0	0	4	4
0	1	137	



Clapperton Street

Clapperton Street

Cars	Trucks	Heavys	Totals
3	0	1	4
95	1	2	98
18	0	0	18
116	1	3	

McDonald Street



Cars	Trucks	Heavys	Totals
140	2	0	142

Peds Cross: $\times$

West Peds: 7

West Entering: 138

West Leg Total: 241

Cars	27
Trucks	0
Heavys	0
Totals	27



Cars	5	18	8	31
Trucks	0	0	1	1
Heavys	0	0	0	0
Totals	5	18	9	

Peds Cross: $\times$

South Peds: 3

South Entering: 32

South Leg Total: 59

Comments

McDonald Street & Clapperton Street

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Barrie

Site #: 0000002803

Intersection: McDonald Street & Clapperton Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: McDonald Street runs W/E

North Leg Total: 58

North Entering: 7

North Peds: 3

Peds Cross: $\times$

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	1	2	4	7
Totals	1	2	4	



Heavys	0
Trucks	0
Cars	51
Totals	51

East Leg Total: 292

East Entering: 155

East Peds: 3

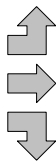
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
0	2	150	152

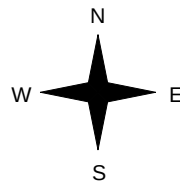


McDonald Street

Heavys	Trucks	Cars	Totals
0	0	13	13
0	1	109	110
0	0	5	5
0	1	127	



Clapperton Street



Cars	Trucks	Heavys	Totals
5	0	0	5
140	2	0	142
8	0	0	8
153	2	0	

McDonald Street



Cars	Trucks	Heavys	Totals
136	1	0	137

Peds Cross: $\times$

West Peds: 3

West Entering: 128

West Leg Total: 280

Cars	15	Cars	9	33	23	65
Trucks	0	Trucks	0	0	0	0
Heavys	0	Heavys	0	0	0	0
Totals	15	Totals	9	33	23	



Peds Cross: $\times$

South Peds: 5

South Entering: 65

South Leg Total: 80

Comments

McDonald Street & Clapperton Street

Total Count Diagram

Municipality: Barrie

Site #: 0000002803

Intersection: McDonald Street & Clapperton Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: McDonald Street runs W/E

North Leg Total: 233

North Entering: 51

North Peds: 10

Peds Cross: $\times$

Heavys	0	0	1	1
Trucks	0	0	0	0
Cars	2	33	15	50
Totals	2	33	16	



Heavys 1

Trucks 0

Cars 181

Totals 182

East Leg Total: 1561

East Entering: 795

East Peds: 31

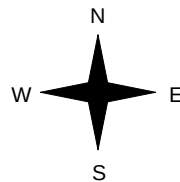
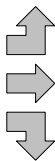
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
4	10	738	752



McDonald Street

Heavys	Trucks	Cars	Totals
0	0	40	40
2	6	666	674
0	0	29	29
2	6	735	



Clapperton Street

Clapperton Street

Cars	Trucks	Heavys	Totals
21	0	1	22
695	10	4	709
64	0	0	64
780	10	5	

McDonald Street



Cars	Trucks	Heavys	Totals
755	8	3	766

Peds Cross: $\times$

West Peds: 49

West Entering: 743

West Leg Total: 1495

Cars	126	Cars	41	120	74	235
Trucks	0	Trucks	0	0	2	2
Heavys	0	Heavys	0	0	0	0
Totals	126	Totals	41	120	76	



Peds Cross: $\times$

South Peds: 23

South Entering: 237

South Leg Total: 363

Comments

McDonald Street & Clapperton Street Traffic Count Summary

Intersection: McDonald Street & Clapperton Street						Count Date: 26-Oct-2021		Municipality: Barrie					
North Approach Totals						North/South Total Approaches	South Approach Totals						
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds	
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total		
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0	
7:00:00	0	1	0	1	1	3	7:00:00	0	1	1	2	0	
8:00:00	0	4	0	4	0	16	8:00:00	2	5	5	12	1	
9:00:00	5	4	0	9	3	34	9:00:00	4	14	7	25	1	
10:00:00	0	7	1	8	1	38	10:00:00	4	16	10	30	5	
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0	
16:00:00	2	5	0	7	1	45	16:00:00	12	16	10	38	5	
17:00:00	5	4	1	10	2	65	17:00:00	7	29	19	55	6	
18:00:00	2	3	0	5	2	52	18:00:00	10	21	16	47	3	
19:00:00	2	5	0	7	0	35	19:00:00	2	18	8	28	2	
Totals:	16	33	2	51	10	288		41	120	76	237	23	
East Approach Totals						East/West Total Approaches	West Approach Totals						
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds	
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total		
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0	
7:00:00	1	33	1	35	0	49	7:00:00	1	11	2	14	6	
8:00:00	7	58	0	65	1	121	8:00:00	1	54	1	56	1	
9:00:00	12	74	3	89	5	213	9:00:00	4	114	6	124	4	
10:00:00	16	97	2	115	10	233	10:00:00	4	110	4	118	7	
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0	
16:00:00	12	123	4	139	6	257	16:00:00	11	99	8	118	9	
17:00:00	8	138	5	151	3	271	17:00:00	9	107	4	120	7	
18:00:00	4	114	7	125	4	258	18:00:00	9	120	4	133	8	
19:00:00	4	72	0	76	2	136	19:00:00	1	59	0	60	7	
Totals:	64	709	22	795	31	1538		40	674	29	743	49	
Calculated Values for Traffic Crossing Major Street													
Hours Ending:	7:00	8:00	9:00	10:00			16:00	17:00	18:00	19:00			
Crossing Values:	7	9	32	37			45	51	45	31			

Worsley Street & Bayfield Street

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 8:15:00

To: 9:15:00

Municipality: Barrie

Site #: 0000002804

Intersection: Bayfield Street & Worsley Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bayfield Street runs N/S

North Leg Total: 674

North Entering: 471

North Peds: 1

Peds Cross: $\bowtie$

Heavys	9	1	10
Trucks	7	0	7
Cars	380	74	454
Totals	396	75	

Heavys	2
Trucks	3
Cars	198
Totals	203

East Leg Total: 138

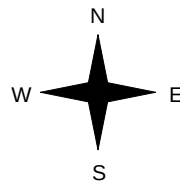
East Entering: 46

East Peds: 11

Peds Cross: $\bowtie$



Bayfield Street



Cars	Trucks	Heavys	Totals
30	0	0	30
16	0	0	16
46	0	0	

Worsley Street



Bayfield Street

Cars	396
Trucks	7
Heavys	9
Totals	412



Cars	168	17	185
Trucks	3	0	3
Heavys	2	0	2
Totals	173	17	

Peds Cross: $\bowtie$

South Peds: 10

South Entering: 190

South Leg Total: 602

Comments

Worsley Street & Bayfield Street

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Barrie

Site #: 0000002804

Intersection: Bayfield Street & Worsley Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bayfield Street runs N/S

North Leg Total: 864

North Entering: 456

North Peds: 5

Peds Cross: $\bowtie$

Heavys	6	0	6
Trucks	1	0	1
Cars	412	37	449
Totals	419	37	



Heavys	0
Trucks	0
Cars	408
Totals	408

East Leg Total: 181

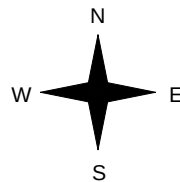
East Entering: 138

East Peds: 13

Peds Cross: $\bowtie$



Bayfield Street



Cars	Trucks	Heavys	Totals
104	0	0	104
34	0	0	34
138	0	0	



Worsley Street



Cars	Trucks	Heavys	Totals
43	0	0	43

Bayfield Street



Cars	446
Trucks	1
Heavys	6
Totals	453



Cars	304	6	310
Trucks	0	0	0
Heavys	0	0	0
Totals	304	6	

Peds Cross: $\bowtie$

South Peds: 10

South Entering: 310

South Leg Total: 763

Comments

Worsley Street & Bayfield Street

Total Count Diagram

Municipality: Barrie

Site #: 0000002804

Intersection: Bayfield Street & Worsley Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Bayfield Street runs N/S

North Leg Total: 4738

North Entering: 2832

North Peds: 24

Peds Cross: $\bowtie$

Heavys	59	1	60
Trucks	21	0	21
Cars	2502	249	2751
Totals	2582	250	

Heavys	8
Trucks	19
Cars	1879
Totals	1906

East Leg Total: 804

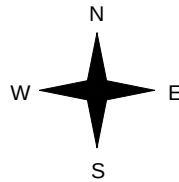
East Entering: 502

East Peds: 59

Peds Cross: $\bowtie$



Bayfield Street



Cars	Trucks	Heavys	Totals
345	6	0	351



Cars	Trucks	Heavys	Totals
150	1	0	151
495	7	0	

Worsley Street



Bayfield Street



Cars	2652	Cars	1534	50	1584
Trucks	22	Trucks	13	2	15
Heavys	59	Heavys	8	0	8
Totals	2733	Totals	1555	52	

Peds Cross: $\bowtie$

South Peds: 98

South Entering: 1607

South Leg Total: 4340

Comments

Worsley Street & Bayfield Street Traffic Count Summary

Intersection: Bayfield Street & Worsley Street

Count Date: 26-Oct-2021

Municipality: Barrie

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	5	161	0	166	1	250	7:00:00	0	81	3	84	5
8:00:00	18	243	0	261	1	371	8:00:00	0	107	3	110	8
9:00:00	78	362	0	440	1	628	9:00:00	0	172	16	188	9
10:00:00	30	336	0	366	5	565	10:00:00	0	190	9	199	19
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	33	420	0	453	2	705	16:00:00	0	247	5	252	16
17:00:00	29	395	0	424	7	732	17:00:00	0	302	6	308	15
18:00:00	37	381	0	418	5	682	18:00:00	0	260	4	264	4
19:00:00	20	284	0	304	2	506	19:00:00	0	196	6	202	22

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	7	0	7	14	3	14	7:00:00	0	0	0	0	0
8:00:00	14	0	22	36	4	36	8:00:00	0	0	0	0	0
9:00:00	21	0	25	46	11	46	9:00:00	0	0	0	0	0
10:00:00	19	0	36	55	5	55	10:00:00	0	0	0	0	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	26	0	77	103	7	103	16:00:00	0	0	0	0	0
17:00:00	22	0	69	91	10	91	17:00:00	0	0	0	0	0
18:00:00	28	0	84	112	11	112	18:00:00	0	0	0	0	0
19:00:00	14	0	31	45	8	45	19:00:00	0	0	0	0	0
Totals:	151	0	351	502	59	502		0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	10:00		16:00	17:00	18:00	19:00
Crossing Values:	13	23	31	43		44	44	37	38

Worsley Street & Clapperton Street

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 10:00:00

One Hour Peak

From: 8:15:00

To: 9:15:00

Municipality: Barrie

Site #: 0000002805

Intersection: Worsley Street & Clapperton Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Worsley Street runs W/E

North Leg Total: 58

North Entering: 28

North Peds: 4

Peds Cross: $\bowtie$

	Heavys	Trucks	Cars	Totals
North	0	0	0	0
East	0	0	0	0
South	8	14	6	28
West	8	14	6	28



	Heavys	Trucks	Cars	Totals
North	0	0	0	0
East	0	0	0	0
South	30	0	0	30
West	30	0	0	30

East Leg Total: 105

East Entering: 33

East Peds: 5

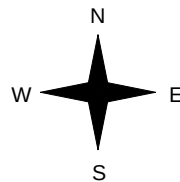
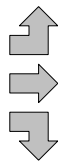
Peds Cross: $\bowtie$

Heavys	Trucks	Cars	Totals
0	0	42	42



Worsley Street

Heavys	Trucks	Cars	Totals
0	0	3	3
0	1	52	53
0	0	9	9
0	1	64	64



Clapperton Street

Cars	Trucks	Heavys	Totals
4	0	0	4
27	0	0	27
2	0	0	2
33	0	0	33



Worsley Street



Cars	Trucks	Heavys	Totals
70	2	0	72

Peds Cross: $\bowtie$

West Peds: 4

West Entering: 65

West Leg Total: 107

	Cars	Trucks	Heavys	Totals
North	25	0	0	25
East	7	0	0	7
South	23	0	0	23
West	12	1	0	13



	Cars	Trucks	Heavys	Totals
North	7	0	0	7
East	23	0	0	23
South	12	1	0	13
West	42	1	0	43

Peds Cross: $\bowtie$

South Peds: 2

South Entering: 43

South Leg Total: 68

Comments

Worsley Street & Clapperton Street

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 19:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Barrie

Site #: 0000002805

Intersection: Worsley Street & Clapperton Street

TFR File #: 1

Count date: 26-Oct-2021

Weather conditions:

Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Worsley Street runs W/E

North Leg Total: 85

North Entering: 16

North Peds: 12

Peds Cross: $\times$

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	5	7	4	16
Totals	5	7	4	



Heavys 0

Trucks 0

Cars 69

Totals 69

East Leg Total: 125

East Entering: 91

East Peds: 4

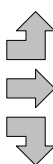
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
0	0	108	108

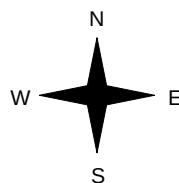


Worsley Street

Heavys	Trucks	Cars	Totals
0	0	6	6
0	0	21	21
0	0	2	2
0	0	29	



Clapperton Street



Cars	Trucks	Heavys	Totals
10	0	0	10
75	0	0	75
6	0	0	6
91	0	0	



Worsley Street



Cars	Trucks	Heavys	Totals
33	1	0	34

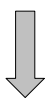
Peds Cross: $\times$

West Peds: 2

West Entering: 29

West Leg Total: 137

Cars	15	Cars	28	53	8	89
Trucks	0	Trucks	0	0	1	1
Heavys	0	Heavys	0	0	0	0
Totals	15	Totals	28	53	9	



Clapperton Street

Peds Cross: $\times$

South Peds: 3

South Entering: 90

South Leg Total: 105

Comments

Worsley Street & Clapperton Street

Total Count Diagram

Municipality: Barrie
Site #: 0000002805
Intersection: Worsley Street & Clapperton Street
TFR File #: 1
Count date: 26-Oct-2021

Weather conditions:
 Rain
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Worsley Street runs W/E

North Leg Total: 365
 North Entering: 124
 North Peds: 75
 Peds Cross: $\bowtie$

Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	0	0
58	42	24	124
58	42	24	

Heavys	Trucks	Cars	Totals
0	3	238	241

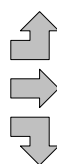
East Leg Total: 609
 East Entering: 344
 East Peds: 46
 Peds Cross: $\bowtie$

Heavys	Trucks	Cars	Totals
0	8	431	439

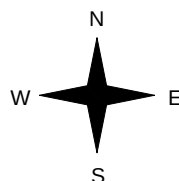


Worsley Street

Heavys	Trucks	Cars	Totals
0	0	25	25
0	1	177	178
0	3	28	31
0	4	230	



Clapperton Street



Cars	Trucks	Heavys	Totals
29	0	0	29
280	5	0	285
30	0	0	30
339	5	0	

Worsley Street



Cars	Trucks	Heavys	Totals
261	4	0	265

Peds Cross: $\bowtie$
 West Peds: 41
 West Entering: 234
 West Leg Total: 673

Cars	Trucks	Heavys	Totals
100	3	0	103



Cars	Trucks	Heavys	Totals
93	3	0	96
184	3	0	187
60	3	0	63
337	9	0	

Peds Cross: $\bowtie$
 South Peds: 43
 South Entering: 346
 South Leg Total: 449

Comments

Worsley Street & Clapperton Street Traffic Count Summary

Intersection: Worsley Street & Clapperton Street				Count Date: 26-Oct-2021			Municipality: Barrie					
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	0	2	2	4	2	7	7:00:00	1	1	1	3	3
8:00:00	1	2	9	12	3	26	8:00:00	2	9	3	14	8
9:00:00	5	10	10	25	2	61	9:00:00	7	17	12	36	1
10:00:00	5	10	10	25	14	79	10:00:00	15	27	12	54	8
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	6	4	11	21	18	82	16:00:00	16	33	12	61	5
17:00:00	5	6	6	17	12	92	17:00:00	19	45	11	75	2
18:00:00	2	5	5	12	15	75	18:00:00	20	34	9	63	5
19:00:00	0	3	5	8	9	48	19:00:00	16	21	3	40	11

Heather Goodman, B. Eng., EIT, MITE
 Transportation Consultant
 Paradigm Transportation Solutions Limited
 5000 Yonge Street, Suite 1901,
 Toronto, Ontario M2N 7E9

January 5, 2018

File: T07-SI

Dear Ms. Goodman,

RE: Traffic Signal Timings – Bayfield Street and Sophia Street

With respect to your inquiry on December 7, 2017, the above intersection traffic signal timings are as follows:

Roadway	Direction	Vehicular Indications				Pedestrian Indications	
		Minimum Green	Maximum Green	Amber	All Red	Walk	Flashing Don't Walk
Bayfield Street (Main Street)	Southbound Advanced Left Turn	7	7	3	1	N/A	N/A
Bayfield Street (Main Street)	Northbound/ Southbound	34	34	4	2	20	14
Sophia Street (Side Street)	Eastbound/ Westbound	10	24	4	2	10	14

NOTE: All times are recorded in seconds, based on full demand.

The side street phases are actuated; meaning a vehicle or pedestrian must be present on the side street before the side street is given a green indication. Actuation at this intersection occurs in two ways: first, for vehicles a loop detector is imbedded into the roadway at the painted stop bar; and secondly, pushbuttons are located on each corner for pedestrians to activate their movement. Vehicle presence only on the side street would result in a possible green time of between the minimum and maximum times noted above, depending on demand.

Pedestrian “Walk” and “Flashing Don’t Walk” times on the side street as noted would be used in the event that the pedestrian push button was activated. Should there be no demand on the actuated phases; the signals would rest in a green indication for the main street.

Should you require any further information please feel free to contact me at (705) 739-4220 ext. 5178.

Yours truly,



Justin MacDonald, C.E.T.
Senior Transportation Operations Technologist

DRAFT



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017
Page No: 1

Turning Movement Data

Start Time	Sophia Street Eastbound						Sophia Street Westbound						Bayfield Street Northbound						Bayfield Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
6:00 AM	6	0	0	0	0	6	1	5	4	0	0	10	0	13	0	0	1	13	1	32	5	0	1	38	67
6:15 AM	8	1	0	0	1	9	3	4	6	0	0	13	0	15	0	0	0	15	0	31	2	0	0	33	70
6:30 AM	8	3	3	0	1	14	4	4	3	0	0	11	0	27	1	0	0	28	2	55	4	0	0	61	114
6:45 AM	11	3	2	0	0	16	3	6	5	0	0	14	3	20	1	0	0	24	3	47	4	0	0	54	108
Hourly Total	33	7	5	0	2	45	11	19	18	0	0	48	3	75	2	0	1	80	6	165	15	0	1	186	359
7:00 AM	17	10	3	0	0	30	4	5	4	0	0	13	0	30	4	0	1	34	4	56	4	0	0	64	141
7:15 AM	12	8	4	0	2	24	3	10	4	0	0	17	0	33	2	0	4	35	12	48	10	0	1	70	146
7:30 AM	19	13	3	0	2	35	8	12	5	0	1	25	3	35	3	0	2	41	17	61	4	0	2	82	183
7:45 AM	26	26	10	0	1	62	12	24	9	0	1	45	5	44	3	0	1	52	34	93	4	0	0	131	290
Hourly Total	74	57	20	0	5	151	27	51	22	0	2	100	8	142	12	0	8	162	67	258	22	0	3	347	760
8:00 AM	25	9	10	0	2	44	5	15	8	0	0	28	4	50	3	0	3	57	26	77	7	0	3	110	239
8:15 AM	25	27	8	0	2	60	4	17	12	0	0	33	4	36	4	0	1	44	56	112	11	0	0	179	316
8:30 AM	20	31	10	0	5	61	5	23	6	0	0	34	5	44	4	0	3	53	42	116	10	0	0	168	316
8:45 AM	30	18	11	0	5	59	11	20	14	0	0	45	4	56	1	0	8	61	39	124	23	0	0	186	351
Hourly Total	100	85	39	0	14	224	25	75	40	0	0	140	17	186	12	0	15	215	163	429	51	0	3	643	1222
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	22	11	3	0	17	36	9	11	11	0	7	31	6	48	2	0	7	56	14	92	16	0	3	122	245
11:15 AM	33	18	4	0	4	55	5	23	17	0	5	45	8	76	2	0	5	86	18	96	13	0	4	127	313
11:30 AM	36	22	7	0	10	65	6	18	22	0	3	46	4	74	1	0	13	79	16	121	15	0	0	152	342
11:45 AM	37	17	9	0	18	63	8	29	21	0	2	58	17	77	5	0	5	99	18	114	11	0	4	143	363
Hourly Total	128	68	23	0	49	219	28	81	71	0	17	180	35	275	10	0	30	320	66	423	55	0	11	544	1263
12:00 PM	28	10	9	0	8	47	6	22	26	0	1	54	14	81	3	0	6	98	17	113	10	0	2	140	339
12:15 PM	34	14	9	0	10	57	7	25	28	0	3	60	13	84	3	0	3	100	14	99	8	0	5	121	338
12:30 PM	33	29	4	0	12	66	7	18	26	0	6	51	9	91	4	0	2	104	17	105	11	0	3	133	354
12:45 PM	32	30	17	0	4	79	6	22	19	0	2	47	7	80	3	0	2	90	23	107	13	0	2	143	359
Hourly Total	127	83	39	0	34	249	26	87	99	0	12	212	43	336	13	0	13	392	71	424	42	0	12	537	1390
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	31	22	4	0	3	57	6	34	20	0	1	60	10	71	3	0	0	84	19	107	10	0	2	136	337
3:15 PM	51	15	7	0	13	73	8	22	19	0	6	49	9	68	3	0	4	80	14	96	12	0	2	122	324
3:30 PM	26	21	7	0	7	54	6	28	16	0	3	50	6	84	0	0	4	90	7	86	12	0	1	105	299
3:45 PM	48	17	14	0	2	79	5	18	18	0	3	41	11	78	2	0	6	91	13	107	16	0	5	136	347
Hourly Total	156	75	32	0	25	263	25	102	73	0	13	200	36	301	8	0	14	345	53	396	50	0	10	499	1307
4:00 PM	43	28	8	0	2	79	5	29	42	0	1	76	9	95	1	0	1	105	20	112	11	0	5	143	403

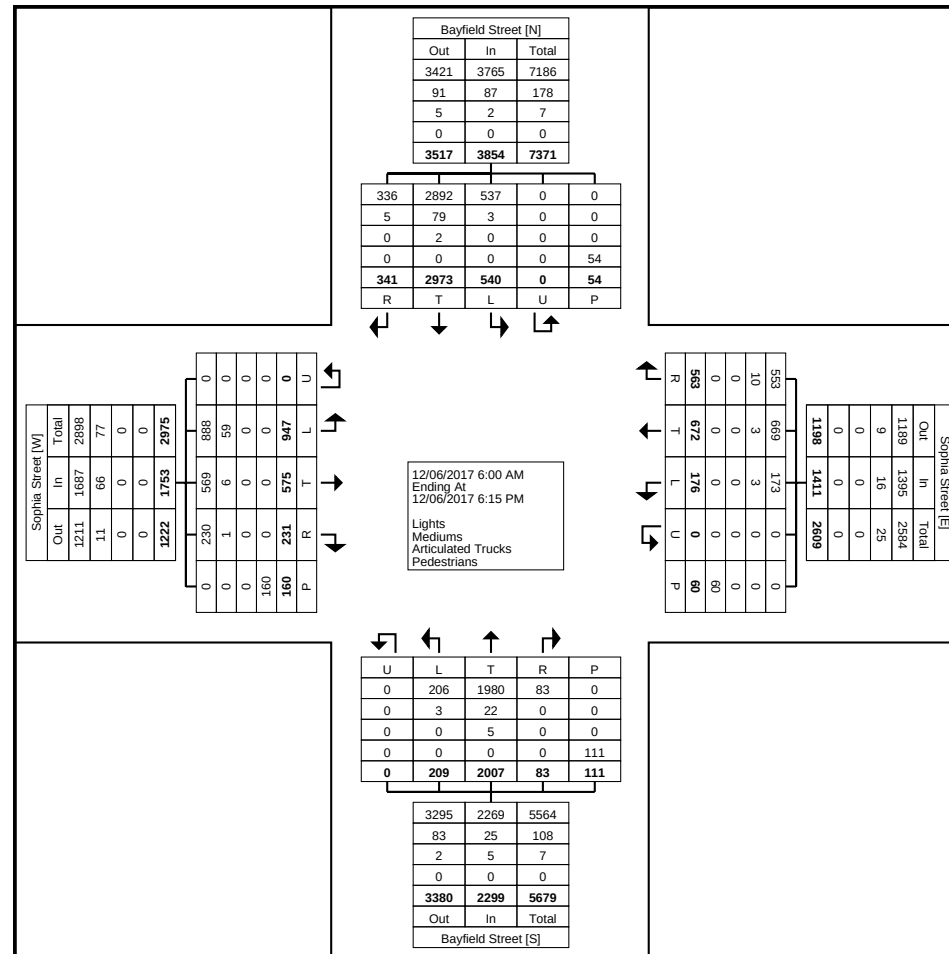
4:15 PM	37	25	18	0	1	80	6	35	38	0	3	79	8	74	2	0	3	84	13	105	13	0	2	131	374
4:30 PM	40	24	12	0	6	76	2	46	44	0	2	92	10	102	3	0	3	115	15	120	9	0	1	144	427
4:45 PM	35	32	10	0	7	77	8	38	38	0	2	84	15	79	3	0	4	97	14	107	18	0	4	139	397
Hourly Total	155	109	48	0	16	312	21	148	162	0	8	331	42	350	9	0	11	401	62	444	51	0	12	557	1601
5:00 PM	45	31	7	0	5	83	2	46	31	0	1	79	11	142	4	0	7	157	18	122	13	0	0	153	472
5:15 PM	38	21	3	0	5	62	0	25	24	0	4	49	6	73	6	0	2	85	13	112	13	0	1	138	334
5:30 PM	49	23	6	0	4	78	4	19	12	0	1	35	4	57	4	0	8	65	10	90	14	0	0	114	292
5:45 PM	42	16	9	0	1	67	7	19	11	0	2	37	4	70	3	0	2	77	11	110	15	0	1	136	317
Hourly Total	174	91	25	0	15	290	13	109	78	0	8	200	25	342	17	0	19	384	52	434	55	0	2	541	1415
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	947	575	231	0	160	1753	176	672	563	0	60	1411	209	2007	83	0	111	2299	540	2973	341	0	54	3854	9317
Approach %	54.0	32.8	13.2	0.0	-	-	12.5	47.6	39.9	0.0	-	-	9.1	87.3	3.6	0.0	-	-	14.0	77.1	8.8	0.0	-	-	-
Total %	10.2	6.2	2.5	0.0	-	18.8	1.9	7.2	6.0	0.0	-	15.1	2.2	21.5	0.9	0.0	-	24.7	5.8	31.9	3.7	0.0	-	41.4	-
Lights	888	569	230	0	-	1687	173	669	553	0	-	1395	206	1980	83	0	-	2269	537	2892	336	0	-	3765	9116
% Lights	93.8	99.0	99.6	-	-	96.2	98.3	99.6	98.2	-	-	98.9	98.6	98.7	100.0	-	-	98.7	99.4	97.3	98.5	-	-	97.7	97.8
Mediums	59	6	1	0	-	66	3	3	10	0	-	16	3	22	0	0	-	25	3	79	5	0	-	87	194
% Mediums	6.2	1.0	0.4	-	-	3.8	1.7	0.4	1.8	-	-	1.1	1.4	1.1	0.0	-	-	1.1	0.6	2.7	1.5	-	-	2.3	2.1
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	5	0	0	-	5	0	2	0	0	-	2	7
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	-	-	0.2	0.0	0.1	0.0	-	-	0.1	0.1
Pedestrians	-	-	-	-	160	-	-	-	-	-	60	-	-	-	-	-	111	-	-	-	-	-	54	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017
Page No: 3



Turning Movement Data Plot



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017
Page No: 4

Turning Movement Peak Hour Data (8:00 AM)

Start Time	Sophia Street Eastbound						Sophia Street Westbound						Bayfield Street Northbound						Bayfield Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:00 AM	25	9	10	0	2	44	5	15	8	0	0	28	4	50	3	0	3	57	26	77	7	0	3	110	239
8:15 AM	25	27	8	0	2	60	4	17	12	0	0	33	4	36	4	0	1	44	56	112	11	0	0	179	316
8:30 AM	20	31	10	0	5	61	5	23	6	0	0	34	5	44	4	0	3	53	42	116	10	0	0	168	316
8:45 AM	30	18	11	0	5	59	11	20	14	0	0	45	4	56	1	0	8	61	39	124	23	0	0	186	351
Total	100	85	39	0	14	224	25	75	40	0	0	140	17	186	12	0	15	215	163	429	51	0	3	643	1222
Approach %	44.6	37.9	17.4	0.0	-	-	17.9	53.6	28.6	0.0	-	-	7.9	86.5	5.6	0.0	-	-	25.3	66.7	7.9	0.0	-	-	-
Total %	8.2	7.0	3.2	0.0	-	18.3	2.0	6.1	3.3	0.0	-	11.5	1.4	15.2	1.0	0.0	-	17.6	13.3	35.1	4.2	0.0	-	52.6	-
PHF	0.833	0.685	0.886	0.000	-	0.918	0.568	0.815	0.714	0.000	-	0.778	0.850	0.830	0.750	0.000	-	0.881	0.728	0.865	0.554	0.000	-	0.864	0.870
Lights	92	85	39	0	-	216	25	74	39	0	-	138	17	184	12	0	-	213	162	417	51	0	-	630	1197
% Lights	92.0	100.0	100.0	-	-	96.4	100.0	98.7	97.5	-	-	98.6	100.0	98.9	100.0	-	-	99.1	99.4	97.2	100.0	-	-	98.0	98.0
Mediums	8	0	0	0	-	8	0	1	1	0	-	2	0	2	0	0	-	2	1	12	0	0	-	13	25
% Mediums	8.0	0.0	0.0	-	-	3.6	0.0	1.3	2.5	-	-	1.4	0.0	1.1	0.0	-	-	0.9	0.6	2.8	0.0	-	-	2.0	2.0
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	14	-	-	-	-	-	0	-	-	-	-	-	15	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data Plot (8:00 AM)



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017
Page No: 6

Turning Movement Peak Hour Data (11:45 AM)

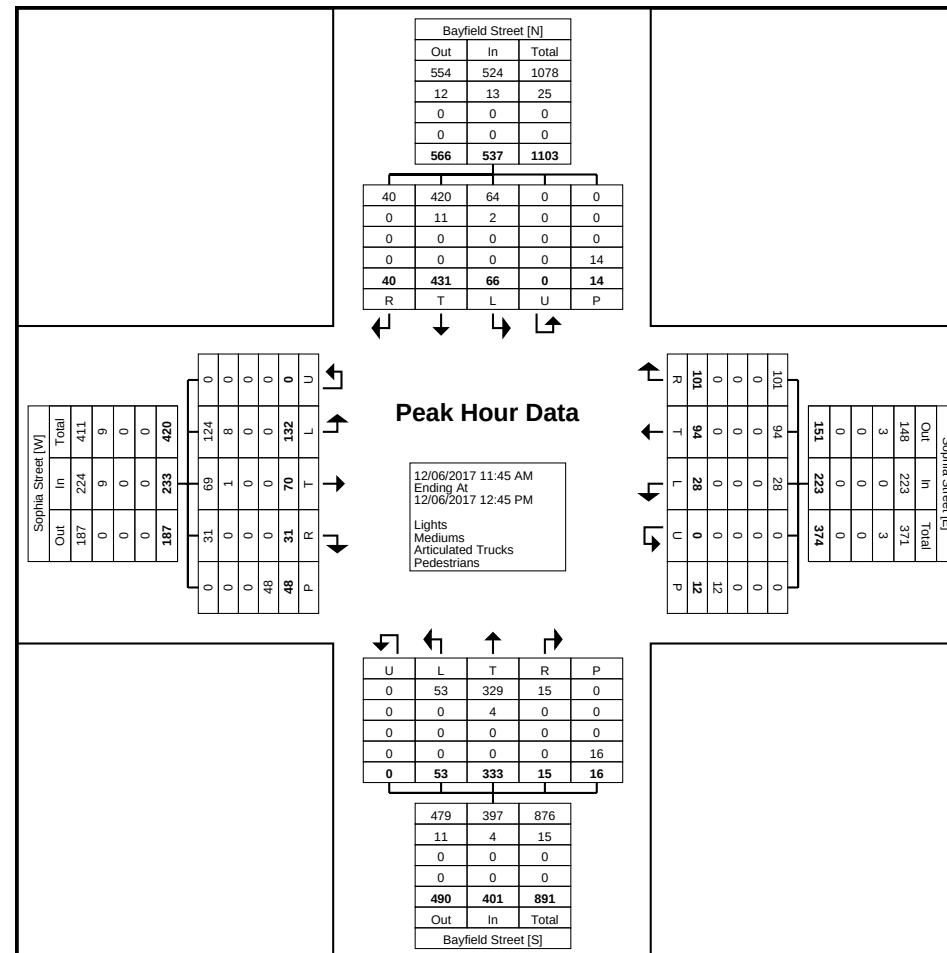
Start Time	Sophia Street Eastbound						Sophia Street Westbound						Bayfield Street Northbound						Bayfield Street Southbound						Int. Total	
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total		
11:45 AM	37	17	9	0	18	63	8	29	21	0	2	58	17	77	5	0	5	99	18	114	11	0	4	143	363	
12:00 PM	28	10	9	0	8	47	6	22	26	0	1	54	14	81	3	0	6	98	17	113	10	0	2	140	339	
12:15 PM	34	14	9	0	10	57	7	25	28	0	3	60	13	84	3	0	3	100	14	99	8	0	5	121	338	
12:30 PM	33	29	4	0	12	66	7	18	26	0	6	51	9	91	4	0	2	104	17	105	11	0	3	133	354	
Total	132	70	31	0	48	233	28	94	101	0	12	223	53	333	15	0	16	401	66	431	40	0	14	537	1394	
Approach %	56.7	30.0	13.3	0.0	-	-	12.6	42.2	45.3	0.0	-	-	13.2	83.0	3.7	0.0	-	-	12.3	80.3	7.4	0.0	-	-	-	
Total %	9.5	5.0	2.2	0.0	-	16.7	2.0	6.7	7.2	0.0	-	16.0	3.8	23.9	1.1	0.0	-	28.8	4.7	30.9	2.9	0.0	-	38.5	-	
PHF	0.892	0.603	0.861	0.000	-	0.883	0.875	0.810	0.902	0.000	-	0.929	0.779	0.915	0.750	0.000	-	0.964	0.917	0.945	0.909	0.000	-	0.939	0.960	
Lights	124	69	31	0	-	224	28	94	101	0	-	223	53	329	15	0	-	397	64	420	40	0	-	524	1368	
% Lights	93.9	98.6	100.0	-	-	96.1	100.0	100.0	100.0	-	-	100.0	100.0	98.8	100.0	-	-	99.0	97.0	97.4	100.0	-	-	-	97.6	98.1
Mediums	8	1	0	0	-	9	0	0	0	0	-	0	0	4	0	0	-	4	2	11	0	0	-	13	26	
% Mediums	6.1	1.4	0.0	-	-	3.9	0.0	0.0	0.0	-	-	0.0	0.0	1.2	0.0	-	-	1.0	3.0	2.6	0.0	-	-	2.4	1.9	
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	
Pedestrians	-	-	-	-	48	-	-	-	-	-	12	-	-	-	-	-	16	-	-	-	-	-	14	-	-	
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017
Page No: 7



Turning Movement Peak Hour Data Plot (11:45 AM)



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017
Page No: 8

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Sophia Street Eastbound						Sophia Street Westbound						Bayfield Street Northbound						Bayfield Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	37	25	18	0	1	80	6	35	38	0	3	79	8	74	2	0	3	84	13	105	13	0	2	131	374
4:30 PM	40	24	12	0	6	76	2	46	44	0	2	92	10	102	3	0	3	115	15	120	9	0	1	144	427
4:45 PM	35	32	10	0	7	77	8	38	38	0	2	84	15	79	3	0	4	97	14	107	18	0	4	139	397
5:00 PM	45	31	7	0	5	83	2	46	31	0	1	79	11	142	4	0	7	157	18	122	13	0	0	153	472
Total	157	112	47	0	19	316	18	165	151	0	8	334	44	397	12	0	17	453	60	454	53	0	7	567	1670
Approach %	49.7	35.4	14.9	0.0	-	-	5.4	49.4	45.2	0.0	-	-	9.7	87.6	2.6	0.0	-	-	10.6	80.1	9.3	0.0	-	-	-
Total %	9.4	6.7	2.8	0.0	-	18.9	1.1	9.9	9.0	0.0	-	20.0	2.6	23.8	0.7	0.0	-	27.1	3.6	27.2	3.2	0.0	-	34.0	-
PHF	0.872	0.875	0.653	0.000	-	0.952	0.563	0.897	0.858	0.000	-	0.908	0.733	0.699	0.750	0.000	-	0.721	0.833	0.930	0.736	0.000	-	0.926	0.885
Lights	148	111	46	0	-	305	17	165	148	0	-	330	42	393	12	0	-	447	60	444	53	0	-	557	1639
% Lights	94.3	99.1	97.9	-	-	96.5	94.4	100.0	98.0	-	-	98.8	95.5	99.0	100.0	-	-	98.7	100.0	97.8	100.0	-	-	98.2	98.1
Mediums	9	1	1	0	-	11	1	0	3	0	-	4	2	4	0	0	-	6	0	10	0	0	-	10	31
% Mediums	5.7	0.9	2.1	-	-	3.5	5.6	0.0	2.0	-	-	1.2	4.5	1.0	0.0	-	-	1.3	0.0	2.2	0.0	-	-	1.8	1.9
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	19	-	-	-	-	-	8	-	-	-	-	-	17	-	-	-	-	-	7	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data Plot (4:15 PM)



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22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
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Start Date: 12/06/2017
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Appendix C

Existing Synchro Analysis Outputs

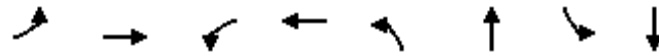


Queues

Base Year (2021) AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	183	173	28	171	21	330	146	876
v/c Ratio	0.71	0.41	0.10	0.40	0.07	0.21	0.22	0.42
Control Delay	42.0	21.8	22.5	20.2	14.1	12.9	7.2	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	21.8	22.5	20.2	14.1	12.9	7.2	8.8
Queue Length 50th (m)	24.7	17.1	3.3	15.5	1.7	14.1	7.4	30.3
Queue Length 95th (m)	40.3	29.5	8.5	27.8	5.9	23.3	16.3	47.1
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	369	598	396	589	282	1609	678	2093
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.29	0.07	0.29	0.07	0.21	0.22	0.42
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

Base Year (2021) AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	92	50	23	83	57	17	258	12	120	638	80
Future Volume (vph)	150	92	50	23	83	57	17	258	12	120	638	80
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		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.94		1.00	0.99		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)	1663	1769		1795	1719		1793	3481		1800	3411	
Flt Permitted	0.65	1.00		0.64	1.00		0.32	1.00		0.49	1.00	
Satd. Flow (perm)	1136	1769		1218	1719		612	3481		937	3411	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	183	112	61	28	101	70	21	315	15	146	778	98
RTOR Reduction (vph)	0	26	0	0	34	0	0	4	0	0	11	0
Lane Group Flow (vph)	183	147	0	28	137	0	21	326	0	146	865	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	3%	0%	0%	4%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.8	16.8		16.8	16.8		34.2	34.2		45.2	45.2	
Effective Green, g (s)	16.8	16.8		16.8	16.8		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.46	0.46		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	257	401		276	390		282	1608		653	2083	
v/s Ratio Prot		0.08			0.08			0.09		0.02	c0.25	
v/s Ratio Perm	c0.16			0.02			0.03			0.12		
v/c Ratio	0.71	0.37		0.10	0.35		0.07	0.20		0.22	0.42	
Uniform Delay, d1	26.4	24.1		22.6	24.0		11.1	11.8		6.2	7.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.0	0.6		0.2	0.5		0.5	0.3		0.2	0.6	
Delay (s)	35.3	24.7		22.8	24.6		11.6	12.1		6.4	8.1	
Level of Service	D	C		C	C		B	B		A	A	
Approach Delay (s)		30.2			24.3			12.1			7.9	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			14.5			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			74.0			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			96.1%			ICU Level of Service				F		
Analysis Period (min)			15									

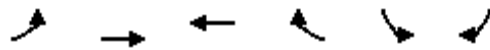
c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

2: Sophia Street East & McDonald Street

Base Year (2021) AM Peak Hour

210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	216	140	0	0	17
Future Volume (Veh/h)	0	216	140	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	0	292	189	0	0	23
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		126				
pX, platoon unblocked					1.00	
vC, conflicting volume	189				481	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	189				480	190
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	97
cM capacity (veh/h)	1397				548	833
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	292	189	23			
Volume Left	0	0	0			
Volume Right	0	0	23			
cSH	1700	1700	833			
Volume to Capacity	0.17	0.11	0.03			
Queue Length 95th (m)	0.0	0.0	0.7			
Control Delay (s)	0.0	0.0	9.4			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.4			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization		21.4%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

Base Year (2021) AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	197	6	27	147	6	8	27	14	3	8	0
Future Volume (Veh/h)	5	197	6	27	147	6	8	27	14	3	8	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	6	221	7	30	165	7	9	30	16	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		208										
pX, platoon unblocked												
vC, conflicting volume	173			231			480	472	234	504	472	176
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	173			231			480	472	234	504	472	176
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			98			98	94	98	99	98	100
cM capacity (veh/h)	1415			1345			476	478	775	435	478	865
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	234	202	55	12								
Volume Left	6	30	9	3								
Volume Right	7	7	16	0								
cSH	1415	1345	538	466								
Volume to Capacity	0.00	0.02	0.10	0.03								
Queue Length 95th (m)	0.1	0.5	2.7	0.6								
Control Delay (s)	0.2	1.3	12.5	12.9								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.3	12.5	12.9								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			34.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Bayfield Street & Worsley Street

Base Year (2021) AM Peak Hour

210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	24	45	260	26	113	594
Future Volume (Veh/h)	24	45	260	26	113	594
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	28	53	306	31	133	699
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.88					
vC, conflicting volume	958	334			348	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	681	334			348	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	92			89	
cM capacity (veh/h)	298	660			1201	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	81	337	366	466		
Volume Left	28	0	133	0		
Volume Right	53	31	0	0		
cSH	465	1700	1201	1700		
Volume to Capacity	0.17	0.20	0.11	0.27		
Queue Length 95th (m)	5.0	0.0	3.0	0.0		
Control Delay (s)	14.4	0.0	3.7	0.0		
Lane LOS	B		A			
Approach Delay (s)	14.4	0.0	1.6			
Approach LOS	B					
Intersection Summary						
Average Delay		2.0				
Intersection Capacity Utilization		49.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

Base Year (2021) AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	80	14	3	41	6	11	35	20	9	21	12
Future Volume (vph)	5	80	14	3	41	6	11	35	20	9	21	12
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Hourly flow rate (vph)	7	119	21	4	61	9	16	52	30	13	31	18
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	147	74	98	62								
Volume Left (vph)	7	4	16	13								
Volume Right (vph)	21	9	30	18								
Hadj (s)	-0.05	-0.06	-0.11	-0.13								
Departure Headway (s)	4.3	4.4	4.4	4.4								
Degree Utilization, x	0.18	0.09	0.12	0.08								
Capacity (veh/h)	804	777	778	766								
Control Delay (s)	8.2	7.8	8.0	7.7								
Approach Delay (s)	8.2	7.8	8.0	7.7								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.0								
Level of Service				A								
Intersection Capacity Utilization				19.8%	ICU Level of Service	A						
Analysis Period (min)				15								

Intersection: 5: Clapperton Street & Worsley Street

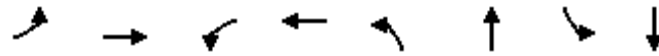
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	18.5	12.0	18.2	9.1
Average Queue (m)	10.3	7.9	9.2	6.5
95th Queue (m)	15.9	13.2	15.5	12.8
Link Distance (m)	127.7	165.1	115.5	108.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

Base Year (2021) PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	255	187	11	251	41	609	61	721
v/c Ratio	0.94	0.35	0.03	0.46	0.13	0.37	0.13	0.36
Control Delay	73.1	22.2	20.7	20.5	15.9	16.1	8.1	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.1	22.2	20.7	20.5	15.9	16.1	8.1	10.1
Queue Length 50th (m)	39.7	21.0	1.3	24.1	4.0	34.9	3.9	30.5
Queue Length 95th (m)	#84.9	38.3	5.0	45.7	10.6	48.4	8.9	42.0
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	281	560	350	561	324	1631	465	1984
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.33	0.03	0.45	0.13	0.37	0.13	0.36

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

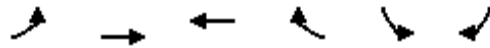
Base Year (2021) PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	245	138	41	11	122	119	39	570	14	59	618	74
Future Volume (vph)	245	138	41	11	122	119	39	570	14	59	618	74
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		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)	1731	1826		1794	1728		1799	3593		1749	3510	
Flt Permitted	0.52	1.00		0.62	1.00		0.38	1.00		0.34	1.00	
Satd. Flow (perm)	939	1826		1171	1728		715	3593		628	3510	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	255	144	43	11	127	124	41	594	15	61	644	77
RTOR Reduction (vph)	0	14	0	0	44	0	0	2	0	0	11	0
Lane Group Flow (vph)	255	173	0	11	207	0	41	607	0	61	710	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	0%	0%	3%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.1	23.1		23.1	23.1		36.3	36.3		45.8	45.8	
Effective Green, g (s)	23.1	23.1		23.1	23.1		36.3	36.3		45.8	45.8	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.45	0.45		0.57	0.57	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	268	521		334	493		320	1612		431	1987	
v/s Ratio Prot		0.09			0.12			0.17		0.01	c0.20	
v/s Ratio Perm	c0.27			0.01			0.06			0.07		
v/c Ratio	0.95	0.33		0.03	0.42		0.13	0.38		0.14	0.36	
Uniform Delay, d1	28.4	22.8		20.8	23.5		13.0	14.8		8.3	9.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	41.7	0.4		0.0	0.6		0.8	0.7		0.2	0.5	
Delay (s)	70.0	23.2		20.9	24.0		13.9	15.5		8.4	10.0	
Level of Service	E	C		C	C		B	B		A	B	
Approach Delay (s)		50.2			23.9			15.4			9.9	
Approach LOS		D			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			21.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			80.9			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 2: Sophia Street East & McDonald Street

Base Year (2021) PM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	200	231	0	2	14
Future Volume (Veh/h)	0	200	231	0	2	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	215	248	0	2	15
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked					0.96	
vC, conflicting volume	248				463	250
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	248				421	250
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1330				570	792
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	215	248	17			
Volume Left	0	0	2			
Volume Right	0	0	15			
cSH	1700	1700	757			
Volume to Capacity	0.13	0.15	0.02			
Queue Length 95th (m)	0.0	0.0	0.6			
Control Delay (s)	0.0	0.0	9.9			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization		22.2%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

Base Year (2021) PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	165	8	12	213	8	14	50	35	6	3	2
Future Volume (Veh/h)	20	165	8	12	213	8	14	50	35	6	3	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	20	168	8	12	217	8	14	51	36	6	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	228				181				468	469	180	524
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	228				181				468	469	180	524
tC, single (s)	4.1				4.1				7.1	6.5	6.2	7.1
tC, 2 stage (s)												
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5
p0 queue free %	99				99				97	89	96	98
cM capacity (veh/h)	1348				1400				489	480	861	399
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	196	237	101	11								
Volume Left	20	12	14	6								
Volume Right	8	8	36	2								
cSH	1348	1400	571	463								
Volume to Capacity	0.01	0.01	0.18	0.02								
Queue Length 95th (m)	0.4	0.2	5.1	0.6								
Control Delay (s)	0.9	0.5	12.6	13.0								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.9	0.5	12.6	13.0								
Approach LOS				B	B							
Intersection Summary												
Average Delay				3.1								
Intersection Capacity Utilization				29.3%	ICU Level of Service				A			
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

Base Year (2021) PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	51	156	456	9	56	629
Future Volume (Veh/h)	51	156	456	9	56	629
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	55	168	490	10	60	676
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.90					
vC, conflicting volume	976	513			513	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744	513			513	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	67			94	
cM capacity (veh/h)	293	502			1049	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	223	500	285	451		
Volume Left	55	0	60	0		
Volume Right	168	10	0	0		
cSH	427	1700	1049	1700		
Volume to Capacity	0.52	0.29	0.06	0.27		
Queue Length 95th (m)	23.5	0.0	1.5	0.0		
Control Delay (s)	22.3	0.0	2.3	0.0		
Lane LOS	C		A			
Approach Delay (s)	22.3	0.0	0.9			
Approach LOS	C					
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization			66.5%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

Base Year (2021) PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	9	32	3	9	113	15	42	80	14	6	11	8
Future Volume (vph)	9	32	3	9	113	15	42	80	14	6	11	8
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	10	37	3	10	131	17	49	93	16	7	13	9
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	50	158	158	29								
Volume Left (vph)	10	10	49	7								
Volume Right (vph)	3	17	16	9								
Hadj (s)	0.00	-0.05	0.02	-0.14								
Departure Headway (s)	4.5	4.3	4.4	4.4								
Degree Utilization, x	0.06	0.19	0.19	0.04								
Capacity (veh/h)	754	785	774	756								
Control Delay (s)	7.8	8.4	8.5	7.6								
Approach Delay (s)	7.8	8.4	8.5	7.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.3									
Level of Service			A									
Intersection Capacity Utilization			27.7%		ICU Level of Service				A			
Analysis Period (min)			15									

Intersection: 5: Clapperton Street & Worsley Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	14.7	16.7	20.8	10.2
Average Queue (m)	7.4	10.7	10.2	4.9
95th Queue (m)	14.1	15.9	15.5	12.2
Link Distance (m)	127.7	165.1	115.5	109.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

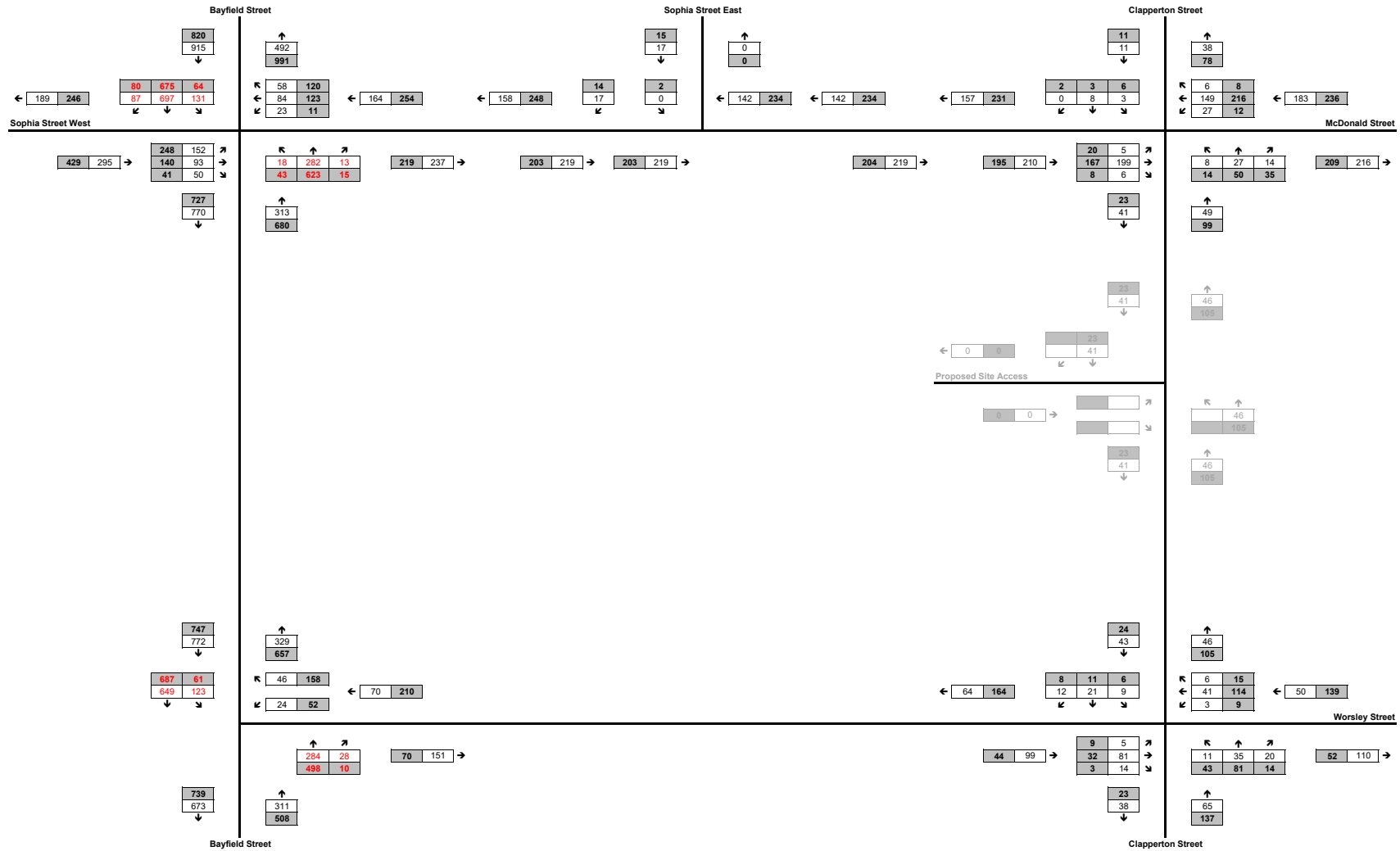
Appendix D

Background Forecasts Components



# Peak Hour	123	Growth Rate:	0.50%	3%	*Note: use a 0.5% growth rate for all local roadways and 3% for Bayfield Street
# Peak Hour	123	Year:		3	

# Peak Hour	123	Growth Rate:	0.50%	3%	*Note: use a 0.5% growth rate for all local roadways and 3% for Bayfield Street
# Peak Hour	123	Year:		3	

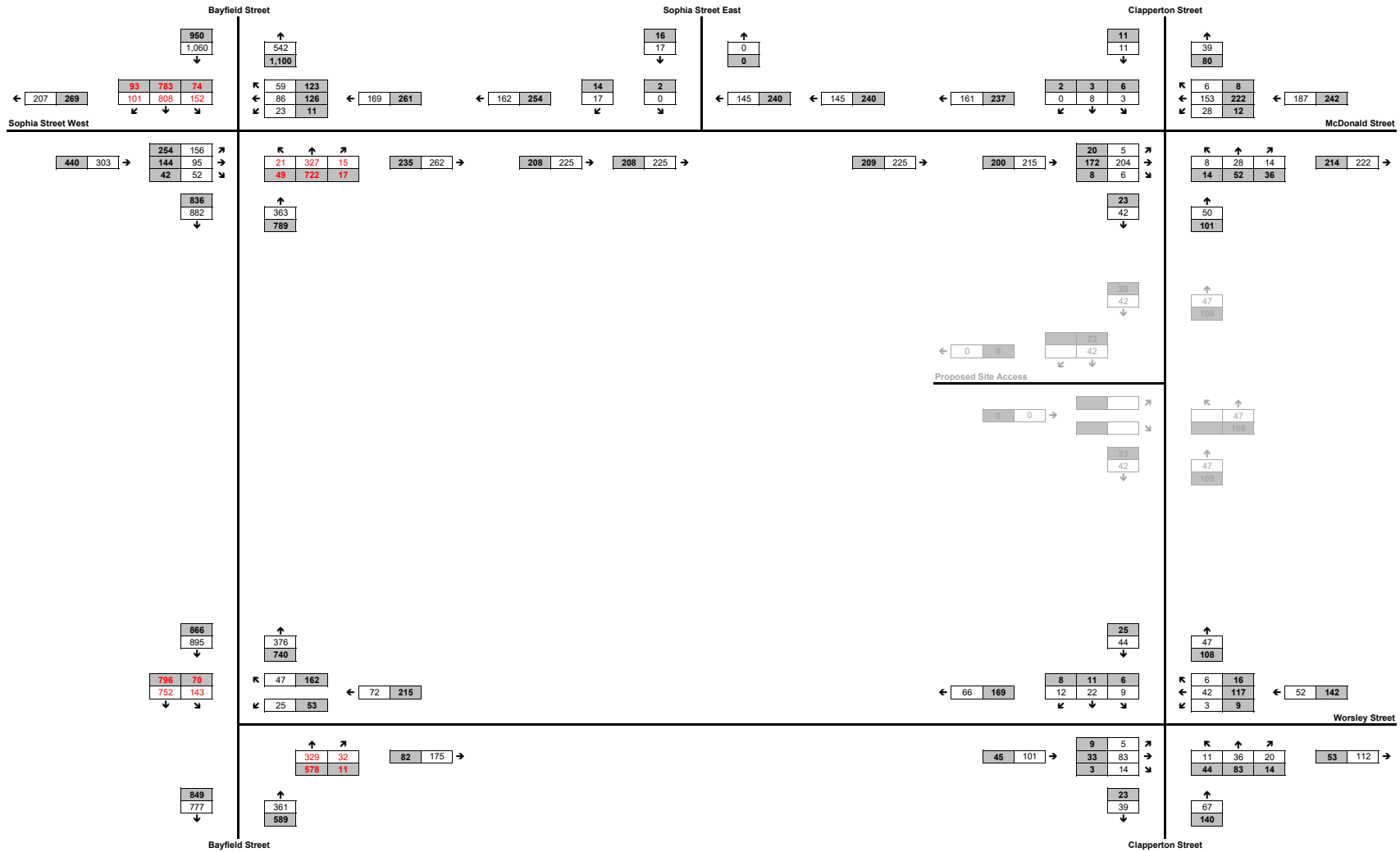


Future Background 2029 (5 Year horizon)

Peak Hour: 123
Peak Hour: 123

Growth Rate: 0.50% 3%
Year: 8

*Note: use a 0.5% growth rate for all local roadways and 3% for Bayfield Street

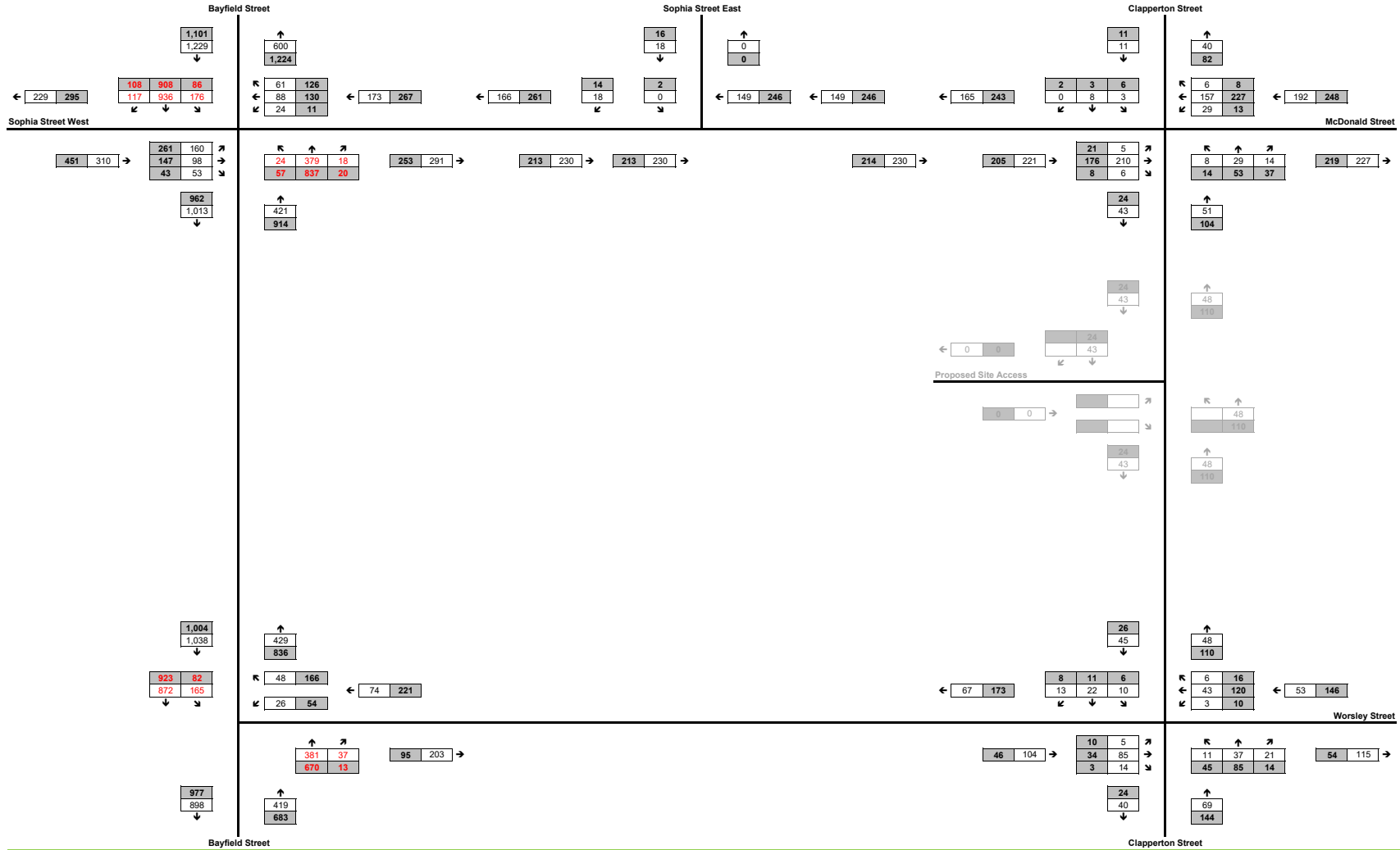


Future Background 2034 (10 Year horizon)

Peak Hour 123
Peak Hour 123

Growth Rate: 0.50% 3%
Year: 13

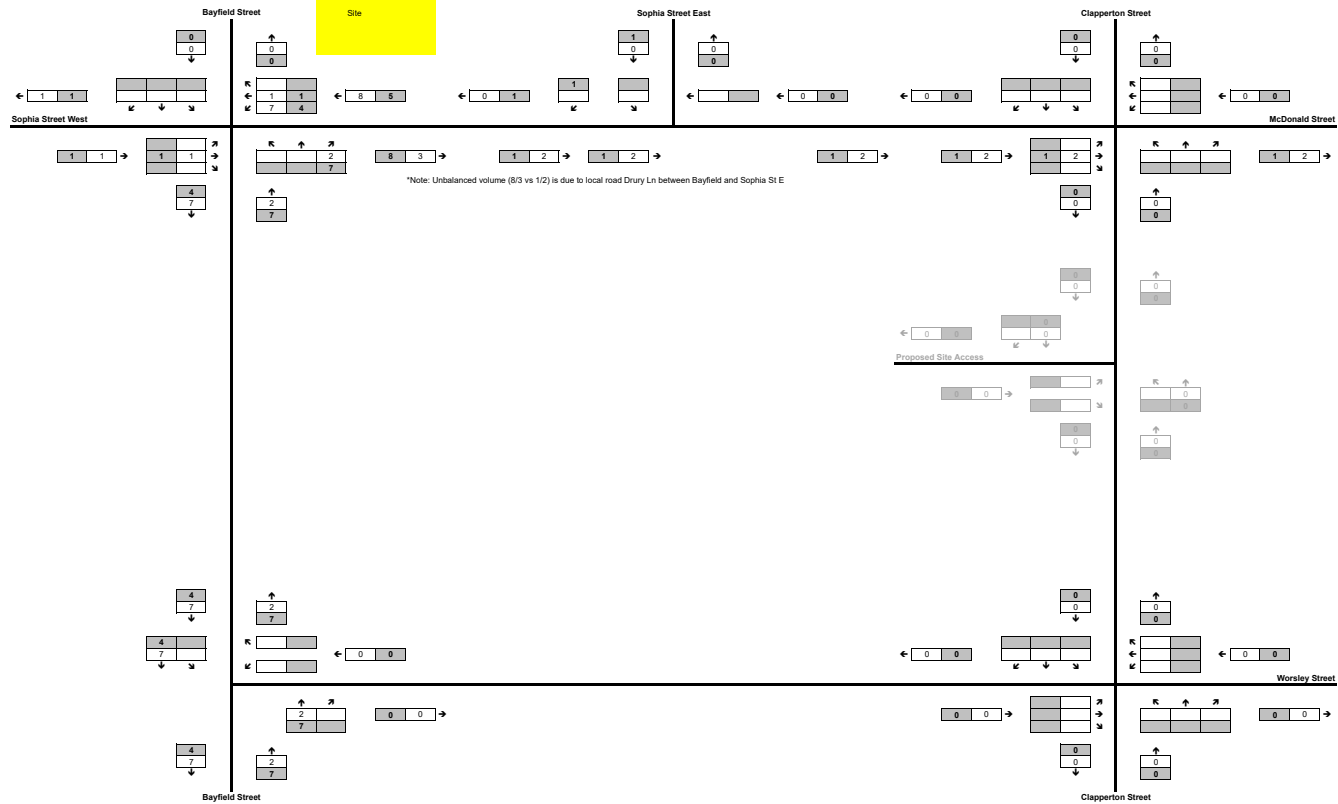
Note: use a 0.5% growth rate for all local roadways and 3% for Bayfield Street



113 & 117 Bayfield Street

A Peak Hour 123

A Peak Hour 123



Source:

113 117 Bayfield & 6 8 12 Sophia

Proposed eight-storey apartment with 108 residential units

Transportation Impact Study

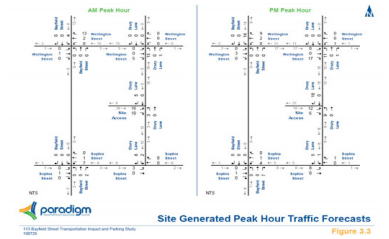
April 2020

Paradigm

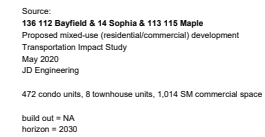
108 residential units

build out = 2022

horizon = 2027



A Peak Hour	123
A Peak Hour	123



LEGEND:

- 20 (10) Traffic Volume AM (PM)
- Stop Sign
- Stop Control
- Stop Sign

NOT TO SCALE



build out = NA

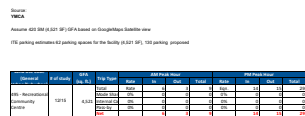
20-storey mixed-use building containing 276 residential units and 950 square metres of ground floor commercial space, together with underground car parking and bicycle racks.

A proposed [Zoning Bylaw](#) amendment to develop a 5-storey mixed-use podium building with two residential towers above: an eight 5-storey tower at the corner of Owen Street and McDonald Street and a 20-storey tower at the corner of Owen Street and Varsity Street. A sixth floor amenity level is proposed to connect the two towers.

AM Peak	
In	Out
64%	66%
62%	28%

Note: Assigned north trips through the route of McDonald St, Sophia St and Bayfield St

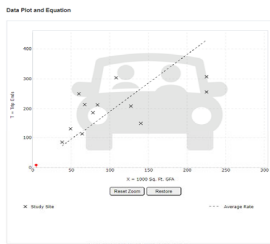
[illegible][illegible][illegible][illegible]



Waiting Time Distribution (from TRAC)					
Out-Station by Direction		Mid-Board		Mid-Board	
(from TRAC)		In	Out	In	Out
North	via Clapperton Street	48%	28%	53%	62%
North	via Clapperton Street	1%	2%	0%	3%
East	via Hagley Street East	1%	0%	1%	0%
East	via McDonald Street	53%	53%	15%	9%
East	via Wadding Street	2%	7%	0%	2%
South	via Clapperton Street	58%	81%	2%	2%
South	via Clapperton Street	2%	3%	8%	1%
South	via Hagley Street West	47%	12%	20%	17%

Note: Trips to/from the north via Bayfield Street were assumed 30% utilizing the route of Bayfield Street, Sophia Street East, McDonald Street and Clapperton Street, and 50% utilizing the route of Bayfield Street, Worsley Street and Clapperton Street. Trips to/from the west via Sophia Street West were assumed 50% utilizing the route of Sophia Street West, Sophia Street East, McDonald Street and Clapperton Street, and 50% utilizing the route of Sophia Street West, Bayfield Street, Worsley Street and Clapperton Street.

check	AM		PM	
	in	out	in	out
internal	0	2	14	15
external	0	2	14	15



DATA STATISTICS

End User:
Recreational Community Center (RCC) - GWS for
Construction and Data Profs

Construction Number:
1000 Sq. Ft. GWS

Time Period:
Variable

Peak Hour of Adjacent Street Traffic
One hour between 7 and 9 a.m.

Setting/Location:
Former Lincoln Schoolroom

Top Type:
Vehicle

Number of Studies:
12

Avg. 1000 Sq. Ft. GWS:
126

Average Rate:
1.91

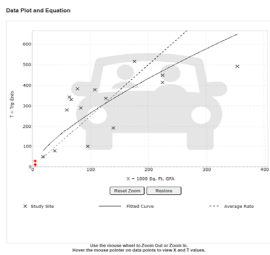
Range of Rates:
1.00 - 4.10

Standard Deviation:
0.88

Fitted Curve Equation:
Not Given

g₁
g₂

Desired Distribution:
95% entering, 34% exiting
Desired Type: Enter
Average Rate: 5 (Total), 6 (Entry), 3 (Exit)



DATA STATISTICS

Client:
Acceleration Community Center 4495 C3C332
Accelerator and Data Pro

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
1990-2010

Location:
East Wing of Apartment Street Traffic
One Hour between 2 and 3 D.D.M.

Seeking Location:
General Urban/Suburban

Stop Type:
Variable

Number of Models:
10

Avg. 1000 Sq. Ft. GFA:
128

Average Rate:
2.50

Range of Rates:
1.00 - 5.20

Standard Deviation:
1.20

Fitted Curve Equation:
 $LN(Y) = 0.71 LN(X) + 2.31$

R²:
0.97

Distributional Distribution:
40% unimodal, 55% bimodal
Unimodal: Trip Rate
Bimodal: Trip Rate
Bimodal Curve: 11 (50%), 5 (50%), 6 (50%)
Fitted Curve: 25 (50%), 12 (50%), 16 (50%)

Appendix E

Background Synchro Analysis Outputs

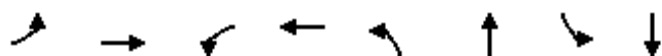


Queues

2024 Future Background AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	165	171	33	161	18	323	161	854
v/c Ratio	0.66	0.42	0.12	0.38	0.06	0.20	0.23	0.41
Control Delay	39.3	21.7	23.1	16.8	13.6	12.5	7.0	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.3	21.7	23.1	16.8	13.6	12.5	7.0	8.3
Queue Length 50th (m)	21.8	16.4	3.8	11.3	1.3	13.2	7.6	27.5
Queue Length 95th (m)	41.0	32.6	10.5	26.4	6.0	25.5	19.8	52.3
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	377	605	403	603	291	1599	689	2099
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.28	0.08	0.27	0.06	0.20	0.23	0.41
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

2024 Future Background AM Peak Hour

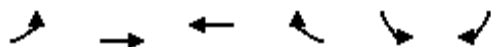
1: Bayfield Street & Sophia Street West/Sophia Street East

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	99	58	30	72	76	17	282	15	148	698	87
Future Volume (vph)	152	99	58	30	72	76	17	282	15	148	698	87
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		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.92		1.00	0.99		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)	1663	1763		1795	1695		1793	3415		1800	3383	
Flt Permitted	0.66	1.00		0.65	1.00		0.33	1.00		0.50	1.00	
Satd. Flow (perm)	1146	1763		1226	1695		625	3415		943	3383	
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)	165	108	63	33	78	83	18	307	16	161	759	95
RTOR Reduction (vph)	0	29	0	0	52	0	0	4	0	0	10	0
Lane Group Flow (vph)	165	142	0	33	109	0	18	319	0	161	844	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	5%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.9	15.9		15.9	15.9		34.2	34.2		45.2	45.2	
Effective Green, g (s)	15.9	15.9		15.9	15.9		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.47	0.47		0.62	0.62	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	249	383		266	368		292	1597		665	2091	
v/s Ratio Prot		0.08			0.06			0.09		0.02	c0.25	
v/s Ratio Perm	c0.14			0.03			0.03			0.13		
v/c Ratio	0.66	0.37		0.12	0.30		0.06	0.20		0.24	0.40	
Uniform Delay, d1	26.1	24.3		23.0	23.9		10.7	11.4		6.0	7.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.5	0.6		0.2	0.4		0.4	0.3		0.2	0.6	
Delay (s)	32.6	25.0		23.2	24.4		11.1	11.7		6.2	7.7	
Level of Service	C	C		C	C		B	B		A	A	
Approach Delay (s)		28.7			24.2			11.7			7.4	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			13.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			73.1				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			96.6%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Sophia Street East & McDonald Street

2024 Future Background AM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	243	147	0	0	17
Future Volume (Veh/h)	0	243	147	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	264	160	0	0	18
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		126				
pX, platoon unblocked						
vC, conflicting volume	160				424	161
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	160				424	161
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	98
cM capacity (veh/h)	1432				591	865
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	264	160	18			
Volume Left	0	0	0			
Volume Right	0	0	18			
cSH	1700	1700	865			
Volume to Capacity	0.16	0.09	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.2			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.2			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			22.8%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2024 Future Background AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	221	8	28	154	6	8	27	14	3	8	0
Future Volume (Veh/h)	5	221	8	28	154	6	8	27	14	3	8	0
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)	5	240	9	30	167	7	9	29	15	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		208										
pX, platoon unblocked												
vC, conflicting volume	175			252			500	492	254	522	494	178
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	175			252			500	492	254	522	494	178
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			98			98	94	98	99	98	100
cM capacity (veh/h)	1412			1321			462	466	755	424	465	863
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	254	204	53	12								
Volume Left	5	30	9	3								
Volume Right	9	7	15	0								
cSH	1412	1321	522	454								
Volume to Capacity	0.00	0.02	0.10	0.03								
Queue Length 95th (m)	0.1	0.6	2.7	0.7								
Control Delay (s)	0.2	1.3	12.7	13.1								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.3	12.7	13.1								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			36.0%	ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Bayfield Street & Worsley Street

2024 Future Background AM Peak Hour

210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	46	285	29	125	663
Future Volume (Veh/h)	25	46	285	29	125	663
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	50	310	32	136	721
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.88					
vC, conflicting volume	980	338			353	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	713	338			353	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	92			89	
cM capacity (veh/h)	284	656			1196	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	77	342	376	481		
Volume Left	27	0	136	0		
Volume Right	50	32	0	0		
cSH	450	1700	1196	1700		
Volume to Capacity	0.17	0.20	0.11	0.28		
Queue Length 95th (m)	4.9	0.0	3.1	0.0		
Control Delay (s)	14.7	0.0	3.7	0.0		
Lane LOS	B		A			
Approach Delay (s)	14.7	0.0	1.6			
Approach LOS	B					
Intersection Summary						
Average Delay		2.0				
Intersection Capacity Utilization		53.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2024 Future Background AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	81	14	3	41	6	11	35	20	9	21	14
Future Volume (vph)	8	81	14	3	41	6	11	35	20	9	21	14
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)	9	88	15	3	45	7	12	38	22	10	23	15
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	112	55	72	48								
Volume Left (vph)	9	3	12	10								
Volume Right (vph)	15	7	22	15								
Hadj (s)	-0.04	-0.07	-0.11	-0.15								
Departure Headway (s)	4.2	4.2	4.2	4.2								
Degree Utilization, x	0.13	0.06	0.08	0.06								
Capacity (veh/h)	832	822	813	817								
Control Delay (s)	7.8	7.5	7.6	7.4								
Approach Delay (s)	7.8	7.5	7.6	7.4								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			20.8%		ICU Level of Service				A			
Analysis Period (min)			15									

Intersection: 5: Clapperton Street & Worsley Street

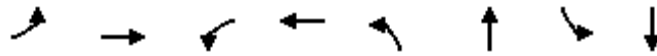
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	14.8	13.2	16.8	13.1
Average Queue (m)	9.7	7.6	8.8	7.2
95th Queue (m)	14.0	13.5	15.3	13.6
Link Distance (m)	127.7	165.1	115.5	108.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2024 Future Background PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	270	211	16	306	51	704	99	824
v/c Ratio	0.80	0.30	0.07	0.79	0.20	0.51	0.31	0.50
Control Delay	39.0	17.7	28.9	40.4	22.3	22.4	15.0	16.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.0	17.7	28.9	40.4	22.3	22.4	15.0	16.8
Queue Length 50th (m)	33.8	22.6	2.4	40.3	6.0	50.0	8.8	49.0
Queue Length 95th (m)	#63.2	39.2	7.7	69.9	16.0	72.8	18.9	72.2
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	342	830	305	496	255	1370	322	1637
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.25	0.05	0.62	0.20	0.51	0.31	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

2024 Future Background PM Peak Hour

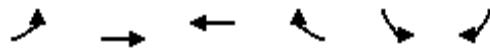
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	248	150	44	15	131	151	47	626	22	91	678	80
Future Volume (vph)	248	150	44	15	131	151	47	626	22	91	678	80
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.92		1.00	0.99		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)	1735	1827		1793	1715		1799	3422		1750	3390	
Flt Permitted	0.23	1.00		0.63	1.00		0.34	1.00		0.27	1.00	
Satd. Flow (perm)	413	1827		1181	1715		640	3422		494	3390	
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)	270	163	48	16	142	164	51	680	24	99	737	87
RTOR Reduction (vph)	0	16	0	0	57	0	0	2	0	0	9	0
Lane Group Flow (vph)	270	195	0	16	249	0	51	702	0	99	815	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	5%	0%	3%	5%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	32.5	32.5		16.7	16.7		34.4	34.4		42.2	42.2	
Effective Green, g (s)	32.5	32.5		16.7	16.7		34.4	34.4		42.2	42.2	
Actuated g/C Ratio	0.37	0.37		0.19	0.19		0.40	0.40		0.49	0.49	
Clearance Time (s)	4.5	6.0		6.0	6.0		6.0	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)	327	684		227	330		253	1357		295	1650	
v/s Ratio Prot	c0.11	0.11			0.15			0.21		0.01	c0.24	
v/s Ratio Perm	c0.20			0.01			0.08			0.15		
v/c Ratio	0.83	0.29		0.07	0.76		0.20	0.52		0.34	0.49	
Uniform Delay, d1	21.3	19.0		28.6	33.1		17.1	19.8		13.0	15.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.5	0.2		0.1	9.5		1.8	1.4		0.7	1.1	
Delay (s)	36.8	19.2		28.8	42.6		18.9	21.3		13.7	16.1	
Level of Service	D	B		C	D		B	C		B	B	
Approach Delay (s)		29.1			41.9			21.1			15.8	
Approach LOS		C			D			C			B	
Intersection Summary												
HCM 2000 Control Delay	23.4			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.70											
Actuated Cycle Length (s)	86.7			Sum of lost time (s)			20.5					
Intersection Capacity Utilization	106.0%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Sophia Street East & McDonald Street

2024 Future Background PM Peak Hour

210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	240	271	0	2	15
Future Volume (Veh/h)	0	240	271	0	2	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	261	295	0	2	16
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked					0.97	
vC, conflicting volume	295				556	297
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	295				524	297
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1278				500	746
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	261	295	18			
Volume Left	0	0	2			
Volume Right	0	0	16			
cSH	1700	1700	707			
Volume to Capacity	0.15	0.17	0.03			
Queue Length 95th (m)	0.0	0.0	0.6			
Control Delay (s)	0.0	0.0	10.2			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization		24.3%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 3: Clapperton Street & McDonald Street

2024 Future Background PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	201	11	14	249	8	18	51	36	6	3	2
Future Volume (Veh/h)	20	201	11	14	249	8	18	51	36	6	3	2
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)	22	218	12	15	271	9	20	55	39	7	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	283			235			585	586	232	646	588	282
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			235			585	586	232	646	588	282
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			99			95	87	95	98	99	100
cM capacity (veh/h)	1287			1337			407	410	806	320	409	758
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	252	295	114	12								
Volume Left	22	15	20	7								
Volume Right	12	9	39	2								
cSH	1287	1337	492	377								
Volume to Capacity	0.02	0.01	0.23	0.03								
Queue Length 95th (m)	0.4	0.3	7.1	0.8								
Control Delay (s)	0.8	0.5	14.5	14.9								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.8	0.5	14.5	14.9								
Approach LOS			B	B								
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization			31.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2024 Future Background PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	56	162	509	13	64	693
Future Volume (Veh/h)	56	162	509	13	64	693
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)	61	176	553	14	70	753
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.85					
vC, conflicting volume	1100	578			580	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	751	578			580	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	77	61			93	
cM capacity (veh/h)	269	456			991	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	237	567	321	502		
Volume Left	61	0	70	0		
Volume Right	176	14	0	0		
cSH	387	1700	991	1700		
Volume to Capacity	0.61	0.33	0.07	0.30		
Queue Length 95th (m)	31.4	0.0	1.8	0.0		
Control Delay (s)	28.0	0.0	2.5	0.0		
Lane LOS	D		A			
Approach Delay (s)	28.0	0.0	1.0			
Approach LOS	D					
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization			72.1%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2024 Future Background PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	32	3	9	114	16	43	82	14	6	11	16
Future Volume (vph)	16	32	3	9	114	16	43	82	14	6	11	16
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)	17	35	3	10	124	17	47	89	15	7	12	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	55	151	151	36								
Volume Left (vph)	17	10	47	7								
Volume Right (vph)	3	17	15	17								
Hadj (s)	0.03	-0.05	0.02	-0.24								
Departure Headway (s)	4.5	4.3	4.4	4.3								
Degree Utilization, x	0.07	0.18	0.19	0.04								
Capacity (veh/h)	752	784	772	777								
Control Delay (s)	7.9	8.3	8.5	7.5								
Approach Delay (s)	7.9	8.3	8.5	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.2									
Level of Service			A									
Intersection Capacity Utilization			29.1%		ICU Level of Service				A			
Analysis Period (min)			15									

Intersection: 5: Clapperton Street & Worsley Street

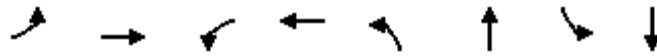
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	14.9	17.8	21.8	11.8
Average Queue (m)	8.2	10.7	11.1	5.3
95th Queue (m)	14.7	16.4	17.3	12.7
Link Distance (m)	127.7	165.1	115.5	109.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2029 Future Background AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	170	174	33	164	22	373	184	989
v/c Ratio	0.68	0.42	0.12	0.39	0.09	0.23	0.28	0.47
Control Delay	40.1	21.8	23.1	17.1	14.2	12.9	7.3	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	21.8	23.1	17.1	14.2	12.9	7.3	9.1
Queue Length 50th (m)	22.7	16.9	3.8	11.8	1.7	15.7	9.1	34.5
Queue Length 95th (m)	42.5	33.2	10.5	27.1	6.9	29.3	22.4	63.6
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	375	604	398	601	255	1594	663	2093
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.29	0.08	0.27	0.09	0.23	0.28	0.47
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

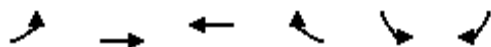
2029 Future Background AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	156	101	59	30	74	77	20	327	17	169	809	101
Future Volume (vph)	156	101	59	30	74	77	20	327	17	169	809	101
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		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.92		1.00	0.99		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)	1663	1763		1795	1696		1795	3416		1800	3383	
Flt Permitted	0.65	1.00		0.64	1.00		0.29	1.00		0.47	1.00	
Satd. Flow (perm)	1143	1763		1214	1696		547	3416		899	3383	
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)	170	110	64	33	80	84	22	355	18	184	879	110
RTOR Reduction (vph)	0	29	0	0	52	0	0	4	0	0	10	0
Lane Group Flow (vph)	170	145	0	33	112	0	22	369	0	184	979	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	5%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.1	16.1		16.1	16.1		34.2	34.2		45.2	45.2	
Effective Green, g (s)	16.1	16.1		16.1	16.1		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.47	0.47		0.62	0.62	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	251	387		266	372		255	1593		640	2086	
v/s Ratio Prot		0.08			0.07			0.11		0.03	c0.29	
v/s Ratio Perm	c0.15			0.03			0.04			0.15		
v/c Ratio	0.68	0.38		0.12	0.30		0.09	0.23		0.29	0.47	
Uniform Delay, d1	26.2	24.3		22.9	23.9		10.9	11.7		6.1	7.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.1	0.6		0.2	0.5		0.7	0.3		0.2	0.8	
Delay (s)	33.3	24.9		23.2	24.4		11.5	12.0		6.4	8.3	
Level of Service	C	C		C	C		B	B		A	A	
Approach Delay (s)		29.1			24.2			12.0			8.0	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay	13.7			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.56											
Actuated Cycle Length (s)	73.3			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 2: Sophia Street East & McDonald Street

2029 Future Background AM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	249	150	0	0	17
Future Volume (Veh/h)	0	249	150	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	271	163	0	0	18
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		126				
pX, platoon unblocked					1.00	
vC, conflicting volume	163				434	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	163				432	164
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	98
cM capacity (veh/h)	1428				583	862
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	271	163	18			
Volume Left	0	0	0			
Volume Right	0	0	18			
cSH	1700	1700	862			
Volume to Capacity	0.16	0.10	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.3			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			23.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 3: Clapperton Street & McDonald Street

2029 Future Background AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	227	8	29	157	6	8	28	14	3	8	0
Future Volume (Veh/h)	5	227	8	29	157	6	8	28	14	3	8	0
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)	5	247	9	32	171	7	9	30	15	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		208										
pX, platoon unblocked												
vC, conflicting volume	179			259			514	508	262	538	508	182
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179			259			514	508	262	538	508	182
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			98			98	93	98	99	98	100
cM capacity (veh/h)	1407			1313			451	456	748	412	455	858
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	261	210	54	12								
Volume Left	5	32	9	3								
Volume Right	9	7	15	0								
cSH	1407	1313	510	444								
Volume to Capacity	0.00	0.02	0.11	0.03								
Queue Length 95th (m)	0.1	0.6	2.8	0.7								
Control Delay (s)	0.2	1.4	12.9	13.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.4	12.9	13.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			36.9%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2029 Future Background AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	26	47	330	33	144	766
Future Volume (Veh/h)	26	47	330	33	144	766
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)	28	51	359	36	157	833
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.85					
vC, conflicting volume	1128	389			406	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	805	389			406	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	92			86	
cM capacity (veh/h)	233	608			1144	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	79	395	435	555		
Volume Left	28	0	157	0		
Volume Right	51	36	0	0		
cSH	388	1700	1144	1700		
Volume to Capacity	0.20	0.23	0.14	0.33		
Queue Length 95th (m)	6.0	0.0	3.8	0.0		
Control Delay (s)	16.7	0.0	4.0	0.0		
Lane LOS	C		A			
Approach Delay (s)	16.7	0.0	1.8			
Approach LOS	C					
Intersection Summary						
Average Delay		2.1				
Intersection Capacity Utilization		59.5%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2029 Future Background AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	83	14	3	42	6	11	36	20	10	22	14
Future Volume (vph)	8	83	14	3	42	6	11	36	20	10	22	14
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)	9	90	15	3	46	7	12	39	22	11	24	15
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	114	56	73	50								
Volume Left (vph)	9	3	12	11								
Volume Right (vph)	15	7	22	15								
Hadj (s)	-0.04	-0.06	-0.11	-0.14								
Departure Headway (s)	4.2	4.2	4.2	4.2								
Degree Utilization, x	0.13	0.07	0.09	0.06								
Capacity (veh/h)	830	819	811	813								
Control Delay (s)	7.8	7.5	7.6	7.5								
Approach Delay (s)	7.8	7.5	7.6	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.7									
Level of Service			A									
Intersection Capacity Utilization			20.9%		ICU Level of Service				A			
Analysis Period (min)			15									

Intersection: 5: Clapperton Street & Worsley Street

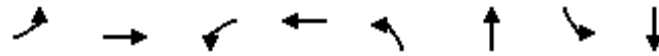
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	20.0	13.4	14.8	11.8
Average Queue (m)	10.3	7.9	8.5	7.2
95th Queue (m)	16.7	13.8	14.1	13.3
Link Distance (m)	127.7	165.1	115.5	108.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2029 Future Background PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	276	217	16	313	59	814	110	954
v/c Ratio	0.80	0.30	0.07	0.80	0.29	0.60	0.40	0.59
Control Delay	38.5	17.6	29.3	42.3	26.2	24.5	17.5	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.5	17.6	29.3	42.3	26.2	24.5	17.5	18.8
Queue Length 50th (m)	34.7	23.3	2.4	42.5	7.4	61.9	10.2	62.2
Queue Length 95th (m)	#67.5	40.0	7.8	72.7	19.5	88.1	21.0	88.9
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	352	842	300	491	200	1355	273	1618
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.26	0.05	0.64	0.29	0.60	0.40	0.59

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

2029 Future Background PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

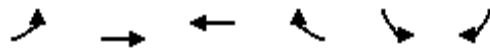
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	254	154	46	15	134	154	54	725	24	101	785	93
Future Volume (vph)	254	154	46	15	134	154	54	725	24	101	785	93
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.92		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)	1735	1826		1793	1716		1800	3423		1751	3390	
Flt Permitted	0.21	1.00		0.62	1.00		0.27	1.00		0.21	1.00	
Satd. Flow (perm)	389	1826		1175	1716		506	3423		393	3390	
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)	276	167	50	16	146	167	59	788	26	110	853	101
RTOR Reduction (vph)	0	16	0	0	57	0	0	2	0	0	9	0
Lane Group Flow (vph)	276	201	0	16	256	0	59	812	0	110	945	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	5%	0%	3%	5%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	33.5	33.5		16.9	16.9		34.4	34.4		42.2	42.2	
Effective Green, g (s)	33.5	33.5		16.9	16.9		34.4	34.4		42.2	42.2	
Actuated g/C Ratio	0.38	0.38		0.19	0.19		0.39	0.39		0.48	0.48	
Clearance Time (s)	4.5	6.0		6.0	6.0		6.0	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)	334	697		226	330		198	1342		247	1631	
v/s Ratio Prot	c0.11	0.11			0.15			0.24		0.02	c0.28	
v/s Ratio Perm	c0.20			0.01			0.12			0.19		
v/c Ratio	0.83	0.29		0.07	0.78		0.30	0.60		0.45	0.58	
Uniform Delay, d1	21.3	18.8		29.0	33.6		18.3	21.2		14.1	16.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.3	0.2		0.1	10.9		3.8	2.0		1.3	1.5	
Delay (s)	36.6	19.1		29.1	44.6		22.2	23.3		15.4	17.9	
Level of Service	D	B		C	D		C	C		B	B	
Approach Delay (s)		28.9			43.8			23.2			17.6	
Approach LOS		C			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			24.5			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			87.7			Sum of lost time (s)			20.5			
Intersection Capacity Utilization			106.6%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Sophia Street East & McDonald Street

2029 Future Background PM Peak Hour

210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	245	277	0	2	15
Future Volume (Veh/h)	0	245	277	0	2	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	266	301	0	2	16
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked					0.97	
vC, conflicting volume	301				567	303
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301				540	303
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1272				492	740
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	266	301	18			
Volume Left	0	0	2			
Volume Right	0	0	16			
cSH	1700	1700	701			
Volume to Capacity	0.16	0.18	0.03			
Queue Length 95th (m)	0.0	0.0	0.6			
Control Delay (s)	0.0	0.0	10.3			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization		24.6%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 3: Clapperton Street & McDonald Street

2029 Future Background PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	205	12	14	255	8	18	52	37	6	3	2
Future Volume (Veh/h)	20	205	12	14	255	8	18	52	37	6	3	2
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)	22	223	13	15	277	9	20	57	40	7	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	289			241			596	598	238	660	600	288
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	289			241			596	598	238	660	600	288
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			99			95	86	95	98	99	100
cM capacity (veh/h)	1281			1331			400	404	800	311	403	752
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	258	301	117	12								
Volume Left	22	15	20	7								
Volume Right	13	9	40	2								
cSH	1281	1331	485	368								
Volume to Capacity	0.02	0.01	0.24	0.03								
Queue Length 95th (m)	0.4	0.3	7.5	0.8								
Control Delay (s)	0.8	0.5	14.8	15.1								
Lane LOS	A	A	B	C								
Approach Delay (s)	0.8	0.5	14.8	15.1								
Approach LOS			B	C								
Intersection Summary												
Average Delay			3.3									
Intersection Capacity Utilization			32.1%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Bayfield Street & Worsley Street

2029 Future Background PM Peak Hour

210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	58	166	589	14	74	802
Future Volume (Veh/h)	58	166	589	14	74	802
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)	63	180	640	15	80	872
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.81					
vC, conflicting volume	1266	666			668	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	849	666			668	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	71	55			91	
cM capacity (veh/h)	219	400			919	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	243	655	371	581		
Volume Left	63	0	80	0		
Volume Right	180	15	0	0		
cSH	329	1700	919	1700		
Volume to Capacity	0.74	0.39	0.09	0.34		
Queue Length 95th (m)	44.6	0.0	2.3	0.0		
Control Delay (s)	41.4	0.0	2.8	0.0		
Lane LOS	E		A			
Approach Delay (s)	41.4	0.0	1.1			
Approach LOS	E					
Intersection Summary						
Average Delay			6.0			
Intersection Capacity Utilization			80.0%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2029 Future Background PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	33	3	9	117	16	44	84	14	7	11	16
Future Volume (vph)	16	33	3	9	117	16	44	84	14	7	11	16
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)	17	36	3	10	127	17	48	91	15	8	12	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	56	154	154	37								
Volume Left (vph)	17	10	48	8								
Volume Right (vph)	3	17	15	17								
Hadj (s)	0.03	-0.05	0.02	-0.23								
Departure Headway (s)	4.6	4.4	4.5	4.3								
Degree Utilization, x	0.07	0.19	0.19	0.04								
Capacity (veh/h)	749	782	770	772								
Control Delay (s)	7.9	8.4	8.5	7.5								
Approach Delay (s)	7.9	8.4	8.5	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.3									
Level of Service			A									
Intersection Capacity Utilization			28.8%		ICU Level of Service				A			
Analysis Period (min)			15									

Queuing and Blocking Report
2029 Future Background PM Peak Hour

03-24-2022

Intersection: 5: Clapperton Street & Worsley Street

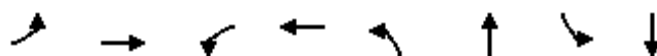
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	12.0	17.9	22.2	10.4
Average Queue (m)	7.6	10.6	11.5	5.9
95th Queue (m)	13.9	15.6	18.4	12.7
Link Distance (m)	127.7	165.1	115.5	109.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2034 Future Background AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	174	178	34	169	25	434	210	1147
v/c Ratio	0.69	0.43	0.13	0.40	0.12	0.27	0.33	0.55
Control Delay	41.0	22.2	23.1	17.5	15.0	13.3	7.8	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.0	22.2	23.1	17.5	15.0	13.3	7.8	10.1
Queue Length 50th (m)	23.3	17.5	4.0	12.6	2.0	18.7	10.6	43.5
Queue Length 95th (m)	43.5	34.2	10.8	28.3	7.8	34.1	25.4	78.6
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	372	602	392	599	217	1589	633	2088
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.30	0.09	0.28	0.12	0.27	0.33	0.55
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

2034 Future Background AM Peak Hour

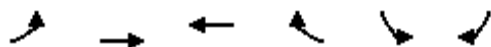
1: Bayfield Street & Sophia Street West/Sophia Street East

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	104	60	31	76	79	23	379	20	193	938	117
Future Volume (vph)	160	104	60	31	76	79	23	379	20	193	938	117
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		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.92		1.00	0.99		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)	1663	1764		1795	1697		1797	3415		1801	3383	
Flt Permitted	0.65	1.00		0.63	1.00		0.25	1.00		0.45	1.00	
Satd. Flow (perm)	1138	1764		1198	1697		468	3415		848	3383	
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)	174	113	65	34	83	86	25	412	22	210	1020	127
RTOR Reduction (vph)	0	28	0	0	51	0	0	4	0	0	10	0
Lane Group Flow (vph)	174	150	0	34	118	0	25	430	0	210	1137	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	5%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.3	16.3		16.3	16.3		34.2	34.2		45.2	45.2	
Effective Green, g (s)	16.3	16.3		16.3	16.3		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.47	0.47		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	252	391		265	376		217	1589		612	2080	
v/s Ratio Prot		0.09			0.07			0.13		0.03	c0.34	
v/s Ratio Perm	c0.15			0.03			0.05			0.18		
v/c Ratio	0.69	0.38		0.13	0.31		0.12	0.27		0.34	0.55	
Uniform Delay, d1	26.3	24.3		22.9	23.9		11.1	12.0		6.3	8.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.9	0.6		0.2	0.5		1.1	0.4		0.3	1.0	
Delay (s)	34.2	25.0		23.1	24.4		12.2	12.4		6.6	9.2	
Level of Service	C	C		C	C		B	B		A	A	
Approach Delay (s)		29.5			24.2			12.4			8.8	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			13.9			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			73.5			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			98.5%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Sophia Street East & McDonald Street

2034 Future Background AM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	254	154	0	0	18
Future Volume (Veh/h)	0	254	154	0	0	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	276	167	0	0	20
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		126				
pX, platoon unblocked					1.00	
vC, conflicting volume	167				443	168
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				441	168
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	98
cM capacity (veh/h)	1423				576	857
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	276	167	20			
Volume Left	0	0	0			
Volume Right	0	0	20			
cSH	1700	1700	857			
Volume to Capacity	0.16	0.10	0.02			
Queue Length 95th (m)	0.0	0.0	0.6			
Control Delay (s)	0.0	0.0	9.3			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			23.4%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 3: Clapperton Street & McDonald Street

2034 Future Background AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	232	8	29	161	6	9	29	15	3	8	0
Future Volume (Veh/h)	5	232	8	29	161	6	9	29	15	3	8	0
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)	5	252	9	32	175	7	10	32	16	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	208											
pX, platoon unblocked												
vC, conflicting volume	183			264			524	516	266	549	518	186
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	183			264			524	516	266	549	518	186
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			98			98	93	98	99	98	100
cM capacity (veh/h)	1403			1308			445	451	743	403	450	854
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	266	214	58	12								
Volume Left	5	32	10	3								
Volume Right	9	7	16	0								
cSH	1403	1308	504	437								
Volume to Capacity	0.00	0.02	0.12	0.03								
Queue Length 95th (m)	0.1	0.6	3.1	0.7								
Control Delay (s)	0.2	1.4	13.1	13.5								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.4	13.1	13.5								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			37.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Background AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	27	49	382	38	167	886
Future Volume (Veh/h)	27	49	382	38	167	886
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)	29	53	415	41	182	963
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.81					
vC, conflicting volume	1302	448			467	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	908	448			467	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	90			83	
cM capacity (veh/h)	184	557			1086	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	82	456	503	642		
Volume Left	29	0	182	0		
Volume Right	53	41	0	0		
cSH	325	1700	1086	1700		
Volume to Capacity	0.25	0.27	0.17	0.38		
Queue Length 95th (m)	7.9	0.0	4.8	0.0		
Control Delay (s)	19.8	0.0	4.4	0.0		
Lane LOS	C		A			
Approach Delay (s)	19.8	0.0	1.9			
Approach LOS	C					
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			66.7%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2034 Future Background AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	85	14	3	43	7	11	37	21	10	22	15
Future Volume (vph)	8	85	14	3	43	7	11	37	21	10	22	15
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)	9	92	15	3	47	8	12	40	23	11	24	16
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	116	58	75	51								
Volume Left (vph)	9	3	12	11								
Volume Right (vph)	15	8	23	16								
Hadj (s)	-0.04	-0.07	-0.11	-0.15								
Departure Headway (s)	4.2	4.2	4.2	4.2								
Degree Utilization, x	0.14	0.07	0.09	0.06								
Capacity (veh/h)	827	818	809	812								
Control Delay (s)	7.9	7.5	7.6	7.5								
Approach Delay (s)	7.9	7.5	7.6	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.7								
Level of Service				A								
Intersection Capacity Utilization				21.2%	ICU Level of Service	A						
Analysis Period (min)				15								

Intersection: 5: Clapperton Street & Worsley Street

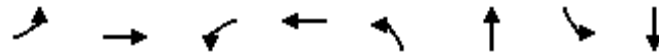
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	16.2	13.3	19.1	11.8
Average Queue (m)	9.7	7.1	9.5	6.8
95th Queue (m)	14.6	13.6	15.5	13.2
Link Distance (m)	127.7	165.1	115.5	108.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2034 Future Background PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	284	222	16	320	67	942	123	1106
v/c Ratio	0.81	0.30	0.07	0.82	0.47	0.70	0.55	0.69
Control Delay	38.5	17.6	29.8	44.6	36.5	27.4	23.6	21.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.5	17.6	29.8	44.6	36.5	27.4	23.6	21.5
Queue Length 50th (m)	35.8	24.2	2.4	44.6	9.4	77.8	11.9	79.9
Queue Length 95th (m)	#72.0	41.3	8.0	75.7	#26.8	107.8	23.6	111.6
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	362	854	296	486	144	1341	225	1600
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.26	0.05	0.66	0.47	0.70	0.55	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

2034 Future Background PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

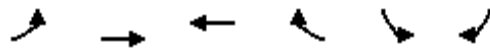
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	261	157	47	15	137	157	62	840	27	113	910	108
Future Volume (vph)	261	157	47	15	137	157	62	840	27	113	910	108
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.92		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)	1735	1826		1793	1715		1801	3423		1752	3390	
Flt Permitted	0.20	1.00		0.62	1.00		0.19	1.00		0.16	1.00	
Satd. Flow (perm)	365	1826		1170	1715		369	3423		288	3390	
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)	284	171	51	16	149	171	67	913	29	123	989	117
RTOR Reduction (vph)	0	15	0	0	57	0	0	2	0	0	9	0
Lane Group Flow (vph)	284	207	0	16	263	0	67	940	0	123	1097	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	5%	0%	3%	5%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.5	34.5		17.1	17.1		34.4	34.4		42.2	42.2	
Effective Green, g (s)	34.5	34.5		17.1	17.1		34.4	34.4		42.2	42.2	
Actuated g/C Ratio	0.39	0.39		0.19	0.19		0.39	0.39		0.48	0.48	
Clearance Time (s)	4.5	6.0		6.0	6.0		6.0	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)	341	710		225	330		143	1327		199	1612	
v/s Ratio Prot	c0.12	0.11			0.15			0.27		0.03	c0.32	
v/s Ratio Perm	c0.20			0.01			0.18			0.27		
v/c Ratio	0.83	0.29		0.07	0.80		0.47	0.71		0.62	0.68	
Uniform Delay, d1	21.3	18.7		29.3	34.2		20.3	22.9		15.6	18.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.8	0.2		0.1	12.6		10.6	3.2		5.6	2.3	
Delay (s)	37.1	18.9		29.4	46.8		30.9	26.1		21.2	20.4	
Level of Service	D	B		C	D		C	C		C	C	
Approach Delay (s)		29.1			46.0			26.4			20.5	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM 2000 Control Delay	26.6			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.82											
Actuated Cycle Length (s)	88.7			Sum of lost time (s)			20.5					
Intersection Capacity Utilization	107.6%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Sophia Street East & McDonald Street

2034 Future Background PM Peak Hour

210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	250	283	0	2	15
Future Volume (Veh/h)	0	250	283	0	2	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	272	308	0	2	16
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked					0.98	
vC, conflicting volume	308				580	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	308				560	310
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1264				482	733
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	272	308	18			
Volume Left	0	0	2			
Volume Right	0	0	16			
cSH	1700	1700	693			
Volume to Capacity	0.16	0.18	0.03			
Queue Length 95th (m)	0.0	0.0	0.6			
Control Delay (s)	0.0	0.0	10.3			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization		24.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 3: Clapperton Street & McDonald Street

2034 Future Background PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	209	12	14	260	8	18	53	38	6	3	2
Future Volume (Veh/h)	21	209	12	14	260	8	18	53	38	6	3	2
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)	23	227	13	15	283	9	20	58	41	7	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	295			245			608	610	242	673	612	294
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	295			245			608	610	242	673	612	294
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			99			95	85	95	98	99	100
cM capacity (veh/h)	1274			1326			392	397	796	303	396	746
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	263	307	119	12								
Volume Left	23	15	20	7								
Volume Right	13	9	41	2								
cSH	1274	1326	479	359								
Volume to Capacity	0.02	0.01	0.25	0.03								
Queue Length 95th (m)	0.4	0.3	7.8	0.8								
Control Delay (s)	0.8	0.5	15.0	15.4								
Lane LOS	A	A	B	C								
Approach Delay (s)	0.8	0.5	15.0	15.4								
Approach LOS			B	C								
Intersection Summary												
Average Delay			3.3									
Intersection Capacity Utilization			32.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Background PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	59	170	681	16	85	929
Future Volume (Veh/h)	59	170	681	16	85	929
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)	64	185	740	17	92	1010
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.75					
vC, conflicting volume	1460	766			770	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	958	766			770	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	62	46			89	
cM capacity (veh/h)	170	343			842	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	249	757	429	673		
Volume Left	64	0	92	0		
Volume Right	185	17	0	0		
cSH	272	1700	842	1700		
Volume to Capacity	0.92	0.45	0.11	0.40		
Queue Length 95th (m)	66.7	0.0	2.9	0.0		
Control Delay (s)	75.5	0.0	3.2	0.0		
Lane LOS	F		A			
Approach Delay (s)	75.5	0.0	1.2			
Approach LOS	F					
Intersection Summary						
Average Delay			9.6			
Intersection Capacity Utilization			89.1%	ICU Level of Service		E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2034 Future Background PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	34	3	10	120	17	45	86	14	7	11	17
Future Volume (vph)	16	34	3	10	120	17	45	86	14	7	11	17
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)	17	37	3	11	130	18	49	93	15	8	12	18
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	57	159	157	38								
Volume Left (vph)	17	11	49	8								
Volume Right (vph)	3	18	15	18								
Hadj (s)	0.03	-0.05	0.02	-0.24								
Departure Headway (s)	4.6	4.4	4.5	4.3								
Degree Utilization, x	0.07	0.19	0.19	0.05								
Capacity (veh/h)	746	779	766	769								
Control Delay (s)	7.9	8.4	8.5	7.6								
Approach Delay (s)	7.9	8.4	8.5	7.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.3								
Level of Service				A								
Intersection Capacity Utilization				29.4%	ICU Level of Service	A						
Analysis Period (min)				15								

Intersection: 5: Clapperton Street & Worsley Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	14.8	23.8	21.5	10.1
Average Queue (m)	8.1	11.3	11.8	6.2
95th Queue (m)	13.8	18.2	18.2	12.8
Link Distance (m)	127.7	165.1	115.5	109.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Appendix F

Total Synchro Analysis Outputs

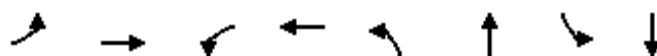


Queues

2024 Future Total AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	165	173	33	171	21	332	165	858
v/c Ratio	0.67	0.42	0.12	0.40	0.07	0.21	0.24	0.41
Control Delay	39.7	21.8	23.1	16.9	13.7	12.6	7.0	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.7	21.8	23.1	16.9	13.7	12.6	7.0	8.4
Queue Length 50th (m)	21.9	16.7	3.8	11.9	1.6	13.6	7.9	27.8
Queue Length 95th (m)	41.2	33.0	10.5	27.6	6.5	26.2	20.2	52.6
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	373	605	400	605	290	1597	684	2097
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.29	0.08	0.28	0.07	0.21	0.24	0.41
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

2024 Future Total AM Peak Hour

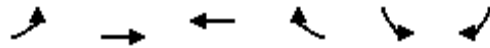
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	100	59	30	74	84	19	291	15	152	702	87
Future Volume (vph)	152	100	59	30	74	84	19	291	15	152	702	87
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		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.92		1.00	0.99		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)	1663	1762		1795	1692		1793	3416		1800	3383	
Flt Permitted	0.65	1.00		0.64	1.00		0.33	1.00		0.49	1.00	
Satd. Flow (perm)	1136	1762		1218	1692		623	3416		935	3383	
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)	165	109	64	33	80	91	21	316	16	165	763	95
RTOR Reduction (vph)	0	29	0	0	56	0	0	4	0	0	10	0
Lane Group Flow (vph)	165	144	0	33	115	0	21	328	0	165	848	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	5%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.0	16.0		16.0	16.0		34.2	34.2		45.2	45.2	
Effective Green, g (s)	16.0	16.0		16.0	16.0		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.47	0.47		0.62	0.62	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	248	385		266	369		291	1596		660	2088	
v/s Ratio Prot		0.08			0.07			0.10		0.02	c0.25	
v/s Ratio Perm	c0.15			0.03			0.03			0.13		
v/c Ratio	0.67	0.37		0.12	0.31		0.07	0.21		0.25	0.41	
Uniform Delay, d1	26.2	24.3		23.0	24.0		10.8	11.5		6.0	7.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.6	0.6		0.2	0.5		0.5	0.3		0.2	0.6	
Delay (s)	32.7	25.0		23.2	24.5		11.2	11.8		6.2	7.7	
Level of Service	C	C		C	C		B	B		A	A	
Approach Delay (s)		28.8			24.3			11.8			7.5	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay	13.8			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.51											
Actuated Cycle Length (s)	73.2			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

2: Sophia Street East & McDonald Street

2024 Future Total AM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	249	157	0	0	17
Future Volume (Veh/h)	0	249	157	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	271	171	0	0	18
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		126				
pX, platoon unblocked					1.00	
vC, conflicting volume	171				442	172
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	171				441	172
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	98
cM capacity (veh/h)	1418				577	853
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	271	171	18			
Volume Left	0	0	0			
Volume Right	0	0	18			
cSH	1700	1700	853			
Volume to Capacity	0.16	0.10	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.3			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization		23.1%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2024 Future Total AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	221	14	30	154	6	19	29	18	3	8	0
Future Volume (Veh/h)	5	221	14	30	154	6	19	29	18	3	8	0
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)	5	240	15	33	167	7	21	32	20	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		208										
pX, platoon unblocked												
vC, conflicting volume	175			258			508	502	258	538	506	178
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	175			258			508	502	258	538	506	178
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			95	93	97	99	98	100
cM capacity (veh/h)	1412			1314			455	459	752	408	457	863
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	260	207	73	12								
Volume Left	5	33	21	3								
Volume Right	15	7	20	0								
cSH	1412	1314	513	444								
Volume to Capacity	0.00	0.03	0.14	0.03								
Queue Length 95th (m)	0.1	0.6	4.0	0.7								
Control Delay (s)	0.2	1.4	13.2	13.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.4	13.2	13.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			38.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2024 Future Total AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	44	57	285	38	131	663
Future Volume (Veh/h)	44	57	285	38	131	663
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)	48	62	310	41	142	721
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.88					
vC, conflicting volume	996	342			362	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	729	342			362	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	90			88	
cM capacity (veh/h)	276	651			1187	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	110	351	382	481		
Volume Left	48	0	142	0		
Volume Right	62	41	0	0		
cSH	408	1700	1187	1700		
Volume to Capacity	0.27	0.21	0.12	0.28		
Queue Length 95th (m)	8.6	0.0	3.3	0.0		
Control Delay (s)	17.0	0.0	3.9	0.0		
Lane LOS	C		A			
Approach Delay (s)	17.0	0.0	1.7			
Approach LOS	C					
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			55.8%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2024 Future Total AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	22	81	14	3	41	7	11	37	20	11	23	43
Future Volume (vph)	22	81	14	3	41	7	11	37	20	11	23	43
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)	24	88	15	3	45	8	12	40	22	12	25	47
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	127	56	74	84								
Volume Left (vph)	24	3	12	12								
Volume Right (vph)	15	8	22	47								
Hadj (s)	-0.01	-0.07	-0.11	-0.31								
Departure Headway (s)	4.3	4.3	4.3	4.1								
Degree Utilization, x	0.15	0.07	0.09	0.10								
Capacity (veh/h)	805	787	793	837								
Control Delay (s)	8.1	7.6	7.7	7.5								
Approach Delay (s)	8.1	7.6	7.7	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.8									
Level of Service			A									
Intersection Capacity Utilization			26.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Clapperton Street & Proposed Site Access

2024 Future Total AM Peak Hour
210362

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	33	17	49	44	8
Future Volume (Veh/h)	16	33	17	49	44	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	36	18	53	48	9
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	142	52	57			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	142	52	57			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	96	99			
cM capacity (veh/h)	841	1015	1547			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	53	71	57			
Volume Left	17	18	0			
Volume Right	36	0	9			
cSH	952	1547	1700			
Volume to Capacity	0.06	0.01	0.03			
Queue Length 95th (m)	1.4	0.3	0.0			
Control Delay (s)	9.0	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.0	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			20.2%	ICU Level of Service		A
Analysis Period (min)			15			

Intersection: 5: Clapperton Street & Worsley Street

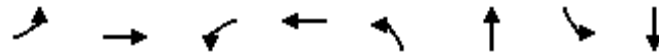
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	18.9	11.8	20.7	13.1
Average Queue (m)	10.1	7.6	8.9	8.5
95th Queue (m)	15.2	13.4	15.9	13.2
Link Distance (m)	127.7	165.1	115.5	69.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2024 Future Total PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	270	219	16	317	54	712	107	832
v/c Ratio	0.82	0.31	0.07	0.80	0.22	0.52	0.34	0.51
Control Delay	40.7	17.8	28.8	41.5	22.8	22.7	15.5	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.7	17.8	28.8	41.5	22.8	22.7	15.5	17.0
Queue Length 50th (m)	33.8	23.5	2.4	42.3	6.5	51.2	9.7	50.4
Queue Length 95th (m)	#66.9	40.5	7.7	72.5	16.7	73.8	20.2	73.0
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	336	826	302	495	251	1366	317	1631
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.27	0.05	0.64	0.22	0.52	0.34	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

2024 Future Total PM Peak Hour

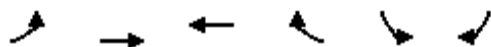
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	248	154	48	15	133	158	50	633	22	98	685	80
Future Volume (vph)	248	154	48	15	133	158	50	633	22	98	685	80
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.92		1.00	0.99		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)	1735	1823		1793	1713		1799	3422		1750	3390	
Flt Permitted	0.21	1.00		0.62	1.00		0.33	1.00		0.26	1.00	
Satd. Flow (perm)	388	1823		1173	1713		630	3422		486	3390	
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)	270	167	52	16	145	172	54	688	24	107	745	87
RTOR Reduction (vph)	0	16	0	0	58	0	0	2	0	0	9	0
Lane Group Flow (vph)	270	203	0	16	259	0	54	710	0	107	823	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	5%	0%	3%	5%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	32.8	32.8		17.0	17.0		34.4	34.4		42.2	42.2	
Effective Green, g (s)	32.8	32.8		17.0	17.0		34.4	34.4		42.2	42.2	
Actuated g/C Ratio	0.38	0.38		0.20	0.20		0.40	0.40		0.49	0.49	
Clearance Time (s)	4.5	6.0		6.0	6.0		6.0	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)	321	687		229	334		249	1353		290	1644	
v/s Ratio Prot	c0.11	0.11			0.15			0.21		0.02	c0.24	
v/s Ratio Perm	c0.21			0.01			0.09			0.16		
v/c Ratio	0.84	0.30		0.07	0.78		0.22	0.52		0.37	0.50	
Uniform Delay, d1	21.4	19.0		28.6	33.2		17.4	20.1		13.2	15.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	17.7	0.2		0.1	10.7		2.0	1.5		0.8	1.1	
Delay (s)	39.1	19.2		28.7	43.9		19.4	21.5		14.0	16.3	
Level of Service	D	B		C	D		B	C		B	B	
Approach Delay (s)		30.2			43.2			21.4			16.1	
Approach LOS		C			D			C			B	
Intersection Summary												
HCM 2000 Control Delay	24.0			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.71											
Actuated Cycle Length (s)	87.0			Sum of lost time (s)			20.5					
Intersection Capacity Utilization	106.5%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Sophia Street East & McDonald Street

2024 Future Total PM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	0	0	0	0	17
Future Volume (Veh/h)	0	0	0	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	18
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked						
vC, conflicting volume	0				0	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	2
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1636				1029	1086
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	0	0	18			
Volume Left	0	0	0			
Volume Right	0	0	18			
cSH	1700	1700	1086			
Volume to Capacity	0.00	0.00	0.02			
Queue Length 95th (m)	0.0	0.0	0.4			
Control Delay (s)	0.0	0.0	8.4			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.4			
Approach LOS			A			
Intersection Summary						
Average Delay			8.4			
Intersection Capacity Utilization			6.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2024 Future Total PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	201	22	18	249	8	27	52	40	6	3	2
Future Volume (Veh/h)	20	201	22	18	249	8	27	52	40	6	3	2
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)	22	218	24	20	271	9	29	57	43	7	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	283			247			601	602	238	667	610	282
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			247			601	602	238	667	610	282
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			98			93	86	95	98	99	100
cM capacity (veh/h)	1287			1324			396	400	799	305	396	758
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	264	300	129	12								
Volume Left	22	20	29	7								
Volume Right	24	9	43	2								
cSH	1287	1324	478	362								
Volume to Capacity	0.02	0.02	0.27	0.03								
Queue Length 95th (m)	0.4	0.4	8.6	0.8								
Control Delay (s)	0.8	0.6	15.3	15.3								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.8	0.6	15.3	15.3								
Approach LOS			C	C								
Intersection Summary												
Average Delay			3.6									
Intersection Capacity Utilization			32.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2024 Future Total PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	75	172	509	31	75	693
Future Volume (Veh/h)	75	172	509	31	75	693
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)	82	187	553	34	82	753
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.84					
vC, conflicting volume	1134	588			600	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	784	588			600	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	67	58			92	
cM capacity (veh/h)	252	449			974	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	269	587	333	502		
Volume Left	82	0	82	0		
Volume Right	187	34	0	0		
cSH	363	1700	974	1700		
Volume to Capacity	0.74	0.35	0.08	0.30		
Queue Length 95th (m)	46.2	0.0	2.2	0.0		
Control Delay (s)	38.6	0.0	2.9	0.0		
Lane LOS	E		A			
Approach Delay (s)	38.6	0.0	1.2			
Approach LOS	E					
Intersection Summary						
Average Delay		6.7				
Intersection Capacity Utilization		75.2%		ICU Level of Service		D
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2024 Future Total PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	45	32	3	9	114	19	43	87	14	7	11	44
Future Volume (vph)	45	32	3	9	114	19	43	87	14	7	11	44
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)	49	35	3	10	124	21	47	95	15	8	12	48
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	87	155	157	68								
Volume Left (vph)	49	10	47	8								
Volume Right (vph)	3	21	15	48								
Hadj (s)	0.09	-0.07	0.02	-0.40								
Departure Headway (s)	4.7	4.5	4.6	4.3								
Degree Utilization, x	0.11	0.19	0.20	0.08								
Capacity (veh/h)	712	758	745	779								
Control Delay (s)	8.3	8.5	8.7	7.6								
Approach Delay (s)	8.3	8.5	8.7	7.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.4									
Level of Service			A									
Intersection Capacity Utilization			39.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Clapperton Street & Proposed Site Access

2024 Future Total PM Peak Hour
210362

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	14	29	37	114	28	15
Future Volume (Veh/h)	14	29	37	114	28	15
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)	15	32	40	124	30	16
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	242	38	46			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242	38	46			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	97	97			
cM capacity (veh/h)	727	1034	1562			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	47	164	46			
Volume Left	15	40	0			
Volume Right	32	0	16			
cSH	911	1562	1700			
Volume to Capacity	0.05	0.03	0.03			
Queue Length 95th (m)	1.3	0.6	0.0			
Control Delay (s)	9.2	2.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.2	2.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		2.9				
Intersection Capacity Utilization		24.7%		ICU Level of Service		A
Analysis Period (min)		15				

Intersection: 5: Clapperton Street & Worsley Street

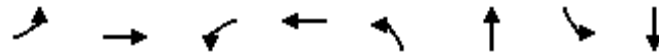
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	17.5	17.9	21.2	12.8
Average Queue (m)	8.9	10.8	11.0	8.2
95th Queue (m)	14.5	16.8	17.7	12.7
Link Distance (m)	127.7	165.0	115.5	62.8
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2029 Future Total AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	170	178	33	176	24	383	188	994
v/c Ratio	0.69	0.43	0.13	0.41	0.09	0.24	0.29	0.47
Control Delay	41.5	22.1	23.1	17.3	14.3	13.0	7.4	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.5	22.1	23.1	17.3	14.3	13.0	7.4	9.1
Queue Length 50th (m)	22.7	17.4	3.9	12.7	1.9	16.3	9.3	34.8
Queue Length 95th (m)	42.8	34.0	10.5	28.7	7.3	30.1	22.7	64.1
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	366	603	393	603	253	1594	658	2093
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.30	0.08	0.29	0.09	0.24	0.29	0.47
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

2029 Future Total AM Peak Hour

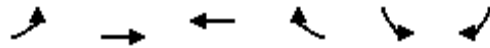
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	156	103	61	30	76	86	22	336	17	173	813	101
Future Volume (vph)	156	103	61	30	76	86	22	336	17	173	813	101
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		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.92		1.00	0.99		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)	1663	1762		1795	1693		1795	3417		1800	3383	
Flt Permitted	0.64	1.00		0.63	1.00		0.29	1.00		0.47	1.00	
Satd. Flow (perm)	1117	1762		1198	1693		545	3417		891	3383	
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)	170	112	66	33	83	93	24	365	18	188	884	110
RTOR Reduction (vph)	0	29	0	0	55	0	0	4	0	0	10	0
Lane Group Flow (vph)	170	149	0	33	121	0	24	379	0	188	984	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	5%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.1	16.1		16.1	16.1		34.2	34.2		45.2	45.2	
Effective Green, g (s)	16.1	16.1		16.1	16.1		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.47	0.47		0.62	0.62	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	245	387		263	371		254	1594		636	2086	
v/s Ratio Prot		0.08			0.07			0.11		0.03	c0.29	
v/s Ratio Perm	c0.15			0.03			0.04			0.15		
v/c Ratio	0.69	0.39		0.13	0.33		0.09	0.24		0.30	0.47	
Uniform Delay, d1	26.3	24.4		23.0	24.0		10.9	11.7		6.1	7.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.2	0.6		0.2	0.5		0.7	0.4		0.3	0.8	
Delay (s)	34.6	25.0		23.2	24.5		11.6	12.1		6.4	8.4	
Level of Service	C	C		C	C		B	B		A	A	
Approach Delay (s)		29.7			24.3			12.1			8.1	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			13.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			73.3				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			97.1%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Sophia Street East & McDonald Street

2029 Future Total AM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	255	161	0	0	17
Future Volume (Veh/h)	0	255	161	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	277	175	0	0	18
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		126				
pX, platoon unblocked					1.00	
vC, conflicting volume	175				452	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	175				448	176
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	98
cM capacity (veh/h)	1414				570	849
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	277	175	18			
Volume Left	0	0	0			
Volume Right	0	0	18			
cSH	1700	1700	849			
Volume to Capacity	0.16	0.10	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.3			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization		23.4%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2029 Future Total AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	227	14	30	157	6	19	30	19	3	8	0
Future Volume (Veh/h)	5	227	14	30	157	6	19	30	19	3	8	0
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)	5	247	15	33	171	7	21	33	21	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		208										
pX, platoon unblocked												
vC, conflicting volume	179			265			520	512	264	550	516	182
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179			265			520	512	264	550	516	182
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			95	93	97	99	98	100
cM capacity (veh/h)	1407			1307			447	453	745	398	450	858
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	267	211	75	12								
Volume Left	5	33	21	3								
Volume Right	15	7	21	0								
cSH	1407	1307	507	436								
Volume to Capacity	0.00	0.03	0.15	0.03								
Queue Length 95th (m)	0.1	0.6	4.1	0.7								
Control Delay (s)	0.2	1.4	13.3	13.5								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.4	13.3	13.5								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			39.1%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2029 Future Total AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	58	330	42	150	766
Future Volume (Veh/h)	45	58	330	42	150	766
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	63	359	46	163	833
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.85					
vC, conflicting volume	1146	394			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	822	394			416	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	90			86	
cM capacity (veh/h)	226	603			1134	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	112	405	441	555		
Volume Left	49	0	163	0		
Volume Right	63	46	0	0		
cSH	348	1700	1134	1700		
Volume to Capacity	0.32	0.24	0.14	0.33		
Queue Length 95th (m)	10.9	0.0	4.0	0.0		
Control Delay (s)	20.2	0.0	4.2	0.0		
Lane LOS	C		A			
Approach Delay (s)	20.2	0.0	1.8			
Approach LOS	C					
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization			61.9%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2029 Future Total AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	22	83	14	3	42	7	11	38	20	12	23	44
Future Volume (vph)	22	83	14	3	42	7	11	38	20	12	23	44
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)	24	90	15	3	46	8	12	41	22	13	25	48
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	129	57	75	86								
Volume Left (vph)	24	3	12	13								
Volume Right (vph)	15	8	22	48								
Hadj (s)	-0.01	-0.07	-0.10	-0.30								
Departure Headway (s)	4.3	4.3	4.3	4.1								
Degree Utilization, x	0.15	0.07	0.09	0.10								
Capacity (veh/h)	803	784	791	825								
Control Delay (s)	8.1	7.6	7.7	7.5								
Approach Delay (s)	8.1	7.6	7.7	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.8									
Level of Service			A									
Intersection Capacity Utilization			26.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Clapperton Street & Proposed Site Access

2029 Future Total AM Peak Hour
210362

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	33	17	50	45	8
Future Volume (Veh/h)	16	33	17	50	45	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	36	18	54	49	9
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	144	54	58			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	144	54	58			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	96	99			
cM capacity (veh/h)	839	1014	1546			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	53	72	58			
Volume Left	17	18	0			
Volume Right	36	0	9			
cSH	950	1546	1700			
Volume to Capacity	0.06	0.01	0.03			
Queue Length 95th (m)	1.4	0.3	0.0			
Control Delay (s)	9.0	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.0	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			20.2%	ICU Level of Service	A	
Analysis Period (min)			15			

Intersection: 5: Clapperton Street & Worsley Street

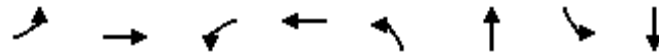
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	18.3	13.4	17.4	13.4
Average Queue (m)	10.2	7.4	8.8	8.6
95th Queue (m)	15.7	13.7	14.6	12.7
Link Distance (m)	127.7	165.3	115.5	62.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2029 Future Total PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	276	224	16	323	62	822	117	963
v/c Ratio	0.82	0.31	0.07	0.82	0.32	0.61	0.43	0.60
Control Delay	40.4	17.6	29.3	43.7	27.1	24.7	18.4	19.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.4	17.6	29.3	43.7	27.1	24.7	18.4	19.0
Queue Length 50th (m)	34.7	24.1	2.4	44.2	8.0	63.5	11.0	63.8
Queue Length 95th (m)	#70.6	41.2	7.8	75.2	20.7	89.3	22.1	90.1
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	345	840	298	491	196	1352	270	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.27	0.05	0.66	0.32	0.61	0.43	0.60

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

2029 Future Total PM Peak Hour

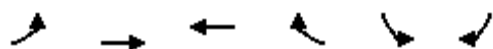
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	254	157	49	15	136	161	57	732	24	108	793	93
Future Volume (vph)	254	157	49	15	136	161	57	732	24	108	793	93
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.92		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)	1735	1824		1793	1713		1800	3423		1751	3390	
Flt Permitted	0.20	1.00		0.62	1.00		0.26	1.00		0.21	1.00	
Satd. Flow (perm)	364	1824		1168	1713		496	3423		385	3390	
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)	276	171	53	16	148	175	62	796	26	117	862	101
RTOR Reduction (vph)	0	17	0	0	58	0	0	2	0	0	9	0
Lane Group Flow (vph)	276	207	0	16	265	0	62	820	0	117	954	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	5%	0%	3%	5%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	33.7	33.7		17.1	17.1		34.4	34.4		42.2	42.2	
Effective Green, g (s)	33.7	33.7		17.1	17.1		34.4	34.4		42.2	42.2	
Actuated g/C Ratio	0.38	0.38		0.19	0.19		0.39	0.39		0.48	0.48	
Clearance Time (s)	4.5	6.0		6.0	6.0		6.0	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)	328	699		227	333		194	1339		243	1627	
v/s Ratio Prot	c0.12	0.11			0.15			0.24		0.02	c0.28	
v/s Ratio Perm	c0.21			0.01			0.12			0.21		
v/c Ratio	0.84	0.30		0.07	0.80		0.32	0.61		0.48	0.59	
Uniform Delay, d1	21.4	18.9		28.9	33.7		18.6	21.4		14.3	16.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	17.4	0.2		0.1	12.4		4.3	2.1		1.5	1.6	
Delay (s)	38.8	19.1		29.0	46.1		22.9	23.5		15.8	18.1	
Level of Service	D	B		C	D		C	C		B	B	
Approach Delay (s)		30.0			45.3			23.5			17.8	
Approach LOS		C			D			C			B	
Intersection Summary												
HCM 2000 Control Delay	25.1			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.77											
Actuated Cycle Length (s)	87.9			Sum of lost time (s)			20.5					
Intersection Capacity Utilization	107.1%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Sophia Street East & McDonald Street

2029 Future Total PM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘↘	
Traffic Volume (veh/h)	0	0	0	0	0	17
Future Volume (Veh/h)	0	0	0	0	0	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	18
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked						
vC, conflicting volume	0				0	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	2
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1636				1029	1086
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	0	0	18			
Volume Left	0	0	0			
Volume Right	0	0	18			
cSH	1700	1700	1086			
Volume to Capacity	0.00	0.00	0.02			
Queue Length 95th (m)	0.0	0.0	0.4			
Control Delay (s)	0.0	0.0	8.4			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.4			
Approach LOS			A			
Intersection Summary						
Average Delay			8.4			
Intersection Capacity Utilization			6.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2029 Future Total PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	205	22	18	255	8	27	53	41	6	3	2
Future Volume (Veh/h)	20	205	22	18	255	8	27	53	41	6	3	2
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)	22	223	24	20	277	9	29	58	45	7	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	289			252			612	613	243	680	620	288
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	289			252			612	613	243	680	620	288
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			98			93	85	94	98	99	100
cM capacity (veh/h)	1281			1318			389	394	794	297	390	752
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	269	306	132	12								
Volume Left	22	20	29	7								
Volume Right	24	9	45	2								
cSH	1281	1318	474	353								
Volume to Capacity	0.02	0.02	0.28	0.03								
Queue Length 95th (m)	0.4	0.4	9.0	0.8								
Control Delay (s)	0.8	0.6	15.5	15.5								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.8	0.6	15.5	15.5								
Approach LOS			C	C								
Intersection Summary												
Average Delay			3.7									
Intersection Capacity Utilization			32.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2029 Future Total PM Peak Hour
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Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	76	176	589	33	85	802
Future Volume (Veh/h)	76	176	589	33	85	802
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)	83	191	640	36	92	872
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						72
pX, platoon unblocked	0.80					
vC, conflicting volume	1301	676			689	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	883	676			689	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	59	51			90	
cM capacity (veh/h)	204	393			903	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	274	676	383	581		
Volume Left	83	0	92	0		
Volume Right	191	36	0	0		
cSH	307	1700	903	1700		
Volume to Capacity	0.89	0.40	0.10	0.34		
Queue Length 95th (m)	66.3	0.0	2.7	0.0		
Control Delay (s)	65.4	0.0	3.2	0.0		
Lane LOS	F		A			
Approach Delay (s)	65.4	0.0	1.3			
Approach LOS	F					
Intersection Summary						
Average Delay		10.0				
Intersection Capacity Utilization		83.1%		ICU Level of Service		E
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2029 Future Total PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	46	33	3	9	117	19	44	89	14	8	12	44
Future Volume (vph)	46	33	3	9	117	19	44	89	14	8	12	44
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)	50	36	3	10	127	21	48	97	15	9	13	48
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	89	158	160	70								
Volume Left (vph)	50	10	48	9								
Volume Right (vph)	3	21	15	48								
Hadj (s)	0.09	-0.07	0.02	-0.39								
Departure Headway (s)	4.7	4.5	4.6	4.3								
Degree Utilization, x	0.12	0.20	0.20	0.08								
Capacity (veh/h)	709	754	741	772								
Control Delay (s)	8.3	8.6	8.8	7.7								
Approach Delay (s)	8.3	8.6	8.8	7.7								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.5									
Level of Service			A									
Intersection Capacity Utilization			39.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Clapperton Street & Proposed Site Access

2029 Future Total PM Peak Hour
210362

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	14	29	37	116	29	15
Future Volume (Veh/h)	14	29	37	116	29	15
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)	15	32	40	126	32	16
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	246	40	48			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	246	40	48			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	97	97			
cM capacity (veh/h)	723	1031	1559			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	47	166	48			
Volume Left	15	40	0			
Volume Right	32	0	16			
cSH	908	1559	1700			
Volume to Capacity	0.05	0.03	0.03			
Queue Length 95th (m)	1.3	0.6	0.0			
Control Delay (s)	9.2	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.2	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		2.9				
Intersection Capacity Utilization		24.8%		ICU Level of Service		A
Analysis Period (min)		15				

Intersection: 5: Clapperton Street & Worsley Street

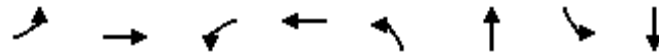
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	17.3	17.9	19.0	17.4
Average Queue (m)	9.3	10.7	10.9	8.3
95th Queue (m)	14.5	15.9	16.6	14.3
Link Distance (m)	127.7	165.1	115.5	65.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2034 Future Total AM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	174	181	34	180	27	444	214	1151
v/c Ratio	0.71	0.43	0.13	0.42	0.12	0.28	0.34	0.55
Control Delay	42.8	22.2	23.1	17.5	15.2	13.4	7.9	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.8	22.2	23.1	17.5	15.2	13.4	7.9	10.1
Queue Length 50th (m)	23.4	17.8	4.0	13.2	2.1	19.4	10.9	44.0
Queue Length 95th (m)	44.0	34.7	10.8	29.5	8.3	34.9	25.8	79.1
Internal Link Dist (m)		72.2		101.9		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	360	601	388	602	216	1590	629	2087
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.30	0.09	0.30	0.13	0.28	0.34	0.55
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

2034 Future Total AM Peak Hour

210362

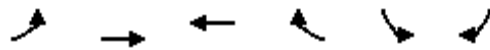
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	105	62	31	78	87	25	388	20	197	942	117
Future Volume (vph)	160	105	62	31	78	87	25	388	20	197	942	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	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	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.92		1.00	0.99		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)	1663	1762		1795	1693		1797	3415		1801	3383	
Flt Permitted	0.63	1.00		0.63	1.00		0.25	1.00		0.44	1.00	
Satd. Flow (perm)	1102	1762		1186	1693		466	3415		840	3383	
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)	174	114	67	34	85	95	27	422	22	214	1024	127
RTOR Reduction (vph)	0	29	0	0	55	0	0	4	0	0	10	0
Lane Group Flow (vph)	174	152	0	34	125	0	27	440	0	214	1141	0
Confl. Peds. (#/hr)	7		8	8		7	21		10	10		21
Heavy Vehicles (%)	8%	0%	3%	0%	5%	0%	0%	5%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.3	16.3		16.3	16.3		34.2	34.2		45.2	45.2	
Effective Green, g (s)	16.3	16.3		16.3	16.3		34.2	34.2		45.2	45.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.47	0.47		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	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)	244	390		263	375		216	1589		608	2080	
v/s Ratio Prot		0.09			0.07			0.13		0.03	c0.34	
v/s Ratio Perm	c0.16			0.03			0.06			0.18		
v/c Ratio	0.71	0.39		0.13	0.33		0.12	0.28		0.35	0.55	
Uniform Delay, d1	26.4	24.4		22.9	24.0		11.2	12.1		6.3	8.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.5	0.6		0.2	0.5		1.2	0.4		0.4	1.0	
Delay (s)	35.9	25.0		23.1	24.6		12.3	12.5		6.7	9.3	
Level of Service	D	C		C	C		B	B		A	A	
Approach Delay (s)		30.4			24.3			12.5			8.9	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			14.1			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			73.5			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			99.1%			ICU Level of Service				F		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

2: Sophia Street East & McDonald Street

2034 Future Total AM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	260	165	0	0	18
Future Volume (Veh/h)	0	260	165	0	0	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	283	179	0	0	20
Pedestrians		1				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		126				
pX, platoon unblocked					0.99	
vC, conflicting volume	179				462	180
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	179				456	180
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	98
cM capacity (veh/h)	1409				563	844
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	283	179	20			
Volume Left	0	0	0			
Volume Right	0	0	20			
cSH	1700	1700	844			
Volume to Capacity	0.17	0.11	0.02			
Queue Length 95th (m)	0.0	0.0	0.6			
Control Delay (s)	0.0	0.0	9.4			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.4			
Approach LOS			A			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization		23.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2034 Future Total AM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	232	14	31	161	6	19	30	19	3	8	0
Future Volume (Veh/h)	5	232	14	31	161	6	19	30	19	3	8	0
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)	5	252	15	34	175	7	21	33	21	3	9	0
Pedestrians		7			7			3			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		208										
pX, platoon unblocked												
vC, conflicting volume	183			270			530	524	270	562	528	186
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	183			270			530	524	270	562	528	186
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			95	93	97	99	98	100
cM capacity (veh/h)	1403			1301			439	446	741	391	443	854
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	272	216	75	12								
Volume Left	5	34	21	3								
Volume Right	15	7	21	0								
cSH	1403	1301	499	429								
Volume to Capacity	0.00	0.03	0.15	0.03								
Queue Length 95th (m)	0.1	0.6	4.2	0.7								
Control Delay (s)	0.2	1.4	13.5	13.6								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.2	1.4	13.5	13.6								
Approach LOS			B	B								
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			40.0%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Total AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	59	382	47	173	886
Future Volume (Veh/h)	45	59	382	47	173	886
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	64	415	51	188	963
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.81					
vC, conflicting volume	1319	452			477	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	926	452			477	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	72	88			83	
cM capacity (veh/h)	178	553			1077	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	113	466	509	642		
Volume Left	49	0	188	0		
Volume Right	64	51	0	0		
cSH	289	1700	1077	1700		
Volume to Capacity	0.39	0.27	0.17	0.38		
Queue Length 95th (m)	14.3	0.0	5.0	0.0		
Control Delay (s)	25.3	0.0	4.6	0.0		
Lane LOS	D		A			
Approach Delay (s)	25.3	0.0	2.0			
Approach LOS	D					
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			69.0%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2034 Future Total AM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	85	14	3	43	7	11	39	21	12	24	44
Future Volume (vph)	23	85	14	3	43	7	11	39	21	12	24	44
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)	25	92	15	3	47	8	12	42	23	13	26	48
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	132	58	77	87								
Volume Left (vph)	25	3	12	13								
Volume Right (vph)	15	8	23	48								
Hadj (s)	-0.01	-0.07	-0.11	-0.30								
Departure Headway (s)	4.3	4.3	4.3	4.1								
Degree Utilization, x	0.16	0.07	0.09	0.10								
Capacity (veh/h)	800	781	789	821								
Control Delay (s)	8.1	7.7	7.8	7.6								
Approach Delay (s)	8.1	7.7	7.8	7.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.8									
Level of Service			A									
Intersection Capacity Utilization			27.2%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Clapperton Street & Proposed Site Access

2034 Future Total AM Peak Hour
210362

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	33	17	51	46	8
Future Volume (Veh/h)	16	33	17	51	46	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	36	18	55	50	9
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	146	54	59			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	146	54	59			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	96	99			
cM capacity (veh/h)	837	1012	1545			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	53	73	59			
Volume Left	17	18	0			
Volume Right	36	0	9			
cSH	949	1545	1700			
Volume to Capacity	0.06	0.01	0.03			
Queue Length 95th (m)	1.4	0.3	0.0			
Control Delay (s)	9.0	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.0	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			20.3%	ICU Level of Service		A
Analysis Period (min)			15			

Intersection: 5: Clapperton Street & Worsley Street

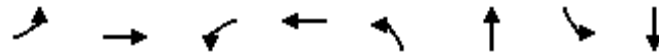
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	18.7	15.0	17.7	13.4
Average Queue (m)	10.3	8.1	9.2	8.7
95th Queue (m)	15.7	14.0	14.7	13.1
Link Distance (m)	127.7	165.3	115.5	66.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queues

2034 Future Total PM Peak Hour

1: Bayfield Street & Sophia Street West/Sophia Street East

210362



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	284	229	16	329	71	950	130	1114
v/c Ratio	0.84	0.32	0.07	0.85	0.50	0.73	0.60	0.68
Control Delay	43.1	18.5	29.8	47.6	38.4	28.8	26.7	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.1	18.5	29.8	47.6	38.4	28.8	26.7	21.3
Queue Length 50th (m)	35.8	25.8	2.4	46.0	10.0	79.1	12.7	81.4
Queue Length 95th (m)	#75.9	43.2	8.0	#80.7	#29.4	109.0	#27.8	112.9
Internal Link Dist (m)		72.2		106.5		48.1		185.6
Turn Bay Length (m)	42.0		25.0		25.0		27.0	
Base Capacity (vph)	346	845	298	494	142	1300	218	1634
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.27	0.05	0.67	0.50	0.73	0.60	0.68

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

1: Bayfield Street & Sophia Street West/Sophia Street East

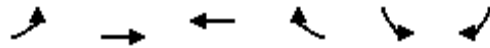
2034 Future Total PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	261	161	50	15	139	164	65	847	27	120	917	108
Future Volume (vph)	261	161	50	15	139	164	65	847	27	120	917	108
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		6.0	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	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.92		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)	1735	1824		1793	1713		1801	3423		1752	3390	
Flt Permitted	0.18	1.00		0.62	1.00		0.20	1.00		0.15	1.00	
Satd. Flow (perm)	335	1824		1162	1713		377	3423		272	3390	
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)	284	175	54	16	151	178	71	921	29	130	997	117
RTOR Reduction (vph)	0	12	0	0	59	0	0	2	0	0	9	0
Lane Group Flow (vph)	284	217	0	16	270	0	71	948	0	130	1105	0
Confl. Peds. (#/hr)	4		8	8		4	8		14	14		8
Heavy Vehicles (%)	4%	0%	0%	0%	1%	1%	0%	5%	0%	3%	5%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.8	34.8		17.3	17.3		34.2	34.2		43.2	43.2	
Effective Green, g (s)	34.8	34.8		17.3	17.3		34.2	34.2		43.2	43.2	
Actuated g/C Ratio	0.39	0.39		0.19	0.19		0.38	0.38		0.48	0.48	
Clearance Time (s)	4.5	6.0		6.0	6.0		6.0	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)	331	705		223	329		143	1300		212	1627	
v/s Ratio Prot	c0.12	0.12			0.16			0.28		0.03	c0.33	
v/s Ratio Perm	c0.21			0.01			0.19			0.26		
v/c Ratio	0.86	0.31		0.07	0.82		0.50	0.73		0.61	0.68	
Uniform Delay, d1	21.9	19.2		29.8	34.9		21.3	23.9		15.9	18.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.2	0.2		0.1	15.0		11.8	3.6		5.2	2.3	
Delay (s)	41.1	19.5		29.9	49.9		33.1	27.5		21.1	20.4	
Level of Service	D	B		C	D		C	C		C	C	
Approach Delay (s)		31.4			49.0			27.9			20.4	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			27.8			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			20.5			
Intersection Capacity Utilization			108.3%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Sophia Street East & McDonald Street

2034 Future Total PM Peak Hour
210362



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↘	
Traffic Volume (veh/h)	0	0	0	0	0	18
Future Volume (Veh/h)	0	0	0	0	0	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	20
Pedestrians		2				
Lane Width (m)		3.6				
Walking Speed (m/s)		1.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		130				
pX, platoon unblocked						
vC, conflicting volume	0				0	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	2
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	1636				1029	1086
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	0	0	20			
Volume Left	0	0	0			
Volume Right	0	0	20			
cSH	1700	1700	1086			
Volume to Capacity	0.00	0.00	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	8.4			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	8.4			
Approach LOS			A			
Intersection Summary						
Average Delay			8.4			
Intersection Capacity Utilization			6.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Clapperton Street & McDonald Street

2034 Future Total PM Peak Hour

210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	209	23	19	260	8	28	54	42	6	3	2
Future Volume (Veh/h)	21	209	23	19	260	8	28	54	42	6	3	2
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)	23	227	25	21	283	9	30	59	46	7	3	2
Pedestrians		3			3			5			3	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		210										
pX, platoon unblocked												
vC, conflicting volume	295			257			626	628	248	696	636	294
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	295			257			626	628	248	696	636	294
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			98			92	85	94	98	99	100
cM capacity (veh/h)	1274			1313			380	386	790	287	382	746
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	275	313	135	12								
Volume Left	23	21	30	7								
Volume Right	25	9	46	2								
cSH	1274	1313	465	344								
Volume to Capacity	0.02	0.02	0.29	0.03								
Queue Length 95th (m)	0.4	0.4	9.5	0.9								
Control Delay (s)	0.8	0.7	15.9	15.9								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.8	0.7	15.9	15.9								
Approach LOS			C	C								
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utilization			33.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Total PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	77	180	681	35	96	929
Future Volume (Veh/h)	77	180	681	35	96	929
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)	84	196	740	38	104	1010
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.75					
vC, conflicting volume	1495	777			791	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1001	777			791	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	46	42			87	
cM capacity (veh/h)	156	338			827	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	280	778	441	673		
Volume Left	84	0	104	0		
Volume Right	196	38	0	0		
cSH	250	1700	827	1700		
Volume to Capacity	1.12	0.46	0.13	0.40		
Queue Length 95th (m)	98.1	0.0	3.4	0.0		
Control Delay (s)	135.0	0.0	3.5	0.0		
Lane LOS	F		A			
Approach Delay (s)	135.0	0.0	1.4			
Approach LOS	F					
Intersection Summary						
Average Delay		18.1				
Intersection Capacity Utilization		92.2%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 5: Clapperton Street & Worsley Street

2034 Future Total PM Peak Hour
210362

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	46	34	3	10	120	19	45	91	14	8	12	44
Future Volume (vph)	46	34	3	10	120	19	45	91	14	8	12	44
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)	50	37	3	11	130	21	49	99	15	9	13	48
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	90	162	163	70								
Volume Left (vph)	50	11	49	9								
Volume Right (vph)	3	21	15	48								
Hadj (s)	0.09	-0.06	0.02	-0.39								
Departure Headway (s)	4.7	4.5	4.6	4.3								
Degree Utilization, x	0.12	0.20	0.21	0.08								
Capacity (veh/h)	706	752	739	768								
Control Delay (s)	8.4	8.6	8.8	7.7								
Approach Delay (s)	8.4	8.6	8.8	7.7								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.5									
Level of Service			A									
Intersection Capacity Utilization			40.1%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 6: Clapperton Street & Proposed Site Access

2034 Future Total PM Peak Hour
210362

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	14	29	37	119	29	15
Future Volume (Veh/h)	14	29	37	119	29	15
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)	15	32	40	129	32	16
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	249	40	48			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	249	40	48			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	97	97			
cM capacity (veh/h)	721	1031	1559			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	47	169	48			
Volume Left	15	40	0			
Volume Right	32	0	16			
cSH	907	1559	1700			
Volume to Capacity	0.05	0.03	0.03			
Queue Length 95th (m)	1.3	0.6	0.0			
Control Delay (s)	9.2	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.2	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		2.9				
Intersection Capacity Utilization		25.0%		ICU Level of Service		A
Analysis Period (min)		15				

Intersection: 5: Clapperton Street & Worsley Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	17.7	37.9	52.3	21.8
Average Queue (m)	9.4	17.4	17.2	9.7
95th Queue (m)	14.0	48.5	48.6	19.1
Link Distance (m)	127.7	165.3	115.5	66.2
Upstream Blk Time (%)			0	
Queuing Penalty (veh)			0	
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Appendix G

Sensitivity Analysis Synchro Outputs



HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Total AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	59	382	47	173	886
Future Volume (Veh/h)	45	59	382	47	173	886
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	64	415	51	188	963
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.81					
vC, conflicting volume	1319	452			477	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	924	452			477	
tC, single (s)	*5.0	*5.0			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	91			83	
cM capacity (veh/h)	283	702			1077	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	113	466	509	642		
Volume Left	49	0	188	0		
Volume Right	64	51	0	0		
cSH	427	1700	1077	1700		
Volume to Capacity	0.26	0.27	0.17	0.38		
Queue Length 95th (m)	8.4	0.0	5.0	0.0		
Control Delay (s)	16.4	0.0	4.6	0.0		
Lane LOS	C		A			
Approach Delay (s)	16.4	0.0	2.0			
Approach LOS	C					
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			69.0%		ICU Level of Service	C
Analysis Period (min)			15			
* User Entered Value						

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Total PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	77	180	681	35	96	929
Future Volume (Veh/h)	77	180	681	35	96	929
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)	84	196	740	38	104	1010
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.75					
vC, conflicting volume	1495	777			791	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1001	777			791	
tC, single (s)	*5.0	*5.0			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	67	61			87	
cM capacity (veh/h)	258	509			827	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	280	778	441	673		
Volume Left	84	0	104	0		
Volume Right	196	38	0	0		
cSH	394	1700	827	1700		
Volume to Capacity	0.71	0.46	0.13	0.40		
Queue Length 95th (m)	42.9	0.0	3.4	0.0		
Control Delay (s)	33.7	0.0	3.5	0.0		
Lane LOS	D		A			
Approach Delay (s)	33.7	0.0	1.4			
Approach LOS	D					
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			92.2%	ICU Level of Service		F
Analysis Period (min)			15			
* User Entered Value						

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

2034 Future Total AM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	59	382	47	173	886
Future Volume (Veh/h)	45	59	382	47	173	886
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	64	415	51	188	963
Pedestrians	11		10			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			0
Right turn flare (veh)		1				
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.81					
vC, conflicting volume	1319	452			477	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	924	452			477	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	72	88			83	
cM capacity (veh/h)	178	553			1077	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	113	466	509	642		
Volume Left	49	0	188	0		
Volume Right	64	51	0	0		
cSH	411	1700	1077	1700		
Volume to Capacity	0.28	0.27	0.17	0.38		
Queue Length 95th (m)	8.8	0.0	5.0	0.0		
Control Delay (s)	21.2	0.0	4.6	0.0		
Lane LOS	C		A			
Approach Delay (s)	21.2	0.0	2.0			
Approach LOS	C					
Intersection Summary						
Average Delay		2.7				
Intersection Capacity Utilization		66.3%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 4: Bayfield Street & Worsley Street

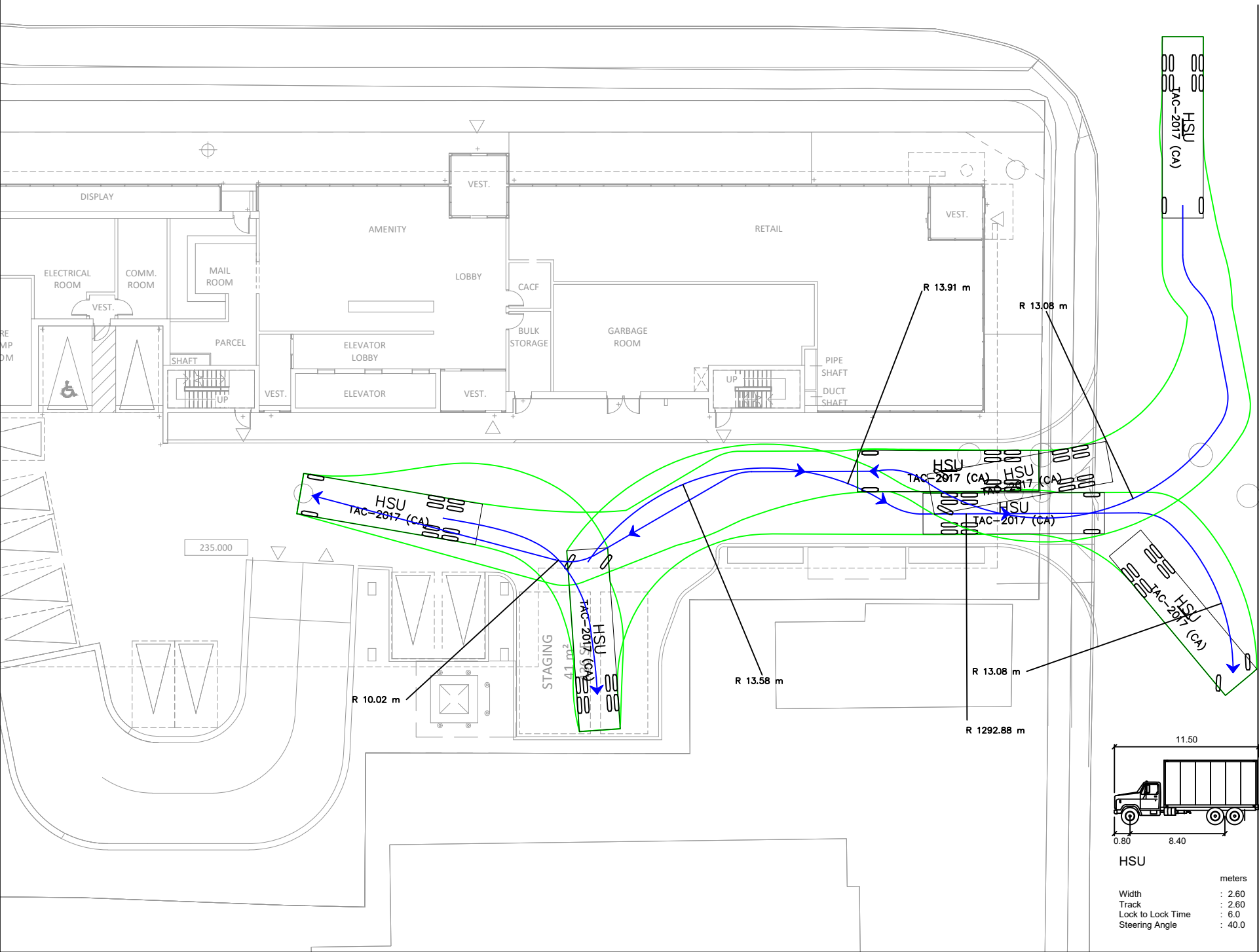
2034 Future Total PM Peak Hour
210362

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	77	180	681	35	96	929
Future Volume (Veh/h)	77	180	681	35	96	929
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)	84	196	740	38	104	1010
Pedestrians	13		10			5
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)		1				
Median type			None			None
Median storage veh						
Upstream signal (m)						72
pX, platoon unblocked	0.75					
vC, conflicting volume	1495	777			791	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1001	777			791	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	46	42			87	
cM capacity (veh/h)	156	338			827	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	280	778	441	673		
Volume Left	84	0	104	0		
Volume Right	196	38	0	0		
cSH	367	1700	827	1700		
Volume to Capacity	0.76	0.46	0.13	0.40		
Queue Length 95th (m)	49.4	0.0	3.4	0.0		
Control Delay (s)	40.4	0.0	3.5	0.0		
Lane LOS	E		A			
Approach Delay (s)	40.4	0.0	1.4			
Approach LOS	E					
Intersection Summary						
Average Delay			5.9			
Intersection Capacity Utilization			82.2%	ICU Level of Service		E
Analysis Period (min)			15			

Appendix H

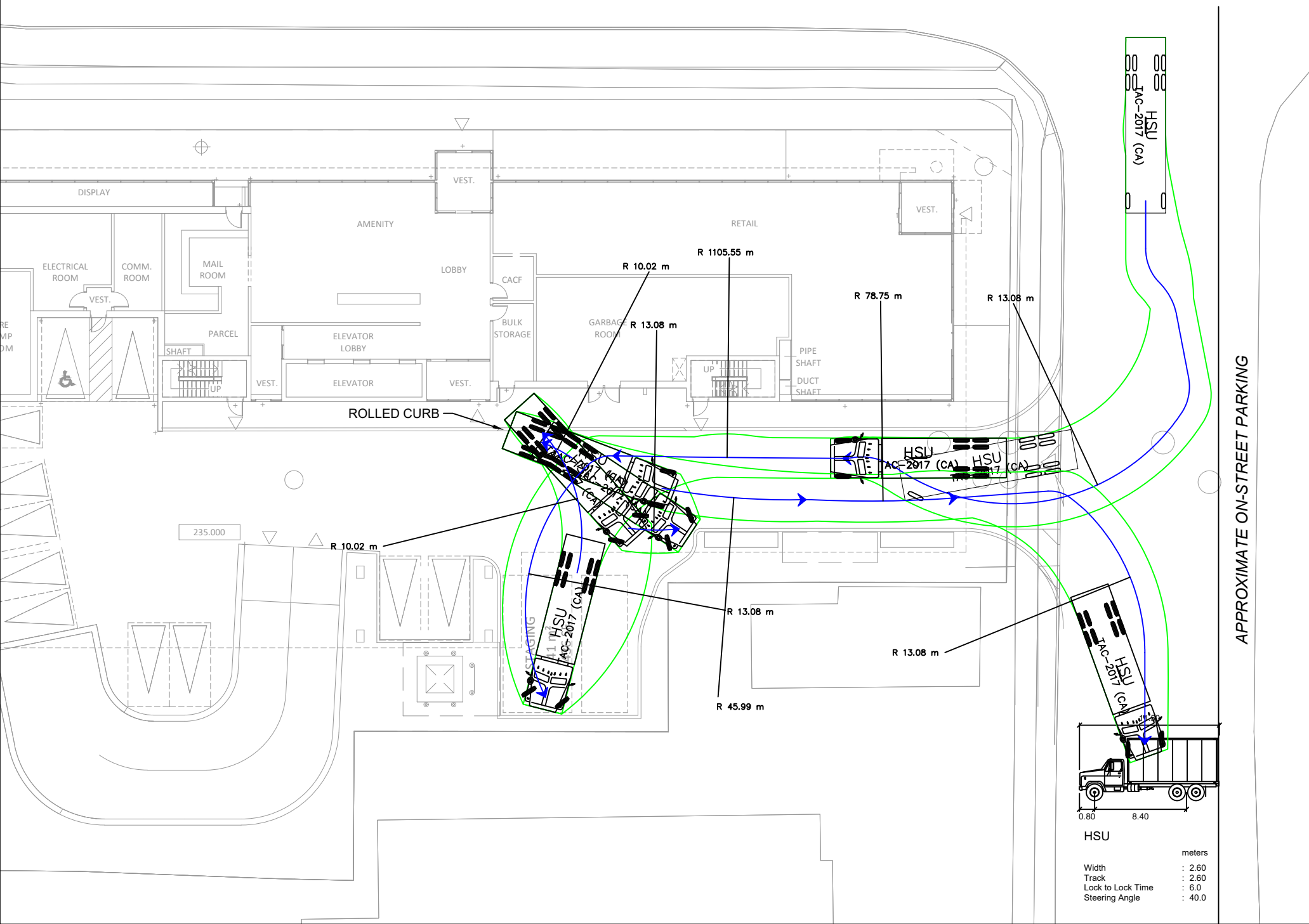
AutoTURN Vehicle Turning Diagrams and Pavement Marking and Signage Plan

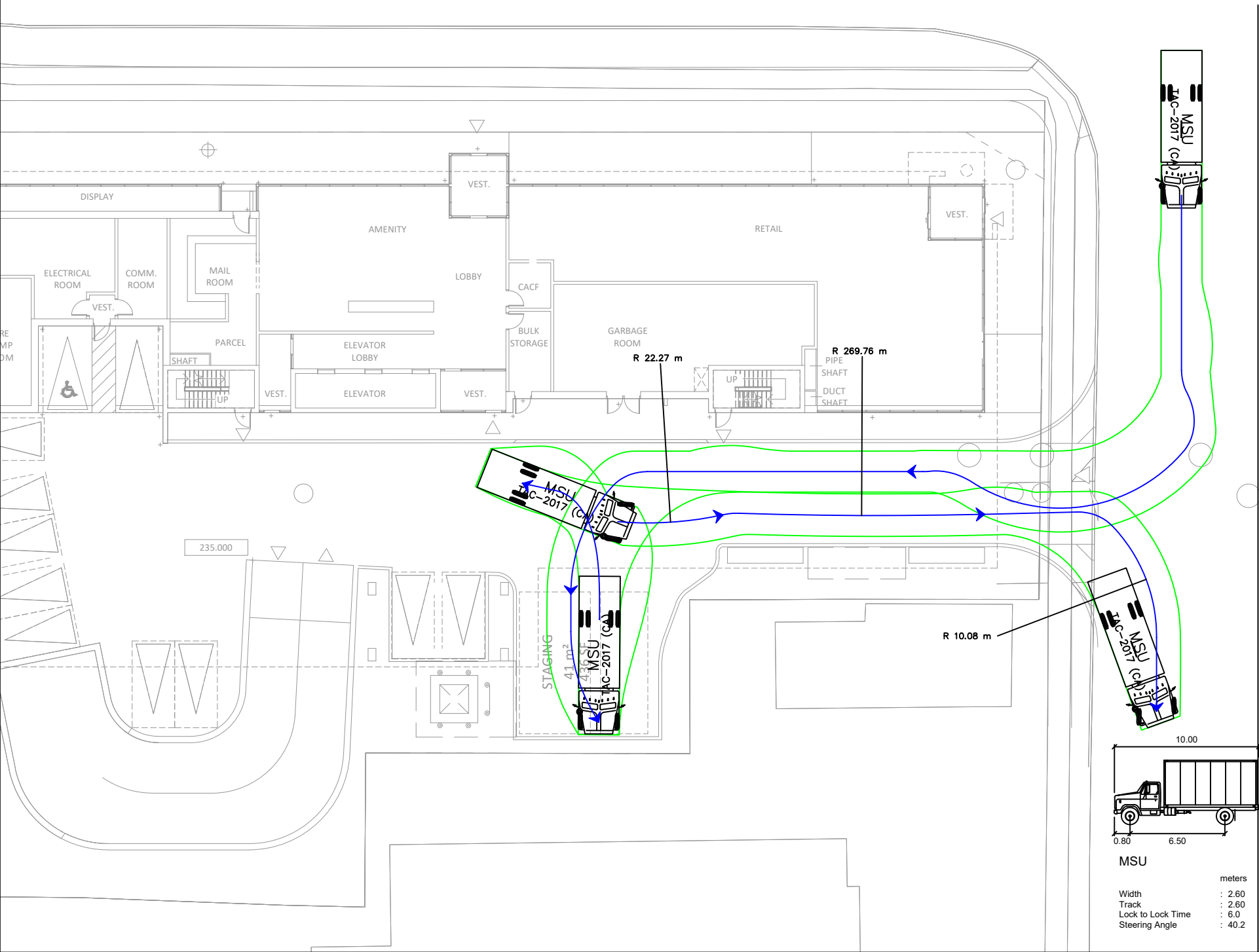




APPROXIMATE ON-STREET PARKING

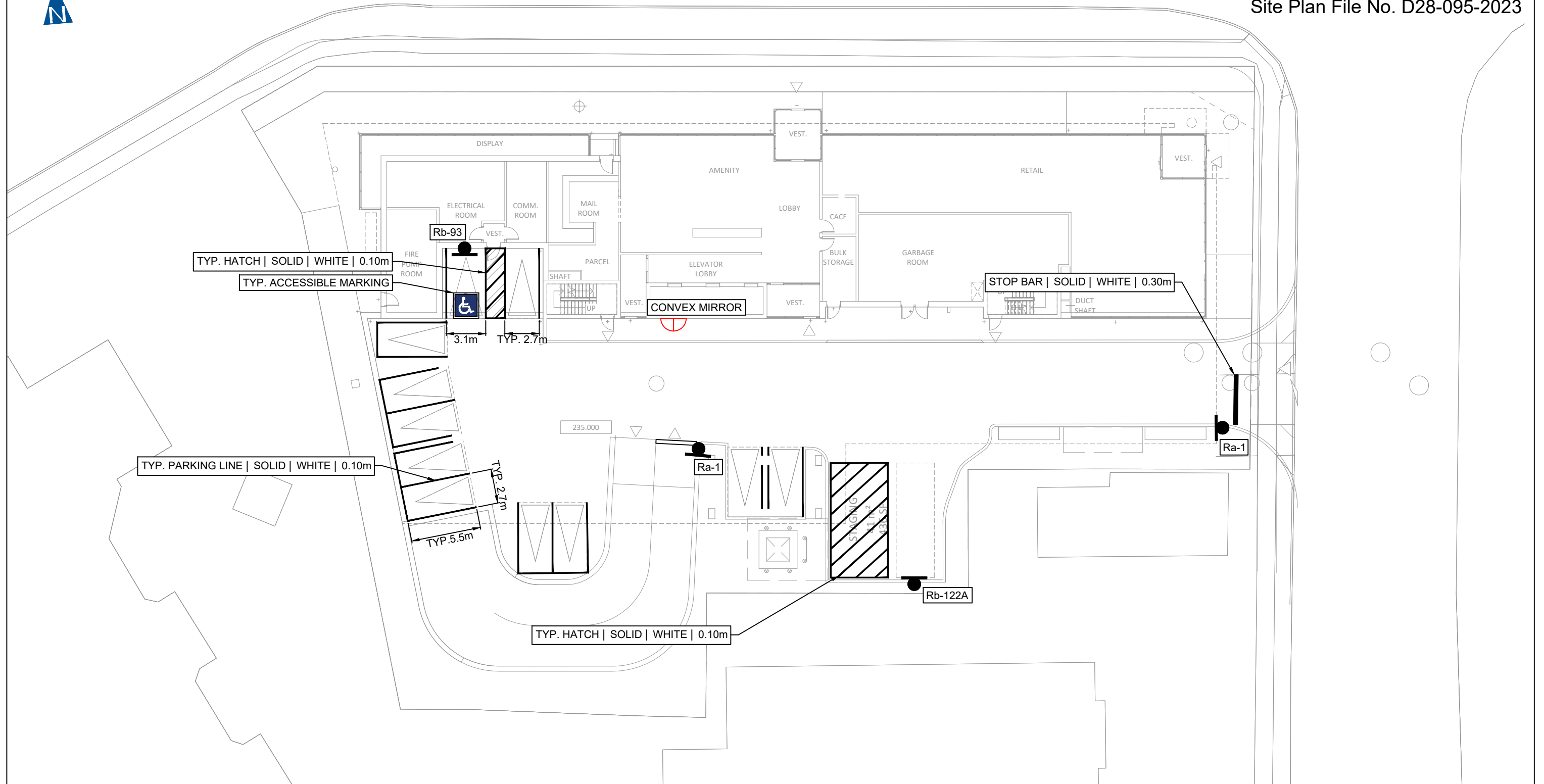
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Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0





APPROXIMATE ON-STREET PARKING

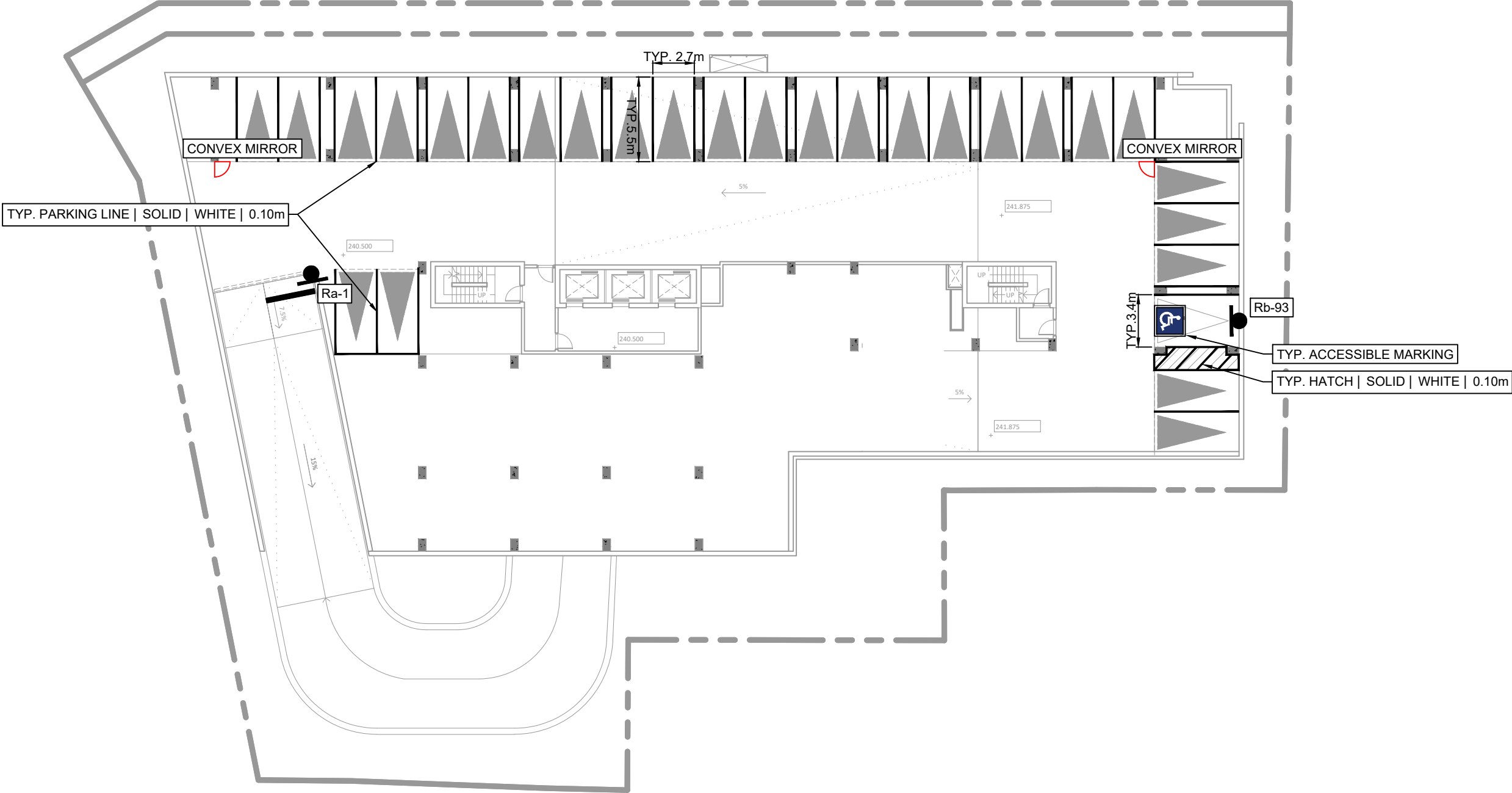
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meters	
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Track	: 2.60
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Steering Angle	: 40.2



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					PROJECT NO.: 230701	DATE: JUNE 2024	SCALE: 1:300	DRAWING NO.: 01
					DRAWN: LC	DESIGN: LC	CHECK: ASo	
NO.	DATE	INITIAL	REVISION DETAIL					



LEVEL 2



NO.	DATE	INITIAL	REVISION DETAIL

PAVEMENT MARKING & SIGNAGE PLAN
17 SOPHIA STREET EAST
BARRIE, ON



PROJECT NO.: 230701

DATE: JUNE 2024

SCALE: 1:300

DRAWING NO.:

DRAWN: LC

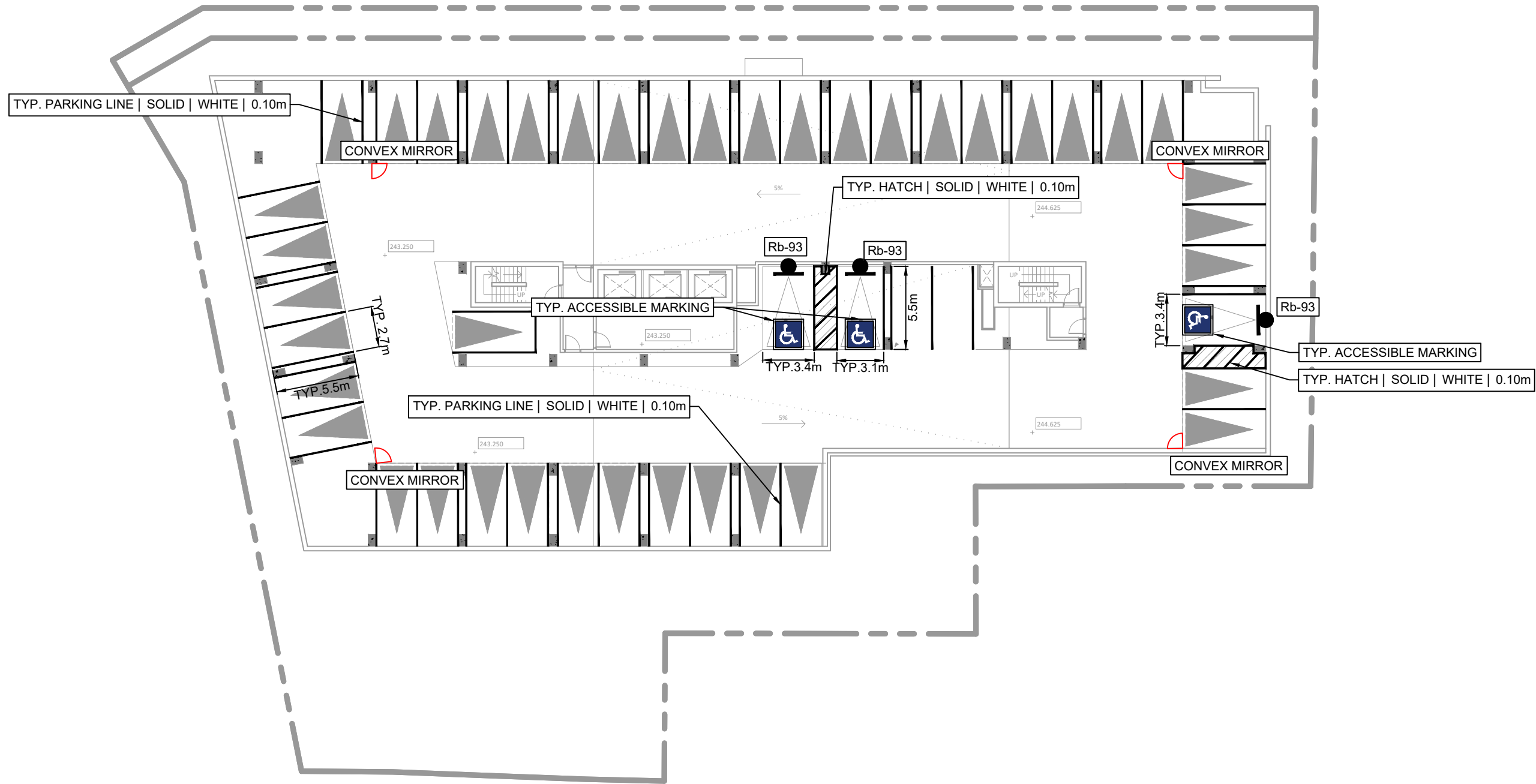
DESIGN: LC

CHECK: ASo

02



LEVEL 3



NO.	DATE	INITIAL	REVISION DETAIL

PAVEMENT MARKING & SIGNAGE PLAN
17 SOPHIA STREET EAST
BARRIE, ON



PROJECT NO.: 230701

DATE: JUNE 2024

SCALE: 1:300

DRAWING NO.:

DRAWN: LC

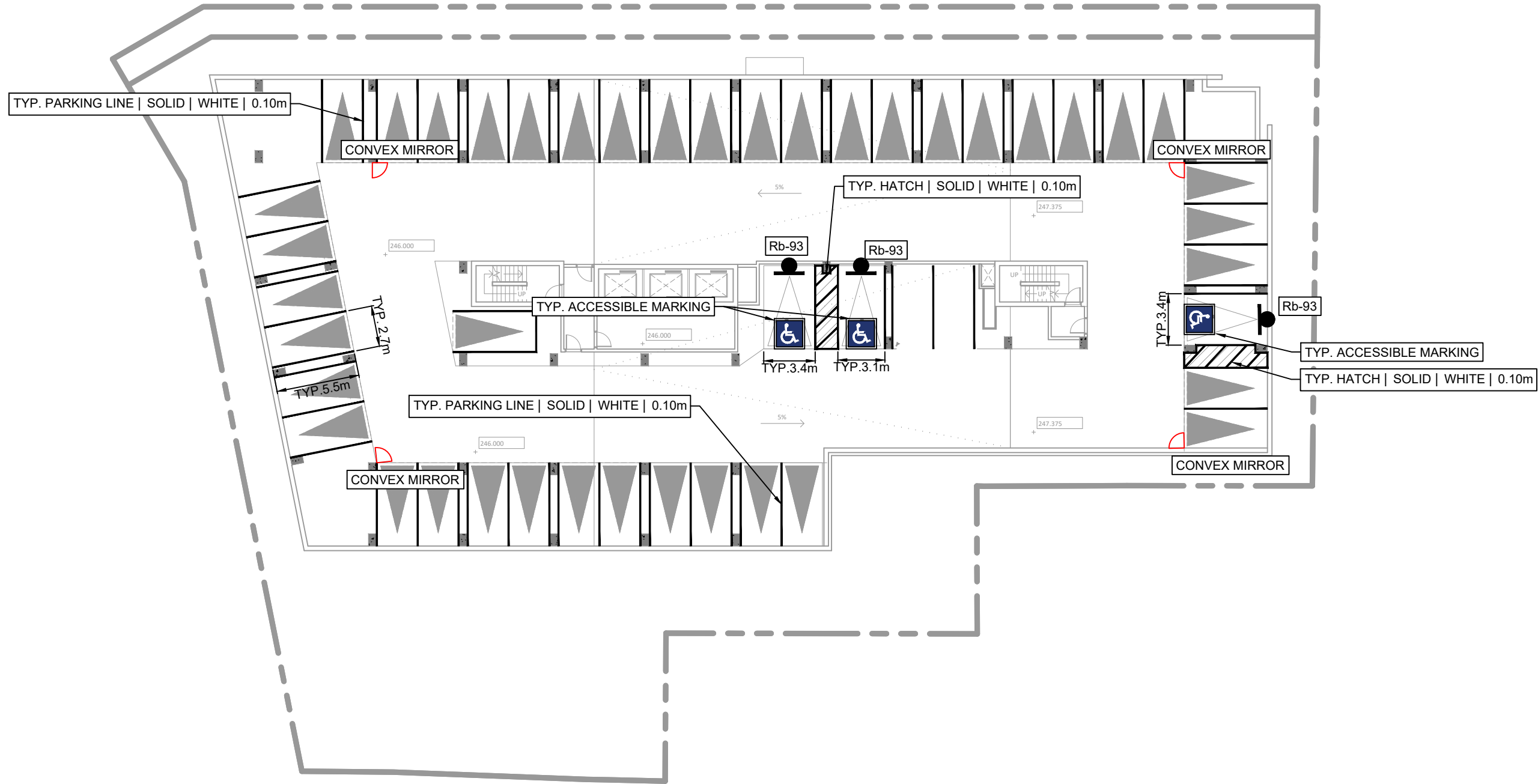
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CHECK: ASo

03



LEVEL 4



NO.	DATE	INITIAL	REVISION DETAIL

PAVEMENT MARKING & SIGNAGE PLAN
17 SOPHIA STREET EAST
BARRIE, ON



PROJECT NO.: 230701

DATE: JUNE 2024

SCALE: 1:300

DRAWING NO.:

DRAWN: LC

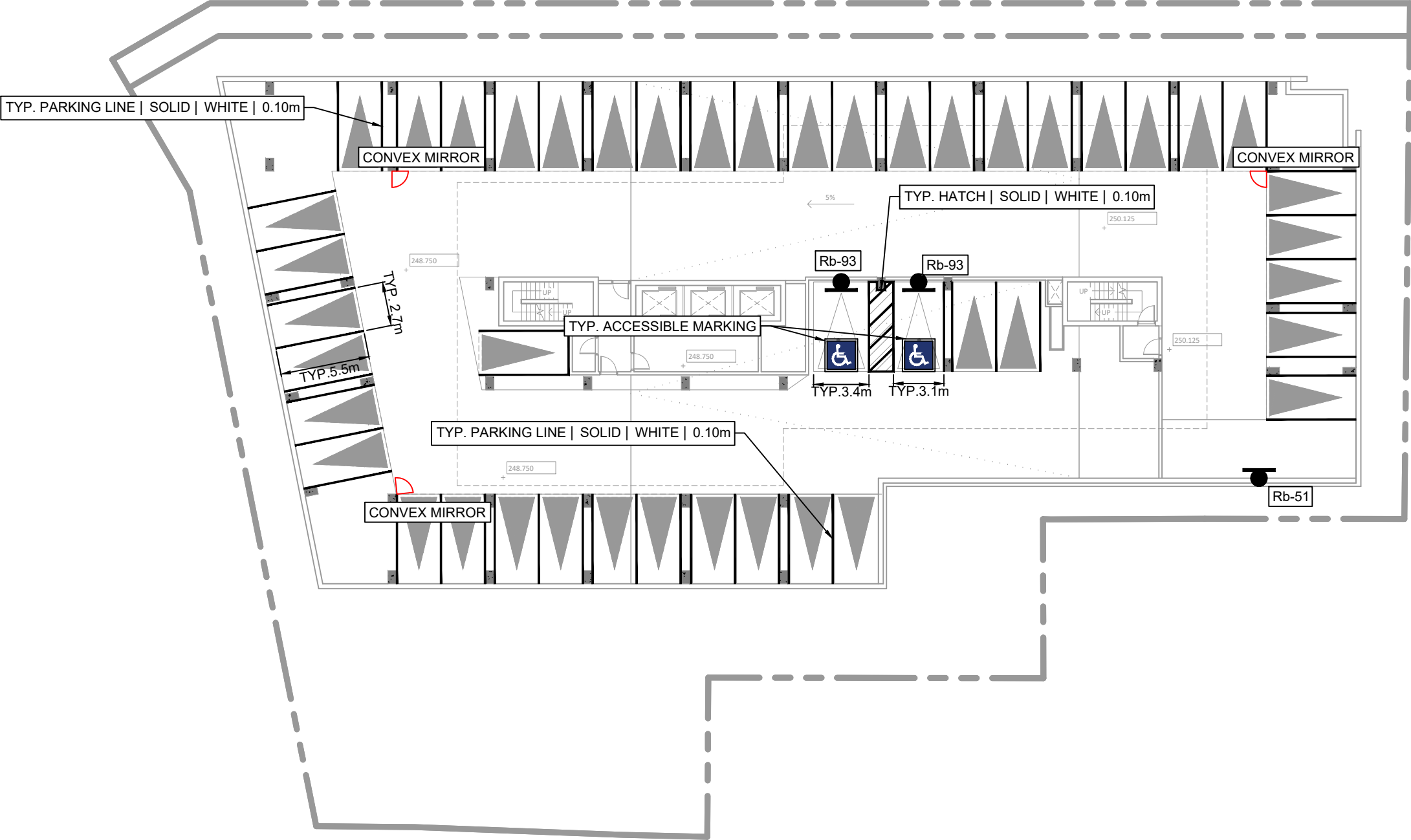
DESIGN: LC

CHECK: ASo

04



LEVEL 5



NO.	DATE	INITIAL	REVISION DETAIL

PAVEMENT MARKING & SIGNAGE PLAN
17 SOPHIA STREET EAST
BARRIE, ON



PROJECT NO.: 230701

DATE: JUNE 2024

SCALE: 1:300

DRAWING NO.:

DRAWN: LC

DESIGN: LC

CHECK: ASo

05

SIGNAGE NOTES

REGULATORY SIGNS SHALL NORMALLY BE LOCATED IN ACCORDANCE WITH SECTION 12 (SIGN POSITION) OF BOOK 1B. HOWEVER, SPECIFIC OR ADDITIONAL REQUIREMENTS FOR CERTAIN REGULATORY SIGNS MAY PRE-EMPT OR REVISE DIRECTIONS OR SPECIFICATIONS PRESCRIBED UNDER THE GENERAL STANDARDS IN BOOK 1B. SUCH DEVIATIONS OR EXCEPTIONS FROM THE BOOK 1B LOCATION PRINCIPLES ARE NOTED IN THIS BOOK UNDER THE HEADING "LOCATION CRITERIA" FOR THE RESPECTIVE SIGNS TO WHICH THEY APPLY. IF FOR A GIVEN SIGN, EXCEPTIONS ARE NOT NOTED UNDER THIS HEADING, THE BOOK 1B LOCATION PRINCIPLES APPLY.

SIGNAGE POSITION NOTES

SIGNAGE SHOULD CONFORM TO ONTARIO TRAFFIC MANUAL STANDARDS WHERE POSSIBLE.

HORIZONTAL MOUNTING OFFSET

THE BASIC GUIDELINES FOR HORIZONTAL MOUNTING OFFSETS ARE AS FOLLOWS:

- URBAN OR RESIDENTIAL AREAS WITH RAISED CURBS: 30 CM TO 2 M FROM THE CURB LINE.

WHERE RESTRICTED BY PHYSICAL FEATURES SUCH AS CLIFFS, OR STRUCTURE FEATURES SUCH AS BRIDGE SUPPORTS, THE HORIZONTAL OFFSET SHOULD BE AS CLOSE AS POSSIBLE TO THE ABOVE GUIDELINES.

VERTICAL MOUNTING OFFSET

THE BASIC GUIDELINES FOR VERTICAL MOUNTING OFFSETS OF GROUND-MOUNTED SIGNS INCLUDE THE FOLLOWING:

- AREAS WITH NO PEDESTRIANS AND WITHOUT RAISED CURBS: 1.5 M TO 2.5 M FROM OUTER EDGE OF OUTER LANE TO BOTTOM OF PRINCIPAL SIGN, REGARDLESS OF WHETHER THERE IS A TAB SIGN MOUNTED BENEATH PRINCIPAL SIGN.
- AREAS WITH NO PEDESTRIANS AND WITH RAISED CURBS: 1.5 M TO 2.5 M FROM CURB LINE TO BOTTOM OF PRINCIPAL SIGN, REGARDLESS OF WHETHER THERE IS A TAB SIGN MOUNTED BENEATH PRINCIPAL SIGN.
- AREAS WITH PEDESTRIANS: 2 M TO 3 M FROM GROUND ELEVATION AT THE BASE OF THE SIGN POST TO THE BOTTOM OF THE OVERALL SIGN, INCLUDING TAB IF PRESENT.

HORIZONTAL & VERTICAL ANGLING OF SIGN FACE

GENERALLY, SIGNS MUST BE MOUNTED AT APPROXIMATELY RIGHT ANGLES TO THE DIRECTION OF TRAFFIC, FACING THE TRAFFIC THAT THEY ARE INTENDED TO ADDRESS. EXCEPTIONS TO THIS RULE INCLUDE REGULATORY PARKING CONTROL SIGNS. THESE SIGNS SHOULD BE PLACED AT AN ANGLE OF 30 TO 45 DEGREES TO THE FLOW OF TRAFFIC, AND SHOULD ALWAYS BE VISIBLE TO APPROACHING TRAFFIC.

SIGN MOUNTING

MOUNTING TO BE DETERMINED IN FIELD.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES AND UTILITIES IN WORKING AREA PRIOR TO CONSTRUCTION AND SHALL PROTECT THESE UTILITIES AND SERVICES TO THE SATISFACTION OF THE CONCERNED UTILITY COMPANIES AND OWNER. DAMAGES BY THE CONTRACTOR SHALL BE RESTORED TO THE SATISFACTION OF THE CONCERNED UTILITY COMPANY AT NO EXPENSE TO THE OWNER

PAVEMENT MARKING NOTES

PROVINCIAL LEGISLATION PROVIDES THAT MARKINGS MAY BE PLACED BY THE ROAD AUTHORITY HAVING JURISDICTION FOR THE PURPOSE OF REGULATING, WARNING OR GUIDING TRAFFIC (SECTION 182 OF THE HIGHWAY TRAFFIC ACT (R.S.O. 1990)).

PAVEMENT AND CURB MARKINGS, BEING EXCLUSIVELY WITHIN THE BOUNDARIES OF PUBLIC HIGHWAYS, SHOULD ONLY BE PLACED BY THE ROAD AUTHORITY. DELINEATORS AND OBJECT MARKERS THAT ARE WITHIN THE HIGHWAY RIGHT-OF-WAY ARE SUBJECT TO THE SAME JURISDICTIONAL REGULATIONS.

MARKINGS AND DELINEATION SERVE AN ADVISORY OR WARNING FUNCTION, AND DO NOT HAVE LEGAL FORCE OF THEIR OWN. THEY MAY BE USED TO COMPLEMENT OTHER TRAFFIC CONTROL DEVICES ENFORCEABLE UNDER THE HTA, ITS REGULATIONS, OR A MUNICIPAL BY-LAW, BUT THEIR ENFORCEABILITY DERIVES FROM THE MAIN REGULATORY TRAFFIC CONTROL DEVICE, NOT FROM THE MARKINGS OR DELINEATION. TO AVOID POSSIBLE CONFLICT OR CONFUSION, THE MEANING OF MARKINGS AND DELINEATION SHOULD BE CHECKED AGAINST THE PREVAILING TRAFFIC LAWS AND REGULATIONS BEFORE THEY ARE INSTALLED OR REMOVED.

SIGNAGE LEGEND

SIGN DETAIL	NAME
	Ra-1 STOP SIGN 600 x 600 mm
	Rb-51 NO PARKING SIGN 300 x 300 mm
	Rb-93 ACCESSIBLE PARKING ONLY SIGN 450 x 600 mm
	Rb-122A COMMERCIAL LOADING ZONE SIGN 450 x 600 mm

				PAVEMENT MARKING & SIGNAGE PLAN 17 SOPHIA STREET EAST BARRIE, ON				
					PROJECT NO.: 230701	DATE: JUNE 2024	SCALE: 1:300	DRAWING NO.: 06
NO.	DATE	INITIAL	REVISION DETAIL		DRAWN: LC	DESIGN: LC	CHECK: ASo	