113 Bayfield Street, Barrie Transportation Impact and Parking Study

Paradigm Transportation Solutions Limited

April 2020

ptsl.com

Project Summary

Project Number
190726

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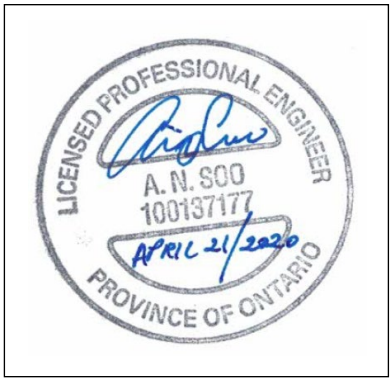
113 Bayfield Street
Transportation Impact and Parking Study

Signatures and Seals



Signature

Engineer's Seal

Disclaimer

Executive Summary

Content

Coral Sophia Housing Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to complete this Transportation Impact and Parking Study for a proposed residential development at 113 Bayfield Street in Barrie, Ontario.

The purpose of this Transportation Impact and Parking Study is to determine the net impacts of the development traffic on the surrounding road network, outline 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 for implementation. This study assesses the 2027 horizon which represents five years following full build-out of the subject site.

Development Concept

The subject site is located at the northeast corner of Bayfield Street and Sophia Street at the municipal address of 113 Bayfield Street.

The proposed 0.37 hectare (0.92 acre) development is planned to be constructed in a single phase with completion and occupancy anticipated in 2022. The development will consist of an eight-storey apartment building providing a total of 108 residential units. The building will contain a mixture of market rate units and up to 70 (approximately 65%) affordable housing units. The final number of affordable units will be confirmed at a later date.

A total parking supply of 114 stalls on-site is proposed, including four barrier-free stalls and 18 secondary tandem stalls. Parking is to be provided above-grade within the podium of the building.

Ten short-term bicycle parking stalls are proposed adjacent to the building entrance. Secure long-term bicycle and scooter parking for building residents is provided on the main floor of the building, accommodating 56 bicycles and seven scooters. Additionally, 53 storage lockers are proposed on the second parking lot level.

Vehicular access to the site is proposed via a single full-movement driveway connection to Drury Lane located approximately 30 metres north of Sophia Street. This driveway (herein referred to as the “Site Access”) is planned to operate unsignalized with the minor road (driveway) leg operating under stop-control.

Conclusions

Based on the investigations carried out, the following is concluded:

Existing Traffic Operations

Under base year traffic conditions, all intersections and movements within the study area operate at acceptable levels of service and are within capacity. The exception would be the eastbound left-turn movement at Bayfield Street and Sophia Street. This movement currently operates at LOS F with a v/c ratio of 0.98 under the PM peak hour. The 95th percentile queue is also noted to exceed the available storage by 26 metres.

Development Trip Generation

The residential development is forecast to generate a total of 35 AM peak hour trips and 46 PM peak hour trips. This estimate accounts for potential trips made by transit.

2027 Background Traffic Operations

Under 2027 background traffic conditions, all intersections and movements within the study area are forecast to operate at acceptable levels of service and within capacity. The exceptions include:

- Eastbound left-turn movement at Bayfield Street and Wellington Street, which is forecast to operate at LOS D with a v/c ratio of 0.88 during the PM peak hour; and
- Eastbound left-turn movement at Bayfield Street and Sophia Street, which is forecast to operate at LOS F with a v/c ratio of 1.04 and the 95th percentile queue is anticipated to exceed the available storage by 32 metres during the PM peak hour.

2027 Total Traffic Operations

Under 2027 total traffic conditions, all intersections and movements within the study area are forecast to operate at acceptable levels of service and within capacity. The exceptions include:

- Eastbound left-turn movement at Bayfield Street and Wellington Street, which is forecast to operate at LOS D with a v/c ratio of 0.89 during the PM peak hour; and
- Eastbound left-turn movement at Bayfield Street and Sophia Street, which is forecast to operate at LOS F with a v/c ratio of 1.05 and the 95th percentile queue is anticipated to exceed the available storage by 32 metres during the PM peak hour.

Remedial Measures

Left-Turn Lanes

Upon full build-out of the development, a left-turn lane is not warranted on Drury Road at the Site Access.

Right-Turn Lanes

Upon full build-out of the development, a right-turn lane is not warranted on Drury Road at the Site Access.

Signal Optimization

The signalized study area intersections are generally forecast to operate at acceptable levels of service and within capacity under the 2027 total traffic conditions with the optimization of signal timing splits.

Parking Assessment

Zoning By-law Parking Requirements

Based on Zoning By-law 2009-141, a total of 108 stalls are determined to be required. A total of 96 stalls are proposed to serve the anticipated parking demands, this results in a theoretical deficiency of 12 stalls.

Proxy Site Parking Data

Based on proxy site parking demand rates of 0.45 stalls per unit (affordable housing) and 0.95 stalls per unit (market rate), it is determined that a minimum of 15% of the total residential units be designated as affordable. Providing a total of 15% affordable units, the development is estimated to generate a parking demand of 94 stalls and a maximum surplus of two stalls, plus 18 tandem stalls. Providing a total of 65% affordable housing units (the maximum proposed for the building), the development is estimated to generate a parking demand of 68 stalls and a maximum surplus of 28 stalls, plus 18 tandem stalls.

City of Mississauga Parking Guidelines for Public and Private Non-Profit Housing

Based on the Mississauga non-profit housing parking demand rate and market rate proxy site parking demand rate, it is determined that a minimum of 10% of units should be designated as affordable. This increases to 15% if a shallow subsidy is provided for the affordable housing units. The parking demand is as follow:

- **Shallow Subsidy:** At 15% affordable units, the development will have a parking demand of 96 stalls and no surplus of stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 76 stalls and a maximum surplus of 20 stalls, plus 18 tandem stalls.
- **Deep Subsidy:** At 10% affordable units, the development will have a parking demand of 96 stalls and no surplus of stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 64 stalls and a maximum surplus of 32 stalls, plus 18 tandem stalls.

Parking Justification Summary

The anticipated parking demand for the residential component is expected to be lower than the Zoning By-law requirements based on the analysis completed using proxy site data and the City of Mississauga non-profit housing parking rates. The planned parking supply is expected to adequately serve residential demand with a surplus ranging from 0 to 32 stalls, if a minimum of 15% of the total residential units are designated as affordable. Furthermore, the 18 secondary tandem stalls will provide additional parking if unit tenants require more than one parking stall.

Transportation Demand Management (TDM) Measures

The subject site is acknowledged to be accessible by alternative travel modes. The site plan indicates connections provided to transit and active transportation facilities. The client should consider the implementing the identified recommended TDM measures to further promote the use of alternative travel modes and to reduce parking demands.

Recommendations

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

- The proposed development be permitted to proceed with the proposed number of units and parking supply, with a minimum of 15% of the total residential units designated as affordable;
- The 18 secondary tandem parking stalls be allocated to building tenants with primary stalls;
- Optimize the signal timing splits and phasing at the Bayfield Street intersections with Wellington Street and Sophia Street to ensure the best operations all movements; and

- Incorporate the recommended Transportation Demand Management measures into the site plan.

Contents

Appendices

Figures

Tables

1 Introduction

1.1 Overview

Coral Sophia Housing Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to complete this Transportation Impact and Parking Study for a proposed residential development at 113 Bayfield Street in Barrie, Ontario. **Figure 1.1** illustrates the location of the proposed development.

The subject lands are proposed to be developed as a mid-rise apartment building providing both market rate and affordable housing units. A total of 108 residential units are proposed within an eight-storey building.

1.2 Purpose and Scope

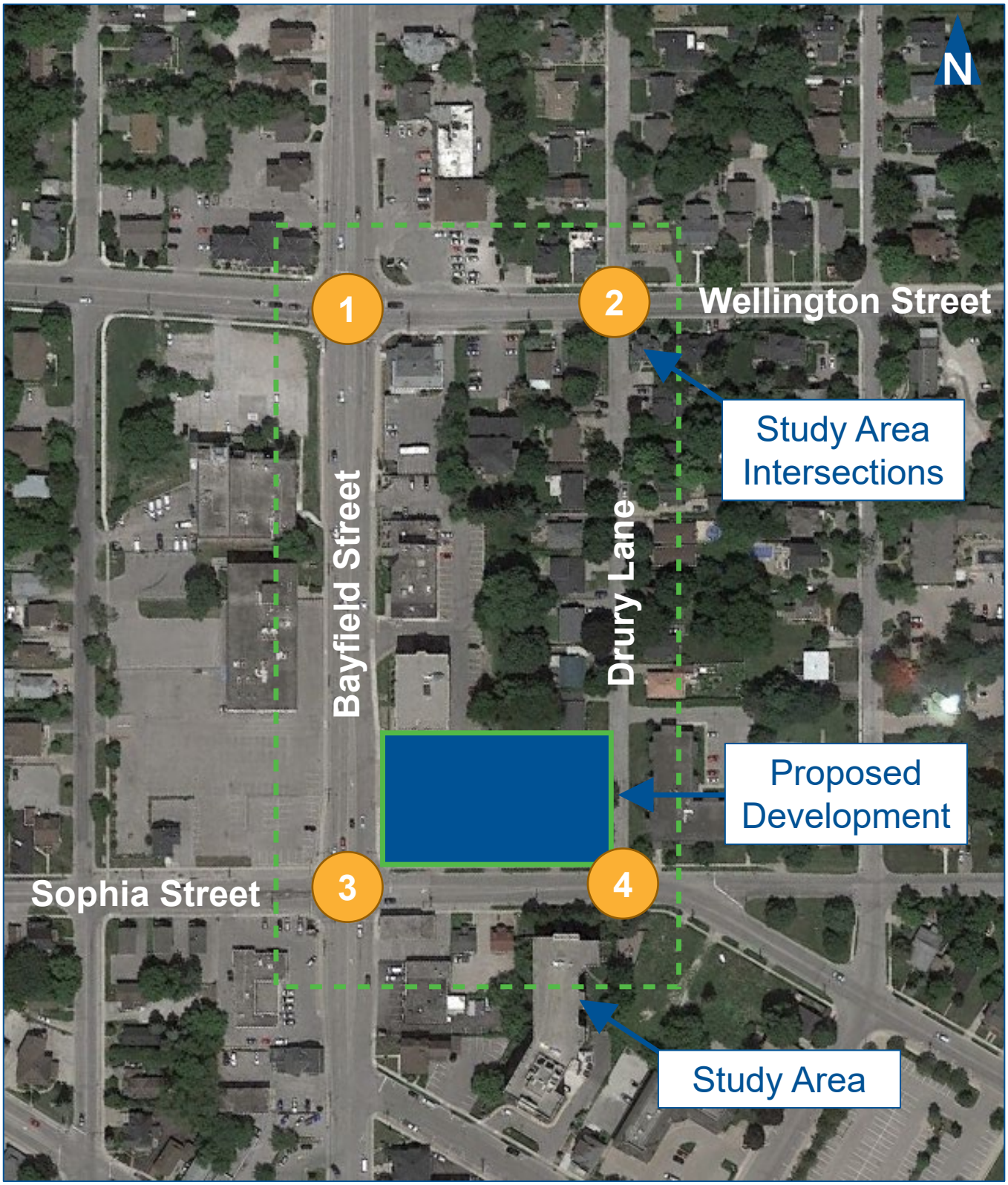
The purpose of the study is to:

- Determine and assess the current study area traffic conditions;
- Forecast the traffic generated by the proposed development;
- Analyze the impacts of this additional traffic on the study area street transportation network;
- Recommend necessary remedial measures required to mitigate these impacts, if any;
- Document the anticipated parking needs of the development;
- Determine the adequacy of the proposed parking supply; and
- Assess the potential Transportation Demand Management measures to integrate into the site plan.

This report has been prepared to meet the City of Barrie Traffic Impact Study (TIS) Guidelines[1] contained within their Urban Design Manual. This report assesses the 2027 horizon year (five years beyond full build-out), as required under the City's Guidelines.

Pre-study consultation was undertaken with the City of Barrie via e-mail in December 2017. After revisions to the development plan, additional correspondence to confirm use of 2017 count data was conducted in March 2020. **Appendix A** contains the pre-study consultation correspondence.

[1] City of Barrie. *Urban Design Manual, Appendix 2 – Transportation Impact Study Requirements.* October 2014.



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Study Area and Proposed Development Location

1.3 Study Area Intersections

The intersections assessed within this study include:

- Bayfield Street and Wellington Street (signalized);
- Bayfield Street and Sophia Street (signalized);
- Wellington Street and Drury Lane (two-way Stop-controlled);
- Sophia Street and Drury Lane (two-way Stop-controlled); and
- The proposed site driveway connection to Drury Lane (assumed Stop-controlled).

1.4 Definitions

The following terms in regard to the parking discussion are used in this report:

- **Supply** is defined as the total number of parking stalls provided and legally available at a location or within a specific district;
- **Demand** is defined as the total number of vehicles seeking a parking space at a location or within a specific district over a specified period. Demand is typically determined by counting the number of vehicles parked at a given time. It is recognized that demand may be greater than the number of parked vehicles as once all stalls are full, vehicles must go elsewhere to park; and
- **Occupancy or Utilization** refers to the proportionate number of stalls that are occupied by parked vehicles at any given time, expressed as a percentage of total number of stalls provided (i.e. demand divided by capacity). Utilization rates greater than 100% suggest that the number of vehicles within the parking area exceeds the actual number of stalls, which would imply illegal or inappropriate parking behaviour.

2 Existing Conditions

2.1 Road Network

The characteristics of the roadways in the study area are described below. Reference was made to the City of Barrie Official Plan[2] and the City of Barrie Traffic By-Law[3]. All study area roads operate under the City's jurisdiction.

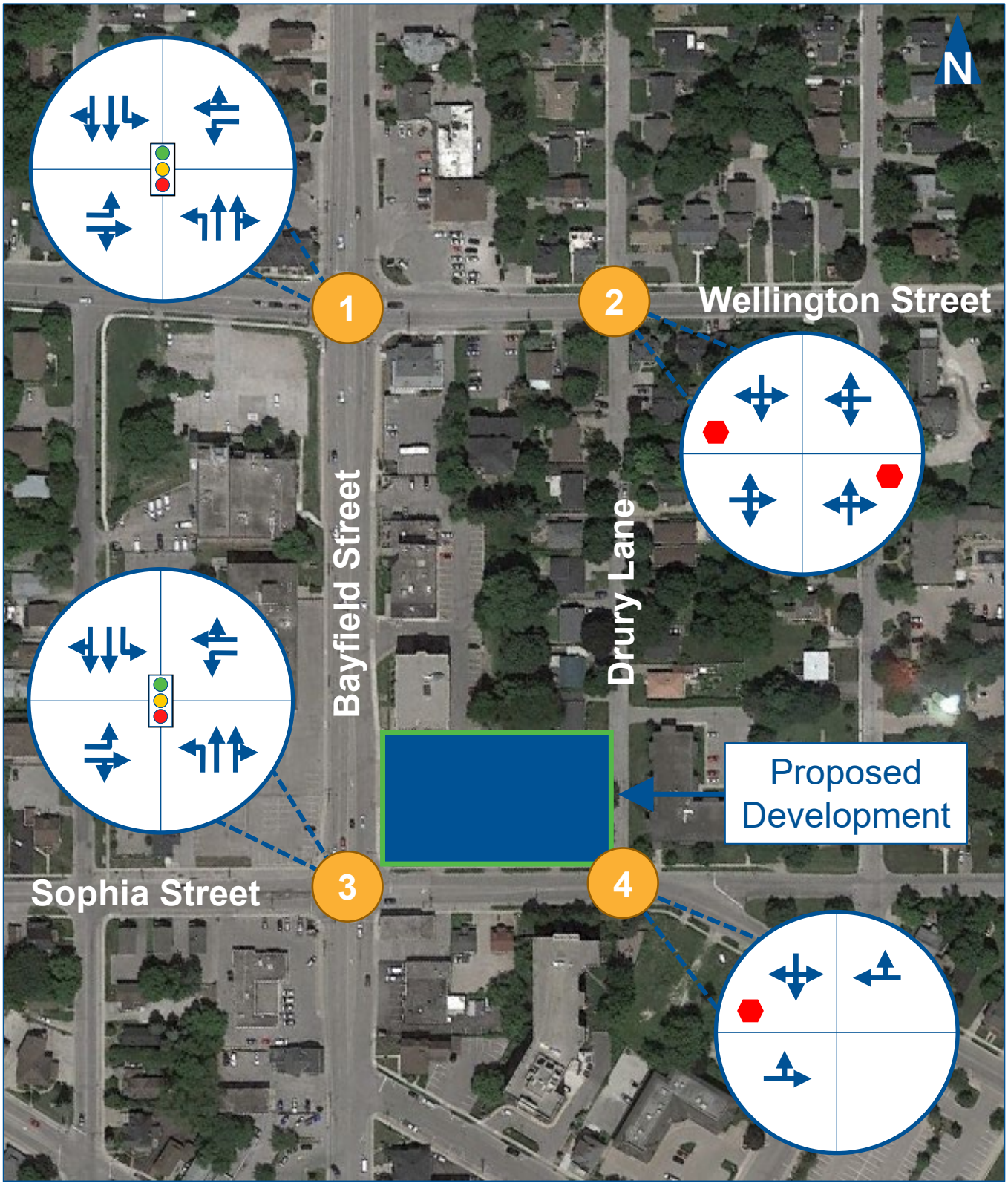
- **Bayfield Street** is a four-lane north-south arterial road with a posted speed limit of 50 km/h. Bayfield Street has an urban cross-section with sidewalks provided along both sides of the roadway. Parking is restricted along the east side of Bayfield Street between 8:00 AM and 5:00 PM, Monday through Saturday.
- **Wellington Street** is a two-lane east-west arterial road with a posted speed limit of 50 km/h. Wellington Street has an urban cross-section with sidewalks provided along both sides of the roadway. On-street parking is not permitted on Wellington Street within the study area.
- **Sophia Street** is a two-lane east-west minor collector road with a posted speed limit of 50 km/h. Sophia Street has an urban cross-section with sidewalks provided along both sides of the roadway. On-street parking is not permitted on Sophia Street within the study area.
- **Drury Lane** is a two-lane north-south local road with an assumed statutory speed limit of 50 km/h. Drury Lane has an urban cross-section. On-street parking is not permitted along the west side of the roadway, whereas, two hours of on-street parking is permitted along the east side of the roadway between 9:00 AM and 6:00 PM, Monday through Friday.

In general, on-street parking is not permitted between December 1 and March 31 between 12:01 AM and 7:00 AM to allow for necessary winter maintenance.

Adjacent land uses in the study area include residential and commercial properties, as well as surface parking lots.

Figure 2.1 shows the existing lane configuration and traffic control for the study area intersections.

[2] City of Barrie. *City of Barrie Official Plan – Schedule D Roads Plan.* March 2017
[3] City of Barrie. *By-law 80-138 Traffic By-law Consolidated – as amended.* 1980.



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Existing Lane Configuration and Traffic Control

2.2 Transit Service

Barrie Transit currently operates four routes in the study area. The following is a summary of the transit services provided. Please note the summary reflects pre-pandemic COVID-19 transit operations.

- **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. Daytime service runs on 30-minute headways from 5:03 AM to 7:30 PM Monday to Friday, and from 7:03 AM to 8:10 PM on Saturdays. Evening service runs from 7:33 PM to 11:55 PM Monday to Saturday on 45-minute headways. Sunday service operates from 9:18 AM to 9:55 PM on 45-minute headways.
- **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. Morning service runs from 5:45 AM to 7:38 AM Monday to Friday on 30-minute headways. Daytime service runs from 7:20 AM to 8:01 PM Monday to Saturday on 35-minute headways. Evening service runs from 8:05 PM to 11:13 PM on 65-minute headways. Sunday service operates from 9:15 AM to 10:11 PM on 65-minute headways.
- **Route 6 Letitia/College** operates in a loop originating at the Downtown Barrie Terminal with major stops at Cedar Pointe at Edgehill, Cundles at Livingstone, Livingstone at Bayfield, Living stone at Marjoy, Georgian College, and Wellington at Oak. Daytime service runs from 5:45 AM Monday to Friday, and from 7:15 AM to 7:48 PM Saturday on 30-minute headways. Evening service runs from 6:15 PM to 12:06 AM Monday to Saturday on 60-minute headways. Sunday service operates from 9:00 AM to 10:06 PM on 60-minute headways.
- **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). Daytime service runs from 5:25 AM Monday to Friday, and from 6:55 AM to 7:25 PM Saturday on 30-minute headways. Evening service runs from 6:25 PM to 11:25 PM Monday to Saturday on 60-minute headways. Sunday service operates from 9:25 AM to 9:25 PM on 60-minute headways.

Bus stops along Route 3 Georgian Drive/Painswick, Route 5 Blake/Edgehill, and Route 8 RVH/Yonge/Crosstown/Essa are all within a 100-metre walking distance from the proposed development. In addition, the Barrie Downtown Bus Terminal is located 600 metres southwest of the site on Maple Avenue. In summary the subject site is well served by transit.

Figure 2.2 shows the existing transit network serving the proposed development.

2.3 Active Transportation

Sidewalks are located on both sides of Bayfield Street, Wellington Street and Sophia Street. No dedicated cycling facilities are provided within the study area; therefore, all cycling trips would be made within the travelled roadway.

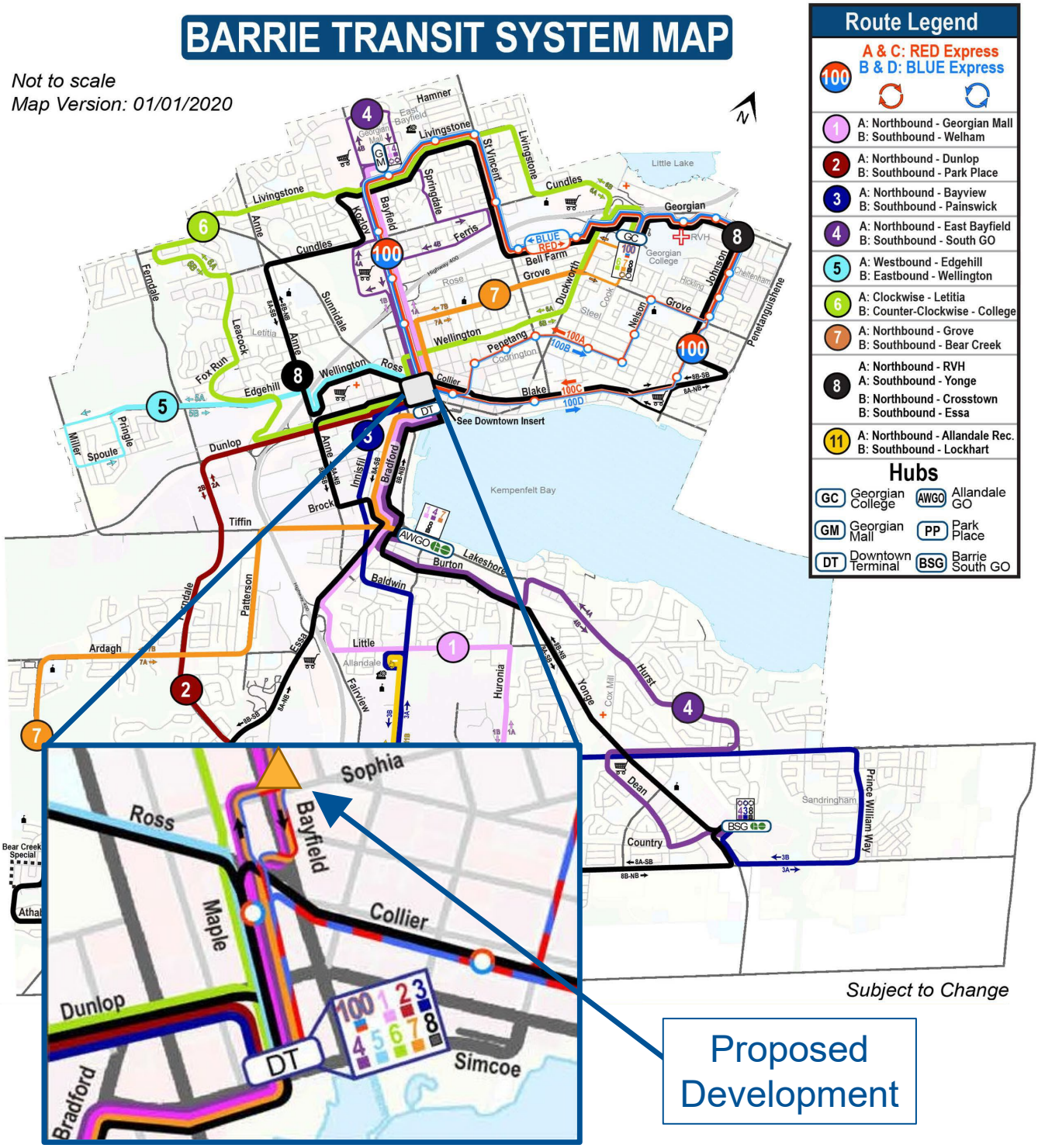
2.4 Traffic Volumes

Paradigm collected peak period turning movement counts at the study area intersections on Wednesday, December 6, 2017 during the morning (6:00 to 9:00 AM) and afternoon (3:00 to 6:00 PM) peak periods using Miovision video collection units. **Appendix B** provides the detailed traffic count data for reference.

To estimate 2020 base year traffic volumes, a growth rate of 0.75% per annum compounded for three years (total growth of 2.3%) was applied to the 2017 TMC data. This growth rate was derived from population data available through Statistics Canada[4]. The data indicate the population of the City of Barrie grew 3.9% between 2011 and 2016 (from 136,060 to 141,430), resulting in a compound annual growth rate of 0.75% per year.

Figure 2.3 summarizes the base year (2020) AM and PM peak hour traffic volumes. The mid-block traffic volumes are not balanced between intersections due to the presence of access driveways.

[4] Statistics Canada. *Census Profile, 2016 Census – Barrie, City [Census Subdivision], Ontario and Simcoe, County [Census division], Ontario.* 16 November 2017.



Source: City of Barrie. *Barrie Transit System Map.* January 2020.

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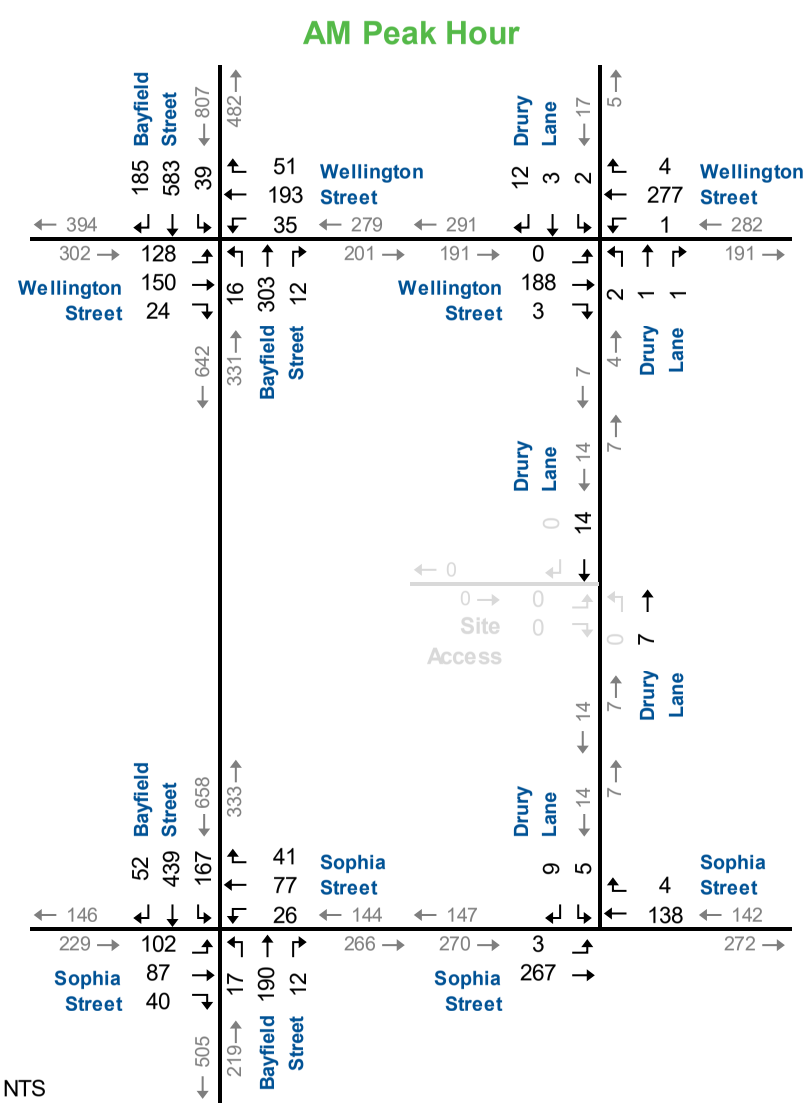
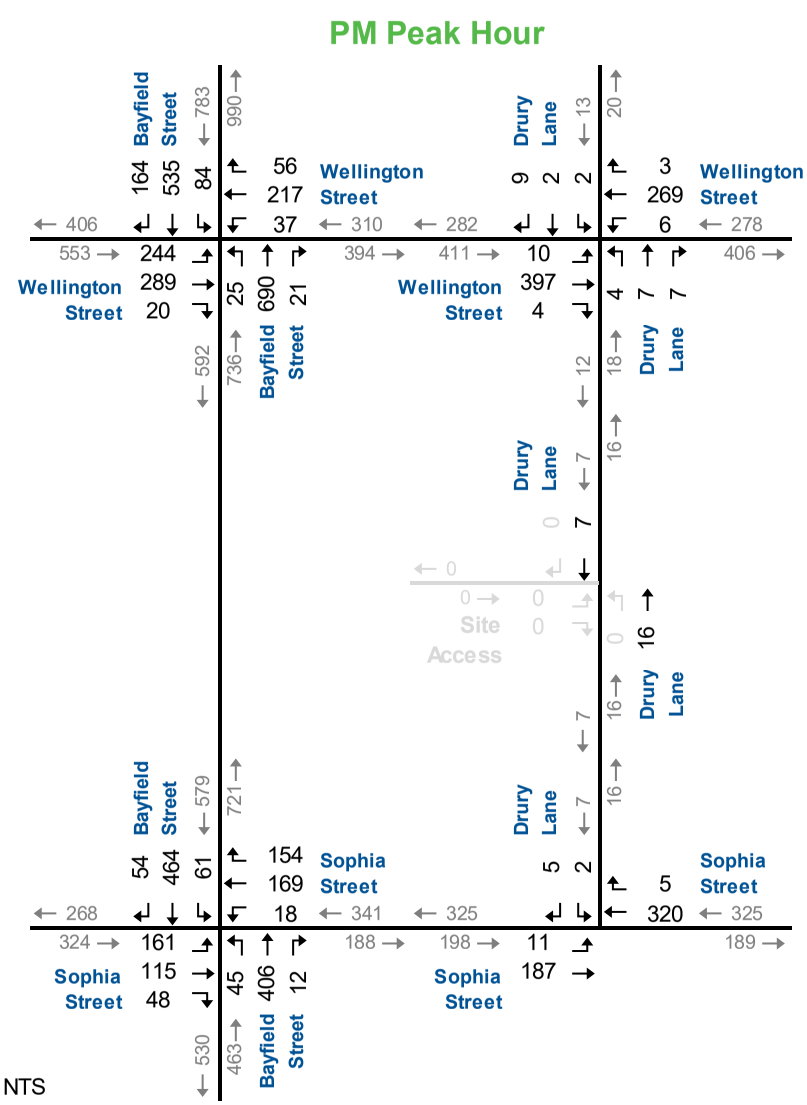
Existing Transit Network





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Base Year (2020) Peak Hour Traffic Volumes

2.5 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 2.1 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.

TABLE 2.1: 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 & ≤ 20	> 10 & ≤ 15
C	> 20 & ≤ 35	> 15 & ≤ 25
D	> 35 & ≤ 55	> 25 & ≤ 35
E	> 55 & ≤ 80	> 35 & ≤ 50
F	> 80	> 50

To assess the existing peak hour conditions, a level of service analysis was conducted using Synchro 9 software, which implements the methods of the Highway Capacity Manual. The intersection analysis considered the following measures of performance:

- LOS for each movement and the overall intersection;
- The v/c ratio for each movement and the overall intersection; and
- The estimated 95th percentile queue lengths for each movement.

To adhere to the City of Barrie TIS Guidelines for operational analysis, the following criteria defines critical movements and intersections:

- An intersection where the overall volume to capacity (v/c) ratio exceeds 0.85 in urban areas or 0.70 in rural areas;
- An individual movement v/c ratio that exceeds 0.85 in urban areas or 0.70 in rural areas; or
- An exclusive turning movement with queues that exceed available storage.

Appendix C contains the intersection signal timings as provided by the City of Barrie.

Table 2.2 summarizes the base year AM and PM peak hour intersection operations including the LOS, v/c ratios and 95th percentile queue lengths. Any movements identified as critical movements are highlighted within the results table. **Appendix D** contains the detailed Synchro 9 reports for reference.

The analysis of existing conditions indicate that the study area intersections are currently operating at acceptable levels of service and within capacity during the AM and PM peak hours. One critical movement is noted at the intersection of Bayfield Street and Sophia Street. The eastbound left-turn movement operates at LOS F with a v/c ratio of 0.98 and the 95th percentile queue exceeding the available storage by 26 metres during the PM peak hour.

TABLE 2.2: BASE YEAR (2020) TRAFFIC OPERATIONS SUMMARY

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	B	B	>	B	C	C	>	C	B	B	>	B	A	B	>	B	B
			Delay	20	19	>	19	24	32	>	31	14	15	>	15	10	13	>	13	17
			V/C	0.47	0.30	>		0.16	0.67	>		0.07	0.25	>		0.09	0.47	>		0.57
			Q	24	32	>		12	57	>		7	33	>		9	64	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		8	-	>		18	-	>		11	-	>		
	2 - Wellington Street & Drury Lane	TWSC	LOS	<	A	>	A	<	A	>	A	<	B	>	B	<	B	>	B	A
			Delay	<	0	>	0	<	0	>	0	<	12	>	12	<	11	>	11	1
			V/C	<	0.00	>		<	0.00	>		<	0.01	>		<	0.03	>		
			Q	<	0	>		<	0	>		<	0	>		<	1	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	C	C	>	C	C	C	>	C	A	A	>	A	A	A	>	A	B
			Delay	28	26	>	27	24	25	>	25	9	10	>	10	5	5	>	5	12
			V/C	0.52	0.35	>		0.12	0.32	>		0.04	0.12	>		0.24	0.24	>		0.33
			Q	29	28	>		10	26	>		5	15	>		18	24	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	11	-	>		10	-	>		25	-	>		13	-	>		
	4 - Sophia Street & Drury Lane	TWSC	LOS	<	A		A		A	>	A					A		>	A	A
			Delay	<	0		0		0	>	0					10		>	10	0
			V/C	<	0.00				0.09	>						0.02		>		
			Q	<	0				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
PM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	C	B	>	C	C	C	>	C	B	C	>	C	B	B	>	B	C
			Delay	35	19	>	26	24	33	>	32	18	23	>	23	13	14	>	14	22
			V/C	0.82	0.49	>		0.17	0.71	>		0.11	0.63	>		0.31	0.45	>		0.75
			Q	51	59	>		13	64	>		10	81	>		17	59	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		8	-	>		15	-	>		3	-	>		
	2 - Wellington Street & Drury Lane	TWSC	LOS	<	A	>	A	<	A	>	A	<	B	>	B	<	B	>	B	A
			Delay	<	0	>	0	<	0	>	0	<	15	>	15	<	12	>	12	1
			V/C	<	0.01	>		<	0.01	>		<	0.05	>		<	0.03	>		
			Q	<	0	>		<	0	>		<	1	>		<	1	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	F	C	>	E	C	C	>	C	B	B	>	B	A	A	>	A	C
			Delay	89	23	>	56	21	28	>	28	14	14	>	14	8	9	>	9	23
			V/C	0.98	0.32	>		0.06	0.64	>		0.14	0.28	>		0.12	0.28	>		0.54
			Q	66	36	>		8	70	>		12	36	>		9	32	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	-26	-	>		13	-	>		18	-	>		21	-	>		
	4 - Sophia Street & Drury Street	TWSC	LOS	<	A		A		A	>	A					B		>	B	A
			Delay	<	1		1		0	>	0					11		>	11	0
			V/C	<	0.01				0.21	>						0.01		>		
			Q	<	0				0	>						0		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

3 Development Concept

3.1 Description

The subject site is located at the northeast corner of Bayfield Street and Sophia Street at the municipal address of 113 Bayfield Street.

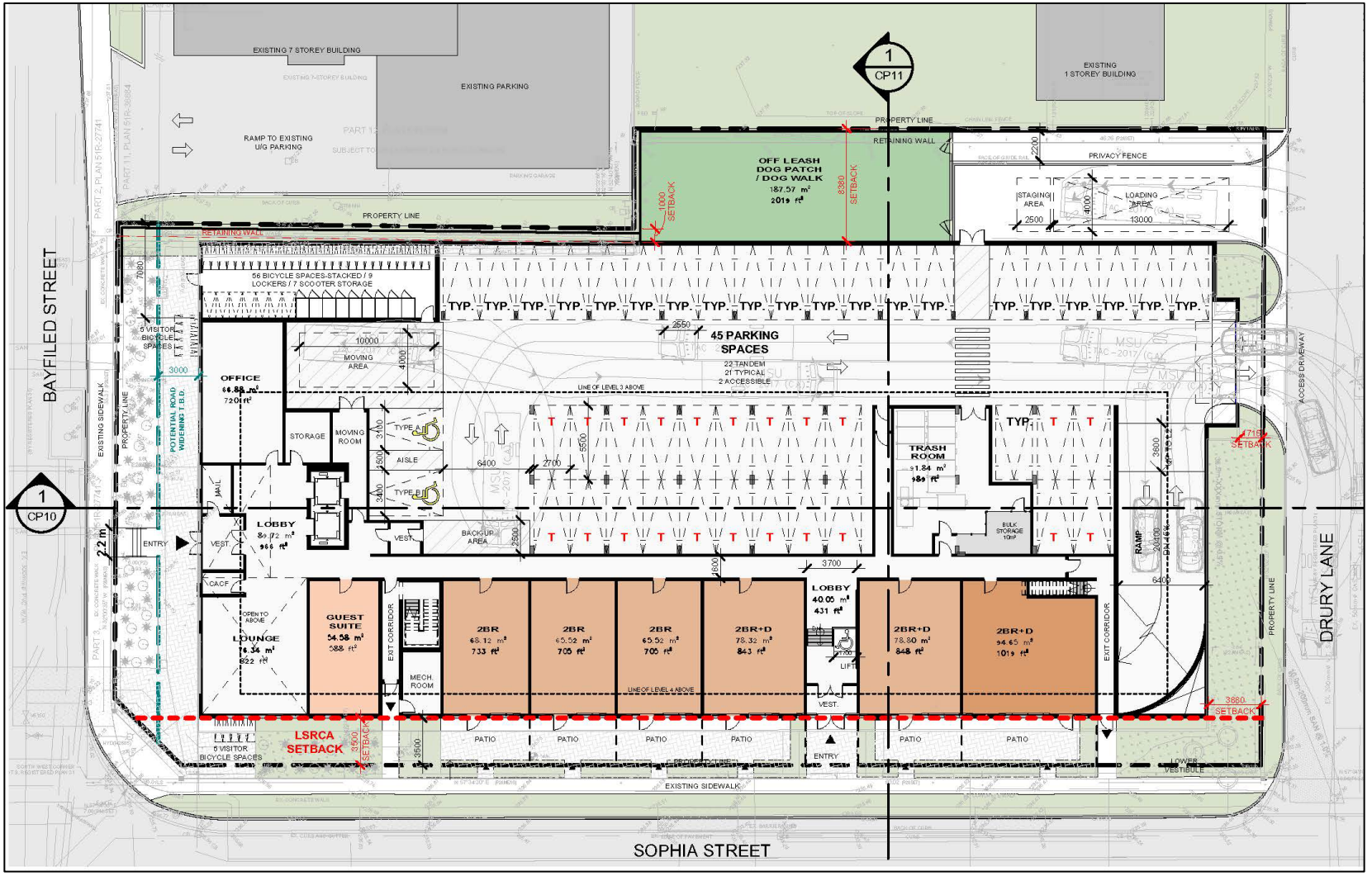
The proposed 0.37 hectare (0.92 acre) development is planned to be constructed in a single phase with completion and occupancy anticipated in 2022. The development will consist of an eight-storey apartment building providing a total of 108 residential units. The building will contain a mixture of market rate units and up to 70 (approximately 65%) affordable housing units. The final number of affordable units will be confirmed at a later date.

A total parking supply of 114 stalls on-site is proposed, including four barrier-free stalls and 18 secondary tandem stalls. Parking is to be provided above-grade within the podium of the building.

Ten short-term bicycle parking stalls are proposed adjacent to the building entrance. Secure long-term bicycle and scooter parking for building residents is provided on the main floor of the building, accommodating 56 bicycles and seven scooters. Additionally, 53 storage lockers are proposed on the second parking lot level.

Vehicular access to the site is proposed via a single full-movement driveway connection to Drury Lane located approximately 30 metres north of Sophia Street. This driveway (herein referred to as the “Site Access”) is planned to operate unsignalized with the minor road (driveway) leg operating under stop-control.

Figure 3.1 illustrates the development concept site plan.



Proposed Development Concept Site Plan

3.2 Trip Generation

3.2.1 Base Trip Generation

Trip generation data obtained from the Institute of Transportation Engineers (ITE) publication "Trip Generation Manual (10th Edition)[5]" (the ITE Manual) was used to forecast vehicle trips generated by the proposed development. Specifically, the trip equations for Land Use Code (LUC) 221 – Multifamily Housing (Mid-Rise) were used. This land use is defined as *"apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors)."*

Table 3.1 summarizes the forecast base trip generation and indicates the proposed development is expected to generate 37 AM peak hour trips and 48 PM peak hour trips at full build-out.

3.2.2 Non-Automobile Mode Share

Given the proximity of the subject site to transit facilities and its central urban location in the city, a share of trips generated by the proposed development are likely to travel via modes other than the automobile (transit, walking, etc.). To estimate the potential share of trips made by transit, 2016 Transportation Tomorrow Survey[6] (TTS) data was extracted. The TTS data is compiled from *"a time series telephone survey on travel behaviours in the greater Toronto and surrounding area. Data are categorized into household, person and trip tables".*

Table 3.2 summarizes the travel mode split for daily trips originating within and destined to the Traffic Analysis Zone (TAZ) for the subject site (8501), which is shown in **Figure 3.2**.

Applying a 5% mode share reduction to the base trip generation estimates in **Table 3.1** (to account for potential travel by transit), reduces the trip generation by two trips for both the AM peak hour and PM peak hour. **Table 3.3** summarizes the resultant adjusted trip generation where the development is estimated to generate a total of 35 and 46 vehicle trips during the AM and PM peak hours, respectively.

[5] Institute of Transportation Engineers. *Trip Generation Manual, 10th Edition*. 2017.
[6] www.jpint.utoronto.ca/drs

TABLE 3.1: BASE TRIP GENERATION

Land Use	Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 221 - Mutlifamily Housing (Mid-Rise)	108	FCE[1]	10	27	37	FCE[2]	29	19	48
Total Trips - Unadjusted			**10**	**27**	**37**		**29**	**19**	**48**

[1] Ln(t) = 0.98 Ln(x) - 0.98 [2] Ln(t) = 0.96 Ln(x) - 0.63

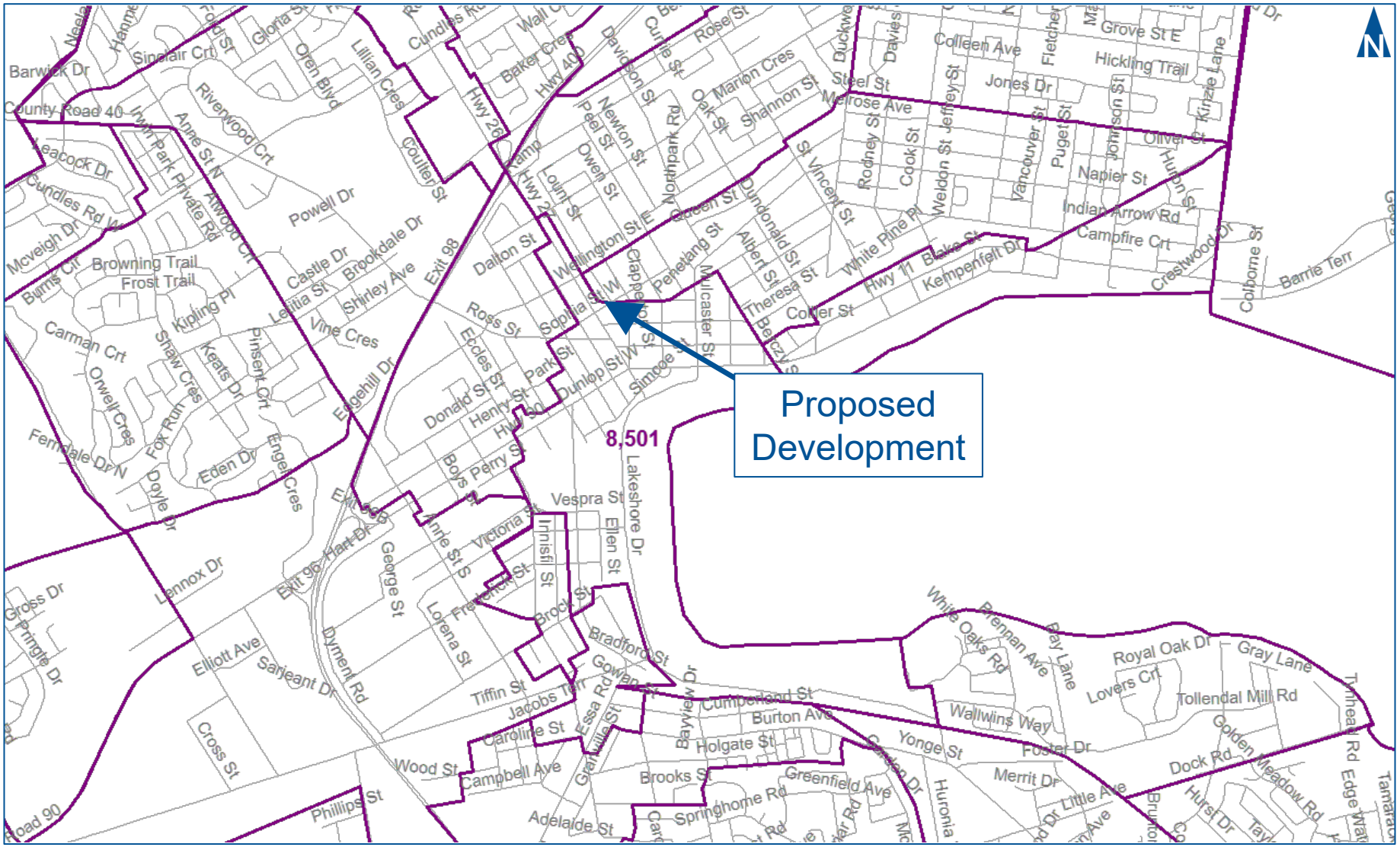
TABLE 3.2: MODE SHARE

Trip Mode	Number of Trips	Percent of Total
Auto driver	5,778	76%
Auto passenger	1,125	15%
Taxi passenger	26	0%
Transit excluding GO rail	320	4%
Joint GO rail and local transit	10	0%
GO rail only	42	1%
Motorcycle	83	1%
Walk	228	3%
Other	11	0%
Total	**7,625**	**100%**

TABLE 3.3: ADJUSTED TRIP GENERATION

Land Use	Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 221 - Mutlifamily Housing (Mid-Rise)	108	FCE[1]	10	27	37	FCE[2]	29	19	48
Total Trips - Unadjusted			**10**	**27**	**37**		**29**	**19**	**48**
Total Transit Reduction		5%	1	1	2	5%	1	1	2
Total New Trips			**9**	**26**	**35**		**28**	**18**	**46**

[1] Ln(t) = 0.98 Ln(x) - 0.98 [2] Ln(t) = 0.96 Ln(x) - 0.63



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Subject Site Traffic Analysis Zone

3.3 Trip Distribution and Assignment

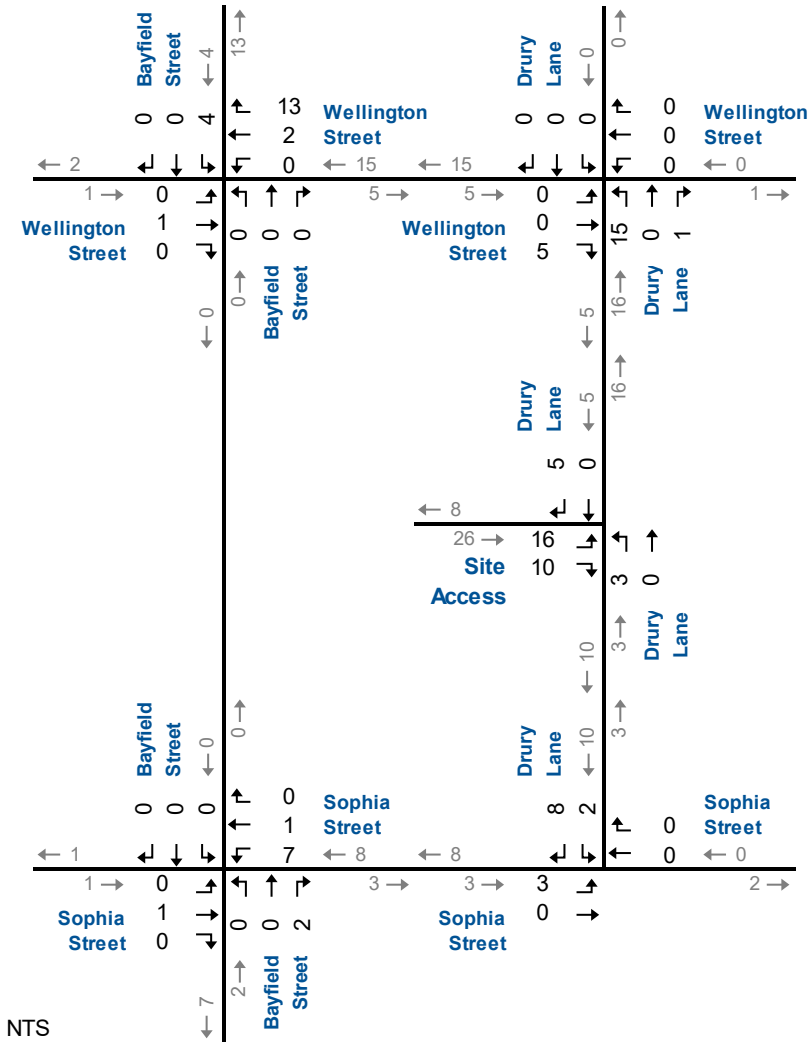
2016 TTS data was reviewed in combination with existing travel patterns to determine the distribution for site-generated trips. TTS data was queried for all inbound and outbound trips between TAZ 8501 and the TTS defined regional municipalities between 8:00 AM and 9:00 AM and 4:00 PM and 5:00 PM. **Table 3.4** summarizes the estimated trip distribution.

TABLE 3.4: ESTIMATED PEAK HOUR TRIP DISTRIBUTION

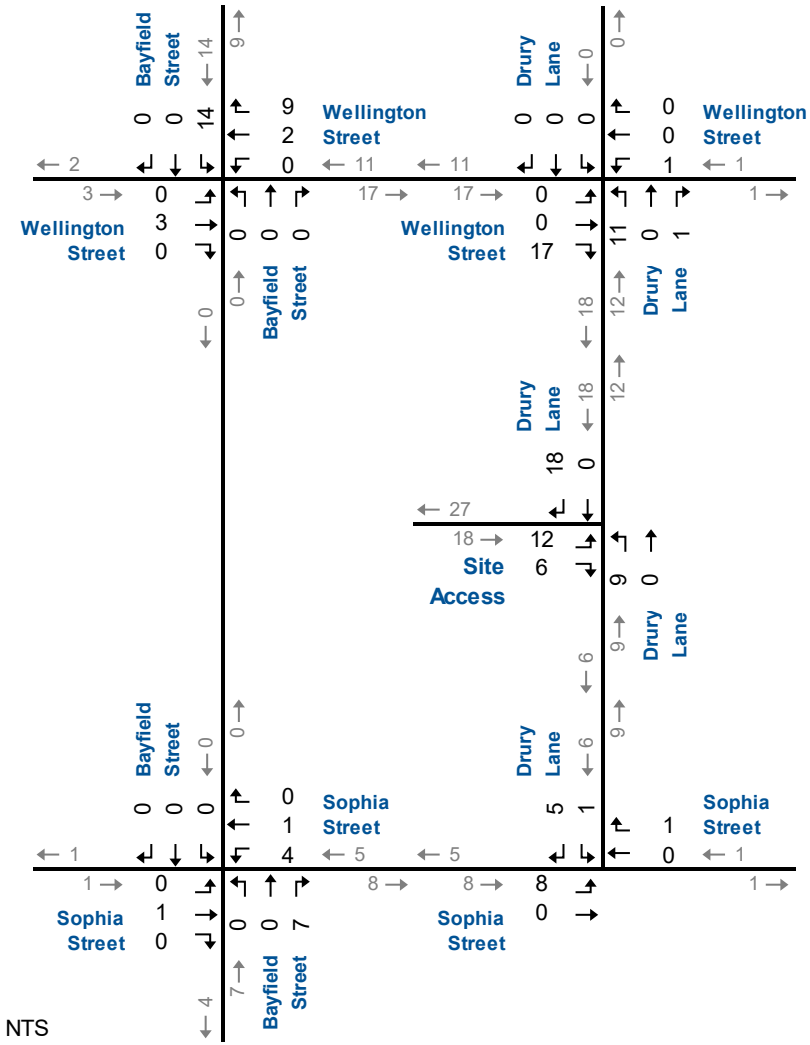
Origin/Destination	AM/PM Peak Hour
East via Sophia Street	5%
West via Sophia Street	5%
East via Wellington Street	5%
West via Wellington Street	10%
North via Bayfield Street	50%
South via Bayfield Street	25%
Total	**100%**

Using the adjusted trip generation and trip distribution, the site traffic was assigned to the road network. **Figure 3.3** illustrates the trip assignment for the AM and PM peak hours.

AM Peak Hour



PM Peak Hour



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Site Generated Peak Hour Traffic Forecasts

4 Future Conditions

The assessment of future traffic conditions includes estimates of future background and total traffic volumes and the analyses for the 2027 horizon (five years beyond full build-out, opening year anticipated in 2022). 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 (if any) and the site traffic generated by the proposed development.

4.1 2027 Background Traffic Volumes

Background traffic forecasts were developed by applying a growth rate of 0.75% per annum compounded for seven years (total growth of 5.4%) to the existing traffic volumes. **Section 2.4** summarizes the calculation for this growth rate.

No approved or in-stream developments near the subject site were identified from background information and pre-study consultation with City staff.

Figure 4.1 illustrates the 2027 background traffic forecasts for the AM and PM peak hours.

4.2 2027 Background Traffic Operations

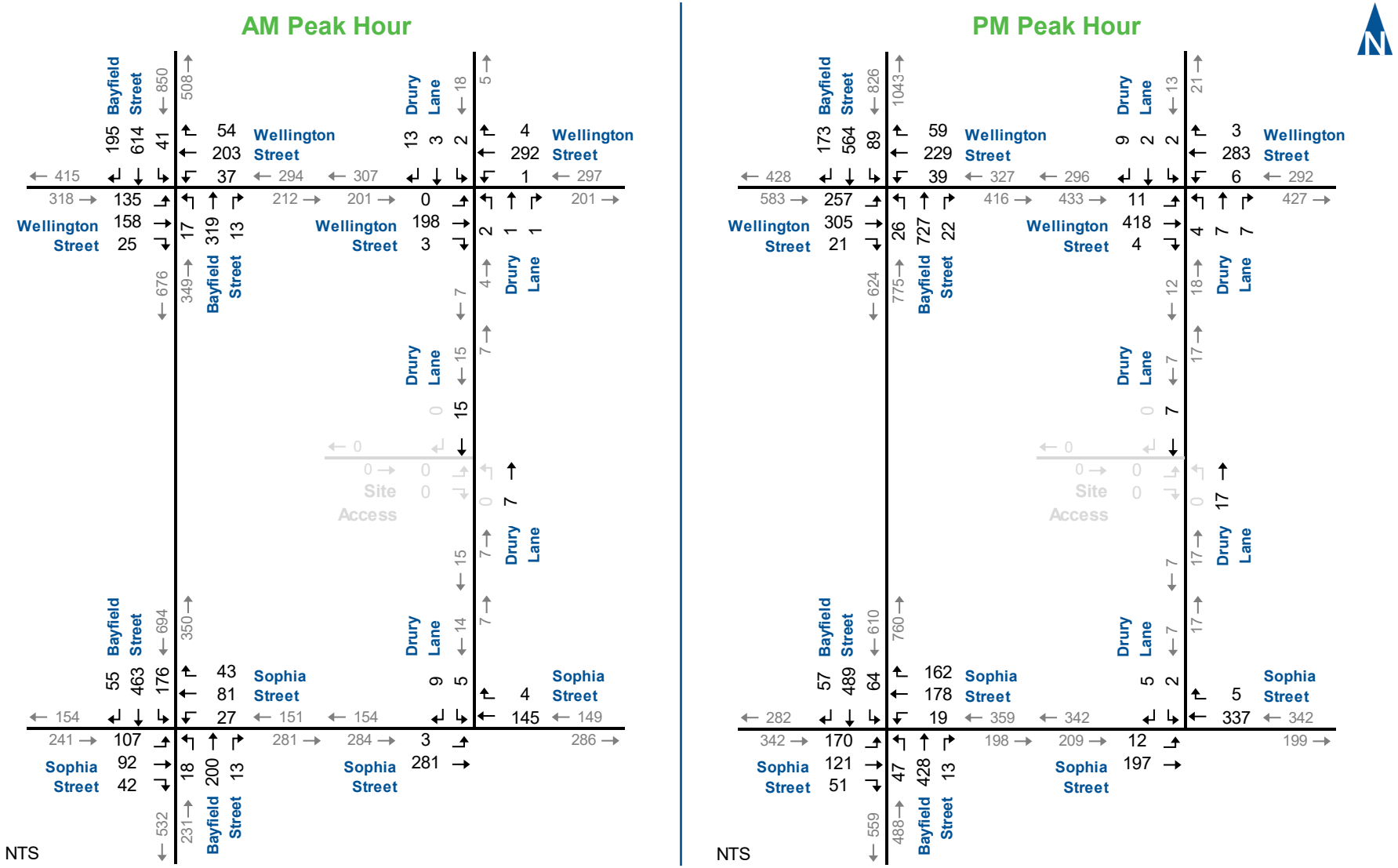
The study area intersections under 2027 background traffic conditions (without subject development) were analyzed using Synchro 9 following the same methodology as under existing conditions.

Table 4.1 summarizes the peak hour background traffic intersection operations including the LOS, v/c ratios and 95th percentile queue lengths.

The results indicate the study area intersections are forecast to operate at acceptable levels of service and within capacity during the AM and PM peak hours. Two critical movements are identified:

- The eastbound left-turn movement at Bayfield Street and Wellington Street is forecast to operate at LOS D with a v/c ratio of 0.88 during the PM peak hour; and
- The eastbound left-turn movement at Bayfield Street and Sophia Street forecast to operate at LOS F with a v/c ratio of 1.04 and the 95th percentile queue is anticipated to exceed the available storage by 32 metres during the PM peak hour.

Appendix E contains the detailed Synchro 9 reports for reference.



2027 Background Peak Hour Traffic Forecasts

TABLE 4.1: 2027 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	B	B	>	B	C	C	>	C	B	B	>	B	B	B	>	B	B
			Delay	19	18	>	18	25	33	>	32	16	17	>	17	11	15	>	14	18
			V/C	0.46	0.30	>		0.16	0.70	>		0.08	0.27	>		0.10	0.52	>		0.60
			Q	26	34	>		12	60	>		7	36	>		10	70	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		8	-	>		18	-	>		10	-	>		
	2 - Wellington Street & Drury Lane	TWSC	LOS	<	A	>	A	<	A	>	A	<	B	>	B	<	B	>	B	A
			Delay	<	0	>	0	<	0	>	0	<	12	>	12	<	11	>	11	1
			V/C	<	0.00	>		<	0.00	>		<	0.01	>		<	0.03	>		
			Q	<	0	>		<	0	>		<	0	>		<	1	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	C	C	>	C	C	C	>	C	A	A	>	A	A	A	>	A	B
			Delay	29	26	>	27	24	25	>	25	10	10	>	10	5	6	>	5	12
			V/C	0.54	0.37	>		0.13	0.33	>		0.05	0.13	>		0.26	0.25	>		0.34
			Q	30	30	>		10	27	>		5	16	>		19	26	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	10	-	>		10	-	>		25	-	>		11	-	>		
	4 - Sophia Street & Drury Lane	TWSC	LOS	<	A		A		A	>	A					A		>	A	A
			Delay	<	0		0		0	>	0					10		>	10	0
			V/C	<	0.00				0.10	>						0.02		>		
			Q	<	0				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
PM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	D	B	>	C	C	C	>	C	B	C	>	C	B	B	>	B	C
			Delay	44	19	>	30	24	34	>	32	18	24	>	24	14	15	>	15	23
			V/C	0.88	0.51	>		0.18	0.73	>		0.12	0.67	>		0.35	0.48	>		0.80
			Q	59	62	>		13	68	>		10	88	>		18	64	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		7	-	>		15	-	>		2	-	>		
	2 - Wellington Street & Drury Lane	TWSC	LOS	<	A	>	A	<	A	>	A	<	C	>	C	<	B	>	B	A
			Delay	<	0	>	0	<	0	>	0	<	15	>	15	<	13	>	13	1
			V/C	<	0.01	>		<	0.01	>		<	0.05	>		<	0.03	>		
			Q	<	0	>		<	0	>		<	1	>		<	1	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	F	C	>	E	C	C	>	C	B	B	>	B	A	A	>	A	C
			Delay	107	23	>	65	21	28	>	28	15	15	>	15	9	10	>	10	25
			V/C	1.04	0.32	>		0.07	0.65	>		0.15	0.30	>		0.14	0.30	>		0.59
			Q	72	38	>		8	74	>		13	38	>		10	34	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	-32	-	>		12	-	>		18	-	>		20	-	>		
	4 - Sophia Street & Drury Lane	TWSC	LOS	<	A		A		A	>	A					B		>	B	A
			Delay	<	1		1		0	>	0					11		>	11	0
			V/C	<	0.01				0.22	>						0.01		>		
			Q	<	0				0	>						0		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

4.3 2027 Total Traffic Volumes

The background traffic forecasts were summed with the site traffic assignments to develop the total traffic forecasts. **Figure 4.2** illustrates the 2027 total traffic forecasts for the AM and PM peak hours.

4.4 2027 Total Traffic Operations

The study area intersections under 2027 total traffic conditions (with subject development) were analyzed using Synchro 9 for the same methodology as under existing and background conditions.

Table 4.2 summarizes the peak hour total traffic intersection operations including the LOS, v/c ratios and 95th percentile queue lengths.

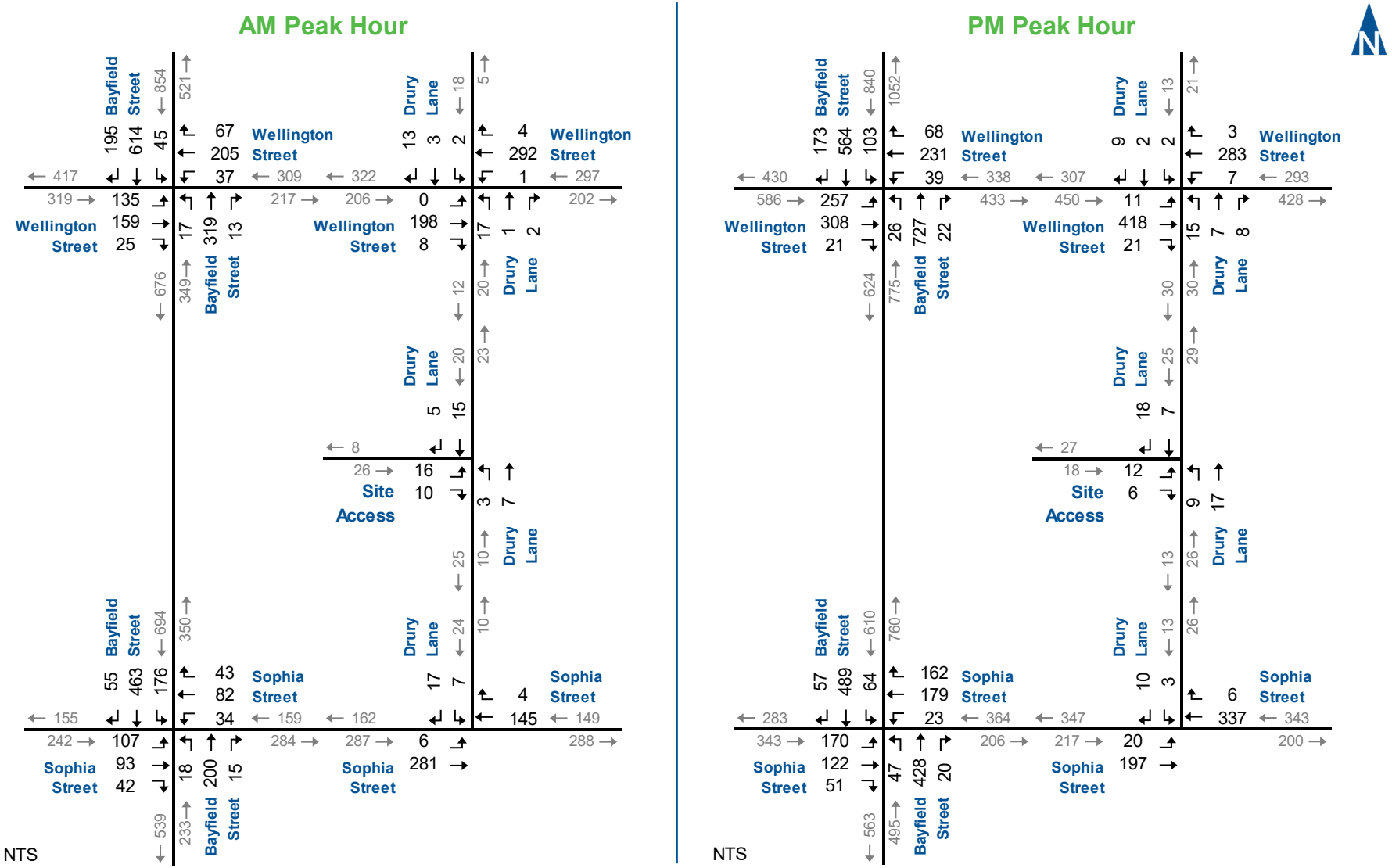
The results indicate the study area intersections are forecast to continue operating at acceptable levels of service and within capacity during the AM and PM peak hours. It is concluded that the intersections are forecast to operate similar to the background conditions with the addition of the site generated traffic, specifically the impact is imperceptible. The two critical movements previously identified under background traffic conditions are slightly exacerbated. The movements are summarized as:

- The eastbound left-turn movement at Bayfield Street and Wellington Street is forecast to operate at LOS D with a v/c ratio of 0.89 during the PM peak hour; and
- The eastbound left-turn movement at Bayfield Street and Sophia Street is forecast to operate at LOS F with a v/c ratio of 1.05 and 95th percentile queues exceeding available storage by 32 metres during the PM peak hour.

The site driveway intersection on Drury Lane is forecast to operate with acceptable levels of service and well within capacity during both peak hours.

Overall, the existing road network and traffic control can accommodate the additional site generated traffic. Minimal increases to average vehicle delay at the study area intersections are noted and concluded to be imperceptible.

Appendix F contains the detailed Synchro 9 reports.



2027 Total Peak Hour Traffic Forecasts

TABLE 4.2: 2027 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	B	B	>	B	C	C	>	C	B	B	>	B	B	B	>	B	B
			Delay	19	18	>	18	25	34	>	33	16	17	>	17	11	15	>	15	19
			V/C	0.47	0.29	>		0.16	0.72	>		0.08	0.27	>		0.11	0.52	>		0.61
			Q	25	34	>		12	63	>		8	36	>		11	72	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		8	-	>		18	-	>		9	-	>		
	2 - Wellington Street & Drury Lane	TWSC	LOS	<	A	>	A	<	A	>	A	<	B	>	B	<	B	>	B	A
			Delay	<	0	>	0	<	0	>	0	<	13	>	13	<	11	>	11	1
			V/C	<	0.00	>		<	0.00	>		<	0.05	>		<	0.03	>		
			Q	<	0	>		<	0	>		<	1	>		<	1	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	C	C	>	C	C	C	>	C	A	A	>	A	A	A	>	A	B
			Delay	29	26	>	27	24	26	>	25	10	10	>	10	5	6	>	5	13
			V/C	0.54	0.37	>		0.16	0.34	>		0.05	0.13	>		0.26	0.25	>		0.34
			Q	30	30	>		12	27	>		5	16	>		19	26	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	10	-	>		8	-	>		25	-	>		11	-	>		
	4 - Sophia Street & Drury Lane	TWSC	LOS	<	A		A		A	>	A					B		>	B	A
			Delay	<	0		0		0	>	0					10		>	10	1
			V/C	<	0.00				0.10	>						0.04		>		
			Q	<	0				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
	5 - Drury Lane & Site Access	TWSC	LOS	A		>	A					<	A		A		A	>	A	A
			Delay	9		>	9					<	2		2		0	>	0	4
			V/C	0.03		>						<	0.00				0.01	>		
			Q	1		>						<	0				0	>		
			Ex	-		>						<	-				-	>		
			Avail.	-		>						<	-				-	>		
PM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	D	B	>	C	C	C	>	C	B	C	>	C	B	B	>	B	C
			Delay	47	19	>	31	24	34	>	33	18	24	>	24	14	15	>	15	24
			V/C	0.89	0.51	>		0.17	0.74	>		0.12	0.67	>		0.41	0.48	>		0.81
			Q	61	63	>		13	70	>		10	88	>		21	64	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		7	-	>		15	-	>		-1	-	>		
	2 - Wellington Street & Drury Lane	TWSC	LOS	<	A	>	A	<	A	>	A	<	C	>	C	<	B	>	B	A
			Delay	<	0	>	0	<	0	>	0	<	18	>	18	<	13	>	13	1
			V/C	<	0.01	>		<	0.01	>		<	0.10	>		<	0.03	>		
			Q	<	0	>		<	0	>		<	3	>		<	1	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	F	C	>	E	C	C	>	C	B	B	>	B	A	A	>	A	C
			Delay	111	23	>	67	21	28	>	28	15	15	>	15	9	10	>	10	26
			V/C	1.05	0.33	>		0.08	0.65	>		0.15	0.31	>		0.14	0.30	>		0.59
			Q	72	38	>		9	75	>		13	38	>		10	34	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	-32	-	>		11	-	>		18	-	>		20	-	>		
	4 - Sophia Street & Drury Lane	TWSC	LOS	<	A		A		A	>	A					B		>	B	A
			Delay	<	1		1		0	>	0					11		>	11	1
			V/C	<	0.02				0.22	>						0.02		>		
			Q	<	1				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
	5 - Drury Lane & Site Access	TWSC	LOS	A		>	A					<	A		A		A	>	A	A
			Delay	9		>	9					<	3		3		0	>	0	3
			V/C	0.02		>						<	0.01				0.02	>		
			Q	1		>						<	0				0	>		
			Ex	-		>						<	-				-	>		
			Avail.	-		>						<	-				-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

5 Remedial Measures

5.1 Left-Turn Lanes

The eastbound left-turn movements at Bayfield Street with Wellington Street and Sophia Street were both identified as critical movements. The Highway Capacity Manual and Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR)[7] both recommend the consideration of dual left-turn lanes at intersections where left-turn volumes exceed 300 vehicles per hour. Based upon this guidance, the volume thresholds for the consideration of dual left-turns is not satisfied under total traffic conditions. Additionally, the provision of implementing dual left-turn lanes at these locations is not feasible due to right-of-way constraints.

The Ministry of Transportation Ontario (MTO) Design Supplement for the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR)[8] provides procedures to assess the need for auxiliary left-turn lanes. The need for a northbound left-turn lane on Drury Lane at the Site Access was assessed using a design speed of 60 km/h (10km/h over the assumed speed). The analysis was conducted for the 2027 total traffic conditions for peak hours.

It is determined a northbound left-turn lane is not warranted on Drury Lane at the Site Access. **Appendix G** contains the warrant analyses for reference.

5.2 Right-Turn Lanes

The TAC GDGCR details the requirements for auxiliary right-turn lanes. The GDGCR recommends a right-turn lane at unsignalized intersections “when the volume of decelerating or accelerating vehicles compared with the through traffic volumes causes undue hazard”[9].

At the intersection of Drury Lane and the Site Access, five of the 20 southbound vehicles in the AM peak hour and 18 of the 25 southbound vehicles in the PM peak hour are estimated to enter the development via a right-turn movement under the 2027 horizon year. As the southbound volumes (through volumes plus right-turn volumes) are low, it is unlikely that any portion of the through volumes making a right

[7] Ministry of Transportation Ontario. *Design Supplement for the TAC Geometric Design Guide for Canadian Roads, Section 9.17.* June 2017.
[8] Ministry of Transportation Ontario. *Design Supplement for the TAC Geometric Design Guide for Canadian Roads, Section 9.17.* June 2017.
[9] Transportation Association of Canada. *Geometric Design Guide for Canadian Roads, Chapter 9.14.2.* June 2017.

turn at the Site Access would cause “undue hazard”. Therefore, based upon anticipated volumes and a low travel speed along this roadway section, a southbound right-turn lane is determined not to be required on Drury Lane at the Site Access.

5.3 Signal Optimization

Under base year (2020) conditions, the eastbound left-turn movement at Bayfield Street and Sophia Street is identified as a critical movement under the PM peak hour (LOS F, v/c ratio of 0.98 and 95th percentile queue exceeding available storage by 26 metres). Section 5.1 determined that provision of additional capacity through dual left-turn lanes would not be applicable.

The provision of an advanced protected/permissive eastbound left-turn phase in the PM peak hour is a potential mitigation measure. The intersection is currently equipped with an eastbound left-turn signal head, so adjustments to the phasing plan would not require upgrading the signal infrastructure.

As indicated in Chapter 4, the Bayfield Street intersections with Sophia Street and Wellington Street are forecast to experience capacity issues under background as well as total traffic conditions. Irrespective of the development, capacity issues are forecast to occur at the study area intersections and improvements are needed. To mitigate the critical movements, signal timings were optimized to improve performance.

Table 5.1 summarizes the AM and PM peak hour 2027 total traffic intersection operations with signal timing improvements. The intersections are forecast to operate at acceptable levels of service and within capacity. The previously identified critical movements would now be within the defined capacity threshold.

The exception would be the southbound left-turn at Bayfield Street and Wellington Street. The 95th percentile queue is forecast to slightly exceed the available storage by approximately one metre. The 95th percentile queue is an estimate of the longest queue that could occur during the peak hour; however, this level of queuing only has a five 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 for the southbound left-turn movement is estimated to be 9.4 metres and would be well within the provided storage. **Appendix H** provides the detailed Synchro 9 output.

The City should monitor the intersection operations and optimize signal timings as need to provide acceptable levels of service.

TABLE 5.1: 2027 TOTAL TRAFFIC OPERATIONS SUMMARY WITH SIGNAL OPTIMIZATION

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Bayfield Street & Wellington Street	TCS	LOS	C	B	>	C	C	D	>	C	B	C	>	C	B	B	>	B	C
			Delay	31	19	>	24	25	36	>	35	20	26	>	26	15	16	>	16	23
			V/C	0.81	0.48	>		0.18	0.75	>		0.13	0.69	>		0.44	0.49	>		0.78
			Q	54	63	>		13	72	>		11	92	>		21	67	>		
			Ex	-	-	>		20	-	>		25	-	>		20	-	>		
			Avail.	-	-	>		7	-	>		14	-	>		-1	-	>		
	3 - Bayfield Street & Sophia Street	TCS	LOS	C	C	>	C	C	D	>	D	C	C	>	C	B	B	>	B	C
			Delay	26	21	>	23	30	50	>	49	21	22	>	22	15	17	>	17	26
			V/C	0.61	0.25	>		0.09	0.83	>		0.17	0.35	>		0.17	0.35	>		0.55
			Q	39	37	>		11	100	>		18	59	>		17	60	>		
			Ex	40	-	>		20	-	>		30	-	>		30	-	>		
			Avail.	1	-	>		9	-	>		12	-	>		13	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

6 Parking Assessment

6.1 Overview

City of Barrie Zoning By-law 2009-141 (the Zoning By-law) defines the subject lands as C2-1 Transition Centre Commercial. This zoning allows dwelling units in conjunction with permitted commercial uses (except defined automotive uses). The subject lands are within the City Centre Revitalization area and the Urban Growth Centre limits as identified in Appendix C of the By-law. The Zoning By-law does not define parking requirements specific to the C2-1 zone, meaning the general provisions of Section 4.6 apply.

6.2 Zoning By-law Parking Requirements

For residential dwelling in the Urban Growth Centre, the City of Barrie Zoning By-Law specifies provision of parking at a rate of 1.0 parking stalls per dwelling unit. Based on this rate, the proposed development requires 108 parking stalls.

Table 6.1 compares the parking requirements to the proposed on-site supply. The proposed parking supply of 96 stalls results in a theoretical deficiency of 12 stalls. The 18 secondary tandem stalls denoted within the site plan were not included in the proposed supply total and subsequent analyses since the tandem stalls do not have unfettered access to the drive aisle[10].

TABLE 6.1: ZONING BY-LAW PARKING REQUIREMENTS

Parking Measurement	Number of Units	Number of Stalls	Rate
By-law Required Parking	108 units	108	1.0 per unit
Proposed Parking		96	0.89 per unit
Theoretical Stall Deficiency		**12**	

6.3 Parking Demand Forecasts

6.3.1 Rationale

Parking can represent a significant cost to an affordable housing project especially if an underground structure is required. In many cases, the cost to supply parking based on standard zoning by-law rates can escalate the rental/sale prices of individual dwelling units

[10] Section 4.6.2.5 Size of Parking Spaces, City of Barrie Zoning By-law 2009-141

beyond the means of families requiring this type of housing, which impacts the viability of the development.

The parking demand for the proposed development was estimated to assess whether a reduction from the Zoning By-law parking requirements could be justified. Two approaches were considered and are discussed subsequently.

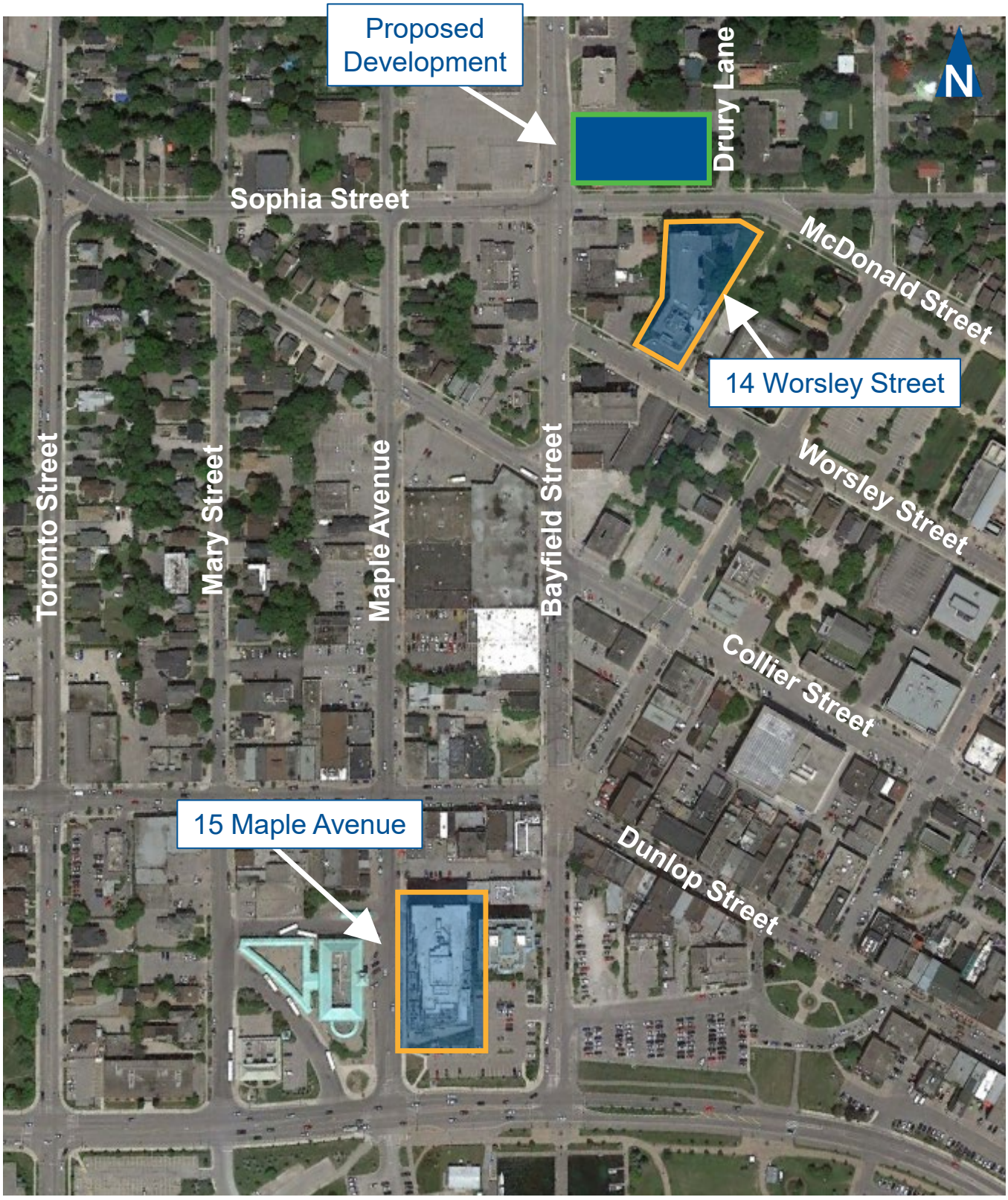
6.3.2 Proxy Site Parking Survey Data

Proxy site surveys are a common method used to estimate parking demand when the proposed land use exists nearby in a similar context.

Paradigm conducted parking utilization surveys at existing market rate and affordable housing apartment buildings in downtown Barrie to derive local parking demand rates applicable to the proposed development. The proxy sites surveyed include 14 Worsley Street and 15 Maple Avenue. The Worsley Street proxy site is owned by the client, while both properties are managed by the client's agent. The proxy sites were selected as they have similar characteristics to the development including location with the downtown urban area, access to transit, tenants and management. **Figure 6.1** illustrates the location of the sites located immediately south of the subject lands and described as follows:

- **14 Worsley Street**, a 115-unit apartment building located on the north side of Worsley Street, between Bayfield Street and Clapperton Street. The parking supply for the site comprises 116 underground stalls, with 94 stalls designated for residents and 22 stalls allocated to visitors. The building includes 80 affordable (70%) and 35 market (30%) rental units, similar to proposed proportion of affordable units for the subject development.
- **15 Maple Avenue**, a 169-unit apartment building located on the east side of Maple Avenue north of Simcoe Street at the City's waterfront. The parking supply for the site comprises 242 underground stalls, with no stalls allocated to visitors. The building does not include any affordable housing rental units.

The proxy parking utilization surveys were conducted on Thursday, February 1, 2018 from 9:00 AM to 8:00 PM and Friday, February 2, 2018 from 12:00 AM to 2:00 AM. These time periods typically exhibit the highest parking demands for residential uses. Data was collected in 60-minute intervals to assess variation in utilization and ensure "typical" demand for the sites was observed. **Appendix I** provides the detailed parking survey data for reference.



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Location of Proxy Sites

Table 6.2 summarizes the observed parking demand and calculated rates from the proxy sites. The demand rate was calculated by dividing the maximum total number of vehicles parked by the number of units in the development. The maximum resident parking demand for both buildings was observed at 1:00 AM on Friday, summarized as follows:

- 14 Worsley Street – Peak parking demand rate of 0.45 stalls per dwelling unit. *This peak parking demand rate will be used to calculate parking demand for affordable housing units.*
- 15 Maple Avenue – Peak parking demand rate of 0.95 stalls per dwelling unit. *This peak parking demand rate will be used to calculate parking demand for market rate units.*

TABLE 6.2: OBSERVED PARKING DEMAND AND RATES FROM PROXY SITE SURVEY

Date & Time		Parking Demand	
		14 Worsley Street	15 Maple Avenue
Thursday 1 February 2018	9:00 AM	38	98
	10:00 AM	36	87
	11:00 AM	33	81
	12:00 PM	32	78
	1:00 PM	34	77
	2:00 PM	36	72
	3:00 PM	32	81
	4:00 PM	36	88
	5:00 PM	44	99
	6:00 PM	46	119
	7:00 PM	48	132
	8:00 PM	45	136
Fri 2 Feb 18	12:00 AM	48	159
	1:00 AM	52	161
Maximum Demand (Stalls)		*52*	*161*
Total Dwelling Units		**115**	**169**
Maximum Surveyed Rate		**0.45 stalls/unit**	**0.95 stalls/unit**

The observed proxy site parking demand rates were applied to the proposed 108 units, considering up to 70% of the units designated as affordable housing. **Figure 6.2** illustrates the calculated parking demands for each unit type (market or affordable) and any result surplus parking.

The planned parking supply of 96 stalls should adequately serve the parking demand if at least 15% of units are designated as affordable. At 15% affordable units, the development will have a parking demand of 94 stalls and a maximum surplus of two stalls, plus 18 tandem stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 68 stalls and a maximum surplus of 28 stalls, plus 18 tandem stalls.

6.3.3 City of Mississauga Parking Guidelines for Public and Private Non-Profit Housing

In 2005, the City of Mississauga commissioned a study on parking demand for public and private non-profit housing developments. The study concluded that fewer parking stalls were needed for residents and visitors than their zoning by-law required for certain non-profit housing providers and specific built forms.

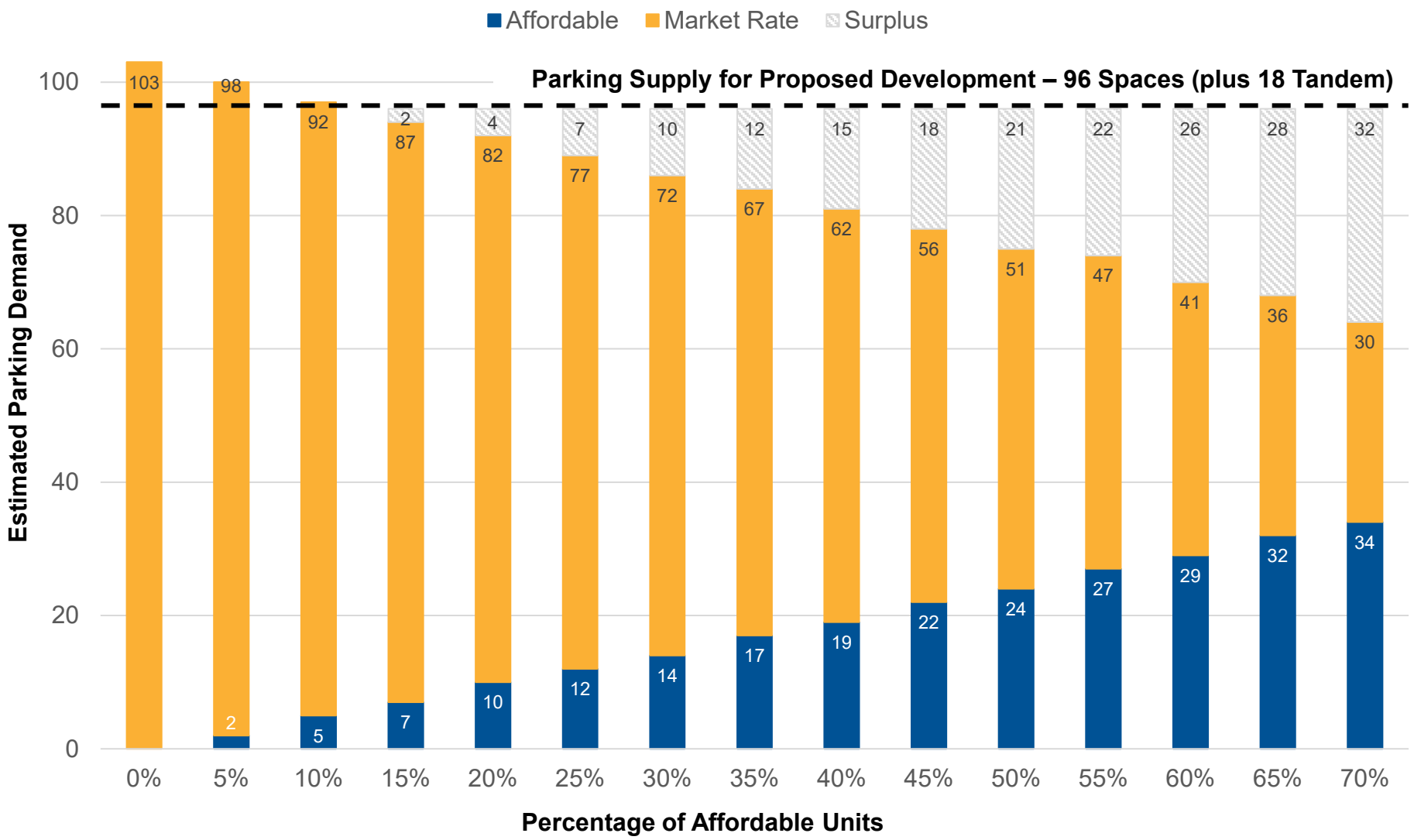
Based on these findings, Mississauga City Council approved reduced parking rates for selected types of public and private non-profit housing developments. Appendix 1 of the Mississauga Parking Guidelines for Public and Private Non-Profit Housing Report[11] summarizes this information. **Table 6.3** details the non-profit housing parking rates.

TABLE 6.3: MISSISSAUGA NON-PROFIT HOUSING PARKING RATES

Number of Bedrooms	Parking Rate	
	Shallow Subsidy	Deep Subsidy
1 Bedroom Unit	0.37 stalls/unit	0.21 stalls/unit
2 Bedroom Unit	0.83 stalls/unit	0.63 stalls/unit

The Mississauga non-profit housing parking demand rates were applied to the proposed development, considering up to 70% of the units designated as affordable housing. The 15 Maple Avenue proxy site parking demand rate (0.95 stalls/unit) was applied to the market rate units.

[11] City of Mississauga. *Parking Guidelines for Public and Private Non-Profit Housing – Report on Comments.* 11 October 2005.



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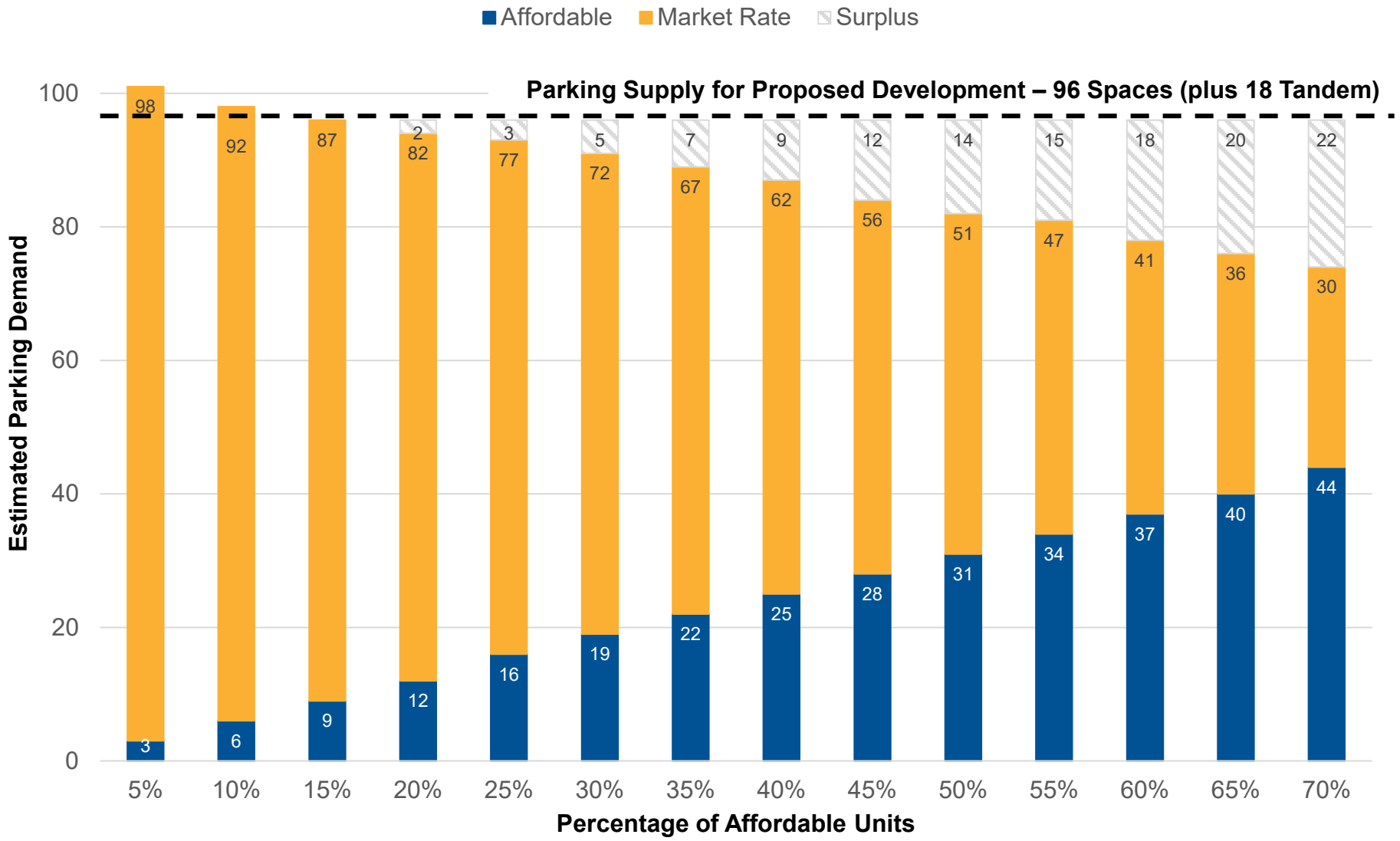
Estimated Parking Demand based on Barrie Proxy Site Surveys

Figure 6.2

Figure 6.3 summarizes the calculation for a shallow subsidy. The planned parking supply should adequately serve the parking demand if at least 15% of units are designated as affordable. At 15% affordable units, the development will have a parking demand of 96 stalls and no surplus of stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 76 stalls and a maximum surplus of 20 stalls, plus 18 tandem stalls.

Figure 6.4 summarizes the calculation for a deep subsidy. The planned parking supply should adequately serve the parking demand if at least 10% of units are designated as affordable. At 10% affordable units, the development will have a parking demand of 96 stalls and no surplus of stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 64 stalls and a maximum surplus of 32 stalls, plus 18 tandem stalls.



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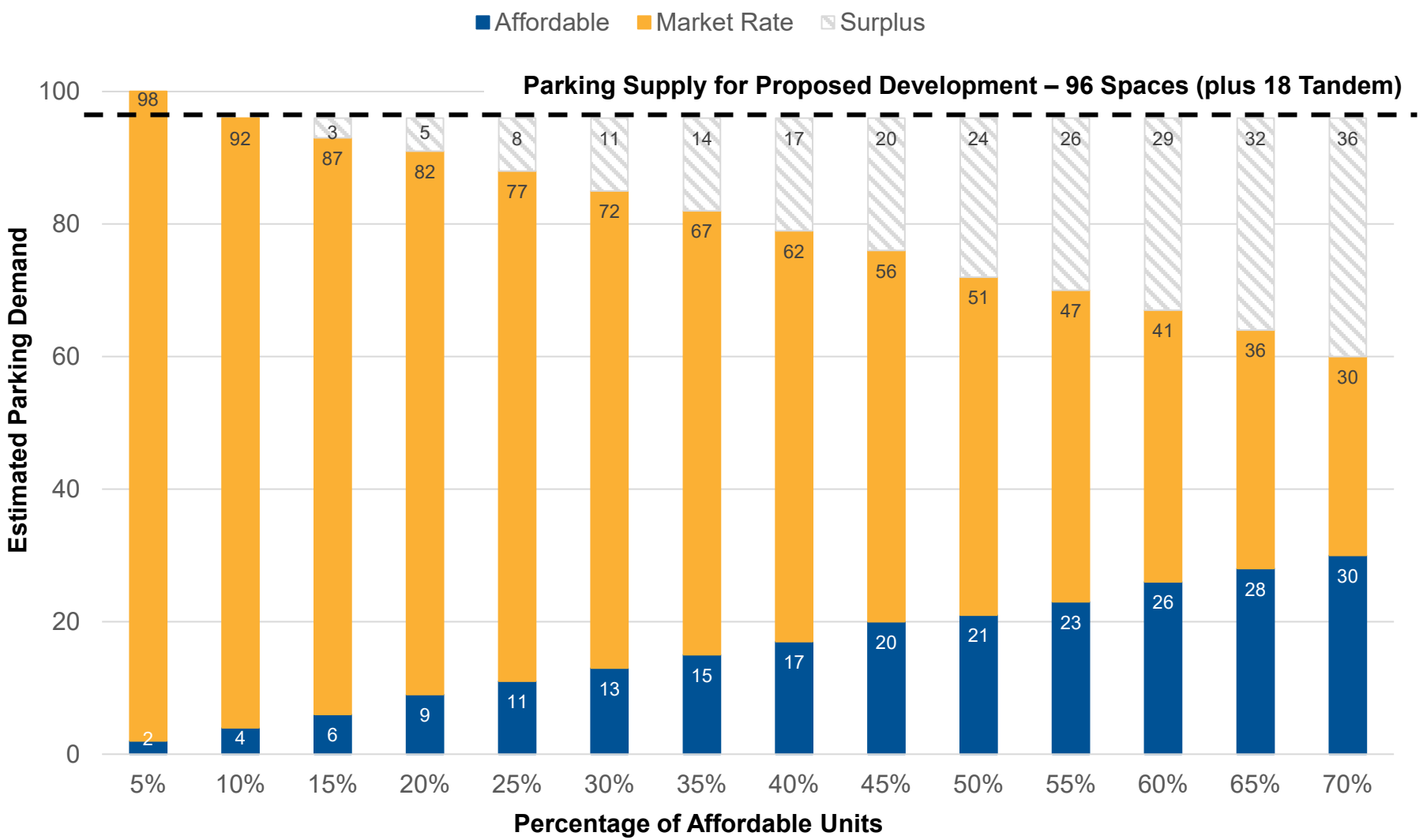
Estimated Parking Demand based on Mississauga Non-Profit Housing Shallow Subsidy and Barrie Market Rate Proxy Site Survey



Estimated Parking Demand based on Mississauga Non-Profit Housing Deep Subsidy and Barrie Market Rate Proxy Site Survey

6.4 Parking Justification Summary

The planned parking supply for the proposed development results in a theoretical shortfall of 12 stalls in comparison to the City of Barrie Zoning By-law requirements.

Actual parking demand for the development is anticipated to be lower than the Zoning By-law requirements based on proxy site data collected and the City of Mississauga non-profit housing parking rates.

Based on the parking demand forecasts, the planned parking supply should adequately serve the demand with a surplus ranging from 0 to 32 stalls, if at least 15% of units are designated as affordable. The owner is targeting up to 70 units (about 65%) as affordable housing units, well within the range expected to generate a surplus of parking stalls. Furthermore, the 18 secondary tandem stalls will provide additional parking if any unit tenants require more than one parking stall.

Other factors supporting the planned parking supply include:

- Proximity to transit services and facilities and the implementation of recommended Transportation Demand Management measures noted in **Chapter 7**. The implementation of identified TDM measures would help to further reduce the need for vehicle travel (and ownership) and related resident and visitor parking demands. The subject lands are served by pedestrian facilities and provide access to transit services via the Barrie Downtown Bus Terminal, which is located approximately 600 metres southwest of the site. As detailed in **Section 3.2**, several bus routes serve the subject site. Additional route connections are also provided at the bus terminal;
- TTS data indicates lower-income families tend to exhibit lower automobile ownership rates, especially if living in areas well served by transit and active transportation modes. **Appendix J** provides the TTS query data. This typically translates into a reduced demand for residential parking;
- Availability of public off-site parking on adjacent streets and in nearby parking lots in case visitor parking demand exceeds supply on occasion. **Figure 6.5** illustrates available on-street parking on Drury Lane and Sophia Street. The figure also identifies several public parking facilities in proximity. While it is not intended that residents would park off-site, it is not unreasonable to assume that visitors to the building may use public parking; and

Legend

- Monthly Permit Lots = **$75** / month + Taxes
- Monthly Permit Lot = **$85** / month + Taxes
- Monthly Permit Lots = **$60** / month + Taxes
- **$1.00**/hour - 5 hour parking maximum
- Accessible Parking
- On-street Parking

Parking Rates

Daily rates for off-street parking lots	= **$5.50** / day
Hourly rates for off-street parking	= **$1.00** / hour
Hourly rates for on-street parking	= **$1.25** / hour
Hourly rates for Collier Street Parkade	= **$1.25** / hour (no daily maximum)
Veterans and Accessible Parking	= **Free everywhere**

Source: City of Barrie. *Downtown Parking Map.* January 2019.

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Public Parking in Downtown Barrie

- Relative consistency of the parking demand estimates for the two different methods, which are all somewhat lower than the Zoning By-law requirements.

Additionally, the City does not provide or detail provisions for the reduction of parking rates for affordable housing developments. These types of provisions can be found in other Ontario municipal policies, such as the City of Mississauga, Town of Newmarket and City of Belleville documents.

6.5 Alignment with Affordable Housing Strategy

The City of Barrie 10-year Affordable Housing Strategy (AHS)[12] aims to encourage, stimulate and increase the supply and range of affordable housing options to meet the needs of residents at all income levels and stages of life. The City's goal is to create 840 new affordable units by 2024.

Consistent with this goal, the AHS recommends the review of existing engineering and urban design standards to remove/reduce requirements that increase the cost of developing affordable housing. Specifically, the strategy proposes a Built Form Task Force to revisit zoning and parking standards for affordable housing developments, recognizing existing provisions can adversely affect project viability.

Reducing the parking requirement for the proposed development would be consistent with the AHS. Allowing a lower residential parking standard will help make the project more viable without adversely impacting the adjacent transportation system and nearby property owners. This will aid in advancing the City's objective to create more affordable housing units locally.

[12] City of Barrie. *Affordable Housing Strategy*. February 2015.

7 Transportation Demand Management Measures

7.1 Overview

Transportation Demand Management (TDM) programs consider how people's choices of mode travel are affected by land use patterns, development design, parking availability, parking cost, and the relative cost, convenience, and availability of alternative modes of travel. Various TDM strategies are used to influence those factors so that alternatives to single occupant vehicle travel, such as transit or carpooling, are more competitive. TDM strategies that can be considered at a residential site development can be divided into two basic categories:

- **Pre-occupancy:** measures that can be implemented while a development is being designed and built; and
- **Post-development:** measures that can be implemented once the development is occupied.

The pre-occupancy actions are critical because they are most likely to determine how attractive, convenient and safe alternative travel will be once the site is occupied. Before a site is occupied, or during a remodel, it can be designed to be convenient and safe for pedestrians and cyclists. As well, vehicle parking can be provided to meet/satisfy but not exceed demand.

After the development is built, incentives can be offered, but those incentives may not be as effective if the site and its surroundings are predominately auto-oriented. The incentives generally include subsidies to use transit or rideshare services and information about where and how to use alternative modes of transportation.

TDM is one of the tools that municipalities are using to create vibrant and sustainable communities. 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, create stronger communities, and build more prosperous and liveable cities.

7.2 Potential TDM Measures

To further promote sustainable modes of travel, potential TDM measures that could be implemented are described below. Considering the land uses planned for the proposed development and

the available transportation options in the area, the following measures would have the greatest potential to promote the use of non-auto travel modes and influence parking demand for the subject site.

The TDM measures noted should be considered by the developer for implementation to further promote sustainable transportation modes. They are not expected to be required to justify development of the subject site.

7.2.1 Cycling

Providing opportunities for individuals (residents and visitors) to travel by bicycle can reduce vehicle travel and parking demand.

To encourage cycling (and alleviate a potential barrier to its use), the proposed development should provide secure, convenient bicycle parking for residents and visitors. The site plan indicates the provision of secure long-term bicycle and scooter parking on the ground floor accommodating 56 bicycles and seven scooters. Ten short-term bicycle parking stalls are provided adjacent to the building entrance for visitor use.

7.2.2 Walking

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.

Sidewalks are currently provided adjacent to the property on Bayfield Street and Sophia Street. The proposed site plan includes several direct on-site pedestrian pathways connecting the development entrances to the existing City sidewalk infrastructure.

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

7.2.3 Transit

The availability of convenient and desirable transit options can reduce the number of personal automobile trips. As previously discussed, public transportation is provided via seven Barrie Transit routes, and additional connections at the Barrie Downtown Bus Terminal located 600 metres southwest of the development on Maple Avenue. These routes and station provide good connectivity to the broader transit network and key destinations within the City, including recreational facilities and shopping.

To further enhance the bus stops near the site, it is recommended that the client advocate to Barrie Transit for the provision of 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.

7.2.4 Parking Management

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.

To further encourage residents to the building to utilize sustainable travel modes, the redevelopment should consider unbundling parking stalls from the cost to rent a unit. This is more equitable and efficient since occupants are not forced to pay for parking they do not need and allows consumers to adjust their parking supply to reflect their needs.

8 Conclusions and Recommendations

8.1 Conclusions

Based on the investigations carried out, the following is concluded:

Existing Traffic Operations

Under base year traffic conditions, all intersections and movements within the study area operate at acceptable levels of service and are within capacity. The exception would be the eastbound left-turn movement at Bayfield Street and Sophia Street. This movement currently operates at LOS F with a v/c ratio of 0.98 under the PM peak hour. The 95th percentile queue is also noted to exceed the available storage by 26 metres.

Development Trip Generation

The residential development is forecast to generate a total of 35 AM peak hour trips and 46 PM peak hour trips. This estimate accounts for potential trips made by transit.

2027 Background Traffic Operations

Under 2027 background traffic conditions, all intersections and movements within the study area are forecast to operate at acceptable levels of service and within capacity. The exceptions include:

- Eastbound left-turn movement at Bayfield Street and Wellington Street, which is forecast to operate at LOS D with a v/c ratio of 0.88 during the PM peak hour; and
- Eastbound left-turn movement at Bayfield Street and Sophia Street, which is forecast to operate at LOS F with a v/c ratio of 1.04 and the 95th percentile queue is anticipated to exceed the available storage by 32 metres during the PM peak hour.

2027 Total Traffic Operations

Under 2027 total traffic conditions, all intersections and movements within the study area are forecast to operate at acceptable levels of service and within capacity. The exceptions include:

- Eastbound left-turn movement at Bayfield Street and Wellington Street, which is forecast to operate at LOS D with a v/c ratio of 0.89 during the PM peak hour; and

- Eastbound left-turn movement at Bayfield Street and Sophia Street, which is forecast to operate at LOS F with a v/c ratio of 1.05 and the 95th percentile queue is anticipated to exceed the available storage by 32 metres during the PM peak hour.

Remedial Measures

Left-Turn Lanes

Upon full build-out of the development, a left-turn lane is not warranted on Drury Road at the Site Access.

Right-Turn Lanes

Upon full build-out of the development, a right-turn lane is not warranted on Drury Road at the Site Access.

Signal Optimization

The signalized study area intersections are generally forecast to operate at acceptable levels of service and within capacity under the 2027 total traffic conditions with the optimization of signal timing splits.

Parking Assessment

Zoning By-law Parking Requirements

Based on Zoning By-law 2009-141, a total of 108 stalls are determined to be required. A total of 96 stalls are proposed to serve the anticipated parking demands, this results in a theoretical deficiency of 12 stalls.

Proxy Site Parking Data

Based on proxy site parking demand rates of 0.45 stalls per unit (affordable housing) and 0.95 stalls per unit (market rate), it is determined that a minimum of 15% of the total residential units be designated as affordable. Providing a total of 15% affordable units, the development is estimated to generate a parking demand of 94 stalls and a maximum surplus of two stalls, plus 18 tandem stalls. Providing a total of 65% affordable housing units (the maximum proposed for the building), the development is estimated to generate a parking demand of 68 stalls and a maximum surplus of 28 stalls, plus 18 tandem stalls.

City of Mississauga Parking Guidelines for Public and Private Non-Profit Housing

Based on the Mississauga non-profit housing parking demand rate and market rate proxy site parking demand rate, it is determined that a

minimum of 10% of units should be designated as affordable. This increases to 15% if a shallow subsidy is provided for the affordable housing units. The parking demand is as follow:

- **Shallow Subsidy:** At 15% affordable units, the development will have a parking demand of 96 stalls and no surplus of stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 76 stalls and a maximum surplus of 20 stalls, plus 18 tandem stalls.
- **Deep Subsidy:** At 10% affordable units, the development will have a parking demand of 96 stalls and no surplus of stalls. At 65% affordable units (the maximum proposed for the building), the development will have a parking demand of 64 stalls and a maximum surplus of 32 stalls, plus 18 tandem stalls.

Parking Justification Summary

The anticipated parking demand for the residential component is expected to be lower than the Zoning By-law requirements based on the analysis completed using proxy site data and the City of Mississauga non-profit housing parking rates. The planned parking supply is expected to adequately serve residential demand with a surplus ranging from 0 to 32 stalls, if a minimum of 15% of the total residential units are designated as affordable. Furthermore, the 18 secondary tandem stalls will provide additional parking if unit tenants require more than one parking stall.

Transportation Demand Management (TDM) Measures

The subject site is acknowledged to be accessible by alternative travel modes. The site plan indicates connections provided to transit and active transportation facilities. The client should consider the implementing the identified recommended TDM measures to further promote the use of alternative travel modes and to reduce parking demands.

8.2 Recommendations

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

- The proposed development be permitted to proceed with the proposed number of units and parking supply, with a minimum of 15% of the total residential units designated as affordable;
- The 18 secondary tandem parking stalls be allocated to building tenants with primary stalls;

- Optimize the signal timing splits and phasing at the Bayfield Street intersections with Wellington Street and Sophia Street to ensure the best operations all movements; and
- Incorporate the recommended Transportation Demand Management measures into the site plan.

Appendix A

Pre-Study Consultation Correspondence

From:	Justin MacDonald
To:	Heather Hector
Subject:	RE: (190726 formerly 170257) 113 Bayfield Street TIS & PS - Scope of Work
Date:	January 6, 2020 10:37:44 AM
Attachments:	image002.png image003.png

Good morning Heather.

Yes, the Dec 2017 counts would still be valid.

Thanks,

Justin MacDonald, C.E.T.,
Senior Transportation Operations Technologist
Roads, Parks & Fleet

City of Barrie: Barrie Operations Centre, 165 Ferndale Drive North, Barrie ON, L4N 9V9
Office: 705-739-4220 5178

From: Heather Hector [mailto:hhector@ptsl.com]
Sent: Thursday, January 02, 2020 3:07 PM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Subject: RE: (190726 formerly 170257) 113 Bayfield Street TIS & PS - Scope of Work

Happy New Year Justin,

We are still working on the TIS and PS for 113 Bayfield Street, detailed in my previous email below. We are currently updating the study to reflect changes to the site plan. Our turning movement counts were collected December 6, 2017. Will the City still accept these counts for the TIS? The TIS guidelines do not indicate how recent the counts need to be.

Please let me know if you have any questions.

Regards,

Heather (Goodman) Hector, M.Eng., EIT
Transportation Consultant

Paradigm Transportation Solutions Limited
p: 416.479.9684 x502
m: 905.506.0454

e: hhector@ptsl.com **<<< New Email Address**

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: December 19, 2017 3:25 PM
To: Heather Goodman <hgoodman@ptsl.com>
Cc: Gene Chartier <gchartier@ptsl.com>
Subject: RE: 170257 (113 Bayfield Street TIS & PS) - Scope of Work

Good afternoon Heather.

As per our conversation please include an overnight component of your parking study, typically this is completed from 12am to 2am. I would be happy to discuss this further should you have any questions or concerns.

Thanks,

Justin MacDonald, C.E.T.,
Senior Transportation Operations Technologist
Roads, Parks & Fleet

City of Barrie: Barrie Operations Centre, 165 Ferndale Drive North, Barrie ON, L4N 9V9
Office: 705-739-4220 5178

From: Steve Rose
Sent: Monday, December 18, 2017 8:02 AM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Subject: FW: 170257 (113 Bayfield Street TIS & PS) - Scope of Work

Steven Rose
Manager of Traffic & Parking Services
Roads, Parks & Fleet

City of Barrie: Barrie Operations Centre, 165 Ferndale Drive North, Barrie ON, L4N 9V9
Office: 705-739-4220 x4382
www.barrie.ca

From: Heather Goodman [mailto:hgoodman@ptsl.com]
Sent: Friday, December 15, 2017 11:05 AM
To: Steve Rose <Steve.Rose@barrie.ca>
Cc: Gene Chartier <gchartier@ptsl.com>
Subject: RE: 170257 (113 Bayfield Street TIS & PS) - Scope of Work

Hi Steve,

Just following up as we have not received a reply. Please let us know if the City has any comments on the scope of work.

Regards,

Heather Goodman, B.Eng., EIT, MITE
Transportation Consultant

Paradigm Transportation Solutions Limited
p: 416.479.9684 x502
m: 905.506.0454

From: Heather Goodman
Sent: December 7, 2017 3:40 PM
To: steve.rose@barrie.ca
Cc: Gene Chartier <gchartier@ptsl.com>
Subject: 170257 (113 Bayfield Street TIS & PS) - Scope of Work

Hi Steve,

Paradigm would like to inform the City that we will be undertaking a Traffic Impact Study and Parking Study for the proposed mixed-use development (96 apartment units & 2,500 sq ft commercial) located at 113 Bayfield Street detailed in the enclosed project overview and work plan. We ask that you please review the work plan to ensure the scope of the study is acceptable and provide comments if necessary.

In addition, we request the following information from the City for our study:

- The following intersections will be included in the study, please confirm that this is acceptable:
  - Bayfield Street and Sophia Street (signalized);
  - Bayfield Street and Wellington Street (signalized);
  - Drury Lane and Sophia Street East (unsignalized); and
  - Drury Lane and Wellington Street East (unsignalized).

- The traffic impact study will be prepared to conform to the City guidelines and will assess a five-year horizon from the estimated date of full development and occupancy. Please confirm this is acceptable.
- The growth rate to be used for the study;
- 12-hour parking counts (8AM – 8 PM) will be collected at 14 Maple Street and 15 Worsley Street apartments as proxy sites. The counts will include all underground, surface, visitor and customer parking. The counts will be collected next week (December 11-15) or early January (8-12). Please confirm this is acceptable.
- Other in-stream or recently approved developments in the area that should be reflected in the study.

Due to the time sensitive nature of the project, we ask that you please provide comments at your earliest convenience. Please do not hesitate to contact me if you have questions relating to this project.

Regards,

Heather Goodman, B.Eng., EIT, MITE
Transportation Consultant

Paradigm Transportation Solutions Limited
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07 December 2017
Project: 170257

Steve Rose, CET, TSOS
Manager of Traffic and Parking Services
City of Barrie
70 Collier Street, P.O. Box 400
Barrie, ON L4M 4T5

Dear Mr. Rose:

RE: TRAFFIC IMPACT AND PARKING STUDY
PROPOSED MIXED-USE DEVELOPMENT, 113 BAYFIELD STREET, BARRIE

Paradigm Transportation Solutions Limited (Paradigm) was retained on behalf of **DMS Property Management Ltd.** (the Client) to carry out a Traffic Impact and Parking Study (TIS) for lands located at 113 Bayfield Street in the City of Barrie.

Project Understanding

The subject site is located at 113, 115 and 117 Bayfield Street and 12 and 15 Sophia Street East, in the north-east quadrant of the Bayfield Street and Sophia Street East intersection in the City of Barrie. The property owner is proposing an eight (8)-storey mixed-used development providing a total of 96 residential units and ground floor retail space. The commercial component would occupy 234.81 m_2 of gross floor area. A total of 71 parking spaces are proposed via surface parking (20 spaces) and a single underground level (51 spaces). Additionally, 54 bicycle parking spaces will be supplied on site. Based on the latest drawings, access would be provided via an all-moves driveway with Drury Lane. Traffic Impact and Parking Justification Studies are required to support the development applications.

In preparing our scope of work for this assignment, we have assumed that:

- The development will be built out in a single phase;
- The traffic and parking studies will be carried out concurrently and according to applicable City of Barrie standards and guidelines, including the Transportation Impact Study Requirements as contained within City's Urban Design Manual (Revised October 2014); and
- Both studies will be documented in one (1) combined report.

For the traffic study component, we have assumed a study area comprising the following intersections:

- Bayfield Street and Sophia Street (signalized);
- Bayfield Street and Wellington Street (signalized);
- Drury Lane and Sophia Street East (unsignalized);
- Drury Lane and Wellington Street East (unsignalized); and
- Site access driveway intersections with the adjacent road system.

Work Plan

The following outlines our proposed work plan to carry out this assignment:

- **Task 1: Pre-Study Consultation** – We will contact City of Barrie transportation staff by telephone/email to confirm and refine the scope and assumptions prior to undertaking the studies.
- **Task 2: Information Assembly** – We will gather available traffic counts, traffic signal timings, background growth rates and/or traffic forecasts, transit routes and ridership, walking and cycling data, applicable Zoning By-law provisions, relevant background reports, and any other information about the study area pertinent to the assessment (e.g., other development applications in the vicinity, existing traffic issues in the area).
- **Task 3: Data Collection** – This task will involve the following activities:
  - Site Visit – We will conduct a site visit to view current traffic conditions on roads near the subject lands during a typical weekday morning and/or afternoon peak period.
  - Turning Movement Counts – If traffic data is outdated (more than two (2) years old) or not available, we will arrange for eight (8) hour turning movement counts at the intersections and site driveways noted above. The counts would collect all types of vehicular traffic (cars, trucks, bicycles) and pedestrians.
  - Proxy Site Parking Utilization Surveys – We will conduct utilization surveys on one (1) weekday (8:00 AM to 8:00 PM) at two (2) proxy locations to derive peak parking generation rates for uses with similar characteristics to the proposed development. The dates and specific locations to be surveyed will be confirmed with the City.
- **Task 4: Traffic Forecasting** – In accordance with the City's guidelines, we will prepare traffic forecasts for the weekday AM and PM peak hours for a future horizon year five (5) years post full build-out/occupancy. The components of the traffic forecasts are:
  - Existing (Base Year) – We will develop Existing (2017) vehicle traffic volumes for the AM and PM peak hours from the turning movement counts. Data collected prior to 2017 will be factored to the base year using an appropriate growth rate;
  - Future (Horizon Year) Background – We will estimate Future Background AM and PM peak hour vehicle traffic volumes for the horizon year by applying a growth rate to the Existing volumes and adding anticipated trips from nearby approved and in-stream developments. The growth rate will be derived from historical traffic data and/or the City's EMME travel demand forecasting model outputs. Developments to include in the background traffic forecasts will be confirmed with the City; and

- Future (Horizon Year) Total – We will forecast the AM and PM peak hour vehicle traffic volumes generated by the proposed development based on information from the Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition). The site vehicle trips will be distributed to the proposed site access intersection and the study area road network based on existing traffic patterns and/or Transportation Tomorrow Survey (TTS) data. The site generated traffic volumes will be added to the Future Background estimates to produce Future Total traffic volumes for the analysis periods.

- **Task 5: Traffic Analysis** – We will evaluate the operation of the study area intersections for the Existing, Future Background (without the development) and Future Total (with the development) AM and PM peak hour traffic conditions using Synchro 9.1 software. The operational analyses will assess volume-to-capacity (v/c) ratios, Level of Service (LOS) and queuing conditions. Based on the analysis results, we will evaluate the net impact of the proposed development on the study area road network, especially the accesses. The need for road improvements (e.g., provision of auxiliary turn lanes), changes to accesses (e.g. relocation, reconfiguration, elimination) and/or modifications to traffic control devices (e.g., addition of signs or markings) to address any issues will be determined.
- **Task 6: Parking Forecasting** – We will summarize the parking supply and demand data collected in Task 3 for the proxy sites, and forecast the peak parking demand for the proposed development based on this data. The calculated parking rate will be compared to the ITE Parking Generation Manual data and the parking requirements of the City of Barrie Zoning Bylaw (2009-141). It is noted that the subject site is situated just outside the City's Urban Growth Centre Boundary and is subject to slightly higher minimum parking rates as a result.
- **Task 7: Parking Assessment** – We will assess whether the on-site parking provision is sufficient to meet peak demand, and justify the proposed number of on-site parking spaces, recognizing the site constraints and local conditions. We will also compare these values to the Zoning By-law requirement to assess degree of compliance and required relief, if needed.
- **Task 8: Transit and Active Transportation Review** – We will provide a description and review of the existing transit services and active transportation facilities that are provided within the study area. A qualitative review will be undertaken to describe how the proposed development would access these services and facilities, and whether the additional site person trips would have any significant impact to warrant any changes.
- **Task 9: Transportation Demand Management (TDM) Options** – We will identify potential TDM measures that can be implemented during both the pre-occupancy and post-occupancy periods of the development which can be used to further manage parking demands for the site. We will assess the potential benefits for the proposed plan and its support for non-auto initiatives available including public transit, walkability and the potential for other TDM initiatives.
- **Task 10: Report and Recommendations** – We will prepare a report documenting the study findings and conclusions, and providing recommendations regarding the proposed development from a transportation perspective. The final report will include appendices containing relevant traffic data as well as the detailed output generated by the operational analysis software.

We trust the foregoing work plan is acceptable. If you have any questions related to this project, please contact me at (416) 479-9684 x501 or by email at gchartier@ptsl.com

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

Gene Chartier
M.A.Sc., P.Eng., FITE
Vice-President

Appendix B

Existing Turning Movement Counts

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017

Turning Movement Data

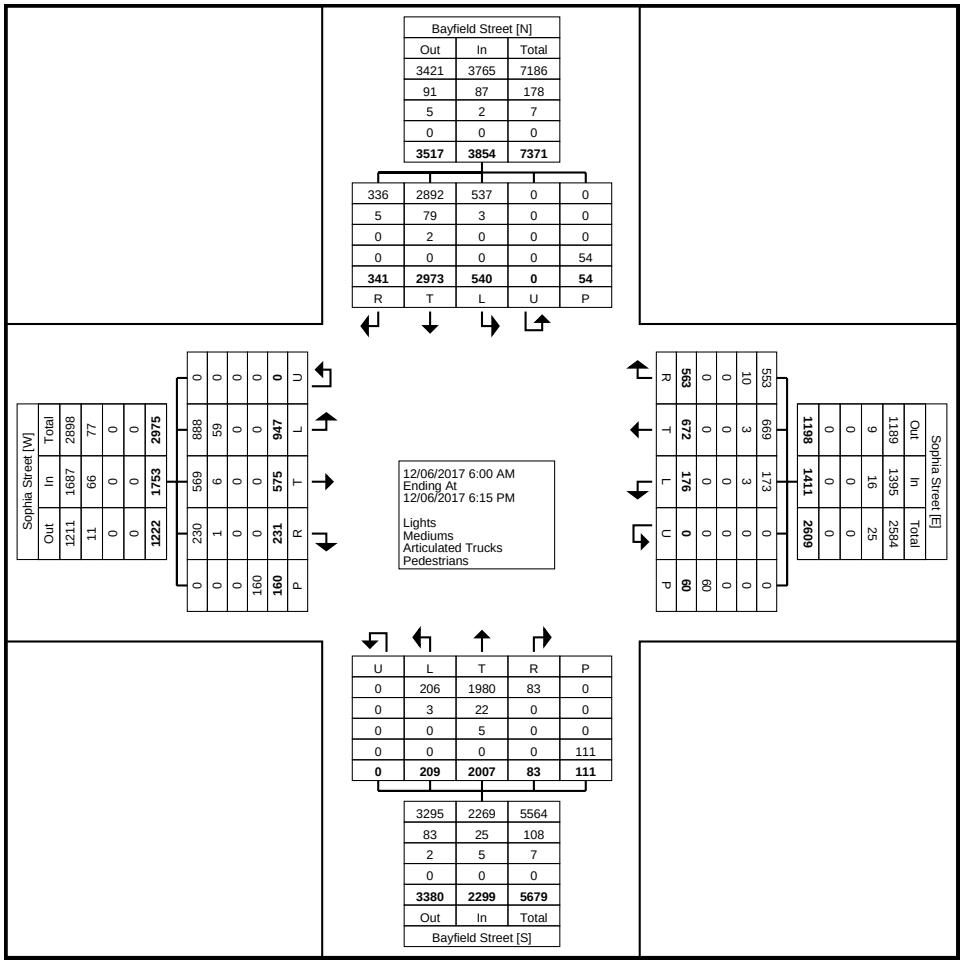
Start Time	Sophia Street Eastbound						Sophia Street Westbound						Bayfield Street Northbound						Bayfield Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
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



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

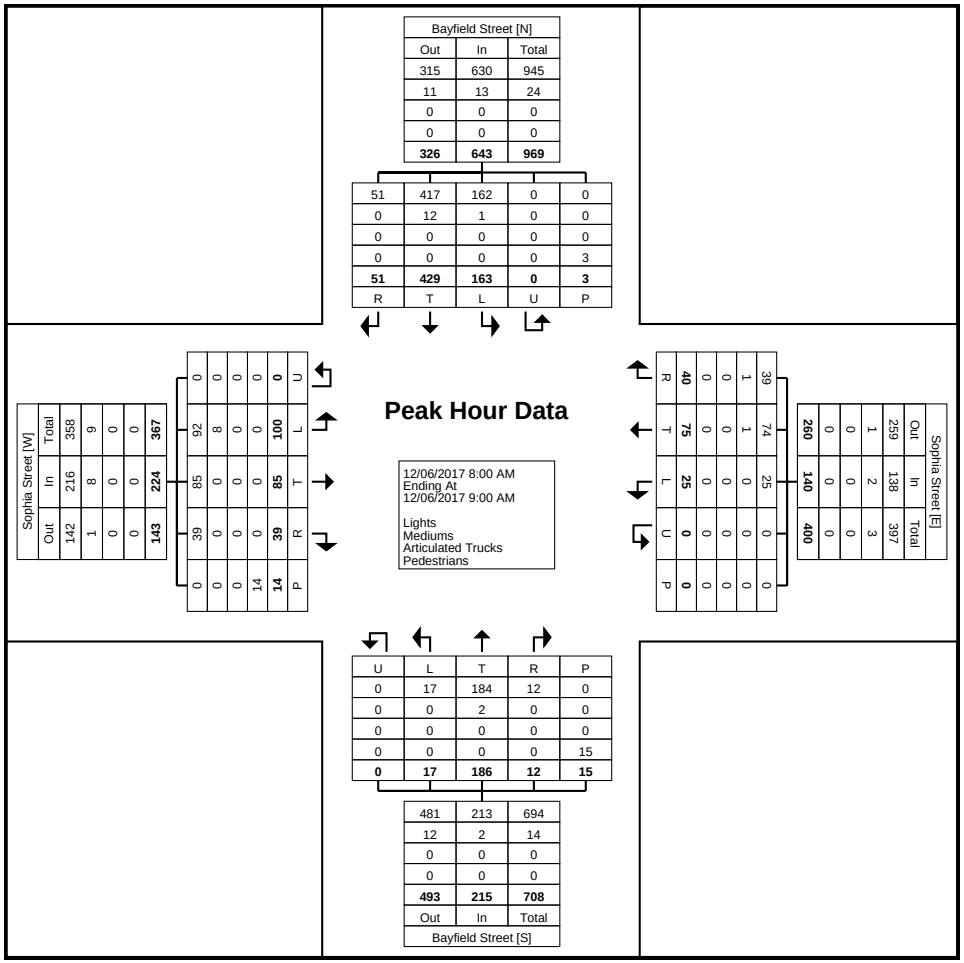
Turning Movement Peak Hour Data (8:00 AM)

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	-	-

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



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

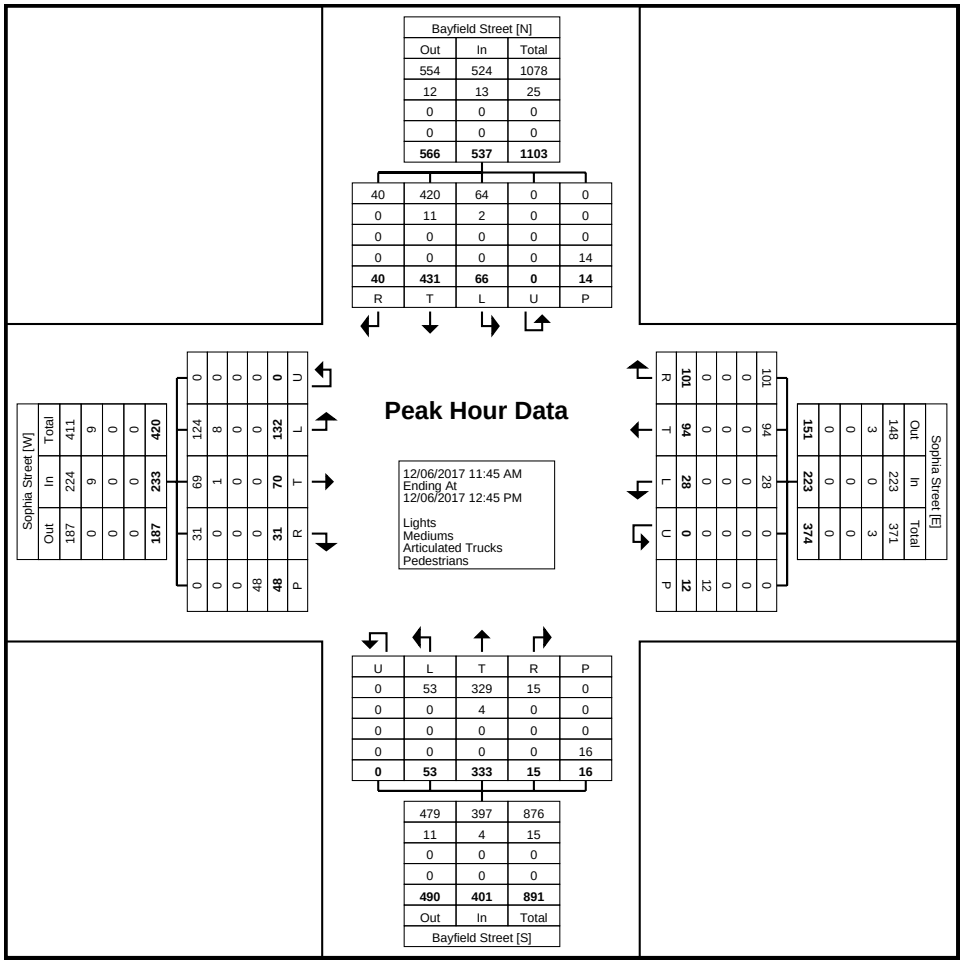
Turning Movement Peak Hour Data (11:45 AM)

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



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

Paradigm Transportation Solutions Limited
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Waterloo, Ontario, Canada N2J 1N8
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Count Name: Bayfield Street & Sophia Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Sophia Street Eastbound						Sophia Street Westbound						Bayfield Street Northbound						Bayfield Street Southbound						
	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	Int. 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	-	-

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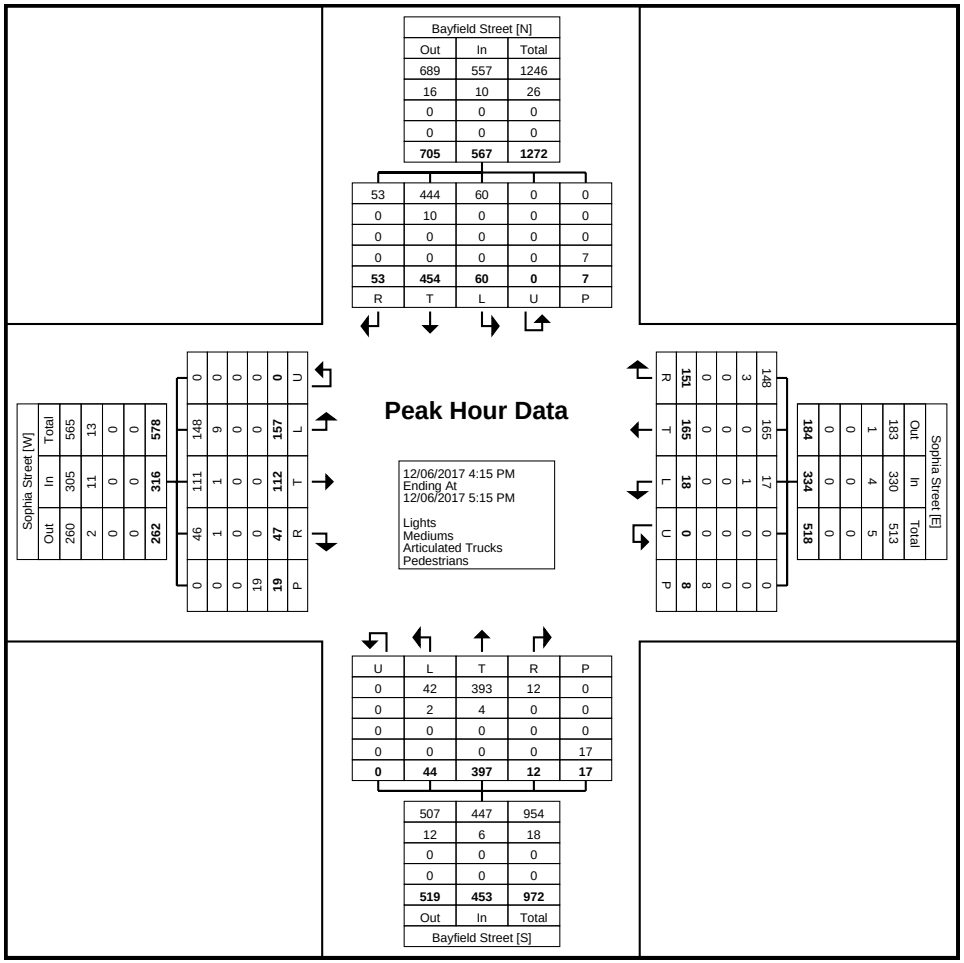
Start Date: 12/06/2017



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

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 & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Data

Start Time	Wellington Street Eastbound						Wellington 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	4	7	0	0	0	11	1	9	7	0	2	17	0	22	0	0	0	22	3	35	6	0	0	44	94
6:15 AM	8	11	0	0	0	19	6	19	5	0	0	30	0	32	0	0	0	32	7	28	12	0	0	47	128
6:30 AM	8	16	1	0	0	25	1	30	8	0	0	39	3	37	1	0	0	41	1	60	24	0	0	85	190
6:45 AM	11	17	3	0	0	31	6	37	10	0	1	53	0	31	2	0	0	33	4	49	22	0	0	75	192
Hourly Total	31	51	4	0	0	86	14	95	30	0	3	139	3	122	3	0	0	128	15	172	64	0	0	251	604
7:00 AM	23	14	3	0	0	40	3	34	14	0	2	51	2	40	8	0	0	50	6	50	16	0	3	72	213
7:15 AM	20	19	2	0	0	41	4	41	13	0	0	58	2	44	2	0	0	48	4	66	21	0	0	91	238
7:30 AM	36	29	4	0	1	69	8	49	20	0	0	77	2	49	4	0	0	55	9	76	33	0	0	118	319
7:45 AM	28	48	8	0	0	84	9	53	11	0	1	73	2	79	3	0	0	84	5	121	51	0	2	177	418
Hourly Total	107	110	17	0	1	234	24	177	58	0	3	259	8	212	17	0	0	237	24	313	121	0	5	458	1188
8:00 AM	37	25	3	0	0	65	9	46	14	0	2	69	2	76	3	0	1	81	7	99	35	0	0	141	356
8:15 AM	25	35	8	0	1	68	11	41	11	0	0	63	1	70	1	0	0	72	12	154	50	0	1	216	419
8:30 AM	30	45	4	0	2	79	8	43	9	0	1	60	5	66	3	0	0	74	11	148	46	0	0	205	418
8:45 AM	33	42	8	0	2	83	6	59	16	0	4	81	8	84	5	0	2	97	8	169	50	0	1	227	488
Hourly Total	125	147	23	0	5	295	34	189	50	0	7	273	16	296	12	0	3	324	38	570	181	0	2	789	1681
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	44	37	4	0	2	85	5	38	9	0	7	52	3	73	2	0	3	78	10	114	43	0	6	167	382
11:15 AM	43	37	6	0	2	86	7	48	11	0	7	66	5	112	8	0	0	125	8	108	43	0	3	159	436
11:30 AM	58	38	10	0	2	106	8	36	10	0	3	54	11	113	9	0	0	133	12	142	39	0	1	193	486
11:45 AM	46	40	7	0	2	93	5	39	10	0	1	54	3	125	3	0	2	131	8	136	44	0	1	188	466
Hourly Total	191	152	27	0	8	370	25	161	40	0	18	226	22	423	22	0	5	467	38	500	169	0	11	707	1770
12:00 PM	56	51	10	0	2	117	8	37	7	0	1	52	4	134	3	0	0	141	4	115	31	0	0	150	460
12:15 PM	50	35	4	0	0	89	8	39	8	0	4	55	8	131	2	0	0	141	11	118	42	0	3	171	456
12:30 PM	48	30	6	0	4	84	6	34	10	0	6	50	12	133	1	0	1	146	9	120	46	0	1	175	455
12:45 PM	52	40	10	0	0	102	10	28	10	0	3	48	11	118	4	0	2	133	11	132	56	0	0	199	482
Hourly Total	206	156	30	0	6	392	32	138	35	0	14	205	35	516	10	0	3	561	35	485	175	0	4	695	1853
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	49	57	3	0	2	109	10	41	7	0	1	58	4	125	6	0	2	135	11	123	53	0	0	187	489
3:15 PM	46	60	5	0	0	111	8	67	13	0	5	88	8	116	7	0	1	131	12	109	47	0	3	168	498
3:30 PM	46	58	4	0	1	108	9	57	11	0	2	77	7	120	3	0	2	130	14	93	44	0	2	151	466
3:45 PM	46	58	4	0	0	108	12	52	8	0	3	72	5	134	2	0	2	141	17	121	53	0	2	191	512
Hourly Total	187	233	16	0	3	436	39	217	39	0	11	295	24	495	18	0	7	537	54	446	197	0	7	697	1965
4:00 PM	74	62	12	0	2	148	7	31	6	0	4	44	8	159	9	0	2	176	21	127	47	0	1	195	563

4:15 PM	48	58	8	0	2	114	9	51	15	0	3	75	8	142	4	0	2	154	19	120	40	0	1	179	522
4:30 PM	77	74	5	0	3	156	9	48	14	0	5	71	6	174	6	0	1	186	12	137	44	0	2	193	606
4:45 PM	52	70	4	0	1	126	9	58	11	0	2	78	1	151	4	0	1	156	25	122	40	0	8	187	547
Hourly Total	251	264	29	0	8	544	34	188	46	0	14	268	23	626	23	0	6	672	77	506	171	0	12	754	2238
5:00 PM	62	81	3	0	1	146	9	55	15	0	1	79	9	208	7	0	6	224	26	144	36	0	2	206	655
5:15 PM	64	65	6	0	2	135	11	34	12	0	0	57	8	131	2	0	1	141	27	113	39	0	0	179	512
5:30 PM	56	78	2	0	3	136	6	28	7	0	0	41	2	105	6	0	2	113	17	111	41	0	0	169	459
5:45 PM	53	57	9	0	3	119	8	48	12	0	0	68	3	117	2	0	2	122	27	124	41	0	0	192	501
Hourly Total	235	281	20	0	9	536	34	165	46	0	1	245	22	561	17	0	11	600	97	492	157	0	2	746	2127
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	1333	1394	166	0	40	2893	236	1330	344	0	71	1910	153	3251	122	0	35	3526	378	3484	1235	0	43	5097	13426
Approach %	46.1	48.2	5.7	0.0	-	-	12.4	69.6	18.0	0.0	-	-	4.3	92.2	3.5	0.0	-	-	7.4	68.4	24.2	0.0	-	-	-
Total %	9.9	10.4	1.2	0.0	-	21.5	1.8	9.9	2.6	0.0	-	14.2	1.1	24.2	0.9	0.0	-	26.3	2.8	25.9	9.2	0.0	-	38.0	-
Lights	1310	1366	162	0	-	2838	234	1303	340	0	-	1877	150	3165	119	0	-	3434	370	3400	1204	0	-	4974	13123
% Lights	98.3	98.0	97.6	-	-	98.1	99.2	98.0	98.8	-	-	98.3	98.0	97.4	97.5	-	-	97.4	97.9	97.6	97.5	-	-	97.6	97.7
Mediums	20	26	4	0	-	50	2	27	3	0	-	32	3	80	3	0	-	86	6	83	30	0	-	119	287
% Mediums	1.5	1.9	2.4	-	-	1.7	0.8	2.0	0.9	-	-	1.7	2.0	2.5	2.5	-	-	2.4	1.6	2.4	2.4	-	-	2.3	2.1
Articulated Trucks	3	2	0	0	-	5	0	0	1	0	-	1	0	6	0	0	-	6	2	1	1	0	-	4	16
% Articulated Trucks	0.2	0.1	0.0	-	-	0.2	0.0	0.0	0.3	-	-	0.1	0.0	0.2	0.0	-	-	0.2	0.5	0.0	0.1	-	-	0.1	0.1
Pedestrians	-	-	-	-	40	-	-	-	-	-	71	-	-	-	-	-	35	-	-	-	-	-	43	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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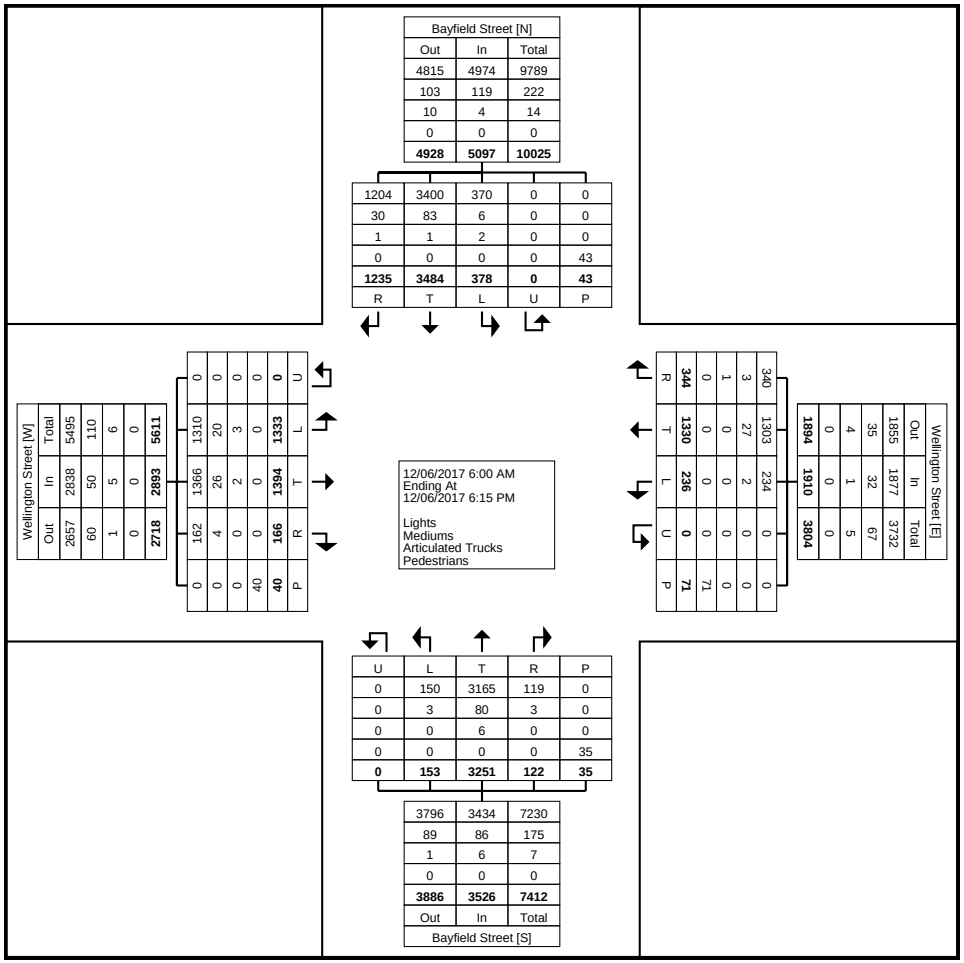

Turning Movement Data Plot

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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519-896-3163 cbowness@ptsl.com

Count Name: Bayfield Street & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (8:00 AM)

Start Time	Wellington Street Eastbound						Wellington 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	37	25	3	0	0	65	9	46	14	0	2	69	2	76	3	0	1	81	7	99	35	0	0	141	356
8:15 AM	25	35	8	0	1	68	11	41	11	0	0	63	1	70	1	0	0	72	12	154	50	0	1	216	419
8:30 AM	30	45	4	0	2	79	8	43	9	0	1	60	5	66	3	0	0	74	11	148	46	0	0	205	418
8:45 AM	33	42	8	0	2	83	6	59	16	0	4	81	8	84	5	0	2	97	8	169	50	0	1	227	488
Total	125	147	23	0	5	295	34	189	50	0	7	273	16	296	12	0	3	324	38	570	181	0	2	789	1681
Approach %	42.4	49.8	7.8	0.0	-	-	12.5	69.2	18.3	0.0	-	-	4.9	91.4	3.7	0.0	-	-	4.8	72.2	22.9	0.0	-	-	-
Total %	7.4	8.7	1.4	0.0	-	17.5	2.0	11.2	3.0	0.0	-	16.2	1.0	17.6	0.7	0.0	-	19.3	2.3	33.9	10.8	0.0	-	46.9	-
PHF	0.845	0.817	0.719	0.000	-	0.889	0.773	0.801	0.781	0.000	-	0.843	0.500	0.881	0.600	0.000	-	0.835	0.792	0.843	0.905	0.000	-	0.869	0.861
Lights	123	142	23	0	-	288	33	186	49	0	-	268	15	287	12	0	-	314	35	558	178	0	-	771	1641
% Lights	98.4	96.6	100.0	-	-	97.6	97.1	98.4	98.0	-	-	98.2	93.8	97.0	100.0	-	-	96.9	92.1	97.9	98.3	-	-	97.7	97.6
Mediums	2	5	0	0	-	7	1	3	1	0	-	5	1	9	0	0	-	10	2	12	3	0	-	17	39
% Mediums	1.6	3.4	0.0	-	-	2.4	2.9	1.6	2.0	-	-	1.8	6.3	3.0	0.0	-	-	3.1	5.3	2.1	1.7	-	-	2.2	2.3
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	0	-	1	1
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	2.6	0.0	0.0	-	-	0.1	0.1
Pedestrians	-	-	-	-	5	-	-	-	-	-	7	-	-	-	-	-	3	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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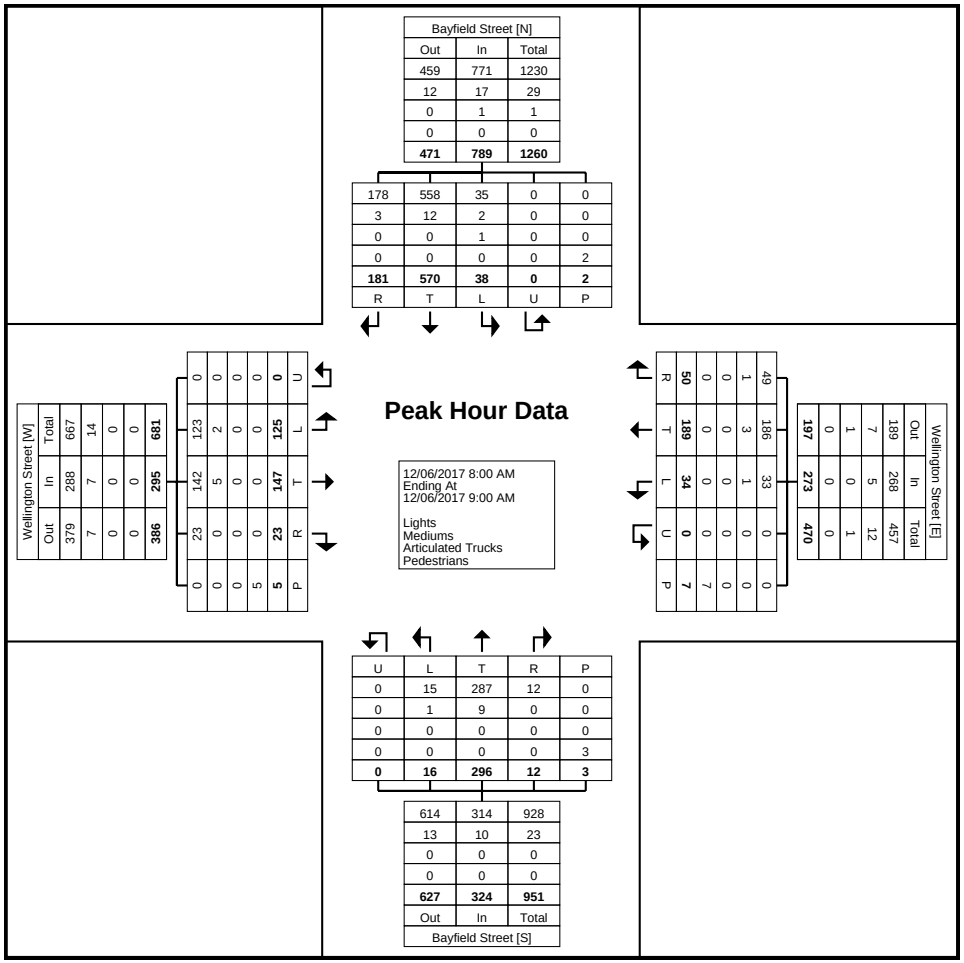
22 King Street South, Suite 300

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

Count Name: Bayfield Street & Wellington Street
Site Code:
Start Date: 12/06/2017



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 & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (11:30 AM)

Start Time	Wellington Street Eastbound						Wellington 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	
11:30 AM	58	38	10	0	2	106	8	36	10	0	3	54	11	113	9	0	0	133	12	142	39	0	1	193	486
11:45 AM	46	40	7	0	2	93	5	39	10	0	1	54	3	125	3	0	2	131	8	136	44	0	1	188	466
12:00 PM	56	51	10	0	2	117	8	37	7	0	1	52	4	134	3	0	0	141	4	115	31	0	0	150	460
12:15 PM	50	35	4	0	0	89	8	39	8	0	4	55	8	131	2	0	0	141	11	118	42	0	3	171	456
Total	210	164	31	0	6	405	29	151	35	0	9	215	26	503	17	0	2	546	35	511	156	0	5	702	1868
Approach %	51.9	40.5	7.7	0.0	-	-	13.5	70.2	16.3	0.0	-	-	4.8	92.1	3.1	0.0	-	-	5.0	72.8	22.2	0.0	-	-	-
Total %	11.2	8.8	1.7	0.0	-	21.7	1.6	8.1	1.9	0.0	-	11.5	1.4	26.9	0.9	0.0	-	29.2	1.9	27.4	8.4	0.0	-	37.6	-
PHF	0.905	0.804	0.775	0.000	-	0.865	0.906	0.968	0.875	0.000	-	0.977	0.591	0.938	0.472	0.000	-	0.968	0.729	0.900	0.886	0.000	-	0.909	0.961
Lights	206	162	28	0	-	396	29	148	34	0	-	211	26	492	15	0	-	533	35	497	150	0	-	682	1822
% Lights	98.1	98.8	90.3	-	-	97.8	100.0	98.0	97.1	-	-	98.1	100.0	97.8	88.2	-	-	97.6	100.0	97.3	96.2	-	-	97.2	97.5
Mediums	4	2	3	0	-	9	0	3	0	0	-	3	0	10	2	0	-	12	0	14	5	0	-	19	43
% Mediums	1.9	1.2	9.7	-	-	2.2	0.0	2.0	0.0	-	-	1.4	0.0	2.0	11.8	-	-	2.2	0.0	2.7	3.2	-	-	2.7	2.3
Articulated Trucks	0	0	0	0	-	0	0	0	1	0	-	1	0	1	0	0	-	1	0	0	1	0	-	1	3
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	2.9	-	-	0.5	0.0	0.2	0.0	-	-	0.2	0.0	0.0	0.6	-	-	0.1	0.2
Pedestrians	-	-	-	-	6	-	-	-	-	-	9	-	-	-	-	-	2	-	-	-	-	-	5	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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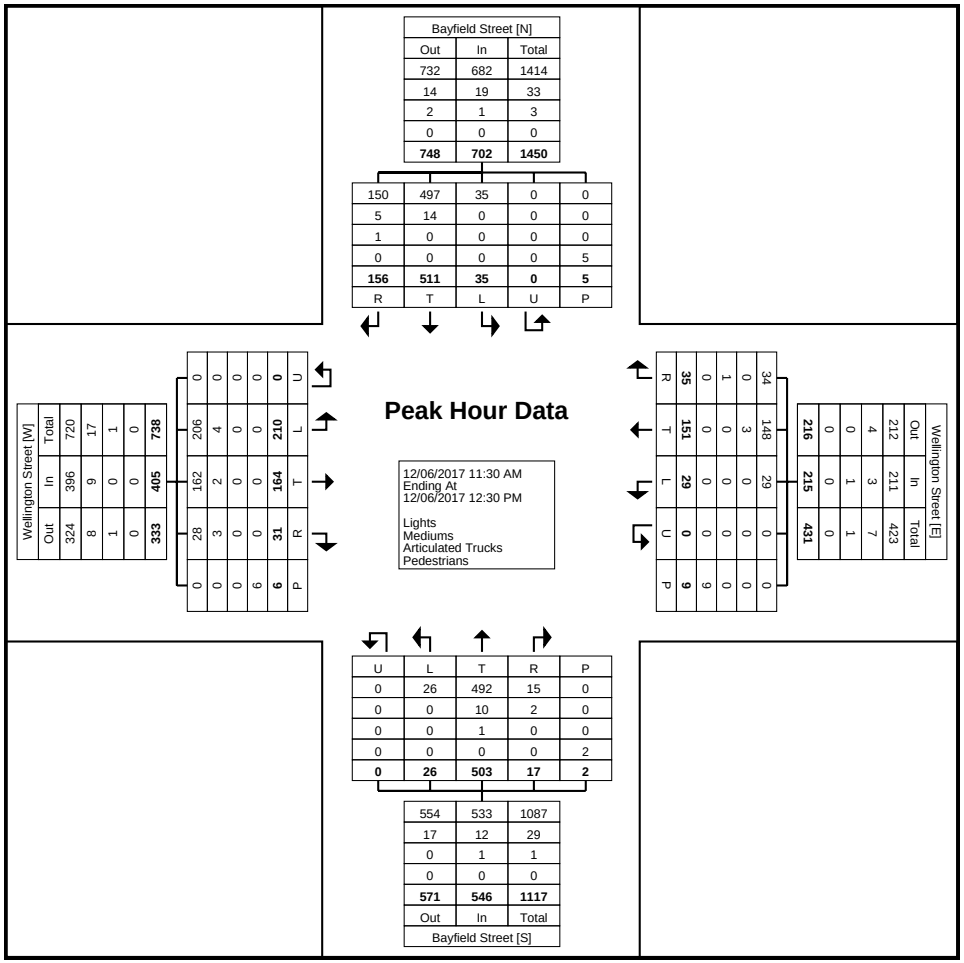
Count Name: Bayfield Street & Wellington Street
Site Code:
Start Date: 12/06/2017



Turning Movement Peak Hour Data Plot (11:30 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 & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Wellington Street Eastbound						Wellington 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	48	58	8	0	2	114	9	51	15	0	3	75	8	142	4	0	2	154	19	120	40	0	1	179	522
4:30 PM	77	74	5	0	3	156	9	48	14	0	5	71	6	174	6	0	1	186	12	137	44	0	2	193	606
4:45 PM	52	70	4	0	1	126	9	58	11	0	2	78	1	151	4	0	1	156	25	122	40	0	8	187	547
5:00 PM	62	81	3	0	1	146	9	55	15	0	1	79	9	208	7	0	6	224	26	144	36	0	2	206	655
Total	239	283	20	0	7	542	36	212	55	0	11	303	24	675	21	0	10	720	82	523	160	0	13	765	2330
Approach %	44.1	52.2	3.7	0.0	-	-	11.9	70.0	18.2	0.0	-	-	3.3	93.8	2.9	0.0	-	-	10.7	68.4	20.9	0.0	-	-	-
Total %	10.3	12.1	0.9	0.0	-	23.3	1.5	9.1	2.4	0.0	-	13.0	1.0	29.0	0.9	0.0	-	30.9	3.5	22.4	6.9	0.0	-	32.8	-
PHF	0.776	0.873	0.625	0.000	-	0.869	1.000	0.914	0.917	0.000	-	0.959	0.667	0.811	0.750	0.000	-	0.804	0.788	0.908	0.909	0.000	-	0.928	0.889
Lights	238	280	20	0	-	538	36	209	54	0	-	299	24	660	21	0	-	705	82	515	159	0	-	756	2298
% Lights	99.6	98.9	100.0	-	-	99.3	100.0	98.6	98.2	-	-	98.7	100.0	97.8	100.0	-	-	97.9	100.0	98.5	99.4	-	-	98.8	98.6
Mediums	0	3	0	0	-	3	0	3	1	0	-	4	0	15	0	0	-	15	0	8	1	0	-	9	31
% Mediums	0.0	1.1	0.0	-	-	0.6	0.0	1.4	1.8	-	-	1.3	0.0	2.2	0.0	-	-	2.1	0.0	1.5	0.6	-	-	1.2	1.3
Articulated Trucks	1	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1
% Articulated Trucks	0.4	0.0	0.0	-	-	0.2	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	-	-	-	-	7	-	-	-	-	-	11	-	-	-	-	-	10	-	-	-	-	-	13	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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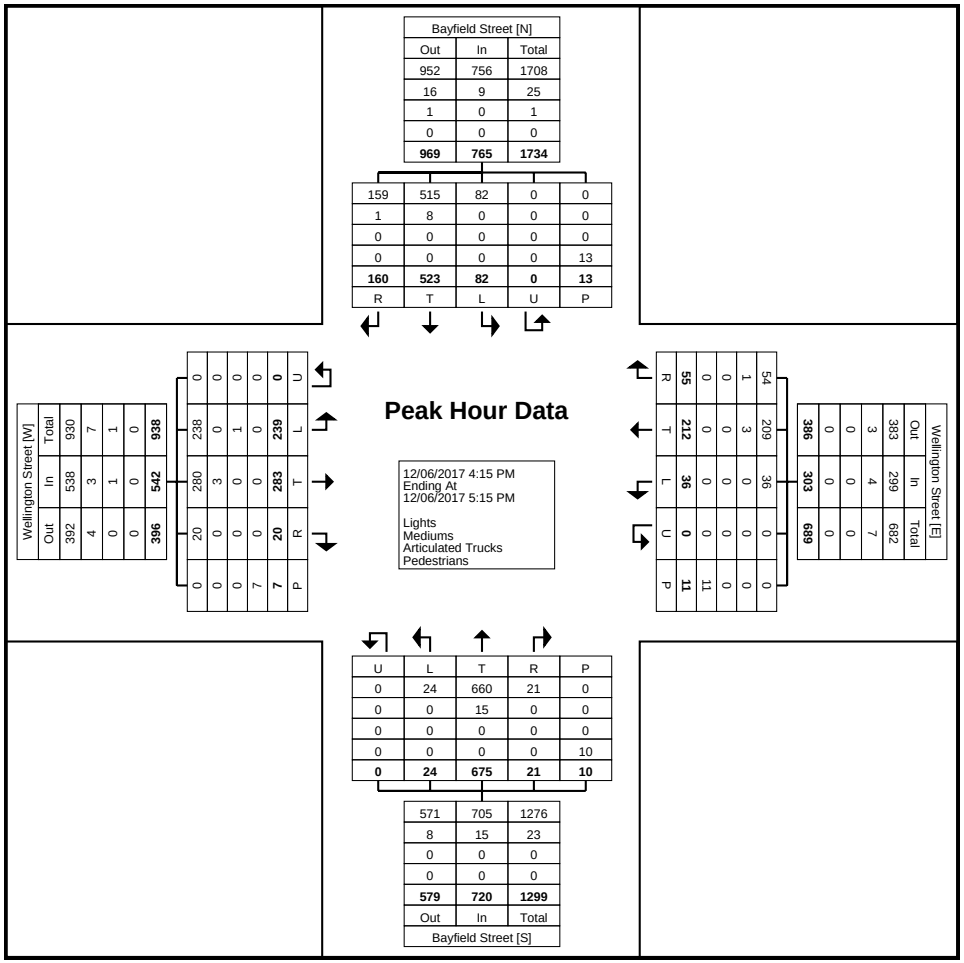
Count Name: Bayfield Street & Wellington Street
Site Code:
Start Date: 12/06/2017



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

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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

Count Name: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017

Turning Movement Data

Start Time	Sophia Street Eastbound						Sophia Street Westbound						McDonald Street Northbound						Drury Lane 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	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	8	0	0	0	0	0	0	8
6:15 AM	0	0	4	0	0	4	0	4	0	0	0	4	13	0	0	0	0	13	0	0	1	0	0	1	22
6:30 AM	0	0	6	0	0	6	0	3	0	0	0	3	5	0	0	0	0	5	0	1	0	0	0	1	15
6:45 AM	0	0	7	0	0	7	0	4	0	0	0	4	10	0	0	1	0	11	0	0	0	0	3	0	22
Hourly Total	0	0	17	0	0	17	0	11	0	0	0	11	36	0	0	1	0	37	0	1	1	0	3	2	67
7:00 AM	1	0	15	0	0	16	0	5	0	0	0	5	6	0	0	0	0	6	0	0	0	0	0	0	27
7:15 AM	0	1	21	0	0	22	0	3	0	0	1	3	18	0	0	0	0	18	0	1	2	0	0	3	46
7:30 AM	0	0	36	0	0	36	0	5	0	0	3	5	23	0	0	0	1	23	0	1	1	0	1	2	66
7:45 AM	0	0	58	0	0	58	0	3	0	0	1	3	31	0	0	0	0	31	0	0	2	0	1	2	94
Hourly Total	1	1	130	0	0	132	0	16	0	0	5	16	78	0	0	0	1	78	0	2	5	0	2	7	233
8:00 AM	0	0	47	0	0	47	0	3	0	0	1	3	22	0	0	0	0	22	0	1	1	0	0	2	74
8:15 AM	0	0	85	0	0	85	0	5	0	0	1	5	31	1	0	0	0	32	0	1	0	0	2	1	123
8:30 AM	3	0	67	0	0	70	1	3	0	0	2	4	31	0	0	0	0	31	0	2	3	0	3	5	110
8:45 AM	0	0	62	0	0	62	0	6	0	0	0	6	34	3	0	0	0	37	0	1	5	0	1	6	111
Hourly Total	3	0	261	0	0	264	1	17	0	0	4	18	118	4	0	0	0	122	0	5	9	0	6	14	418
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	1	0	34	0	2	35	0	0	0	0	0	0	26	1	0	0	6	27	0	1	3	0	7	4	66
11:15 AM	4	0	30	0	5	34	0	1	0	0	0	1	44	2	0	0	0	46	0	0	0	0	7	0	81
11:30 AM	2	0	43	0	3	45	1	3	1	0	2	5	41	0	0	0	2	41	0	1	2	0	1	3	94
11:45 AM	2	0	38	0	0	40	0	5	1	0	0	6	52	0	0	0	0	52	0	1	2	0	2	3	101
Hourly Total	9	0	145	0	10	154	1	9	2	0	2	12	163	3	0	0	8	166	0	3	7	0	17	10	342
12:00 PM	1	0	28	0	0	29	0	2	0	0	0	2	52	1	0	0	1	53	0	2	1	0	1	3	87
12:15 PM	1	1	34	0	0	36	0	5	0	0	1	5	53	0	0	0	0	53	0	2	0	0	1	2	96
12:30 PM	2	0	53	0	1	55	0	0	1	0	0	1	44	1	0	0	0	45	0	0	0	0	0	0	101
12:45 PM	2	0	55	0	0	57	0	6	0	0	0	6	42	0	0	0	0	42	0	2	0	0	0	2	107
Hourly Total	6	1	170	0	1	177	0	13	1	0	1	14	191	2	0	0	1	193	0	6	1	0	2	7	391
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	5	0	37	0	0	42	0	3	0	0	2	3	54	0	0	0	1	54	0	1	2	0	0	3	102
3:15 PM	0	0	28	0	1	28	0	4	0	0	0	4	36	1	0	0	0	37	0	0	2	0	0	2	71
3:30 PM	4	0	33	0	0	37	0	3	1	0	2	4	47	0	0	0	1	47	0	2	0	0	1	2	90
3:45 PM	2	0	30	0	1	32	0	3	0	0	1	3	37	0	0	0	0	37	0	0	1	0	4	1	73
Hourly Total	11	0	128	0	2	139	0	13	1	0	5	14	174	1	0	0	2	175	0	3	5	0	5	8	336
4:00 PM	1	0	47	0	0	48	1	5	0	0	1	6	81	0	0	0	0	81	0	0	0	0	1	0	135
4:15 PM	2	0	38	0	0	40	0	4	0	0	3	4	69	2	0	0	0	71	1	1	0	0	2	2	117
4:30 PM	2	0	40	0	0	42	0	7	0	0	4	7	78	0	0	0	0	78	0	0	1	0	0	1	128

4:45 PM	3	0	50	0	1	53	0	2	0	0	2	2	79	1	0	0	1	80	0	0	2	0	4	2	137
Hourly Total	8	0	175	0	1	183	1	18	0	0	10	19	307	3	0	0	1	310	1	1	3	0	7	5	517
5:00 PM	4	0	55	0	0	59	0	1	1	0	0	2	73	1	0	0	0	74	0	0	2	0	0	2	137
5:15 PM	0	0	34	0	0	34	0	0	0	0	0	0	52	0	0	0	0	52	0	0	0	0	3	0	86
5:30 PM	4	0	33	0	1	37	0	2	0	0	1	2	28	0	0	0	0	28	0	0	0	0	1	0	67
5:45 PM	1	0	29	1	2	31	0	6	0	0	0	6	23	0	0	0	0	23	0	1	2	0	0	3	63
Hourly Total	9	0	151	1	3	161	0	9	1	0	1	10	176	1	0	0	0	177	0	1	4	0	4	5	353
6:00 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	48	2	1177	1	17	1228	3	106	5	0	28	114	1243	14	0	1	13	1258	1	22	35	0	46	58	2658
Approach %	3.9	0.2	95.8	0.1	-	-	2.6	93.0	4.4	0.0	-	-	98.8	1.1	0.0	0.1	-	-	1.7	37.9	60.3	0.0	-	-	-
Total %	1.8	0.1	44.3	0.0	-	46.2	0.1	4.0	0.2	0.0	-	4.3	46.8	0.5	0.0	0.0	-	47.3	0.0	0.8	1.3	0.0	-	2.2	-
Lights	47	1	1173	1	-	1222	3	102	5	0	-	110	1234	13	0	1	-	1248	1	21	35	0	-	57	2637
% Lights	97.9	50.0	99.7	100.0	-	99.5	100.0	96.2	100.0	-	-	96.5	99.3	92.9	-	100.0	-	99.2	100.0	95.5	100.0	-	-	98.3	99.2
Mediums	1	1	4	0	-	6	0	4	0	0	-	4	9	1	0	0	-	10	0	1	0	0	-	1	21
% Mediums	2.1	50.0	0.3	0.0	-	0.5	0.0	3.8	0.0	-	-	3.5	0.7	7.1	-	0.0	-	0.8	0.0	4.5	0.0	-	-	1.7	0.8
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	0.0
Pedestrians	-	-	-	-	17	-	-	-	-	-	28	-	-	-	-	-	13	-	-	-	-	-	46	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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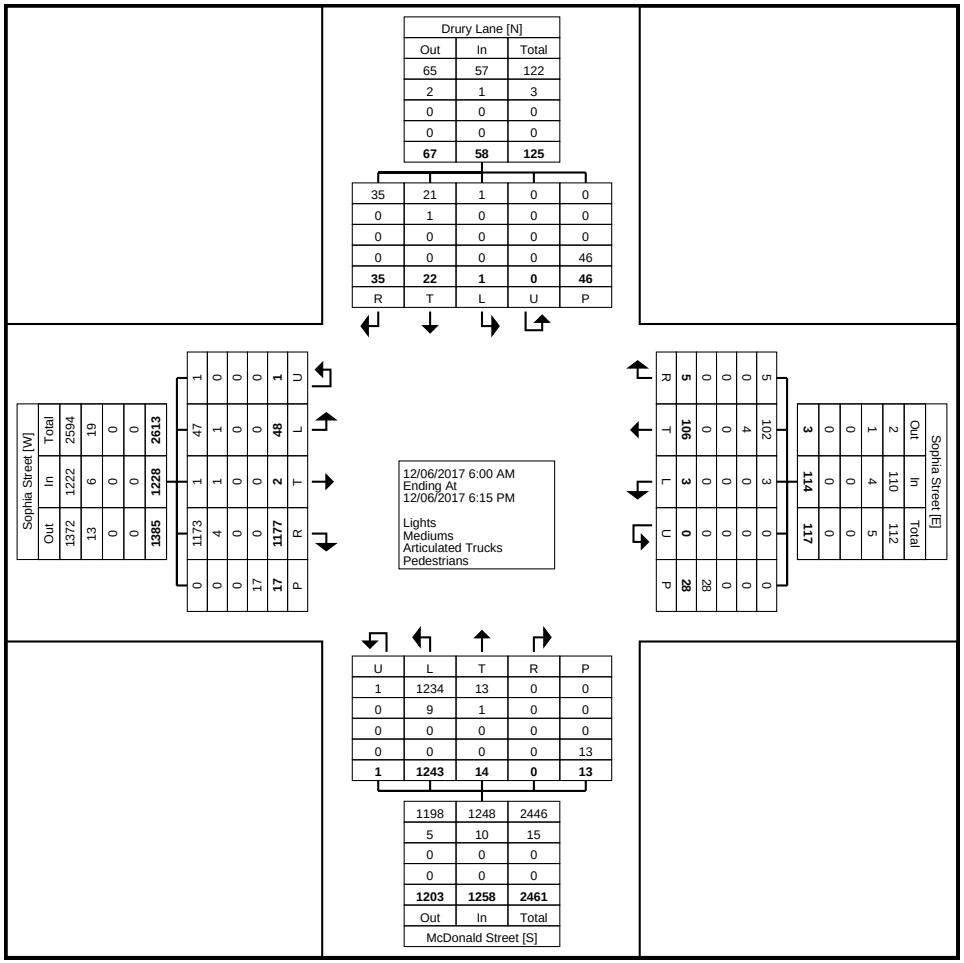

Turning Movement Data Plot

Paradigm Transportation Solutions Limited
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519-896-3163 cbowness@ptsl.com

Count Name: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017

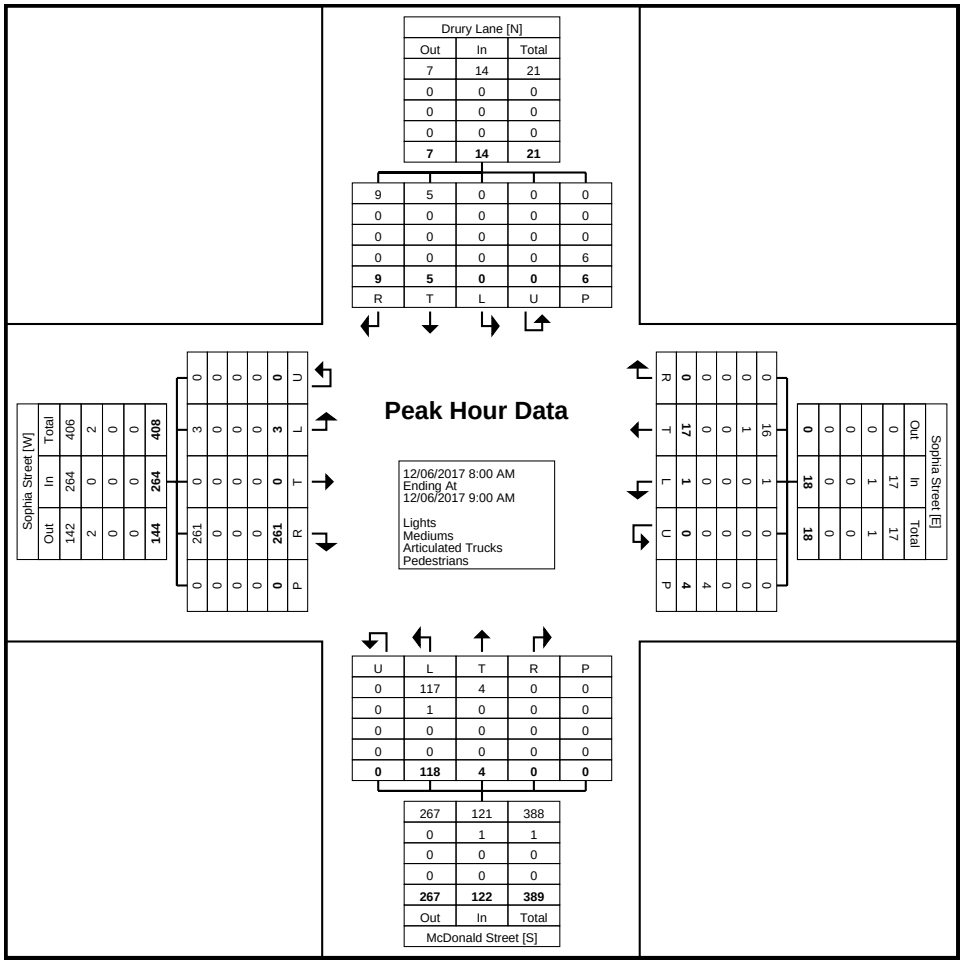
Turning Movement Peak Hour Data (8:00 AM)

Start Time	Sophia Street Eastbound						Sophia Street Westbound						McDonald Street Northbound						Drury Lane 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	0	0	47	0	0	47	0	3	0	0	1	3	22	0	0	0	0	22	0	1	1	0	0	2	74
8:15 AM	0	0	85	0	0	85	0	5	0	0	1	5	31	1	0	0	0	32	0	1	0	0	2	1	123
8:30 AM	3	0	67	0	0	70	1	3	0	0	2	4	31	0	0	0	0	31	0	2	3	0	3	5	110
8:45 AM	0	0	62	0	0	62	0	6	0	0	0	6	34	3	0	0	0	37	0	1	5	0	1	6	111
Total	3	0	261	0	0	264	1	17	0	0	4	18	118	4	0	0	0	122	0	5	9	0	6	14	418
Approach %	1.1	0.0	98.9	0.0	-	-	5.6	94.4	0.0	0.0	-	-	96.7	3.3	0.0	0.0	-	-	0.0	35.7	64.3	0.0	-	-	-
Total %	0.7	0.0	62.4	0.0	-	63.2	0.2	4.1	0.0	0.0	-	4.3	28.2	1.0	0.0	0.0	-	29.2	0.0	1.2	2.2	0.0	-	3.3	-
PHF	0.250	0.000	0.768	0.000	-	0.776	0.250	0.708	0.000	0.000	-	0.750	0.868	0.333	0.000	0.000	-	0.824	0.000	0.625	0.450	0.000	-	0.583	0.850
Lights	3	0	261	0	-	264	1	16	0	0	-	17	117	4	0	0	-	121	0	5	9	0	-	14	416
% Lights	100.0	-	100.0	-	-	100.0	100.0	94.1	-	-	-	94.4	99.2	100.0	-	-	-	99.2	-	100.0	100.0	-	-	100.0	99.5
Mediums	0	0	0	0	-	0	0	1	0	0	-	1	1	0	0	0	-	1	0	0	0	0	-	0	2
% Mediums	0.0	-	0.0	-	-	0.0	0.0	5.9	-	-	-	5.6	0.8	0.0	-	-	-	0.8	-	0.0	0.0	-	-	0.0	0.5
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
Pedestrians	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	0	-	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	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: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017



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: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (12:00 PM)

Start Time	Sophia Street Eastbound						Sophia Street Westbound						McDonald Street Northbound						Drury Lane 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	
12:00 PM	1	0	28	0	0	29	0	2	0	0	0	2	52	1	0	0	1	53	0	2	1	0	1	3	87
12:15 PM	1	1	34	0	0	36	0	5	0	0	1	5	53	0	0	0	0	53	0	2	0	0	1	2	96
12:30 PM	2	0	53	0	1	55	0	0	1	0	0	1	44	1	0	0	0	45	0	0	0	0	0	0	101
12:45 PM	2	0	55	0	0	57	0	6	0	0	0	6	42	0	0	0	0	42	0	2	0	0	0	2	107
Total	6	1	170	0	1	177	0	13	1	0	1	14	191	2	0	0	1	193	0	6	1	0	2	7	391
Approach %	3.4	0.6	96.0	0.0	-	-	0.0	92.9	7.1	0.0	-	-	99.0	1.0	0.0	0.0	-	-	0.0	85.7	14.3	0.0	-	-	-
Total %	1.5	0.3	43.5	0.0	-	45.3	0.0	3.3	0.3	0.0	-	3.6	48.8	0.5	0.0	0.0	-	49.4	0.0	1.5	0.3	0.0	-	1.8	-
PHF	0.750	0.250	0.773	0.000	-	0.776	0.000	0.542	0.250	0.000	-	0.583	0.901	0.500	0.000	0.000	-	0.910	0.000	0.750	0.250	0.000	-	0.583	0.914
Lights	6	0	169	0	-	175	0	13	1	0	-	14	191	2	0	0	-	193	0	5	1	0	-	6	388
% Lights	100.0	0.0	99.4	-	-	98.9	-	100.0	100.0	-	-	100.0	100.0	100.0	-	-	-	100.0	-	83.3	100.0	-	-	85.7	99.2
Mediums	0	1	1	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	3
% Mediums	0.0	100.0	0.6	-	-	1.1	-	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	-	16.7	0.0	-	-	14.3	0.8
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
Pedestrians	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
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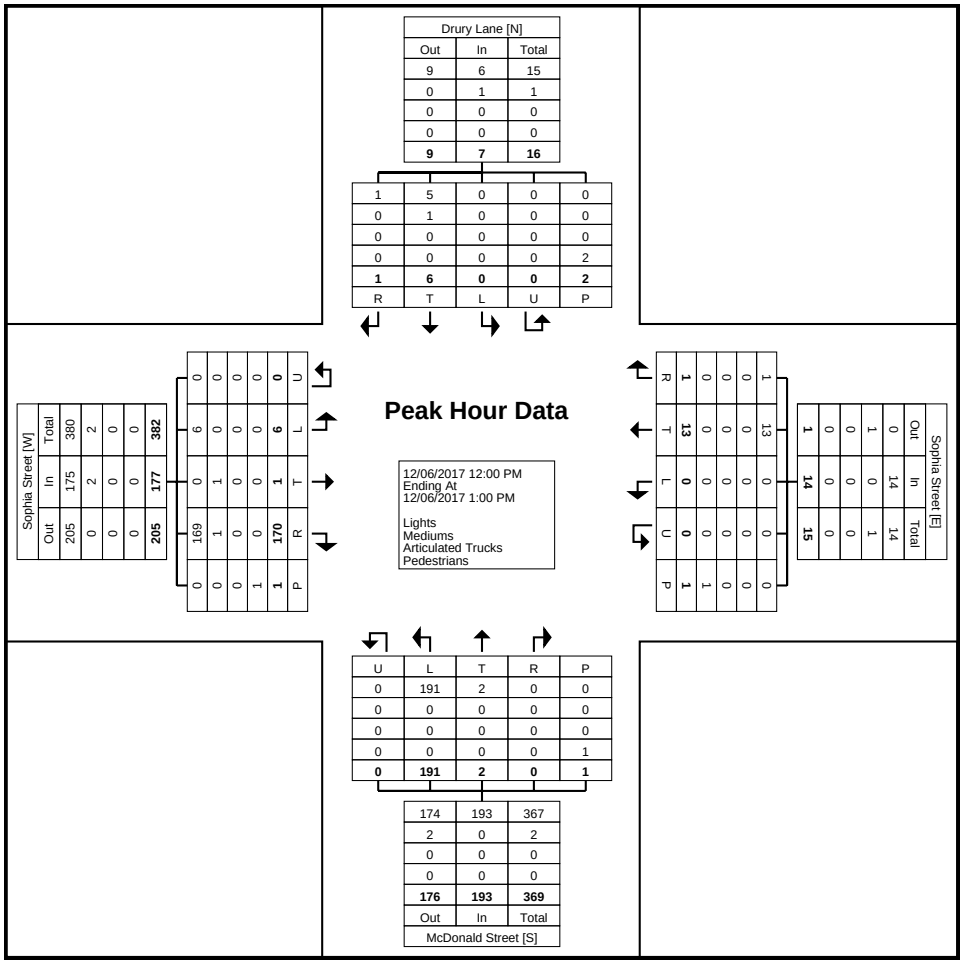
519-896-3163 cbowness@ptsl.com

Count Name: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017



Turning Movement Peak Hour Data Plot (12:00 PM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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

Count Name: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Sophia Street Eastbound						Sophia Street Westbound						McDonald Street Northbound						Drury Lane Southbound						
	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	Int. Total
4:15 PM	2	0	38	0	0	40	0	4	0	0	3	4	69	2	0	0	0	71	1	1	0	0	2	2	117
4:30 PM	2	0	40	0	0	42	0	7	0	0	4	7	78	0	0	0	0	78	0	0	1	0	0	1	128
4:45 PM	3	0	50	0	1	53	0	2	0	0	2	2	79	1	0	0	1	80	0	0	2	0	4	2	137
5:00 PM	4	0	55	0	0	59	0	1	1	0	0	2	73	1	0	0	0	74	0	0	2	0	0	2	137
Total	11	0	183	0	1	194	0	14	1	0	9	15	299	4	0	0	1	303	1	1	5	0	6	7	519
Approach %	5.7	0.0	94.3	0.0	-	-	0.0	93.3	6.7	0.0	-	-	98.7	1.3	0.0	0.0	-	-	14.3	14.3	71.4	0.0	-	-	-
Total %	2.1	0.0	35.3	0.0	-	37.4	0.0	2.7	0.2	0.0	-	2.9	57.6	0.8	0.0	0.0	-	58.4	0.2	0.2	1.0	0.0	-	1.3	-
PHF	0.688	0.000	0.832	0.000	-	0.822	0.000	0.500	0.250	0.000	-	0.536	0.946	0.500	0.000	0.000	-	0.947	0.250	0.250	0.625	0.000	-	0.875	0.947
Lights	10	0	183	0	-	193	0	14	1	0	-	15	295	4	0	0	-	299	1	1	5	0	-	7	514
% Lights	90.9	-	100.0	-	-	99.5	-	100.0	100.0	-	-	100.0	98.7	100.0	-	-	-	98.7	100.0	100.0	100.0	-	-	100.0	99.0
Mediums	1	0	0	0	-	1	0	0	0	0	-	0	4	0	0	0	-	4	0	0	0	0	-	0	5
% Mediums	9.1	-	0.0	-	-	0.5	-	0.0	0.0	-	-	0.0	1.3	0.0	-	-	-	1.3	0.0	0.0	0.0	-	-	0.0	1.0
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
Pedestrians	-	-	-	-	1	-	-	-	-	-	9	-	-	-	-	-	1	-	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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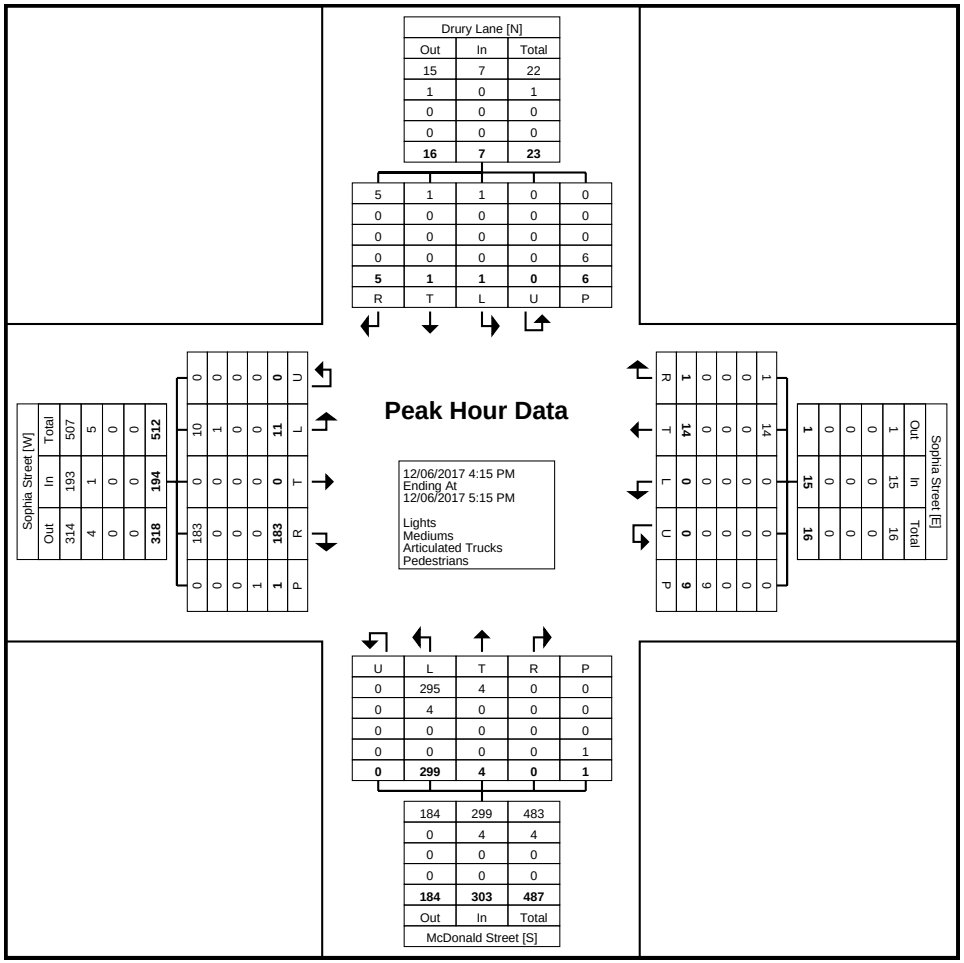
519-896-3163 cbowness@ptsl.com

Count Name: Drury Lane & Sophia Street
Site Code:
Start Date: 12/06/2017



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

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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

Count Name: Drury Lane & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Data

Start Time	Wellington Street Eastbound						Wellington Street Westbound						Drury Lane Northbound						Drury Lane 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	0	10	0	0	0	10	0	17	0	0	0	17	0	0	0	0	0	0	0	0	1	0	0	1	28
6:15 AM	0	19	0	0	0	19	0	35	0	0	0	35	0	0	0	0	0	0	0	1	1	0	0	2	56
6:30 AM	0	19	1	0	0	20	0	36	0	0	0	36	1	0	1	0	0	2	0	0	0	0	0	0	58
6:45 AM	0	23	0	0	0	23	0	55	0	0	0	55	1	0	0	0	0	1	0	0	2	0	0	2	81
Hourly Total	0	71	1	0	0	72	0	143	0	0	0	143	2	0	1	0	0	3	0	1	4	0	0	5	223
7:00 AM	0	30	0	0	0	30	0	49	0	0	0	49	0	0	0	0	0	0	0	1	2	0	1	3	82
7:15 AM	0	25	0	0	0	25	2	62	0	0	0	64	0	0	0	0	0	0	0	1	2	0	2	3	92
7:30 AM	0	42	0	0	1	42	0	74	0	0	0	74	1	1	0	0	0	2	1	2	1	0	6	4	122
7:45 AM	0	62	1	0	3	63	0	74	1	0	0	75	0	0	1	0	1	1	0	1	5	0	4	6	145
Hourly Total	0	159	1	0	4	160	2	259	1	0	0	262	1	1	1	0	1	3	1	5	10	0	13	16	441
8:00 AM	0	32	2	0	0	34	0	69	1	0	0	70	0	0	0	0	1	0	0	0	3	0	0	3	107
8:15 AM	0	48	0	0	1	48	1	54	2	0	0	57	1	0	0	0	0	1	1	0	3	0	6	4	110
8:30 AM	0	54	3	0	1	57	1	54	0	0	0	55	5	2	0	0	1	7	0	1	0	0	0	1	120
8:45 AM	2	50	3	0	0	55	0	83	0	0	0	83	1	3	2	0	0	6	0	2	0	0	1	2	146
Hourly Total	2	184	8	0	2	194	2	260	3	0	0	265	7	5	2	0	2	14	1	3	6	0	7	10	483
9:00 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
11:00 AM	0	44	2	0	1	46	1	54	0	0	0	55	1	2	0	0	1	3	0	2	1	0	39	3	107
11:15 AM	0	53	3	0	0	56	0	60	0	0	0	60	2	1	1	0	0	4	0	0	2	0	15	2	122
11:30 AM	2	59	1	0	4	62	0	53	1	0	2	54	1	1	2	0	0	4	0	1	2	0	34	3	123
11:45 AM	0	52	2	0	0	54	0	50	0	0	1	50	0	0	0	0	1	0	0	0	0	0	0	0	104
Hourly Total	2	208	8	0	5	218	1	217	1	0	3	219	4	4	3	0	2	11	0	3	5	0	88	8	456
12:00 PM	1	69	2	0	0	72	0	48	0	0	0	48	1	0	1	0	0	2	0	1	3	0	3	4	126
12:15 PM	1	43	2	0	0	46	1	50	0	0	0	51	1	1	1	0	0	3	0	1	2	0	1	3	103
12:30 PM	2	46	0	0	1	48	2	54	1	0	0	57	2	1	2	0	0	5	1	0	0	0	8	1	111
12:45 PM	2	60	0	0	2	62	0	41	1	0	2	42	1	0	2	0	2	3	0	2	2	0	2	4	111
Hourly Total	6	218	4	0	3	228	3	193	2	0	2	198	5	2	6	0	2	13	1	4	7	0	14	12	451
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	2	70	2	0	2	74	1	55	0	0	2	56	1	2	2	0	2	5	0	0	4	0	7	4	139
3:15 PM	1	82	2	0	2	85	0	76	0	0	0	76	1	1	0	0	0	2	0	2	1	0	3	3	166
3:30 PM	5	69	1	0	0	75	0	82	0	0	0	82	1	0	1	0	0	2	0	0	0	0	2	0	159
3:45 PM	1	69	1	0	1	71	0	63	1	0	0	64	0	0	2	0	1	2	0	1	1	0	4	2	139
Hourly Total	9	290	6	0	5	305	1	276	1	0	2	278	3	3	5	0	3	11	0	3	6	0	16	9	603
4:00 PM	4	86	2	0	0	92	0	43	0	0	0	43	1	0	1	0	0	2	0	2	1	0	6	3	140

4:15 PM	1	79	0	0	1	80	0	70	0	0	0	70	0	1	2	0	1	3	0	0	1	0	3	1	154
4:30 PM	2	90	2	0	1	94	1	65	1	0	0	67	0	1	2	0	0	3	0	1	2	0	4	3	167
4:45 PM	2	94	1	0	1	97	2	75	0	0	1	77	3	2	1	0	1	6	0	1	2	0	5	3	183
Hourly Total	9	349	5	0	3	363	3	253	1	0	1	257	4	4	6	0	2	14	0	4	6	0	18	10	644
5:00 PM	2	114	0	0	0	116	3	69	2	0	1	74	1	1	4	0	2	6	1	0	2	0	4	3	199
5:15 PM	4	90	1	0	0	95	0	54	0	0	0	54	0	3	0	0	0	3	1	0	3	0	6	4	156
5:30 PM	0	98	3	0	4	101	0	38	0	0	0	38	0	1	1	0	1	2	0	0	1	0	3	1	142
5:45 PM	0	88	2	0	4	90	0	70	0	0	0	70	0	2	0	0	0	2	0	2	0	0	6	2	164
Hourly Total	6	390	6	0	8	402	3	231	2	0	1	236	1	7	5	0	3	13	2	2	6	0	19	10	661
6:00 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	34	1869	39	0	30	1942	15	1834	11	0	9	1860	27	26	29	0	15	82	5	25	50	0	175	80	3964
Approach %	1.8	96.2	2.0	0.0	-	-	0.8	98.6	0.6	0.0	-	-	32.9	31.7	35.4	0.0	-	-	6.3	31.3	62.5	0.0	-	-	-
Total %	0.9	47.1	1.0	0.0	-	49.0	0.4	46.3	0.3	0.0	-	46.9	0.7	0.7	0.7	0.0	-	2.1	0.1	0.6	1.3	0.0	-	2.0	-
Lights	34	1829	39	0	-	1902	15	1805	9	0	-	1829	25	26	29	0	-	80	5	25	49	0	-	79	3890
% Lights	100.0	97.9	100.0	-	-	97.9	100.0	98.4	81.8	-	-	98.3	92.6	100.0	100.0	-	-	97.6	100.0	100.0	98.0	-	-	98.8	98.1
Mediums	0	36	0	0	-	36	0	28	2	0	-	30	2	0	0	0	-	2	0	0	1	0	-	1	69
% Mediums	0.0	1.9	0.0	-	-	1.9	0.0	1.5	18.2	-	-	1.6	7.4	0.0	0.0	-	-	2.4	0.0	0.0	2.0	-	-	1.3	1.7
Articulated Trucks	0	4	0	0	-	4	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	5
% Articulated Trucks	0.0	0.2	0.0	-	-	0.2	0.0	0.1	0.0	-	-	0.1	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.1
Pedestrians	-	-	-	-	30	-	-	-	-	-	9	-	-	-	-	-	15	-	-	-	-	-	175	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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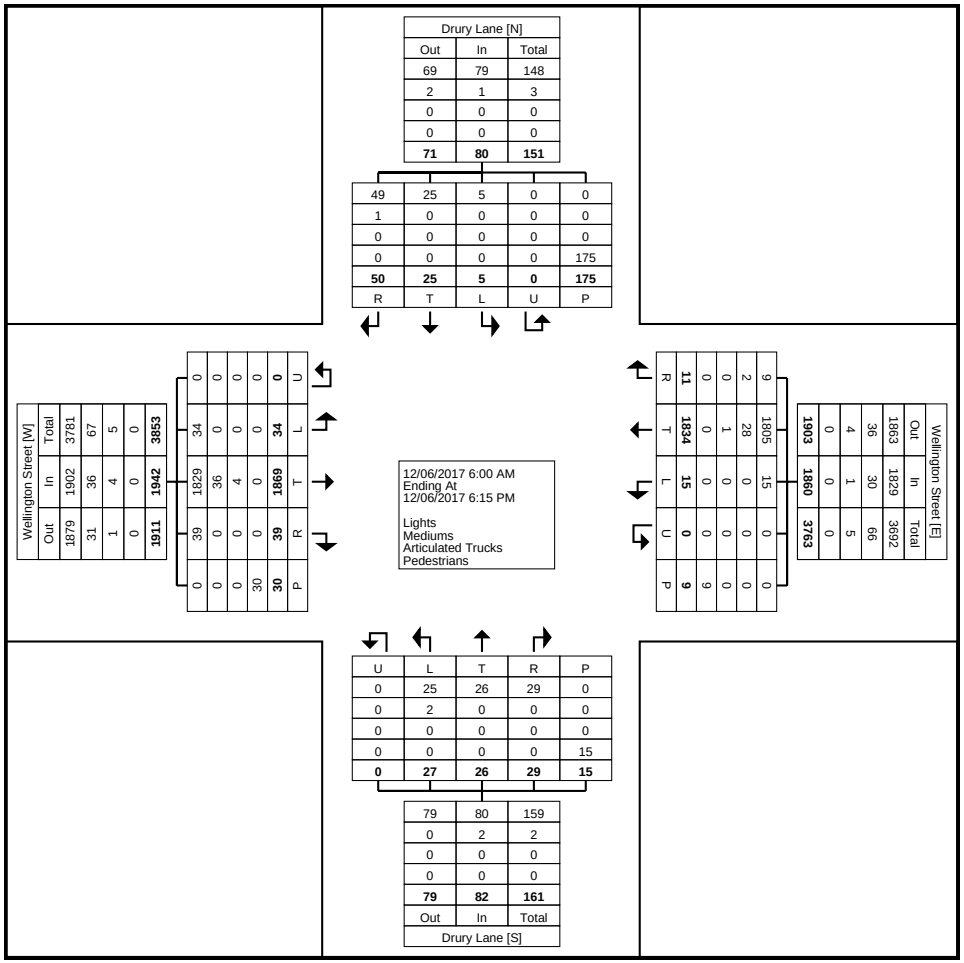
Count Name: Drury Lane & Wellington Street
Site Code:
Start Date: 12/06/2017



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: Drury Lane & Wellington Street
Site Code:
Start Date: 12/06/2017

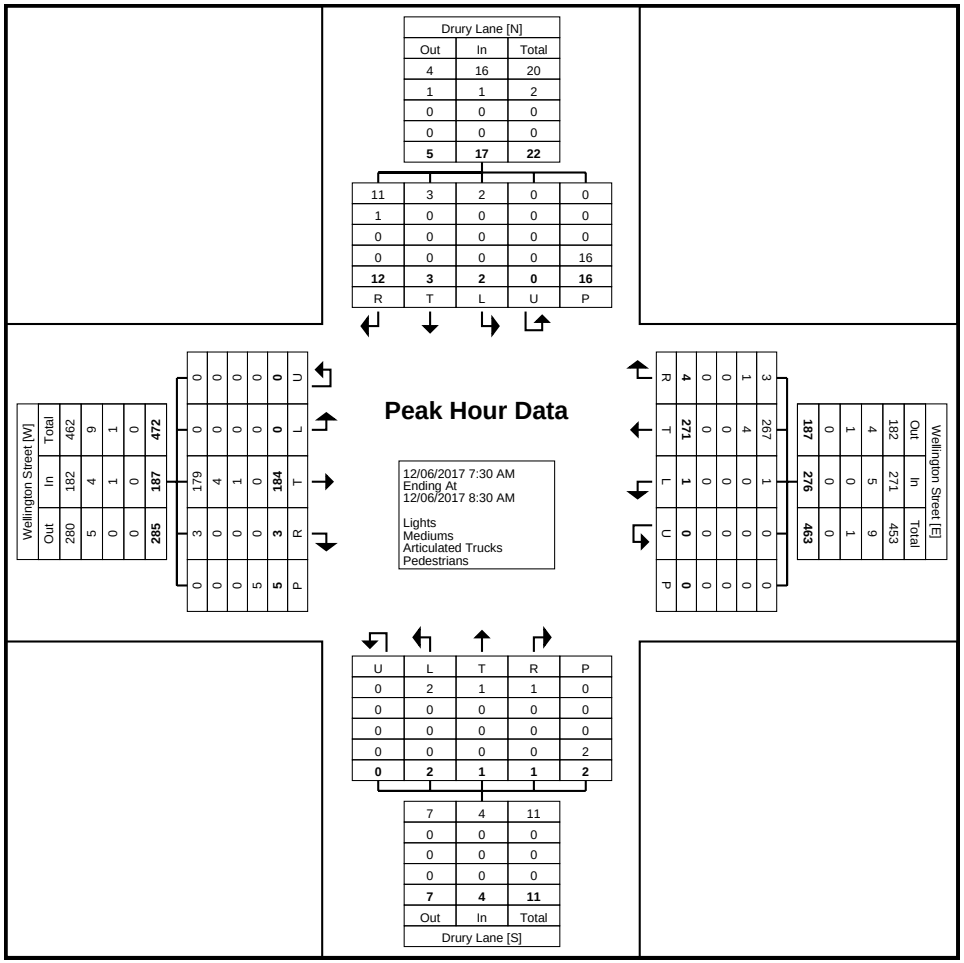
Turning Movement Peak Hour Data (7:30 AM)

Start Time	Wellington Street Eastbound						Wellington Street Westbound						Drury Lane Northbound						Drury Lane 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	
7:30 AM	0	42	0	0	1	42	0	74	0	0	0	74	1	1	0	0	0	2	1	2	1	0	6	4	122
7:45 AM	0	62	1	0	3	63	0	74	1	0	0	75	0	0	1	0	1	1	0	1	5	0	4	6	145
8:00 AM	0	32	2	0	0	34	0	69	1	0	0	70	0	0	0	0	1	0	0	0	3	0	0	3	107
8:15 AM	0	48	0	0	1	48	1	54	2	0	0	57	1	0	0	0	0	1	1	0	3	0	6	4	110
Total	0	184	3	0	5	187	1	271	4	0	0	276	2	1	1	0	2	4	2	3	12	0	16	17	484
Approach %	0.0	98.4	1.6	0.0	-	-	0.4	98.2	1.4	0.0	-	-	50.0	25.0	25.0	0.0	-	-	11.8	17.6	70.6	0.0	-	-	-
Total %	0.0	38.0	0.6	0.0	-	38.6	0.2	56.0	0.8	0.0	-	57.0	0.4	0.2	0.2	0.0	-	0.8	0.4	0.6	2.5	0.0	-	3.5	-
PHF	0.000	0.742	0.375	0.000	-	0.742	0.250	0.916	0.500	0.000	-	0.920	0.500	0.250	0.250	0.000	-	0.500	0.500	0.375	0.600	0.000	-	0.708	0.834
Lights	0	179	3	0	-	182	1	267	3	0	-	271	2	1	1	0	-	4	2	3	11	0	-	16	473
% Lights	-	97.3	100.0	-	-	97.3	100.0	98.5	75.0	-	-	98.2	100.0	100.0	100.0	-	-	100.0	100.0	100.0	91.7	-	-	94.1	97.7
Mediums	0	4	0	0	-	4	0	4	1	0	-	5	0	0	0	0	-	0	0	0	1	0	-	1	10
% Mediums	-	2.2	0.0	-	-	2.1	0.0	1.5	25.0	-	-	1.8	0.0	0.0	0.0	-	-	0.0	0.0	0.0	8.3	-	-	5.9	2.1
Articulated Trucks	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1
% Articulated Trucks	-	0.5	0.0	-	-	0.5	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.2
Pedestrians	-	-	-	-	5	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	16	-	-
% Pedestrians	-	-	-	-	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: Drury Lane & Wellington Street
Site Code:
Start Date: 12/06/2017



Turning Movement Peak Hour Data Plot (7:30 AM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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

Count Name: Drury Lane & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (11:15 AM)

Start Time	Wellington Street Eastbound						Wellington Street Westbound						Drury Lane Northbound						Drury Lane 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	
11:15 AM	0	53	3	0	0	56	0	60	0	0	0	60	2	1	1	0	0	4	0	0	2	0	15	2	122
11:30 AM	2	59	1	0	4	62	0	53	1	0	2	54	1	1	2	0	0	4	0	1	2	0	34	3	123
11:45 AM	0	52	2	0	0	54	0	50	0	0	1	50	0	0	0	0	1	0	0	0	0	0	0	0	104
12:00 PM	1	69	2	0	0	72	0	48	0	0	0	48	1	0	1	0	0	2	0	1	3	0	3	4	126
Total	3	233	8	0	4	244	0	211	1	0	3	212	4	2	4	0	1	10	0	2	7	0	52	9	475
Approach %	1.2	95.5	3.3	0.0	-	-	0.0	99.5	0.5	0.0	-	-	40.0	20.0	40.0	0.0	-	-	0.0	22.2	77.8	0.0	-	-	-
Total %	0.6	49.1	1.7	0.0	-	51.4	0.0	44.4	0.2	0.0	-	44.6	0.8	0.4	0.8	0.0	-	2.1	0.0	0.4	1.5	0.0	-	1.9	-
PHF	0.375	0.844	0.667	0.000	-	0.847	0.000	0.879	0.250	0.000	-	0.883	0.500	0.500	0.500	0.000	-	0.625	0.000	0.500	0.583	0.000	-	0.563	0.942
Lights	3	229	8	0	-	240	0	206	1	0	-	207	4	2	4	0	-	10	0	2	7	0	-	9	466
% Lights	100.0	98.3	100.0	-	-	98.4	-	97.6	100.0	-	-	97.6	100.0	100.0	100.0	-	-	100.0	-	100.0	100.0	-	-	100.0	98.1
Mediums	0	4	0	0	-	4	0	4	0	0	-	4	0	0	0	0	-	0	0	0	0	0	-	0	8
% Mediums	0.0	1.7	0.0	-	-	1.6	-	1.9	0.0	-	-	1.9	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	1.7
Articulated Trucks	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	-	0.5	0.0	-	-	0.5	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.2
Pedestrians	-	-	-	-	4	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	52	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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Count Name: Drury Lane & Wellington Street
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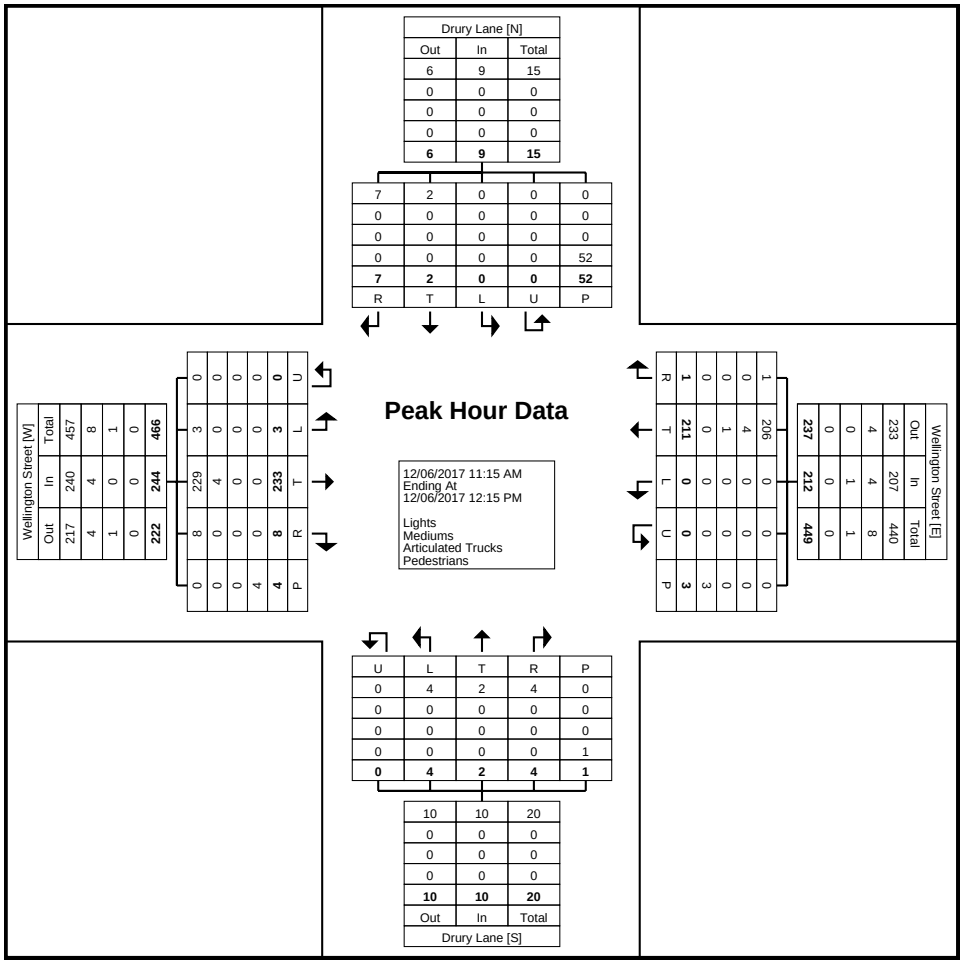
Start Date: 12/06/2017



Turning Movement Peak Hour Data Plot (11:15 AM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

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

Count Name: Drury Lane & Wellington Street
Site Code:
Start Date: 12/06/2017

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Wellington Street Eastbound						Wellington Street Westbound						Drury Lane Northbound						Drury Lane 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	
4:30 PM	2	90	2	0	1	94	1	65	1	0	0	67	0	1	2	0	0	3	0	1	2	0	4	3	167
4:45 PM	2	94	1	0	1	97	2	75	0	0	1	77	3	2	1	0	1	6	0	1	2	0	5	3	183
5:00 PM	2	114	0	0	0	116	3	69	2	0	1	74	1	1	4	0	2	6	1	0	2	0	4	3	199
5:15 PM	4	90	1	0	0	95	0	54	0	0	0	54	0	3	0	0	0	3	1	0	3	0	6	4	156
Total	10	388	4	0	2	402	6	263	3	0	2	272	4	7	7	0	3	18	2	2	9	0	19	13	705
Approach %	2.5	96.5	1.0	0.0	-	-	2.2	96.7	1.1	0.0	-	-	22.2	38.9	38.9	0.0	-	-	15.4	15.4	69.2	0.0	-	-	-
Total %	1.4	55.0	0.6	0.0	-	57.0	0.9	37.3	0.4	0.0	-	38.6	0.6	1.0	1.0	0.0	-	2.6	0.3	0.3	1.3	0.0	-	1.8	-
PHF	0.625	0.851	0.500	0.000	-	0.866	0.500	0.877	0.375	0.000	-	0.883	0.333	0.583	0.438	0.000	-	0.750	0.500	0.500	0.750	0.000	-	0.813	0.886
Lights	10	385	4	0	-	399	6	259	3	0	-	268	3	7	7	0	-	17	2	2	9	0	-	13	697
% Lights	100.0	99.2	100.0	-	-	99.3	100.0	98.5	100.0	-	-	98.5	75.0	100.0	100.0	-	-	94.4	100.0	100.0	100.0	-	-	100.0	98.9
Mediums	0	3	0	0	-	3	0	4	0	0	-	4	1	0	0	0	-	1	0	0	0	0	-	0	8
% Mediums	0.0	0.8	0.0	-	-	0.7	0.0	1.5	0.0	-	-	1.5	25.0	0.0	0.0	-	-	5.6	0.0	0.0	0.0	-	-	0.0	1.1
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	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	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	19	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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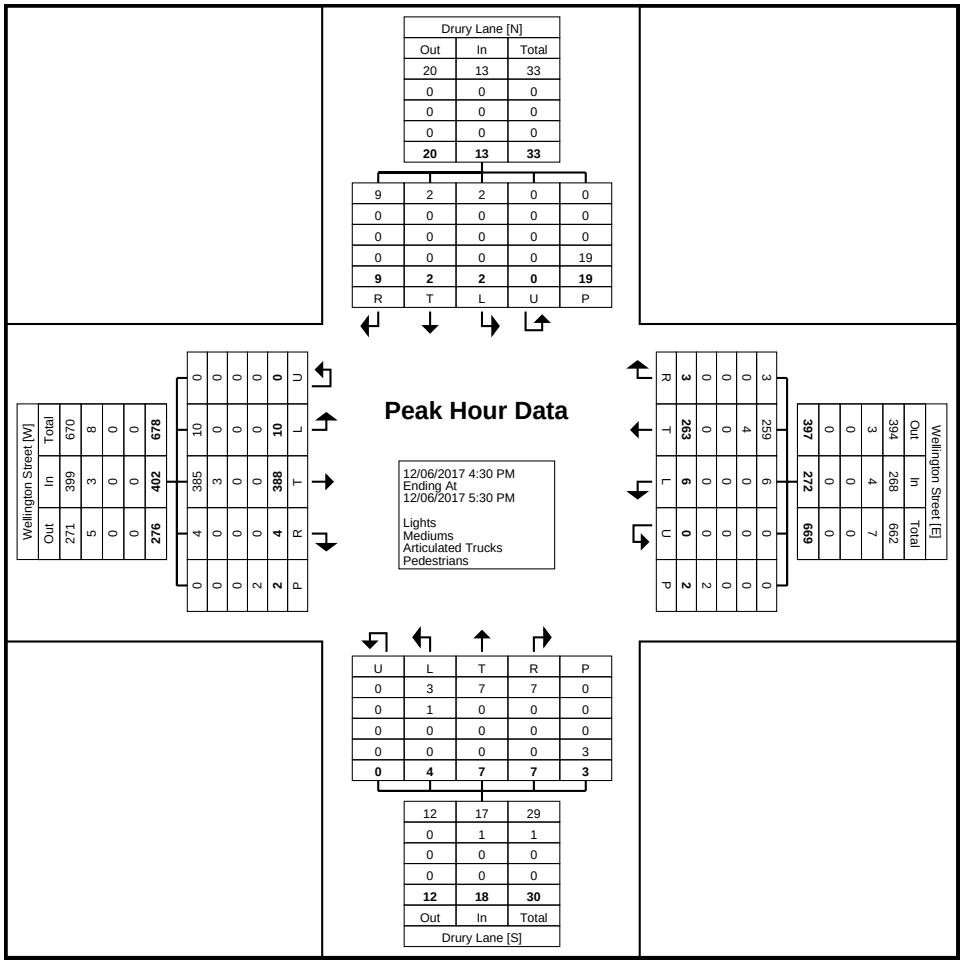


Turning Movement Peak Hour Data Plot (4:30 PM)

Appendix C

Existing Signal Timings

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:

		Vehicular Indications				Pedestrian Indications	
Roadway	**Direction**	**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

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 Wellington Street

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

		Vehicular Indications				Pedestrian Indications	
Roadway	**Direction**	**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	24	24	4	2	10	14
Wellington Street (Side Street)	Eastbound Advanced Left Turn	7	10	3	1	N/A	N/A
Wellington Street (Side Street)	Eastbound/ Westbound	10	25	4	2	10	15

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

Appendix D

Base Year (2020) Traffic Operations Reports

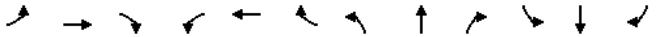
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	139	189	38	265	17	342	42	835
v/c Ratio	0.40	0.31	0.15	0.66	0.07	0.24	0.08	0.49
Control Delay	18.4	17.0	24.4	33.0	20.2	17.6	11.1	13.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	17.0	24.4	33.0	20.2	17.6	11.1	13.5
Queue Length 50th (m)	13.1	17.9	4.5	33.5	1.7	18.8	2.9	38.1
Queue Length 95th (m)	24.4	32.2	11.9	56.8	6.9	33.1	9.0	63.8
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	345	929	417	648	247	1431	523	1714
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	0.40	0.20	0.09	0.41	0.07	0.24	0.08	0.49

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	128	150	24	35	193	51	16	303	12	39	583	185
Future Volume (vph)	128	150	24	35	193	51	16	303	12	39	583	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1769	1810		1749	1800		1699	3485		1667	3389	
Flt Permitted	0.35	1.00		0.64	1.00		0.34	1.00		0.48	1.00	
Satd. Flow (perm)	646	1810		1175	1800		603	3485		843	3389	
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)	139	163	26	38	210	55	17	329	13	42	634	201
RTOR Reduction (vph)	0	8	0	0	13	0	0	3	0	0	31	0
Lane Group Flow (vph)	139	181	0	38	252	0	17	339	0	42	804	0
Confl. Peds. (#/hr)	2		3	3		2	5		7	7		5
Heavy Vehicles (%)	2%	3%	0%	3%	2%	2%	6%	3%	0%	8%	2%	2%
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)	24.7	24.7		15.4	15.4		29.3	29.3		37.2	37.2	
Effective Green, g (s)	24.7	24.7		15.4	15.4		29.3	29.3		37.2	37.2	
Actuated g/C Ratio	0.33	0.33		0.21	0.21		0.40	0.40		0.50	0.50	
Clearance Time (s)	4.0	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)	296	604		244	375		239	1381		467	1705	
v/s Ratio Prot	c0.03	0.10			c0.14			0.10		0.00	c0.24	
v/s Ratio Perm	0.12			0.03			0.03			0.04		
v/c Ratio	0.47	0.30		0.16	0.67		0.07	0.25		0.09	0.47	
Uniform Delay, d1	18.3	18.2		23.9	26.9		13.8	14.9		9.5	11.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.3		0.3	4.7		0.6	0.4		0.1	0.9	
Delay (s)	19.5	18.5		24.2	31.6		14.4	15.3		9.5	12.9	
Level of Service	B	B		C	C		B	B		A	B	
Approach Delay (s)		18.9			30.7			15.3			12.7	
Approach LOS		B			C			B			B	

Intersection Summary					
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.57				
Actuated Cycle Length (s)	73.9	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	66.6%	ICU Level of Service		C	
Analysis Period (min)	15				

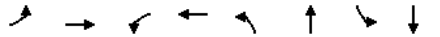
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	188	3	1	277	4	2	1	1	2	3	12
Future Volume (Veh/h)	0	188	3	1	277	4	2	1	1	2	3	12
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)	0	204	3	1	301	4	2	1	1	2	3	13
Pedestrians		5						2			16	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		0						0			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		101										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	
vC, conflicting volume	321			209			532	530	208	528	530	324
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	321			141			481	479	139	477	479	324
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	100			100			100	100	100	100	99	98
cM capacity (veh/h)	1234			1379			454	457	867	464	457	691

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	207	306	4	18
Volume Left	0	1	2	2
Volume Right	3	4	1	13
cSH	1234	1379	516	606
Volume to Capacity	0.00	0.00	0.01	0.03
Queue Length 95th (m)	0.0	0.0	0.2	0.7
Control Delay (s)	0.0	0.0	12.0	11.1
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.0	12.0	11.1
Approach LOS			B	B

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			27.2%	ICU Level of Service	A
Analysis Period (min)			15		



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	111	138	28	129	18	220	182	534
v/c Ratio	0.52	0.40	0.12	0.37	0.04	0.13	0.23	0.24
Control Delay	35.0	23.1	24.7	21.7	10.9	10.0	5.4	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	23.1	24.7	21.7	10.9	10.0	5.4	5.5
Queue Length 50th (m)	13.9	13.2	3.3	11.4	1.2	7.4	7.0	12.3
Queue Length 95th (m)	28.6	27.9	9.6	25.5	4.9	15.2	17.5	23.9
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	408	638	433	632	417	1738	775	2239
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	0.27	0.22	0.06	0.20	0.04	0.13	0.23	0.24

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	102	87	40	26	77	41	17	190	12	167	439	52
Future Volume (vph)	102	87	40	26	77	41	17	190	12	167	439	52
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		0.99	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.95		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)	1668	1797		1786	1768		1793	3545		1787	3447	
Flt Permitted	0.67	1.00		0.67	1.00		0.45	1.00		0.55	1.00	
Satd. Flow (perm)	1184	1797		1257	1768		856	3545		1034	3447	
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)	111	95	43	28	84	45	18	207	13	182	477	57
RTOR Reduction (vph)	0	24	0	0	28	0	0	5	0	0	9	0
Lane Group Flow (vph)	111	114	0	28	101	0	18	215	0	182	525	0
Confl. Peds. (#/hr)	3		15	15		3	14					14
Heavy Vehicles (%)	8%	0%	0%	0%	1%	2%	0%	1%	0%	1%	3%	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)	12.5	12.5		12.5	12.5		34.1	34.1		45.1	45.1	
Effective Green, g (s)	12.5	12.5		12.5	12.5		34.1	34.1		45.1	45.1	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.49	0.49		0.65	0.65	
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)	212	322		225	317		419	1736		745	2233	
v/s Ratio Prot		0.06			0.06			0.06		0.02	c0.15	
v/s Ratio Perm	c0.09			0.02			0.02			c0.13		
v/c Ratio	0.52	0.35		0.12	0.32		0.04	0.12		0.24	0.24	
Uniform Delay, d1	25.9	25.0		24.0	24.8		9.2	9.6		4.9	5.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.3	0.7		0.2	0.6		0.2	0.1		0.2	0.2	
Delay (s)	28.2	25.7		24.2	25.4		9.4	9.8		5.1	5.3	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		26.8			25.2			9.8			5.3	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	69.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	93.3%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	267	138	4	5	9
Future Volume (Veh/h)	3	267	138	4	5	9
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)	3	290	150	4	5	10
Pedestrians			4		6	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		109				
pX, platoon unblocked					0.98	
vC, conflicting volume	160				458	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	160				437	158
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				99	99
cM capacity (veh/h)	1424				563	888

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	293	154	15
Volume Left	3	0	5
Volume Right	0	4	10
cSH	1424	1700	745
Volume to Capacity	0.00	0.09	0.02
Queue Length 95th (m)	0.1	0.0	0.5
Control Delay (s)	0.1	0.0	9.9
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.9
Approach LOS			A

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	26.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	265	336	40	297	27	773	91	760
v/c Ratio	0.77	0.48	0.17	0.71	0.11	0.62	0.28	0.46
Control Delay	33.6	20.2	24.4	35.2	21.7	24.5	13.7	14.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	20.2	24.4	35.2	21.7	24.5	13.7	14.2
Queue Length 50th (m)	27.0	36.8	4.8	38.6	2.8	51.4	6.8	34.9
Queue Length 95th (m)	#51.1	58.6	12.5	63.7	9.9	81.3	17.0	59.3
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	343	899	352	616	242	1247	330	1635
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	0.77	0.37	0.11	0.48	0.11	0.62	0.28	0.46

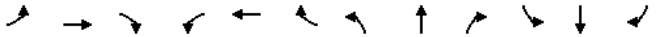
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	244	289	20	37	217	56	25	690	21	84	535	164
Future Volume (vph)	244	289	20	37	217	56	25	690	21	84	535	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1784	1861		1795	1811		1798	3522		1804	3424	
Flt Permitted	0.31	1.00		0.56	1.00		0.36	1.00		0.21	1.00	
Satd. Flow (perm)	582	1861		1055	1811		688	3522		404	3424	
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)	265	314	22	40	236	61	27	750	23	91	582	178
RTOR Reduction (vph)	0	3	0	0	12	0	0	3	0	0	32	0
Lane Group Flow (vph)	265	333	0	40	285	0	27	770	0	91	728	0
Confl. Peds. (#/hr)	13		10	10		13	7		11	11		7
Heavy Vehicles (%)	1%	1%	0%	0%	1%	2%	0%	2%	0%	0%	1%	1%
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)	27.8	27.8		16.8	16.8		26.5	26.5		36.0	36.0	
Effective Green, g (s)	27.8	27.8		16.8	16.8		26.5	26.5		36.0	36.0	
Actuated g/C Ratio	0.37	0.37		0.22	0.22		0.35	0.35		0.47	0.47	
Clearance Time (s)	4.0	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)	324	682		233	401		240	1231		293	1626	
v/s Ratio Prot	c0.08	0.18			0.16			c0.22		0.02	c0.21	
v/s Ratio Perm	c0.22			0.04			0.04			0.12		
v/c Ratio	0.82	0.49		0.17	0.71		0.11	0.63		0.31	0.45	
Uniform Delay, d1	20.1	18.5		23.9	27.2		16.7	20.5		12.2	13.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	14.7	0.6		0.4	5.7		0.9	2.4		0.6	0.9	
Delay (s)	34.8	19.1		24.2	32.9		17.6	22.9		12.8	14.2	
Level of Service	C	B		C	C		B	C		B	B	
Approach Delay (s)		26.0			31.9			22.8			14.0	
Approach LOS		C			C			C			B	

Intersection Summary					
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.75				
Actuated Cycle Length (s)	75.8	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	89.2%	ICU Level of Service		E	
Analysis Period (min)	15				

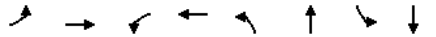
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	397	4	6	269	3	4	7	7	2	2	9
Future Volume (Veh/h)	10	397	4	6	269	3	4	7	7	2	2	9
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)	11	432	4	7	292	3	4	8	8	2	2	10
Pedestrians		2			2			3			19	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		101										
pX, platoon unblocked				0.86			0.86	0.86	0.86	0.86	0.86	
vC, conflicting volume	314			439			780	787	439	796	788	314
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	314			272			666	675	272	686	675	314
tC, single (s)	4.1			4.1			7.3	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.7	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			99	97	99	99	99	99
cM capacity (veh/h)	1238			1123			283	316	664	292	316	718

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	447	302	20	14
Volume Left	11	7	4	2
Volume Right	4	3	8	10
cSH	1238	1123	388	516
Volume to Capacity	0.01	0.01	0.05	0.03
Queue Length 95th (m)	0.2	0.2	1.3	0.7
Control Delay (s)	0.3	0.3	14.8	12.2
Lane LOS	A	A	B	B
Approach Delay (s)	0.3	0.3	14.8	12.2
Approach LOS			B	B

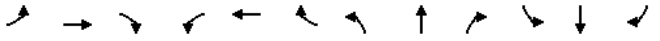
Intersection Summary					
Average Delay			0.9		
Intersection Capacity Utilization			36.7%	ICU Level of Service	A
Analysis Period (min)			15		



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	175	177	20	351	49	454	66	563
v/c Ratio	0.97	0.34	0.06	0.66	0.13	0.28	0.12	0.29
Control Delay	91.3	21.0	21.2	27.4	15.9	15.1	8.0	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	91.3	21.0	21.2	27.4	15.9	15.1	8.0	9.3
Queue Length 50th (m)	27.4	18.7	2.3	40.9	4.8	24.7	4.3	22.3
Queue Length 95th (m)	#66.4	35.5	7.5	69.5	12.0	35.7	9.4	31.7
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	191	553	338	561	363	1623	568	1972
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	0.92	0.32	0.06	0.63	0.13	0.28	0.12	0.29

Intersection Summary

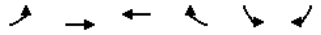
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	161	115	48	18	169	154	45	406	12	61	464	54
Future Volume (vph)	161	115	48	18	169	154	45	406	12	61	464	54
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		0.99	1.00		1.00	1.00	
Frt	1.00	0.96		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)	1697	1778		1680	1732		1718	3557		1802	3475	
Flt Permitted	0.36	1.00		0.64	1.00		0.44	1.00		0.43	1.00	
Satd. Flow (perm)	636	1778		1126	1732		797	3557		820	3475	
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)	175	125	52	20	184	167	49	441	13	66	504	59
RTOR Reduction (vph)	0	19	0	0	41	0	0	2	0	0	11	0
Lane Group Flow (vph)	175	158	0	20	310	0	49	452	0	66	552	0
Confl. Peds. (#/hr)	7		17	17		7	19		8	8		19
Heavy Vehicles (%)	6%	1%	2%	6%	0%	2%	4%	1%	0%	0%	2%	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)	22.7	22.7		22.7	22.7		36.4	36.4		45.9	45.9	
Effective Green, g (s)	22.7	22.7		22.7	22.7		36.4	36.4		45.9	45.9	
Actuated g/C Ratio	0.28	0.28		0.28	0.28		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)	179	500		317	487		359	1606		533	1978	
v/s Ratio Prot		0.09			0.18			0.13		0.01	c0.16	
v/s Ratio Perm	c0.28			0.02			0.06			0.06		
v/c Ratio	0.98	0.32		0.06	0.64		0.14	0.28		0.12	0.28	
Uniform Delay, d1	28.7	22.8		21.2	25.3		12.9	13.9		7.9	8.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	60.1	0.4		0.1	2.7		0.8	0.4		0.1	0.4	
Delay (s)	88.8	23.2		21.3	28.1		13.7	14.3		8.0	9.2	
Level of Service	F	C		C	C		B	B		A	A	
Approach Delay (s)		55.8			27.7			14.3			9.1	
Approach LOS		E			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	93.6%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	187	320	5	2	5
Future Volume (Veh/h)	11	187	320	5	2	5
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)	12	203	348	5	2	5
Pedestrians		1	9		6	
Lane Width (m)		3.6	3.6		3.6	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		0	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		109				
pX, platoon unblocked					0.97	
vC, conflicting volume	359				592	358
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	359				563	358
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				100	99
cM capacity (veh/h)	1151				465	687

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	215	353	7
Volume Left	12	0	2
Volume Right	0	5	5
cSH	1151	1700	604
Volume to Capacity	0.01	0.21	0.01
Queue Length 95th (m)	0.3	0.0	0.3
Control Delay (s)	0.5	0.0	11.0
Lane LOS	A		B
Approach Delay (s)	0.5	0.0	11.0
Approach LOS			B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E

2027 Background Traffic Operations Reports

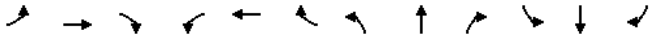
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	147	199	40	280	18	361	45	879
v/c Ratio	0.42	0.30	0.16	0.70	0.08	0.27	0.09	0.54
Control Delay	18.6	16.7	24.4	34.8	20.9	18.4	11.6	14.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	16.7	24.4	34.8	20.9	18.4	11.6	14.9
Queue Length 50th (m)	13.9	19.0	4.8	35.7	1.8	20.3	3.2	41.7
Queue Length 95th (m)	25.5	33.7	12.4	59.9	7.3	35.5	9.6	69.9
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	346	887	393	618	223	1353	492	1636
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	0.42	0.22	0.10	0.45	0.08	0.27	0.09	0.54

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	158	25	37	203	54	17	319	13	41	614	195
Future Volume (vph)	135	158	25	37	203	54	17	319	13	41	614	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1769	1811		1749	1799		1699	3484		1667	3388	
Flt Permitted	0.32	1.00		0.63	1.00		0.32	1.00		0.47	1.00	
Satd. Flow (perm)	604	1811		1165	1799		578	3484		826	3388	
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)	147	172	27	40	221	59	18	347	14	45	667	212
RTOR Reduction (vph)	0	8	0	0	13	0	0	3	0	0	32	0
Lane Group Flow (vph)	147	191	0	40	267	0	18	358	0	45	847	0
Confl. Peds. (#/hr)	2		3	3		2	5		7	7		5
Heavy Vehicles (%)	2%	3%	0%	3%	2%	2%	6%	3%	0%	8%	2%	2%
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)	27.1	27.1		16.1	16.1		28.8	28.8		36.8	36.8	
Effective Green, g (s)	27.1	27.1		16.1	16.1		28.8	28.8		36.8	36.8	
Actuated g/C Ratio	0.36	0.36		0.21	0.21		0.38	0.38		0.48	0.48	
Clearance Time (s)	4.0	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)	323	646		247	381		219	1321		444	1642	
v/s Ratio Prot	c0.04	0.11			c0.15			0.10		0.01	c0.25	
v/s Ratio Perm	0.12			0.03			0.03			0.04		
v/c Ratio	0.46	0.30		0.16	0.70		0.08	0.27		0.10	0.52	
Uniform Delay, d1	17.7	17.5		24.4	27.7		15.1	16.3		10.5	13.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.3		0.3	5.5		0.7	0.5		0.1	1.2	
Delay (s)	18.7	17.8		24.7	33.2		15.8	16.8		10.6	14.6	
Level of Service	B	B		C	C		B	B		B	B	
Approach Delay (s)		18.2			32.1			16.7			14.4	
Approach LOS		B			C			B			B	

Intersection Summary					
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B		
HCM 2000 Volume to Capacity ratio	0.60				
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	20.0		
Intersection Capacity Utilization	69.3%	ICU Level of Service	C		
Analysis Period (min)	15				

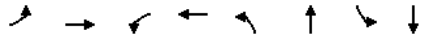
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	198	3	1	292	4	2	1	1	2	3	13
Future Volume (Veh/h)	0	198	3	1	292	4	2	1	1	2	3	13
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)	0	215	3	1	317	4	2	1	1	2	3	14
Pedestrians		5						2			16	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		0						0			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		101										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	
vC, conflicting volume	337			220			560	558	218	555	557	340
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	337			149			508	505	147	502	504	340
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	100			100			100	100	100	100	99	98
cM capacity (veh/h)	1217			1367			434	441	856	444	441	677

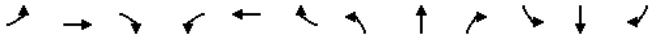
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	218	322	4	19
Volume Left	0	1	2	2
Volume Right	3	4	1	14
cSH	1217	1367	497	594
Volume to Capacity	0.00	0.00	0.01	0.03
Queue Length 95th (m)	0.0	0.0	0.2	0.8
Control Delay (s)	0.0	0.0	12.3	11.3
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.0	12.3	11.3
Approach LOS			B	B

Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			28.0%	ICU Level of Service		A
Analysis Period (min)			15			



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	116	146	29	135	20	231	191	563
v/c Ratio	0.54	0.41	0.13	0.38	0.05	0.13	0.25	0.25
Control Delay	35.5	23.5	24.6	21.9	11.2	10.2	5.6	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.5	23.5	24.6	21.9	11.2	10.2	5.6	5.7
Queue Length 50th (m)	14.6	14.2	3.4	12.2	1.3	8.0	7.6	13.4
Queue Length 95th (m)	29.9	29.6	9.8	26.5	5.4	16.1	18.8	26.0
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	404	636	428	630	405	1731	765	2231
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.23	0.07	0.21	0.05	0.13	0.25	0.25

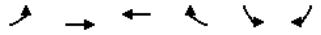
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	92	42	27	81	43	18	200	13	176	463	55
Future Volume (vph)	107	92	42	27	81	43	18	200	13	176	463	55
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		0.99	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.95		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)	1668	1796		1786	1768		1793	3544		1787	3447	
Flt Permitted	0.67	1.00		0.66	1.00		0.44	1.00		0.54	1.00	
Satd. Flow (perm)	1177	1796		1248	1768		832	3544		1023	3447	
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)	116	100	46	29	88	47	20	217	14	191	503	60
RTOR Reduction (vph)	0	24	0	0	28	0	0	5	0	0	9	0
Lane Group Flow (vph)	116	122	0	29	107	0	20	226	0	191	554	0
Confl. Peds. (#/hr)	3		15	15		3	14					14
Heavy Vehicles (%)	8%	0%	0%	0%	1%	2%	0%	1%	0%	1%	3%	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)	12.8	12.8		12.8	12.8		34.1	34.1		45.1	45.1	
Effective Green, g (s)	12.8	12.8		12.8	12.8		34.1	34.1		45.1	45.1	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.49	0.49		0.65	0.65	
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)	215	328		228	323		405	1728		736	2224	
v/s Ratio Prot		0.07			0.06			0.06		0.03	c0.16	
v/s Ratio Perm	c0.10			0.02			0.02			c0.14		
v/c Ratio	0.54	0.37		0.13	0.33		0.05	0.13		0.26	0.25	
Uniform Delay, d1	25.9	25.0		23.9	24.8		9.4	9.8		5.1	5.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	0.7		0.3	0.6		0.2	0.2		0.2	0.3	
Delay (s)	28.5	25.7		24.1	25.4		9.6	9.9		5.3	5.5	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		27.0			25.2			9.9			5.4	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.34			
Actuated Cycle Length (s)	69.9	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	97.9%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	281	145	4	5	9
Future Volume (Veh/h)	3	281	145	4	5	9
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)	3	305	158	4	5	10
Pedestrians			4		6	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		109				
pX, platoon unblocked					0.97	
vC, conflicting volume	168				481	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	168				451	166
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				99	99
cM capacity (veh/h)	1415				548	879

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	308	162	15
Volume Left	3	0	5
Volume Right	0	4	10
cSH	1415	1700	732
Volume to Capacity	0.00	0.10	0.02
Queue Length 95th (m)	0.1	0.0	0.5
Control Delay (s)	0.1	0.0	10.0
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	10.0
Approach LOS			B

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	27.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	279	355	42	313	28	814	97	801
v/c Ratio	0.83	0.50	0.18	0.73	0.12	0.66	0.31	0.49
Control Delay	39.7	20.4	24.3	35.8	22.3	25.9	14.6	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.7	20.4	24.3	35.8	22.3	25.9	14.6	15.0
Queue Length 50th (m)	28.7	39.4	5.1	41.3	3.0	56.0	7.4	38.5
Queue Length 95th (m)	#58.8	62.1	12.9	67.5	10.3	87.5	18.2	64.3
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	336	891	344	610	231	1236	311	1621
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	0.83	0.40	0.12	0.51	0.12	0.66	0.31	0.49

Intersection Summary

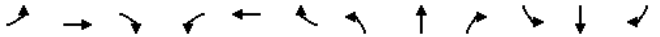
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	305	21	39	229	59	26	727	22	89	564	173
Future Volume (vph)	257	305	21	39	229	59	26	727	22	89	564	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1784	1862		1795	1811		1798	3522		1804	3423	
Flt Permitted	0.29	1.00		0.55	1.00		0.35	1.00		0.19	1.00	
Satd. Flow (perm)	552	1862		1037	1811		661	3522		362	3423	
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)	279	332	23	42	249	64	28	790	24	97	613	188
RTOR Reduction (vph)	0	3	0	0	12	0	0	3	0	0	32	0
Lane Group Flow (vph)	279	352	0	42	301	0	28	811	0	97	769	0
Confl. Peds. (#/hr)	13		10	10		13	7		11	11		7
Heavy Vehicles (%)	1%	1%	0%	0%	1%	2%	0%	2%	0%	0%	1%	1%
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)	28.5	28.5		17.5	17.5		26.5	26.5		36.0	36.0	
Effective Green, g (s)	28.5	28.5		17.5	17.5		26.5	26.5		36.0	36.0	
Actuated g/C Ratio	0.37	0.37		0.23	0.23		0.35	0.35		0.47	0.47	
Clearance Time (s)	4.0	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)	318	693		237	414		228	1220		274	1610	
v/s Ratio Prot	c0.08	0.19			0.17			c0.23		0.03	c0.22	
v/s Ratio Perm	c0.25			0.04			0.04			0.14		
v/c Ratio	0.88	0.51		0.18	0.73		0.12	0.67		0.35	0.48	
Uniform Delay, d1	20.8	18.6		23.7	27.3		17.1	21.2		12.8	13.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.7	0.6		0.4	6.2		1.1	2.9		0.8	1.0	
Delay (s)	43.5	19.2		24.1	33.5		18.2	24.1		13.5	14.8	
Level of Service	D	B		C	C		B	C		B	B	
Approach Delay (s)		29.9			32.4			23.9			14.7	
Approach LOS		C			C			C			B	

Intersection Summary

HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	91.5%	ICU Level of Service	F	
Analysis Period (min)	15			

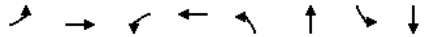
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	418	4	6	283	3	4	7	7	2	2	9
Future Volume (Veh/h)	11	418	4	6	283	3	4	7	7	2	2	9
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)	12	454	4	7	308	3	4	8	8	2	2	10
Pedestrians		2			2			3			19	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		101										
pX, platoon unblocked				0.85			0.85	0.85	0.85	0.85	0.85	
vC, conflicting volume	330			461			820	827	461	836	828	330
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	330			278			700	709	278	720	709	330
tC, single (s)	4.1			4.1			7.3	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.7	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			98	97	99	99	99	99
cM capacity (veh/h)	1221			1100			263	297	648	272	297	703

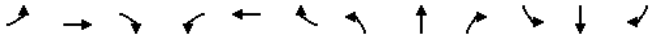
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	470	318	20	14
Volume Left	12	7	4	2
Volume Right	4	3	8	10
cSH	1221	1100	367	495
Volume to Capacity	0.01	0.01	0.05	0.03
Queue Length 95th (m)	0.2	0.2	1.4	0.7
Control Delay (s)	0.3	0.2	15.4	12.5
Lane LOS	A	A	C	B
Approach Delay (s)	0.3	0.2	15.4	12.5
Approach LOS			C	B

Intersection Summary					
Average Delay			0.9		
Intersection Capacity Utilization			38.4%	ICU Level of Service	A
Analysis Period (min)			15		



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	185	187	21	369	51	479	70	594
v/c Ratio	1.03	0.34	0.06	0.67	0.15	0.30	0.13	0.31
Control Delay	107.4	21.2	21.3	27.8	16.2	15.5	8.1	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	107.4	21.2	21.3	27.8	16.2	15.5	8.1	9.7
Queue Length 50th (m)	~31.2	20.1	2.4	43.9	5.0	26.2	4.5	23.9
Queue Length 95th (m)	#72.1	37.5	7.7	74.1	12.5	37.5	9.9	33.7
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	180	545	325	553	344	1592	542	1941
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	1.03	0.34	0.06	0.67	0.15	0.30	0.13	0.31

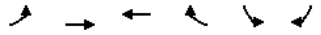
Intersection Summary
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	121	51	19	178	162	47	428	13	64	489	57
Future Volume (vph)	170	121	51	19	178	162	47	428	13	64	489	57
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		0.99	1.00		1.00	1.00	
Frt	1.00	0.96		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)	1697	1778		1680	1732		1718	3557		1802	3475	
Flt Permitted	0.34	1.00		0.62	1.00		0.43	1.00		0.41	1.00	
Satd. Flow (perm)	609	1778		1098	1732		773	3557		785	3475	
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)	185	132	55	21	193	176	51	465	14	70	532	62
RTOR Reduction (vph)	0	18	0	0	41	0	0	3	0	0	11	0
Lane Group Flow (vph)	185	169	0	21	328	0	51	476	0	70	583	0
Confl. Peds. (#/hr)	7		17	17		7	19		8	8		19
Heavy Vehicles (%)	6%	1%	2%	6%	0%	2%	4%	1%	0%	0%	2%	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)	24.0	24.0		24.0	24.0		36.2	36.2		45.8	45.8	
Effective Green, g (s)	24.0	24.0		24.0	24.0		36.2	36.2		45.8	45.8	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.44	0.44		0.56	0.56	
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)	178	521		322	508		342	1574		509	1945	
v/s Ratio Prot		0.09			0.19			0.13		0.01	c0.17	
v/s Ratio Perm	c0.30			0.02			0.07			0.07		
v/c Ratio	1.04	0.32		0.07	0.65		0.15	0.30		0.14	0.30	
Uniform Delay, d1	28.9	22.6		20.8	25.2		13.6	14.7		8.4	9.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	78.2	0.4		0.1	2.8		0.9	0.5		0.1	0.4	
Delay (s)	107.1	22.9		20.9	28.0		14.5	15.2		8.6	9.9	
Level of Service	F	C		C	C		B	B		A	A	
Approach Delay (s)		64.8			27.6			15.1			9.8	
Approach LOS		E			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	81.8	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	97.3%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	197	337	5	2	5
Future Volume (Veh/h)	12	197	337	5	2	5
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)	13	214	366	5	2	5
Pedestrians		1	9		6	
Lane Width (m)		3.6	3.6		3.6	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		0	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		109				
pX, platoon unblocked					0.96	
vC, conflicting volume	377				624	376
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	377				591	376
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	99				100	99
cM capacity (veh/h)	1133				445	671

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	227	371	7
Volume Left	13	0	2
Volume Right	0	5	5
cSH	1133	1700	586
Volume to Capacity	0.01	0.22	0.01
Queue Length 95th (m)	0.3	0.0	0.3
Control Delay (s)	0.6	0.0	11.2
Lane LOS	A		B
Approach Delay (s)	0.6	0.0	11.2
Approach LOS			B

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	30.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Appendix F

2027 Future Total Traffic Operations Reports

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	147	200	40	296	18	361	49	879
v/c Ratio	0.43	0.29	0.15	0.71	0.08	0.27	0.10	0.54
Control Delay	18.6	16.5	24.0	35.0	21.4	18.8	12.0	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	16.5	24.0	35.0	21.4	18.8	12.0	15.4
Queue Length 50th (m)	13.9	19.1	4.8	37.9	1.8	20.6	3.5	42.6
Queue Length 95th (m)	25.4	33.7	12.4	63.0	7.5	36.3	10.6	71.7
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	339	879	389	612	221	1341	487	1621
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	0.43	0.23	0.10	0.48	0.08	0.27	0.10	0.54

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	159	25	37	205	67	17	319	13	45	614	195
Future Volume (vph)	135	159	25	37	205	67	17	319	13	45	614	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.96		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1769	1811		1749	1788		1699	3484		1667	3388	
Flt Permitted	0.31	1.00		0.63	1.00		0.32	1.00		0.47	1.00	
Satd. Flow (perm)	572	1811		1164	1788		578	3484		826	3388	
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)	147	173	27	40	223	73	18	347	14	49	667	212
RTOR Reduction (vph)	0	8	0	0	16	0	0	3	0	0	33	0
Lane Group Flow (vph)	147	192	0	40	280	0	18	358	0	49	846	0
Confl. Peds. (#/hr)	2		3	3		2	5		7	7		5
Heavy Vehicles (%)	2%	3%	0%	3%	2%	2%	6%	3%	0%	8%	2%	2%
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)	27.8	27.8		16.8	16.8		28.8	28.8		36.8	36.8	
Effective Green, g (s)	27.8	27.8		16.8	16.8		28.8	28.8		36.8	36.8	
Actuated g/C Ratio	0.36	0.36		0.22	0.22		0.38	0.38		0.48	0.48	
Clearance Time (s)	4.0	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)	316	657		255	392		217	1309		440	1627	
v/s Ratio Prot	c0.04	0.11			c0.16			0.10		0.01	c0.25	
v/s Ratio Perm	0.13			0.03			0.03			0.05		
v/c Ratio	0.47	0.29		0.16	0.72		0.08	0.27		0.11	0.52	
Uniform Delay, d1	17.7	17.4		24.2	27.7		15.4	16.6		10.8	13.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.2		0.3	6.1		0.7	0.5		0.1	1.2	
Delay (s)	18.8	17.6		24.5	33.8		16.1	17.1		10.9	15.0	
Level of Service	B	B		C	C		B	B		B	B	
Approach Delay (s)		18.1			32.7			17.1			14.8	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	76.6	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	73.5%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

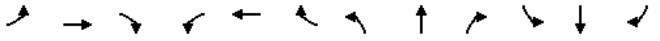
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	198	8	1	292	4	17	1	2	2	3	13
Future Volume (Veh/h)	0	198	8	1	292	4	17	1	2	2	3	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	215	9	1	317	4	18	1	2	2	3	14
Pedestrians		5						2			16	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		0						0			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		101										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	
vC, conflicting volume	337			226			563	560	222	559	563	340
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	337			154			510	507	149	506	510	340
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	100			100			96	100	100	100	99	98
cM capacity (veh/h)	1217			1360			432	439	853	441	437	677

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	224	322	21	19
Volume Left	0	1	18	2
Volume Right	9	4	2	14
cSH	1217	1360	454	592
Volume to Capacity	0.00	0.00	0.05	0.03
Queue Length 95th (m)	0.0	0.0	1.2	0.8
Control Delay (s)	0.0	0.0	13.3	11.3
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.0	13.3	11.3
Approach LOS			B	B

Intersection Summary				
Average Delay			0.9	
Intersection Capacity Utilization			28.6%	ICU Level of Service
Analysis Period (min)			15	

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	116	147	37	136	20	233	191	563
v/c Ratio	0.54	0.42	0.16	0.39	0.05	0.13	0.25	0.25
Control Delay	35.5	23.6	25.2	22.2	11.2	10.2	5.6	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.5	23.6	25.2	22.2	11.2	10.2	5.6	5.7
Queue Length 50th (m)	14.6	14.3	4.3	12.4	1.3	8.0	7.6	13.4
Queue Length 95th (m)	29.9	29.7	11.7	27.0	5.4	16.2	18.8	26.0
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	404	636	427	629	405	1730	764	2231
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.23	0.09	0.22	0.05	0.13	0.25	0.25

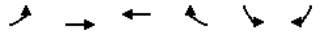
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	93	42	34	82	43	18	200	15	176	463	55
Future Volume (vph)	107	93	42	34	82	43	18	200	15	176	463	55
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		0.99	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.95		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)	1668	1797		1786	1769		1793	3540		1787	3447	
Flt Permitted	0.67	1.00		0.66	1.00		0.44	1.00		0.54	1.00	
Satd. Flow (perm)	1176	1797		1247	1769		832	3540		1021	3447	
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)	116	101	46	37	89	47	20	217	16	191	503	60
RTOR Reduction (vph)	0	24	0	0	27	0	0	6	0	0	9	0
Lane Group Flow (vph)	116	123	0	37	109	0	20	227	0	191	554	0
Confl. Peds. (#/hr)	3		15	15		3	14					14
Heavy Vehicles (%)	8%	0%	0%	0%	1%	2%	0%	1%	0%	1%	3%	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)	12.8	12.8		12.8	12.8		34.1	34.1		45.1	45.1	
Effective Green, g (s)	12.8	12.8		12.8	12.8		34.1	34.1		45.1	45.1	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.49	0.49		0.65	0.65	
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)	215	329		228	323		405	1726		735	2224	
v/s Ratio Prot		0.07			0.06			0.06		0.03	c0.16	
v/s Ratio Perm	c0.10			0.03			0.02			c0.14		
v/c Ratio	0.54	0.37		0.16	0.34		0.05	0.13		0.26	0.25	
Uniform Delay, d1	25.9	25.0		24.0	24.9		9.4	9.8		5.1	5.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	0.7		0.3	0.6		0.2	0.2		0.2	0.3	
Delay (s)	28.5	25.8		24.4	25.5		9.6	10.0		5.3	5.5	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		27.0			25.2			9.9			5.4	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.34			
Actuated Cycle Length (s)	69.9	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	97.9%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	281	145	4	7	17
Future Volume (Veh/h)	6	281	145	4	7	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)	7	305	158	4	8	18
Pedestrians			4		6	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		109				
pX, platoon unblocked					0.97	
vC, conflicting volume	168				489	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	168				458	166
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				99	98
cM capacity (veh/h)	1415				541	879

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	312	162	26
Volume Left	7	0	8
Volume Right	0	4	18
cSH	1415	1700	737
Volume to Capacity	0.00	0.10	0.04
Queue Length 95th (m)	0.1	0.0	0.9
Control Delay (s)	0.2	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	10.1
Approach LOS			B

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	29.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	10	3	7	15	5
Future Volume (Veh/h)	16	10	3	7	15	5
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	11	3	8	16	5
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	32	18	21			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	32	18	21			
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	99	100			
cM capacity (veh/h)	984	1066	1608			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	11	21
Volume Left	17	3	0
Volume Right	11	0	5
cSH	1015	1608	1700
Volume to Capacity	0.03	0.00	0.01
Queue Length 95th (m)	0.7	0.0	0.0
Control Delay (s)	8.6	2.0	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	2.0	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	4.4			
Intersection Capacity Utilization	13.3%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	279	358	42	325	28	814	112	801
v/c Ratio	0.85	0.50	0.17	0.75	0.12	0.66	0.36	0.50
Control Delay	42.0	20.3	24.2	36.3	22.5	26.1	15.5	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	20.3	24.2	36.3	22.5	26.1	15.5	15.2
Queue Length 50th (m)	28.7	39.8	5.1	43.0	3.0	56.6	8.8	39.0
Queue Length 95th (m)	#60.8	62.9	12.9	69.9	10.3	87.5	20.5	64.3
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	329	886	340	606	229	1230	308	1612
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	0.85	0.40	0.12	0.54	0.12	0.66	0.36	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	308	21	39	231	68	26	727	22	103	564	173
Future Volume (vph)	257	308	21	39	231	68	26	727	22	103	564	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	1862		1795	1803		1798	3522		1804	3423	
Flt Permitted	0.28	1.00		0.55	1.00		0.35	1.00		0.19	1.00	
Satd. Flow (perm)	527	1862		1034	1803		661	3522		359	3423	
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)	279	335	23	42	251	74	28	790	24	112	613	188
RTOR Reduction (vph)	0	3	0	0	14	0	0	3	0	0	32	0
Lane Group Flow (vph)	279	355	0	42	311	0	28	811	0	112	769	0
Confl. Peds. (#/hr)	13		10	10		13	7		11	11		7
Heavy Vehicles (%)	1%	1%	0%	0%	1%	2%	0%	2%	0%	0%	1%	1%
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)	28.9	28.9		17.9	17.9		26.5	26.5		36.0	36.0	
Effective Green, g (s)	28.9	28.9		17.9	17.9		26.5	26.5		36.0	36.0	
Actuated g/C Ratio	0.38	0.38		0.23	0.23		0.34	0.34		0.47	0.47	
Clearance Time (s)	4.0	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)	312	699		240	419		227	1213		271	1602	
v/s Ratio Prot	c0.08	0.19			0.17			c0.23		0.03	c0.22	
v/s Ratio Perm	c0.25			0.04			0.04			0.16		
v/c Ratio	0.89	0.51		0.17	0.74		0.12	0.67		0.41	0.48	
Uniform Delay, d1	20.9	18.5		23.6	27.4		17.2	21.5		13.1	14.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	26.0	0.6		0.3	7.0		1.1	2.9		1.0	1.0	
Delay (s)	46.9	19.1		23.9	34.3		18.4	24.4		14.1	15.1	
Level of Service	D	B		C	C		B	C		B	B	
Approach Delay (s)		31.3			33.1			24.2			14.9	
Approach LOS		C			C			C			B	

Intersection Summary				
HCM 2000 Control Delay	24.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	91.9%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	418	21	7	283	3	15	7	8	2	2	9
Future Volume (Veh/h)	11	418	21	7	283	3	15	7	8	2	2	9
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)	12	454	23	8	308	3	16	8	9	2	2	10
Pedestrians		2			2			3			19	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		101										
pX, platoon unblocked				0.84			0.84	0.84	0.84	0.84	0.84	
vC, conflicting volume	330			480			831	838	470	849	848	330
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	330			287			704	713	276	726	725	330
tC, single (s)	4.1			4.1			7.3	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.7	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			94	97	99	99	99	99
cM capacity (veh/h)	1221			1079			258	292	643	266	287	703

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	489	319	33	14
Volume Left	12	8	16	2
Volume Right	23	3	9	10
cSH	1221	1079	319	488
Volume to Capacity	0.01	0.01	0.10	0.03
Queue Length 95th (m)	0.2	0.2	2.7	0.7
Control Delay (s)	0.3	0.3	17.6	12.6
Lane LOS	A	A	C	B
Approach Delay (s)	0.3	0.3	17.6	12.6
Approach LOS			C	B

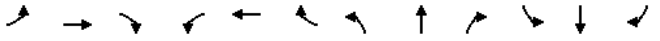
Intersection Summary					
Average Delay			1.2		
Intersection Capacity Utilization			40.1%	ICU Level of Service	A
Analysis Period (min)			15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	185	188	25	371	51	487	70	594
v/c Ratio	1.04	0.34	0.08	0.67	0.15	0.31	0.13	0.31
Control Delay	110.8	21.3	21.5	28.0	16.2	15.5	8.1	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	110.8	21.3	21.5	28.0	16.2	15.5	8.1	9.7
Queue Length 50th (m)	~32.7	20.2	2.9	44.4	5.0	26.6	4.5	23.9
Queue Length 95th (m)	#72.4	37.6	8.8	74.8	12.5	38.1	9.9	33.7
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	178	545	324	553	345	1588	538	1941
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	1.04	0.34	0.08	0.67	0.15	0.31	0.13	0.31

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

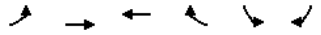
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	122	51	23	179	162	47	428	20	64	489	57
Future Volume (vph)	170	122	51	23	179	162	47	428	20	64	489	57
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		0.99	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.93		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)	1697	1778		1680	1732		1718	3547		1802	3475	
Flt Permitted	0.34	1.00		0.62	1.00		0.43	1.00		0.41	1.00	
Satd. Flow (perm)	603	1778		1096	1732		773	3547		775	3475	
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)	185	133	55	25	195	176	51	465	22	70	532	62
RTOR Reduction (vph)	0	18	0	0	40	0	0	4	0	0	11	0
Lane Group Flow (vph)	185	170	0	25	331	0	51	483	0	70	583	0
Confl. Peds. (#/hr)	7		17	17		7	19		8	8		19
Heavy Vehicles (%)	6%	1%	2%	6%	0%	2%	4%	1%	0%	0%	2%	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)	24.0	24.0		24.0	24.0		36.2	36.2		45.8	45.8	
Effective Green, g (s)	24.0	24.0		24.0	24.0		36.2	36.2		45.8	45.8	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.44	0.44		0.56	0.56	
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)	176	521		321	508		342	1569		504	1945	
v/s Ratio Prot		0.10			0.19			0.14		0.01	c0.17	
v/s Ratio Perm	c0.31			0.02			0.07			0.07		
v/c Ratio	1.05	0.33		0.08	0.65		0.15	0.31		0.14	0.30	
Uniform Delay, d1	28.9	22.6		20.9	25.2		13.6	14.7		8.4	9.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	82.0	0.4		0.1	3.0		0.9	0.5		0.1	0.4	
Delay (s)	110.9	22.9		21.0	28.2		14.5	15.2		8.6	9.9	
Level of Service	F	C		C	C		B	B		A	A	
Approach Delay (s)		66.6			27.8			15.2			9.8	
Approach LOS		E			C			B			A	

Intersection Summary				
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	81.8	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	97.3%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	197	337	6	3	10
Future Volume (Veh/h)	20	197	337	6	3	10
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)	22	214	366	7	3	11
Pedestrians		1	9		6	
Lane Width (m)		3.6	3.6		3.6	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		0	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		109				
pX, platoon unblocked					0.96	
vC, conflicting volume	379				642	376
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	379				610	376
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	98				99	98
cM capacity (veh/h)	1131				430	671

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	236	373	14
Volume Left	22	0	3
Volume Right	0	7	11
cSH	1131	1700	599
Volume to Capacity	0.02	0.22	0.02
Queue Length 95th (m)	0.5	0.0	0.6
Control Delay (s)	0.9	0.0	11.2
Lane LOS	A		B
Approach Delay (s)	0.9	0.0	11.2
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

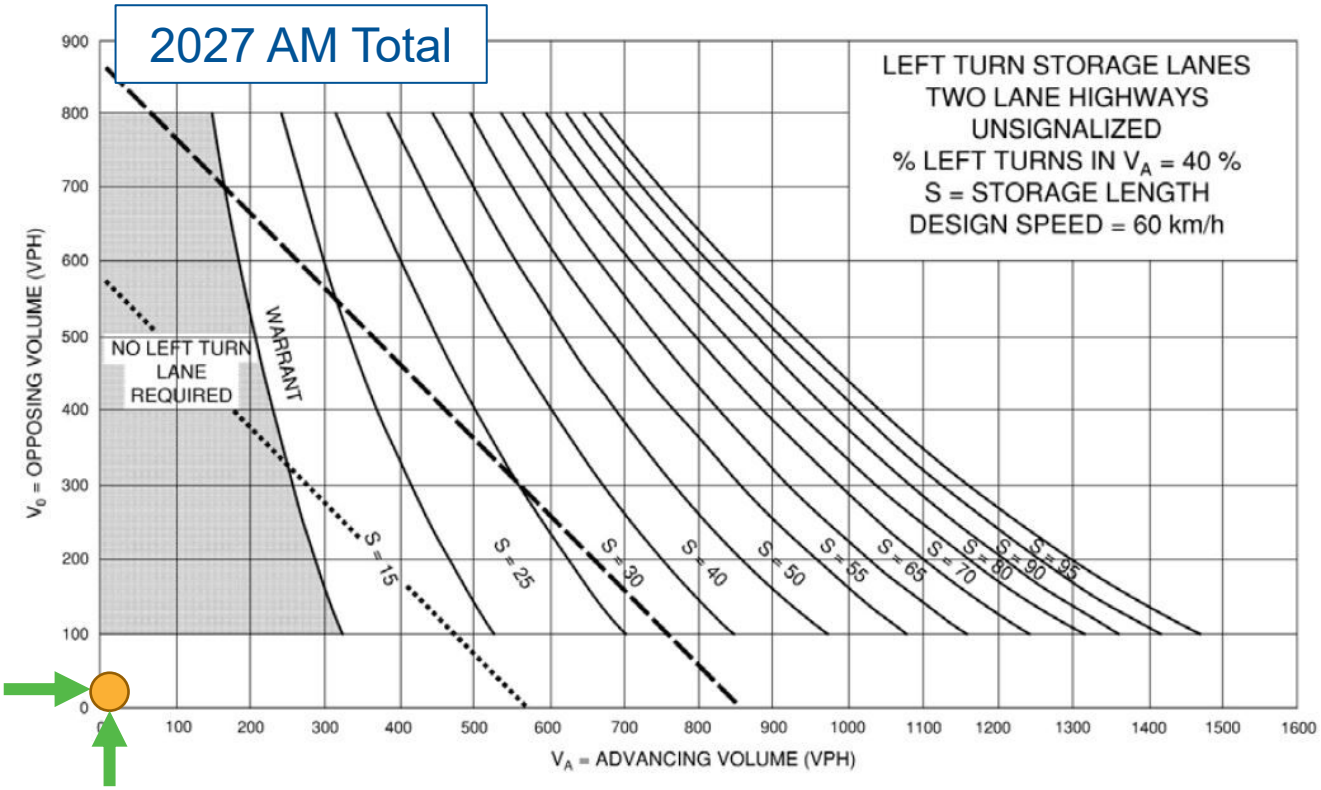
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	6	9	17	7	18
Future Volume (Veh/h)	12	6	9	17	7	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	7	10	18	8	20
Pedestrians						
Lane Width (m)						
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	56	18	28			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	56	18	28			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	951	1066	1599			

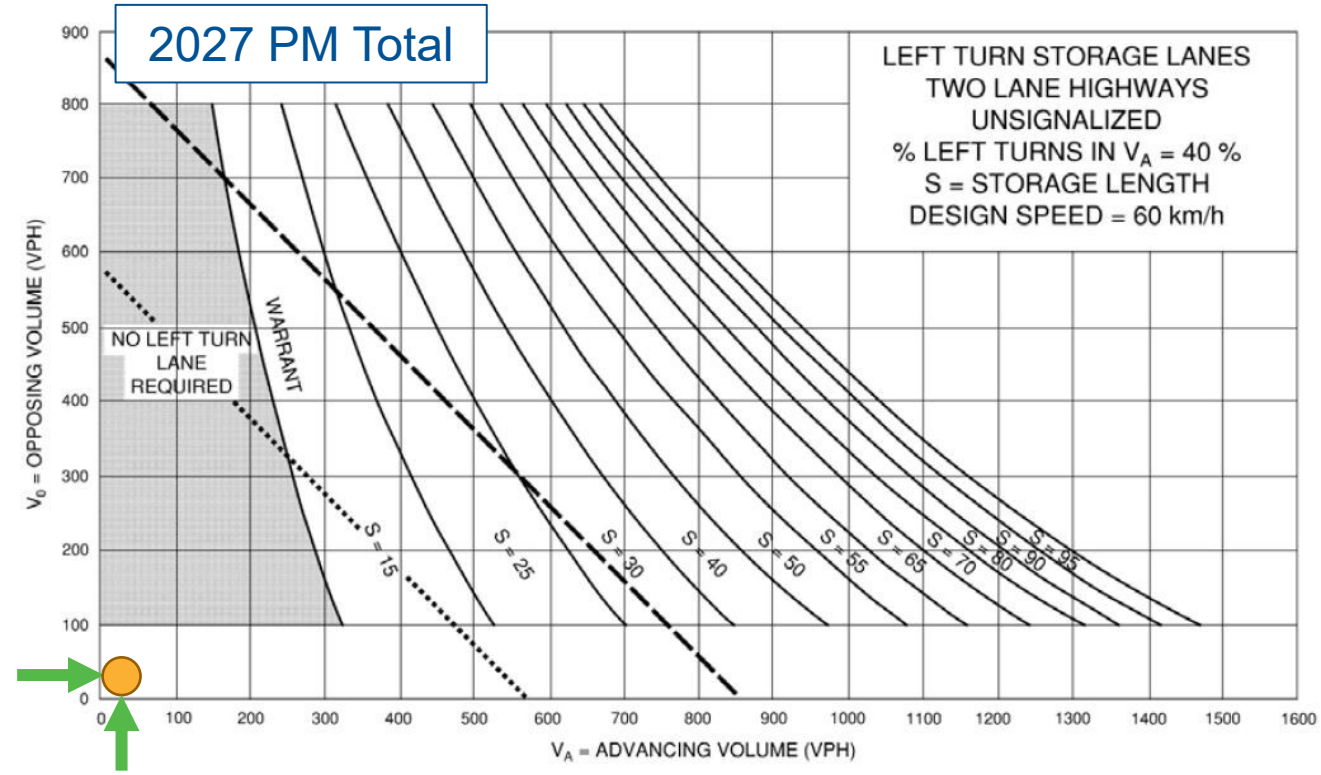
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	20	28	28
Volume Left	13	10	0
Volume Right	7	0	20
cSH	988	1599	1700
Volume to Capacity	0.02	0.01	0.02
Queue Length 95th (m)	0.5	0.2	0.0
Control Delay (s)	8.7	2.6	0.0
Lane LOS	A	A	
Approach Delay (s)	8.7	2.6	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	18.1%	ICU Level of Service		A
Analysis Period (min)	15			

Appendix G

Left-Turn Lane Warrants





paradigm TRANSPORTATION SOLUTIONS LIMITED

2027 Total Traffic Northbound Left-Turn Lane Warrant Drury Lane & Site Access

Appendix H

2027 Future Total Traffic Operations Reports – Signal Optimization

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	279	358	42	325	28	814	112	801
v/c Ratio	0.77	0.48	0.18	0.75	0.13	0.68	0.38	0.51
Control Delay	31.7	19.5	25.2	37.9	23.7	27.9	16.9	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.7	19.5	25.2	37.9	23.7	27.9	16.9	16.4
Queue Length 50th (m)	28.7	39.8	5.3	44.7	3.2	59.5	9.4	41.8
Queue Length 95th (m)	#54.2	62.5	13.3	72.2	10.7	#91.6	21.4	67.3
Internal Link Dist (m)		96.7		77.5		203.5		125.0
Turn Bay Length (m)			20.0		25.0		20.0	
Base Capacity (vph)	363	907	330	589	223	1193	293	1565
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	0.77	0.39	0.13	0.55	0.13	0.68	0.38	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	308	21	39	231	68	26	727	22	103	564	173
Future Volume (vph)	257	308	21	39	231	68	26	727	22	103	564	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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	0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	1862		1795	1803		1798	3522		1804	3423	
Flt Permitted	0.27	1.00		0.55	1.00		0.35	1.00		0.18	1.00	
Satd. Flow (perm)	513	1862		1034	1803		661	3522		344	3423	
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)	279	335	23	42	251	74	28	790	24	112	613	188
RTOR Reduction (vph)	0	3	0	0	14	0	0	3	0	0	32	0
Lane Group Flow (vph)	279	355	0	42	311	0	28	811	0	112	769	0
Confl. Peds. (#/hr)	13		10	10		13	7		11	11		7
Heavy Vehicles (%)	1%	1%	0%	0%	1%	2%	0%	2%	0%	0%	1%	1%
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)	31.2	31.2		18.2	18.2		26.5	26.5		36.0	36.0	
Effective Green, g (s)	31.2	31.2		18.2	18.2		26.5	26.5		36.0	36.0	
Actuated g/C Ratio	0.39	0.39		0.23	0.23		0.33	0.33		0.45	0.45	
Clearance Time (s)	4.0	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)	346	733		237	414		221	1178		257	1555	
v/s Ratio Prot	c0.09	0.19			0.17			c0.23		0.03	c0.22	
v/s Ratio Perm	c0.23			0.04			0.04			0.17		
v/c Ratio	0.81	0.48		0.18	0.75		0.13	0.69		0.44	0.49	
Uniform Delay, d1	18.4	18.0		24.5	28.4		18.3	22.8		14.2	15.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.8	0.5		0.4	7.5		1.2	3.3		1.2	1.1	
Delay (s)	31.2	18.5		24.8	35.9		19.5	26.1		15.3	16.3	
Level of Service	C	B		C	D		B	C		B	B	
Approach Delay (s)		24.1			34.6			25.9			16.2	
Approach LOS		C			C			C			B	

Intersection Summary

HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	79.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	185	188	25	371	51	487	70	594
v/c Ratio	0.60	0.26	0.09	0.84	0.17	0.35	0.16	0.36
Control Delay	26.9	17.7	29.7	48.9	26.1	24.2	16.2	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.9	17.7	29.7	48.9	26.1	24.2	16.2	17.9
Queue Length 50th (m)	24.0	21.5	4.0	65.4	7.1	38.2	7.4	38.8
Queue Length 95th (m)	39.1	36.8	10.9	99.9	18.3	59.0	17.4	60.4
Internal Link Dist (m)		182.0		84.4		127.1		203.5
Turn Bay Length (m)	40.0		20.0		30.0		30.0	
Base Capacity (vph)	320	899	370	599	304	1403	438	1672
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	0.58	0.21	0.07	0.62	0.17	0.35	0.16	0.36

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	122	51	23	179	162	47	428	20	64	489	57
Future Volume (vph)	170	122	51	23	179	162	47	428	20	64	489	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0		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		0.98	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.93		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)	1702	1776		1675	1731		1714	3547		1802	3474	
Flt Permitted	0.19	1.00		0.64	1.00		0.43	1.00		0.39	1.00	
Satd. Flow (perm)	343	1776		1127	1731		772	3547		730	3474	
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)	185	133	55	25	195	176	51	465	22	70	532	62
RTOR Reduction (vph)	0	15	0	0	32	0	0	3	0	0	7	0
Lane Group Flow (vph)	185	173	0	25	339	0	51	484	0	70	587	0
Confl. Peds. (#/hr)	7		17	17		7	19		8	8		19
Heavy Vehicles (%)	6%	1%	2%	6%	0%	2%	4%	1%	0%	0%	2%	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)	40.3	40.3		24.0	24.0		39.7	39.7		49.1	49.1	
Effective Green, g (s)	40.3	40.3		24.0	24.0		39.7	39.7		49.1	49.1	
Actuated g/C Ratio	0.40	0.40		0.24	0.24		0.39	0.39		0.48	0.48	
Clearance Time (s)	4.0	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)	301	705		266	409		302	1388		410	1682	
v/s Ratio Prot	c0.07	0.10			c0.20			0.14		0.01	c0.17	
v/s Ratio Perm	0.17			0.02			0.07			0.07		
v/c Ratio	0.61	0.25		0.09	0.83		0.17	0.35		0.17	0.35	
Uniform Delay, d1	22.6	20.4		30.2	36.7		20.1	21.7		14.4	16.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	0.2		0.2	13.0		1.2	0.7		0.2	0.6	
Delay (s)	26.3	20.6		30.4	49.7		21.3	22.4		14.6	16.8	
Level of Service	C	C		C	D		C	C		B	B	
Approach Delay (s)		23.4			48.5			22.3			16.6	
Approach LOS		C			D			C			B	

Intersection Summary					
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.55				
Actuated Cycle Length (s)	101.4	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	95.7%	ICU Level of Service		F	
Analysis Period (min)	15				

c Critical Lane Group

Appendix I

Proxy Site Parking Survey Data

170257 - 113 Bayfield Street TIS & PJS
Proxy Site Survey - February 1, 2018
15 Maple Avenue
169 units

Time	P1	P2	P3	P4	Total	Comments
9:00 AM	24	26	22	26	**98**	P1 – 34 spaces / 8 Accessible Spaces P2 – 73 Spaces / 4 Accessible Spaces P3 – 73 Spaces / 2 Accessible Spaces P4 – 62 Spaces / 2 Accessible Spaces Total – 242 Spaces / 16 Accessible Spaces 1 in Accessible without permit
10:00 AM	21	21	21	24	**87**	2 in Accessible without permit
11:00 AM	16	25	18	22	**81**	1 in Accessible without permit
12:00 PM	14	26	19	19	**78**	2 in Accessible without permit
1:00 PM	14	26	21	16	**77**	2 in Accessible without permit
2:00 PM	15	22	19	16	**72**	2 in Accessible without permit
3:00 PM	17	24	22	18	**81**	2 in Accessible without permit
4:00 PM	14	28	25	21	**88**	1 in Accessible without permit
5:00 PM	16	31	30	22	**99**	1 in Accessible without permit
6:00 PM	19	38	33	29	**119**	2 in Accessible without permit
7:00 PM	19	41	41	31	**132**	2 in Accessible without permit
8:00 PM	19	42	42	33	**136**	2 in Accessible without permit
12:00 AM	19	50	50	40	**159**	4 in Accessible without permt
1:00 AM	20	51	50	40	**161**	4 in Accessible without permt

170257 - 113 Bayfield Street TIS & PJS
Proxy Site Survey - February 1, 2018
14 Worsley Street
115 units

Time	P1	P2	Visitor	Total	Comments
9:00 AM	3	31	4	**38**	P1 – 60 Spaces / 5 Accessible Spaces P2 – 56 Spaces / 7 Accessible Spaces Visitor – 22 Spaces / 1 Accessible Space 1 in Accessible without permit
10:00 AM	5	26	5	**36**	1 in Accessible without permit
11:00 AM	5	24	4	**33**	1 in Accessible without permit
12:00 PM	5	24	3	**32**	2 in Accessible without permit
1:00 PM	6	26	2	**34**	2 in Accessible without permit
2:00 PM	6	28	2	**36**	2 in Accessible without permit
3:00 PM	4	26	2	**32**	2 in Accessible without permit
4:00 PM	5	28	3	**36**	2 in Accessible without permit
5:00 PM	5	36	3	**44**	3 in Accessible without permit
6:00 PM	4	37	5	**46**	3 in Accessible without permit
7:00 PM	4	37	7	**48**	3 in Accessible without permit
8:00 PM	4	34	7	**45**	3 in Accessible without permit
12:00 AM	5	36	7	**48**	3 in Accessible without permit
1:00 AM	6	39	7	**52**	3 in Accessible without permit

Appendix J

TTS Auto Ownership Data

Tue Apr 21 2020 17:21:34 GMT-0400 (Eastern Daylight Time) - Run Time: 465ms

Cross Tabulation Query Form - Household - 2016 v1.1

Row: No. of vehicles in household - n_vehicle
Column: Income range of household - income

Filters:
Planning district of household - pd_hhld In 81 **City of Barrie**

Household 2016
Table:

Number of Vehicles	Income						
	$0 to $14999	$15000 to $39999	$40000 to $59999	$60000 to $99999	$100000 to $124999	$125000 and above	Decline / don't know
0	999	1306	393	129	24	7	580
1	957	4821	4113	4609	810	617	2826
2	198	1250	2544	6165	3285	4815	3450
3	0	74	553	1670	1020	1907	1073
4	22	17	39	242	370	635	585
5	0	0	0	0	60	106	76
6	0	0	0	0	0	39	26
7	0	0	0	0	0	0	11
Unknown	36	0	0	0	0	0	18
Average Vehicles per household	**0.66**	**1.02**	**1.44**	**1.79**	**2.19**	**2.37**	**1.84**

Tue Apr 21 2020 17:44:41 GMT-0400 (Eastern Daylight Time) - Run Time: 463ms

Cross Tabulation Query Form - Household - 2016 v1.1

Row: No. of vehicles in household - n_vehicle
Column: Income range of household - income

Filters:
2006 GTA zone of household - gta06_hhld In 8501 **Traffic Analysis Zone of Development**

Household 2016
Table:

Number of Vehicles	Income						
	$0 to $14999	$15000 to $39999	$40000 to $59999	$60000 to $99999	$100000 to $124999	$125000 and above	Decline / don't know
0	233	144	52	20	0	7	30
1	119	412	360	269	163	46	197
2	0	32	51	176	54	196	57
3	0	0	0	0	0	54	0
Average Vehicles per household	**0.34**	**0.81**	**1.00**	**1.34**	**1.25**	**1.98**	**1.10**