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Bayside Apartments, Barrie

TRAFFIC IMPACT STUDY

Vitmont Holdings (Barrie) Inc.

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1 Introduction

Tatham Engineering Limited (Tatham) was retained by Vitmont Holdings (Barrie) Inc. to address the traffic impacts associated with the proposed Bayside Apartments mixed-use development to be located on the southwest corner of the intersection of Mulcaster Street and Collier Street within the City of Barrie. The location of the development site is illustrated in Figure 1.

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

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

Chapter 2 of this report addresses the existing conditions, detailing the road system and corresponding traffic operations. Chapter 3 addresses future conditions, prior to the completion of the proposed development, and will address the expected growth in the traffic levels and the resulting operating conditions. Chapters 4 and 5 address the proposed development, the ensuing vehicle trips that it will generate, and the associated impacts on the road system. Chapter 6 addresses potential impacts during construction and lastly, Chapter 7 summarizes the report and the key findings.



2 Existing Conditions

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

2.1 ROAD NETWORK

The road network to be addressed by this study consists of Collier Street, Mulcaster Street, Dunlop Street, Owen Street and the following intersections:

- Mulcaster Street with Collier Street;
- Dunlop Street with Mulcaster Street; and
- Collier Street with Owen Street.

The existing right-in/right-out commercial access on Collier Street, which will serve as the site access, has also been considered.

Photographs of the road system are provided in Figure 2.

2.1.1 Road Sections

Collier Street

As per *The City of Barrie Official Plan*¹, Collier Street is major collector road, providing east-west service parallel to Dunlop Street. To the west of Owen Street, Collier Street has a 2-lane cross section, providing one lane of travel per direction; whereas to the east of Owen Street (through to Mulcaster Street), the road has a 4-lane cross-section providing two lanes of travel per direction. There is a combination of parallel and angled on-street parking provided on both sides of the street (angled parking is provided on the south side only). Collier Street has a landscaped raised centre median throughout the immediate study area, with gaps to allow for left turn lanes at intersections and major driveways. As a major collector road, Collier Street has an assumed planning capacity of 500 vehicles per hour per lane (vphpl). This is consistent with lane capacity assumptions applied in the City's EMME traffic model, as noted in *The City of Barrie Transportation Master Plan - Final Report*².

¹ *The City of Barrie Official Plan*. Planning & Building Services Department. January 2018.

² *The City of Barrie Transportation Master Plan - Final Report*. WSP. June 2019



Mulcaster Street

Mulcaster Street is classified as a major collector road, providing north-south service through the study area. To the north of Collier Street, Mulcaster Street has a 4-lane cross section, providing two lanes of travel per direction; however, only the southbound lanes are delineated as such, with no pavement markings in the northbound direction (although the width can accommodate two-lanes). For the purpose of this study, the road has been modelled as providing two southbound lanes and one northbound lane. To the south of Collier Street, Mulcaster Street provides one lane of travel per direction, with on-street perpendicular parking on both sides of the street. Mulcaster Street has an assumed planning capacity of 500 vphpl.

Dunlop Street

Dunlop Street is an east-west arterial road with a 2-lane cross section (one lane of travel per direction) through the study area. Dunlop Street was recently improved to include a flexible streetscape design, consisting of mountable curb and moveable bollards which allow the on-street parking area to be converted into pedestrian space during the summer months. While designated as an arterial road, a slightly reduced assumed planning capacity of 650 vphpl has been assumed for Dunlop Street, recognizing the urban downtown environment it serves.

Owen Street

Owen Street is a north-south local road with a 2-lane cross-section, providing one lane of travel per direction. On-street parking is currently provided on both sides of the street, with parallel parking on the west side and angled parking on the east side. As a local road, Owen Street has an assumed planning capacity of 400 vphpl.

Speed Limits

The speed limit on each road is 50 km/h, reflective of the built nature of the area and the City's speed limit policy (50 km/h unless otherwise posted). In this regard, a design speed of 60 km/h has been applied (speed limit + 10 km/h on lower speed roads).

2.1.2 Key Intersections

The configuration and control for each of the study area intersections are detailed in Table 1..:



Table 1: Intersection Configuration

INTERSECTION	CONTROL	APPROACH	CONFIGURATION
Mulcaster Street & Collier Street	signals	east	▪ exclusive left, exclusive through & shared through/right
		west	▪ exclusive left, exclusive through & shared through/right
		north	▪ shared left/through & shared through/right
		south	▪ shared left/through & exclusive right
Dunlop Street & Mulcaster Street	signals	east	▪ exclusive left & shared through/right
		west	▪ shared left/through/right
		north	▪ shared left/through & exclusive right
		south	▪ shared left/through/right
Collier Street & Owen Street	signals	east	▪ exclusive left & shared through/right
		west	▪ exclusive left & shared through/right
		north	▪ shared left/through/right
		south	▪ shared left/through/right
Collier Street & Site Access (RI/RO)	stop (at site access)	east	▪ 2 through
		west	▪ exclusive through & shared through/right
		south	▪ right turn

2.2 TRAFFIC VOLUMES

To determine existing traffic volumes on the study area road network, traffic counts were obtained for the following intersections (corresponding traffic count details are provided in Appendix A):

- Mulcaster Street & Collier Street - Wednesday June 1, 2016 (City of Barrie);
- Dunlop Street & Mulcaster Street - Tuesday March 19, 2019 (City of Barrie);



- Collier Street & Owen Street - Wednesday October 11, 2017 ; and
- Owen Street & Dunlop Street - Wednesday October 11, 2017.

In addition to those noted above, traffic counts conducted in April 2014 for the intersections of Mulcaster Street with Collier Street and Dunlop Street as part of the *Dunlop Street Corridor Improvements Class EA*³ were also reviewed.

While some of the traffic data is older than what is typically desired, new traffic counts were not undertaken due to the ongoing COVID-19 pandemic and related restrictions, which have significantly impacted traffic volumes and patterns (i.e. new traffic counts may not reflect typical peak conditions). In addition, there is on-going construction within the Dunlop Street corridor which may also impact traffic volumes and operations through the study area.

Given that the traffic counts were conducted over various years, several adjustments were made to ensure that the existing volumes carried forward in the assessment are reasonably reflective of the existing conditions that would otherwise be anticipated in absence of the current pandemic situation. The adjustments were based on the historic volumes and growth patterns for the area. While most of the adjustments were fairly minor, the following adjustments to the intersection of Dunlop Street with Mulcaster Street were considered more significant in nature:

- The 2019 volumes on Dunlop Street, west of Mulcaster Street, were 15% less than those observed in 2017 at Owen Street - reflecting an annual decrease of approximately 8% per annum. As such, the 2017 volumes observed on Dunlop Street at Owen Street were carried through the intersection with Mulcaster Street based on the 2019 distribution patterns observed at said intersection.
- The 2019 northbound PM peak hour volumes on Mulcaster Street, north of Dunlop Street, reflect a 100% increase when compared to the 2014 northbound volumes (approximately 15% per annum) and a 90% increase when compared to the 2016 northbound volumes (approximately 24% per annum). In reviewing the overall volumes, the 2019 northbound through volumes (PM peak hour) on Mulcaster Street at Dunlop Street are significantly greater than the 2014 volumes, and greater than what would otherwise be expected given the historic volumes observed for this movement along with the growth experienced at the other movements at the intersection over the same time period. The higher volumes may be associated with a traffic event on the wider road network that at the time of the counts, resulting in a route diversion. Regardless, the northbound through volumes are considered uncharacteristically high and thus have been adjusted to avoid an overly conservative assessment. The northbound through volumes (PM peak hour) on Mulcaster Street at

³ *Dunlop Street Corridor Improvements Class EA Phases 1 & 2 Report*. City of Barrie. December 2015



Dunlop Street have been established based on the 2016 observed northbound volumes on Mulcaster Street, south of Collier Street, adjusted by an annual growth rate of 4.8% to reflect 2019 conditions. The 4.8% annual growth rate applied reflects the observed annual growth in the northbound PM peak hour volumes on Mulcaster Street, south of Collier Street, between 2014 and 2016.

In addition to the noted adjustments, the traffic volumes were further adjusted to reflect 2020 conditions. In this respect, the following growth rates were applied:

- 4% per annum - Dunlop Street;
- 2% per annum - Collier Street and Mulcaster Street; and
- 1% per annum - Owen Street.

Additional discussion regarding background growth rates is provide in Section 3.2.

With respect to the existing right-in/right-out access to Collier Street, inbound and outbound peak hour volumes have been assumed as traffic counts were not conducted at this intersection.

The 2020 existing volumes are illustrated in Figure 3.

2.3 TRAFFIC OPERATIONS

The assessment of existing conditions provides the baseline from which the future traffic volumes and operations (both with and without the subject development) can be assessed. The capacity, and hence operations, of a road system is effectively dictated by its intersections. As such, the analysis focused on the operations of the noted key intersections. The analysis is based on the 2020 traffic volumes, the existing configuration and intersection control (including optimization of traffic signal timings) and procedures outlined in the 2000 Highway Capacity Manual (using Synchro v.10 software). For the signalized intersections, the review considers the average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for each approach and the overall intersection. For the unsignalized site access, the analysis considers the same metrics for the critical movements, namely the stop-controlled exit movement. Level of service A corresponds to the best operating condition with minimal delays whereas level of service F corresponds to poor operations resulting from high intersection delays. A v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached. A summary of the analyses is provided in Table 2, whereas detailed operations worksheets for the existing traffic conditions are included in Appendix B.

Based on the existing volumes and intersection configuration and control, the study area intersections provide excellent overall levels of service (LOS B or better) with minimal delays



during both peak hours. As such, no improvements are required to support the existing conditions.

Table 2: Intersection Operations - 2020 Existing Conditions

INTERSECTION & MOVEMENT		CONTROL	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Mulcaster Street & Collier Street	EB	signal	7	A	0.13	7	A	0.14
	WB		14	B	0.19	13	B	0.20
	NB		22	C	0.70	21	C	0.65
	SB		15	B	0.26	17	B	0.42
	overall	signal	15	B	0.39	14	B	0.36
Dunlop Street & Mulcaster Street	EB	signal	16	B	0.38	20	B	0.62
	WB		8	A	0.48	9	A	0.54
	NB		20	C	0.60	18	B	0.51
	SB		22	C	0.60	26	C	0.73
	overall	signal	16	B	0.46	17	B	0.63
Collier Street & Owen Street	EB	signal	3	A	0.26	4	A	0.28
	WB		3	A	0.23	4	A	0.24
	NB		24	C	0.28	22	C	0.30
	SB		24	C	0.30	22	C	0.26
	overall	signal	6	A	0.26	7	A	0.28
Collier Street & Site Access	NB	stop	9	A	0.01	9	A	0.01



3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2023 and 2028. The 2023 horizon year has been adopted to reflect full build-out and occupancy of the proposed development, whereas the 2028 horizon will address the longer-term impacts (5 years beyond build-out). While a 10-year horizon is also often considered in traffic impact studies, such is not considered necessary for this development given the limited volume of traffic that it will generate (as detailed further in Section 4.5).

3.1 ROAD NETWORK

Consideration has been given to the following road improvement (recent and planned) as detailed below.

3.1.1 Dunlop Street Corridor Improvements Class EA

As part of the recent improvements to the Dunlop Street corridor, the intersection of Dunlop Street and Mulcaster Street was reconfigured to eliminate the exclusive left turn lanes on the north, south and west approaches. The exclusive left turn lane on the east approach has been maintained. It is noted that these improvements have been considered in the operations assessment for all horizons and conditions, including existing conditions.

3.1.2 The City of Barrie Transportation Master Plan

The City of Barrie Transportation Master Plan identified the following improvements for the area:

- implement continuous two-way left turn lane along Collier Street from Mulcaster Street to Blake Street; and
- buffered bicycle lanes along Collier Street from Bayfield Street to Blake Street.

The recommended timing for the continuous two-way left turn lane on Collier Street, east of Mulcaster Street is 2026 to 2031, whereas the buffered bicycle lanes are identified by 2041. It is noted that the continuous two-way left turn lane will not have any impact on the study area intersections, recognizing that the east and west approaches on Collier Street already provide exclusive left turn lanes.

3.2 TRAFFIC VOLUMES

Future background traffic volumes expected for the 2023 and 2028 horizon years for the study area have been determined based on the existing traffic volumes, historical and projected



growth, and additional increases in volumes due to other development within the immediate area (apart from the subject development).

3.2.1 Background Growth

Population & Employment Growth

The 2016 census results for the City of Barrie indicate that the population increased from 136,063 persons in 2011 to 141,434 in 2016, translating to an annual growth rate of 0.8%. According to *A Place to Grow: Growth Plan for the Greater Golden Horseshoe*⁴, which is intended to guide future development within the Greater Golden Horseshoe, the City of Barrie has been allocated an ultimate population (year 2051) of 298,000 persons. In consideration of the 2016 census population level of 141,434, this translates to an annual increase of approximately 2.2%.

With respect to employment, the *Growth Plan* identifies an employment level of 198,000 jobs by 2051. When compared to the 2011 employment level of 77,000 jobs, the 2051 employment level translates to an annual increase of 2.4%.

City of Barrie Transportation Model

Traffic growth projections provided in *The City of Barrie Transportation Master Plan*, as derived from the City's EMME transportation model, were reviewed for 2016 (existing conditions) and 2031. The model considers the travel demands of the entire City based primarily on population and employment levels within individual zones. In developing future travel demands, a number of factors are considered including planned growth, development levels, population forecasts, transportation improvements and transit initiatives and service levels.

In comparing the model's 2016 base year volumes to the 2031 volumes, growth rates ranging from -0.2% to 2.1% were realized on the study area road sections.

Other Studies

The following background growth rates were applied in recently completed traffic studies for developments in the downtown area:

- *Downtown Barrie Retirement Residence TIS*⁵: 3.5% for the period 2019 to 2021 and 2% for the period 2021 to 2026;

⁴*A Place to Grow: Growth Plan for the Greater Golden Horseshoe*. Ministry of Municipal Affairs & Housing. August 2020.

⁵ *Downtown Barrie Residences Traffic Impact Study*. Tatham Engineering Ltd. December 2019.



- *The Residences at Five Points TIS*⁶: 4% on Dunlop Street, 2% on Bayfield Street, Clapperton Street, Ross Street and Collier Street, and 1% on Maple Avenue;
- *Barrie Waterfront Developments TIS*⁷: 4% on Dunlop Street, 2% on Bayfield Street and Simcoe Street, and 1% on Mary Street and Maple Street.

Background Growth Rate

In consideration of anticipated population and employment growth and projected traffic growth identified in the City's traffic model, an annual growth rate in the order of 2.0% to 2.5% is justified. However, to maintain consistency with other traffic studies completed in the area, the following background growth rates have been applied:

- 4% on Dunlop Street;
- 2% on Collier Street and Mulcaster Street; and
- 1% on Owen Street.

3.2.2 Development Growth

With respect to planned developments in the immediate area that will contribute additional traffic volumes to the study area road networks, the following have been considered:

- 314-unit retirement residence to be located on the southeast corner of Collier Street and Owen Street (as detailed in the *Downtown Barrie Retirement Residence TIS*);
- Owen Street and Worsley Street mixed-use development consisting of 447 m² of commercial retail space and 307 residential apartment units (*Owen Street TIS*⁸);
- 185 Dunlop Street East mixed-use development consisting of 1,764 m² of commercial space (including a health and fitness club) and 178 residential apartment units (*Traffic Impact Study - Revised Addendum, 185 Dunlop Street*⁹); and
- 157 Dunlop Street East mixed-use development consisting of 500 m² of commercial space, a 130 room hotel and 136 residential condominium units (details provided in the *Traffic Impact Study - Revised Addendum, 185 Dunlop Street*).

The trip generation and distribution for each background development reflects those provided in the respective traffic studies. The volumes have been distributed through the study area road

⁶ *The Residences at Five Points Traffic Impact Study*. Tatham Engineering Ltd. April 2020.

⁷ *Barrie Waterfront Developments Traffic Impact Study*. Tatham Engineering Ltd. April 2020.

⁸ *Owen Street Traffic Impact Study*. JD Northcote Engineering Inc. November 2017.

⁹ *Traffic Impact Study - Revised Addendum, 185 Dunlop Street*. JD Northcote Engineering Inc. October 2019.



network based on observed traffic patterns and anticipated travel routes. Excerpts from the respective traffic studies are provided in Appendix C, as well as figures illustrating the trip distribution through the study area.

For the purpose of this study, it has been assumed that all background development will be built-out by the 2023 horizon year. A summary of the total background development volumes distributed through the study area is illustrated in Figure 4.

3.2.3 Background Traffic Volumes

The resulting 2023 and 2028 background traffic volumes are illustrated in Figure 5 and Figure 6. The background volumes are based on the 2020 traffic volumes, adjusted to reflect the respective annual background growth rates and the additional traffic volumes associated with the noted background developments.

3.3 TRAFFIC OPERATIONS

The study area intersections were again analyzed for each horizon year given the projected background volumes. The results are summarized in Table 3 and Table 4 (detailed worksheets are provided in Appendix D). The previously noted intersection modifications and road improvements have been considered and signal timings have been optimized to ensure efficient operations.

As indicated, the subject intersections will continue to provide good overall operating conditions (LOS C or better) with minimal delays through 2028 given the assumed background traffic volumes and the existing intersection configurations and control.



Table 3: Intersection Operations - 2023 Background Conditions

INTERSECTION & MOVEMENT		CONTROL	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Mulcaster Street & Collier Street	EB	signal	8	A	0.14	7	A	0.16
	WB		15	B	0.21	14	B	0.22
	NB		22	C	0.71	21	C	0.68
	SB		15	B	0.27	17	B	0.44
	overall	signal	15	B	0.41	15	B	0.39
Dunlop Street & Mulcaster Street	EB	signal	18	B	0.46	22	C	0.70
	WB		9	A	0.54	11	B	0.64
	NB		20	C	0.62	19	B	0.55
	SB		23	C	0.62	30	C	0.79
	overall	signal	16	B	0.52	19	B	0.71
Collier Street & Owen Street	EB	signal	4	A	0.30	5	A	0.31
	WB		4	A	0.26	4	A	0.25
	NB		22	C	0.32	22	C	0.37
	SB		22	C	0.21	22	C	0.29
	overall	signal	7	A	0.30	8	A	0.32
Collier Street & Site Access	NB	stop	9	A	0.01	10	A	0.01



Table 4: Intersection Operations - 2028 Background Conditions

INTERSECTION & MOVEMENT		CONTROL	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Mulcaster Street & Collier Street	EB	signal	9	A	0.16	8	A	0.18
	WB		16	B	0.24	15	B	0.26
	NB		23	C	0.74	22	C	0.71
	SB		15	B	0.28	17	B	0.47
	overall	signal	16	B	0.45	15	B	0.43
Dunlop Street & Mulcaster Street	EB	signal	20	C	0.56	30	C	0.84
	WB		10	B	0.63	15	B	0.77
	NB		21	C	0.66	20	B	0.59
	SB		25	C	0.68	34	C	0.84
	overall	signal	17	B	0.61	23	C	0.82
Collier Street & Owen Street	EB	signal	5	A	0.33	5	A	0.34
	WB		4	A	0.29	4	A	0.28
	NB		22	C	0.33	22	C	0.39
	SB		21	C	0.22	22	C	0.30
	overall	signal	7	A	0.33	8	A	0.35
Collier Street & Site Access	NB	stop	9	A	0.01	9	A	0.01



4 Proposed Development

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

4.1 SITE LOCATION

The subject site is located at 79 Collier Street in the City of Barrie (as per Figure 1). The property is bounded by existing development to the west and south, Collier Street to the north and Mulcaster Street to the east.

4.2 PROPOSED LAND-USE & PHASING

The proposed mixed-use development will consist of a 16-storey building with 126 residential apartment units and 404 m² (4,349 ft²) of ground floor commercial space. The development will also include a parking garage with 114 spaces.

A site plan is provided in Figure 7. Full build-out has been assumed by 2023.

4.3 SITE ACCESS

As illustrated in Figure 7, access to the site will be provided via the existing right-in/right-out access on Collier Street, which currently serves the adjacent development to the west (73 Collier Street). The existing access will continue to serve 73 Collier Street and will also provide access to the parking garage serving the subject site.

The loading/garbage enclosure area are located on the south side of the building and will be accessed via the existing public laneway.

4.4 PARKING & ON-SITE CIRCULATION

4.4.1 Parking

As previously noted, the proposed development will include a parking garage, providing 114 spaces for the exclusive use of the residents of the development. This reflects a rate of 0.90 space per unit. Additional discussion on the proposed parking supply, and justification for such, is provided under separate cover.

With respect to the commercial space, the City's *Comprehensive Zoning By-law 2009-141* indicates that commercial uses located within the Central Area Commercial (C1) and Urban Growth Centre area are not required to provide parking,. As such, parking for the commercial/retail space has not been provided.



4.4.2 On-Site Circulation

The internal driveway aisles serving the parking garage will provide two-way operations and maintain a minimum width of 6.4 metres (as per City standards for parking areas with stall angles of 90°). The aisles as proposed are sufficient with respect to the circulation of site generated traffic and the manoeuvring requirements of the design vehicles accessing the parking garage (i.e. passenger cars, SUV's, vans, etc.).

As previously noted, the loading area/garbage enclosure is located on the south side of the building and will be accessed via the existing public laneway. Consideration has been given to the manoeuvring requirements of a garbage truck, a medium single unit truck (i.e. for deliveries, etc.) and a light single unit truck. The truck turning templates are provided in Appendix E.

4.5 SITE TRAFFIC

4.5.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM and PM peak hours has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual*¹⁰, 10th Edition. Based on the proposed development, the trip rates for the *multifamily housing - high-rise* (ITE code 222) land-use have been applied to the residential units.

With respect to the commercial space, it is noted that a significant portion of the commercial trips will be walk-in traffic given the downtown location. Furthermore, recognizing that there will be no commercial parking on site, vehicular trips generated by the commercial use will be dispersed throughout the study area road network rather than concentrated at a single access point (i.e. commercial patrons arriving by vehicle may utilize on-street parking or municipal parking lots in the area). As such, the commercial traffic has not been considered explicitly in the trip generation; rather, it has been assumed that the commercial traffic is otherwise considered in the background growth rates. It is noted that the commercial space, with a gross floor area of 404 m² (4,349 ft²), would generate in the order of 5 to 15 peak hour trips - assuming a retail tenant (based on ITE trip rates for the *shopping centre* land-use). When considering an office use or personal service establishment (i.e. hair salon), the peak hour trips reduce to 10 or less.

The associated trip rates and trip estimates are provided in Table 5.

¹⁰ *ITE Trip Generation Manual, 10th Edition*. Institute of Transportation Engineers. September 2017.



As indicated, the proposed mixed-use development is expected to generate 39 trips during the AM peak hour and 46 trips during the PM peak hour. In context of these reduced trip estimates, a scoped traffic impact study is considered appropriate.

Table 5: Trip Generation - Bayside Apartments

LAND-USE	RATE/ ESTIMATE	VARIABLE/ SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			In	Out	Total	In	Out	Total
multifamily housing -high-rise (ITE 222)	rate	units	0.07	0.24	0.31	0.22	0.14	0.36
	estimate	126 units	9	30	39	28	18	46

Recognizing that the study area is well served by public transit and considering its centralized downtown location, it is expected that a portion of the trips to and from the site will be made via public transit or non-auto modes of transportation (i.e. walking, cycling etc.). Based on a review of the *2016 Transportation Tomorrow Survey (TTS)* data, 10% of all trips with an origin or destination within the City of Barrie were done so via walking, cycling or public transit. To account for these trips, a 10% reduction could reasonably be applied; however, to ensure a conservative approach, no adjustments have been applied.

4.5.2 Trip Distribution & Assignment

The distribution of the new trips generated by the site has been developed based on the *2016 TTS* trip data. The *TTS* is a survey of a random sampling of 5% of the households in the Greater Toronto Area and surrounding area of Central Ontario, including the City of Barrie. Based on a review of the *TTS* data with respect to trips to/from Barrie, the following trip distribution was identified:

- to/from the east beyond Barrie – 5%;
- to/from the west beyond Barrie – 5%;
- to/from the north beyond Barrie – 10%;
- to/from the south beyond Barrie – 10% and
- to/from locations within Barrie – 70%.

As indicated, 70% of the trips remain wholly within Barrie whereas 30% originate from, or are destined to, areas outside of the City. The trips that remain within Barrie were distributed based on additional *TTS* trip data for the traffic zone within which the development is located. When



considering the distribution of trips that remain within the City, the ultimate trip distribution for the site is as follows:

- to/from the east - 5%;
- to/from the west - 20%;
- to/from the north - 40%; and
- to/from the south - 35%.

The assignment of the trips generated by the development to the area road network is based on the trip distribution noted above with consideration given to site access location and configuration, the area road system, and the expected travel routes.

The resulting site generated traffic volumes assigned to the road network are illustrated in Figure 8.



5 Future Total Conditions

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

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

5.1 TRAFFIC VOLUMES

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site generated traffic was combined with the 2023 and 2028 background traffic volumes. The resulting total traffic volumes are presented in Figure 9 and Figure 10.

5.2 TRAFFIC OPERATIONS

The operations of the key intersections were again investigated considering the total traffic volumes for each horizon year. The intersection configurations and control as employed in the background analyses have been maintained. The results of the operational review are provided in Table 6 through Table 7 (detailed worksheets are provided in Appendix F).

As indicated, the study area intersections and site access will continue to provide good overall operations (LOS C or better) with minimal delays through the 2028 horizon given the projected total volumes. It is noted that the total operating conditions are comparable to those experienced under background conditions (i.e. the proposed development will have minimal impact on the intersection operations).

The site access will also operate well below capacity during the noted peak hour conditions and provide excellent operations (LOS A), recognizing that it will operate in a right-in/right-out fashion.

In consideration of the above, no improvements are considered necessary to accommodate the future total conditions.



Table 6: Intersection Operations - 2023 Total Conditions

INTERSECTION & MOVEMENT		CONTROL	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Mulcaster Street & Collier Street	EB	signal	8	A	0.15	7	A	0.16
	WB		15	B	0.21	14	B	0.22
	NB		22	C	0.71	21	C	0.68
	SB		15	B	0.27	17	B	0.44
	overall	signal	15	B	0.41	14	B	0.39
Dunlop Street & Mulcaster Street	EB	signal	18	B	0.46	22	C	0.70
	WB		9	A	0.54	11	B	0.64
	NB		20	C	0.62	19	B	0.54
	SB		24	C	0.66	31	C	0.80
	overall	signal	16	B	0.53	19	B	0.71
Collier Street & Owen Street	EB	signal	4	A	0.30	5	A	0.33
	WB		4	A	0.26	4	A	0.25
	NB		22	C	0.32	22	C	0.38
	SB		22	C	0.23	22	C	0.33
	overall	signal	7	A	0.30	8	A	0.34
Collier Street & Site Access	NB	stop	9	A	0.05	9	A	0.04



Table 7: Intersection Operations - 2028 Total Conditions

INTERSECTION & MOVEMENT		CONTROL	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Mulcaster Street & Collier Street	EB	signal	9	A	0.17	8	A	0.18
	WB		16	B	0.24	15	B	0.26
	NB		23	C	0.74	22	C	0.71
	SB		15	B	0.28	17	B	0.47
	overall	signal	16	B	0.46	15	B	0.43
Dunlop Street & Mulcaster Street	EB	signal	20	C	0.56	31	C	0.84
	WB		10	B	0.63	15	B	0.77
	NB		21	C	0.66	19	B	0.56
	SB		26	C	0.71	36	D	0.85
	overall	signal	18	B	0.62	23	C	0.82
Collier Street & Owen Street	EB	signal	5	A	0.33	5	A	0.36
	WB		4	A	0.29	4	A	0.28
	NB		22	C	0.34	22	C	0.40
	SB		21	C	0.23	22	C	0.35
	overall	signal	7	A	0.33	8	A	0.36
Collier Street & Site Access	NB	stop	9	A	0.05	9	A	0.04

5.3 SIGHT LINE ANALYSIS

Based on TAC geometric design standards, the minimum stopping sight distance for a design speed of 60 km/h (posted 50 km/h + 10 km/h) is 85 metres. The minimum stopping sight distance provides sufficient distance for an approaching motorist to observe a stationary hazard in the road and bring their vehicle to a complete stop prior to the hazard. In consideration of the



right-in/right-out configuration of the access, only the sight lines to/from the west have been considered (i.e. there will be no potential conflict between vehicles exiting the site and vehicles approaching from the east).

While Collier Street maintains a straight and flat alignment, the sight lines to/from the west at the site access are restricted by both the edge of the building at 73 Collier Street and the presence of on-street parking on the south side of Collier Street (sight lines are illustrated in Figure 11). As motorists exit the site and stop prior to the sidewalk, the sight lines are limited to 10 metres due to the proximity of the northeast corner of the building at 73 Collier Street. As motorists pull forward, the sight lines improve slightly (15 to 20 metres) but are still restricted by the presence of on-street parking. While the sight lines are not ideal, it is noted that this condition is common at most private commercial driveways and public laneways located within a downtown area (including the City of Barrie). The condition will necessitate that motorists exit the site with caution. Given the straight and flat alignment of Collier Street, the available sight lines gradually improve as vehicles slowly pull forward. Achieving the desired sight lines in downtown urban conditions is often difficult due to on-street parking, street furniture, reduced building setbacks, etc.; however, vehicle operating speeds are generally lower in downtown areas and motorists' caution/awareness is heightened. Furthermore, Collier Street consists of two eastbound lanes across the access, providing a second lane for approaching vehicles to utilize should they encounter a vehicle exiting from the site unexpectedly. It is also noted that the sight lines exceed the minimum stopping distance requirements when the on-street parking is not being utilized.

While the available sight lines at the site access are not ideal, they are considered typical when compared to other downtown locations. Signage for exiting motorists to watch for pedestrians is recommended.



6 Construction Staging Plan

This chapter will describe the preparation of a preliminary construction staging plan, illustrating how construction of the development will temporarily impact the area road network. The staging plan considers trades parking, deliveries, impacts to on-street parking and pedestrian facilities, etc. It is noted that the construction staging plan is considered preliminary and for discussion purposes only, recognizing that the contractor selected to construct the development may require revisions based on the actual construction operations.

6.1 CONSTRUCTION STAGING PLAN

The following alterations to the study area transportation network (which includes travel lanes, sidewalks and on-street parking) are recommended to accommodate the construction staging for the proposed development:

1. Close the sidewalk on the south side of Collier Street from just beyond the west limit of the site to Mulcaster Street. Pedestrians will be directed to a protected 1.5 metre covered walkway adjacent to the eastbound curb lane. Given the existing curb extensions at the southwest corner of Collier Street with Mulcaster Street, a portion of the existing sidewalk can remain open (although it should also be covered for the duration of construction).
2. Close the sidewalk on the west side of Mulcaster Street from Collier Street to the south limit of the site. Pedestrians will be directed to a protected 1.5 metre covered walkway adjacent to the southbound curb lane.
3. Temporarily remove the 3 parallel parking spaces on the south side of Collier Street (1 to the west of the existing access and 2 to the east of the access) and 2 perpendicular parking spaces on the west side of Mulcaster Street (the first 2 parking spaces south of the existing parking lot access). Removal of the parking spaces will facilitate the accommodation of staging construction areas and the temporary covered walkways within the existing road platform - thus mitigating impacts to the capacity of the road network.
4. Institute and enforce a “No Stopping” zone along Collier Street and Mulcaster Street.
5. Erect construction hoarding along the frontage of the site along Collier Street and Mulcaster Street and construct a covered sidewalk to protect pedestrians.

The preliminary construction staging plan is illustrated in Appendix G.



6.2 TRADES PARKING

Given that the proposed development will be constructed to the limits of the property boundary, there will not be space available to accommodate the parking requirements for the various trade workers working on the site. As such, trade workers will be expected to utilize available municipal parking lots in the area. There are municipal lots located on Worsley Street and Owen Street, as well as on-street parking on Mulcaster Street - north of Worsley Street. The Collier Street Parkade is also in close proximity. The developer may also consider arranging for parking provision at the 100-112 Collier Street location, if available at the time of construction.

6.3 CONSTRUCTION ACCESS

Access to the site will occur via Mulcaster Street. The access will serve as the primary access point during site preparation and throughout construction of the site. A secondary staging area may be established on Collier Street if needed of small-scale deliveries and trades vehicles. Additional information regarding the staging requirements to establish the access is discussed above and illustrated in Appendix G.

6.4 IMPACT TO ADJACENT PROPERTIES

The construction staging requirements are not expected to inhibit or prevent access to the adjacent properties and businesses. While it is acknowledged that the site will require construction hoarding along the perimeter, all efforts will be made to ensure access is maintained throughout the construction process. It is noted that no lane closures are proposed as part of the construction. The existing laneway to the south of the site is to remain unobstructed during construction, allowing delivery and service vehicles to continue to access the various businesses fronting Dunlop Street and Mulcaster Street.

6.5 PEDESTRIAN MOVEMENTS

Pedestrian movements on Collier Street and Mulcaster Street will be largely unaffected by the construction of the proposed development. While portions of the sidewalks on both roads are recommended for closure, sidewalk continuity will be maintained via a covered 1.5 metre pedestrian walkway. It is recommended that the covered pedestrian walkway be constructed in a manner that negates the need for users to step up or down (i.e. the covered walkway should be constructed at the same height of the curb in areas where the walkway is located on the road). This will also allow wheelchairs to navigate the area without issue.

6.6 ON-STREET PARKING

As previously noted, the proposed construction staging plan will require the temporary closure of 5 on-street parking spaces (3 on Collier Street and 2 on Mulcaster Street). It is expected that



vehicles displaced by the removal of the noted parking spaces will park in other municipal lots in the area.



7 Summary

Proposed Development

This study has addressed the transportation impacts associated with the proposed mixed-use development located at 79 Collier Street within the City of Barrie. The proposed Bayside Apartments development is a 16-storey building with 126 residential apartment units and 404 m² of commercial space. Upon completion, the site is expected to generate a total of 39 trips during the AM peak hour and 46 trips during the PM peak hour.

Traffic Operations

In addressing the study area operations, the key intersections were analysed under existing conditions (2020) and for the 2023 and 2028 horizon periods. The results of the operational analysis indicate that the key intersections will provide good overall operating conditions through 2028 under both future background and future total conditions. The site access operations were also reviewed, with the Collier Street access providing excellent levels of service through the 2028 horizon period given the projected traffic volumes.

Sight Lines

The sight lines to/from the west along Collier Street do not satisfy the minimum stopping sight distances for a 60 km/h design speed as they are restricted by the adjacent building at 73 Collier Street and existing on-street parking. It is noted that achieving the desired sight lines in downtown urban conditions is often difficult due to on-street parking, street furniture, reduced building setbacks, etc.; however, vehicle operating speeds are generally lower in downtown areas and motorists' caution/awareness is heightened. While the available sight lines at the site access are not ideal, they are considered typical when compared to other downtown locations.

Construction Staging Plan

The preparation of the preliminary construction staging plan was undertaken to illustrate how construction of the development will temporarily impact the area road network. The staging plan considered trades parking, deliveries, impacts to on-street parking and pedestrian facilities, etc. and mitigating measures to ensure minimal impacts to the adjacent roadways.





Bayside Apartments

Figure 1: Site Location





Bayside Apartments
Figure 2A: Area Road Network





Looking south along Mulcaster Street from Collier Street



Looking west along Collier Street from Mulcaster Street

Bayside Apartments

Figure 2B: Area Road Network





Looking east along Collier Street from site access

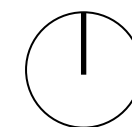
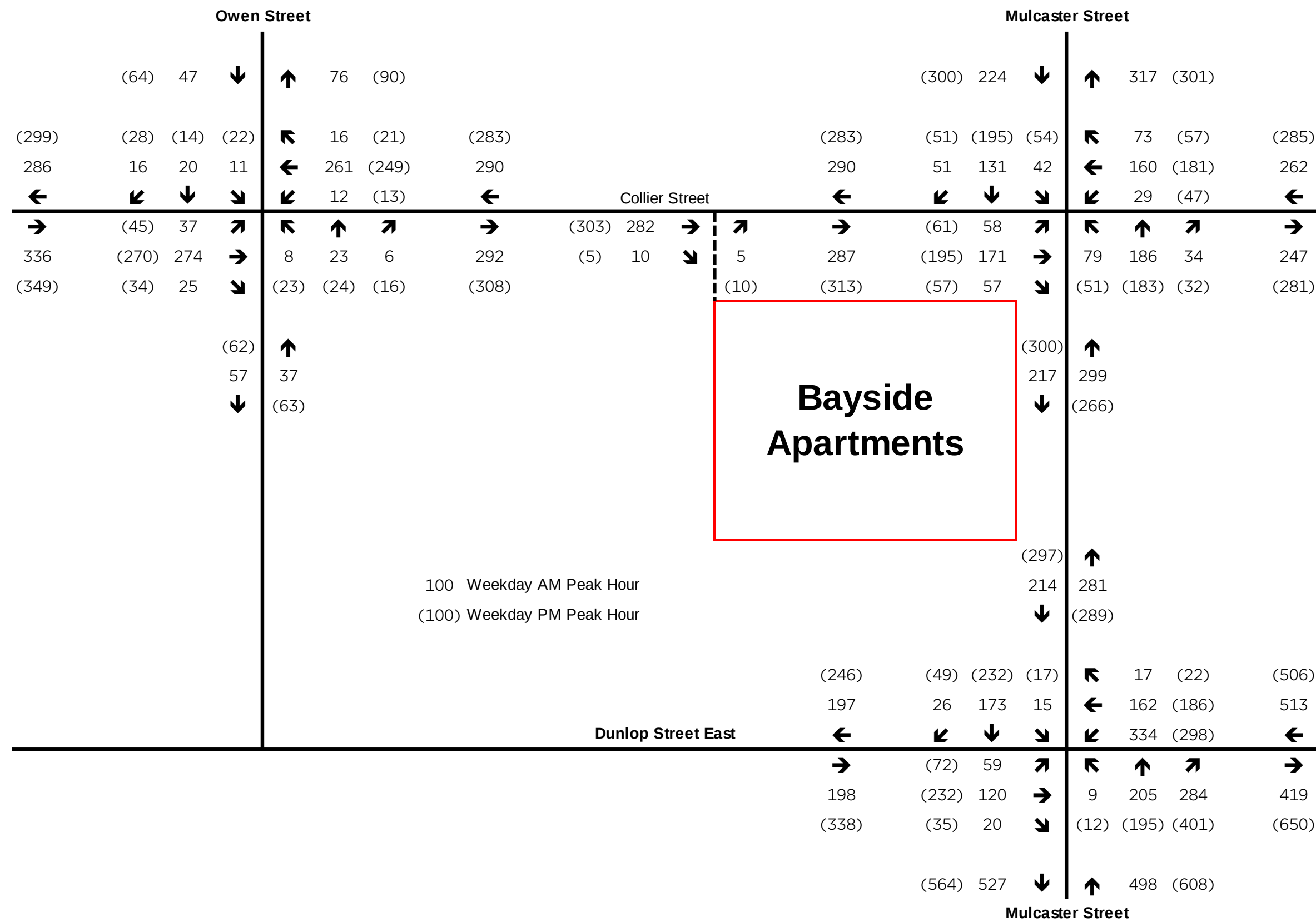


Looking west along Collier Street from site access

Bayside Apartments

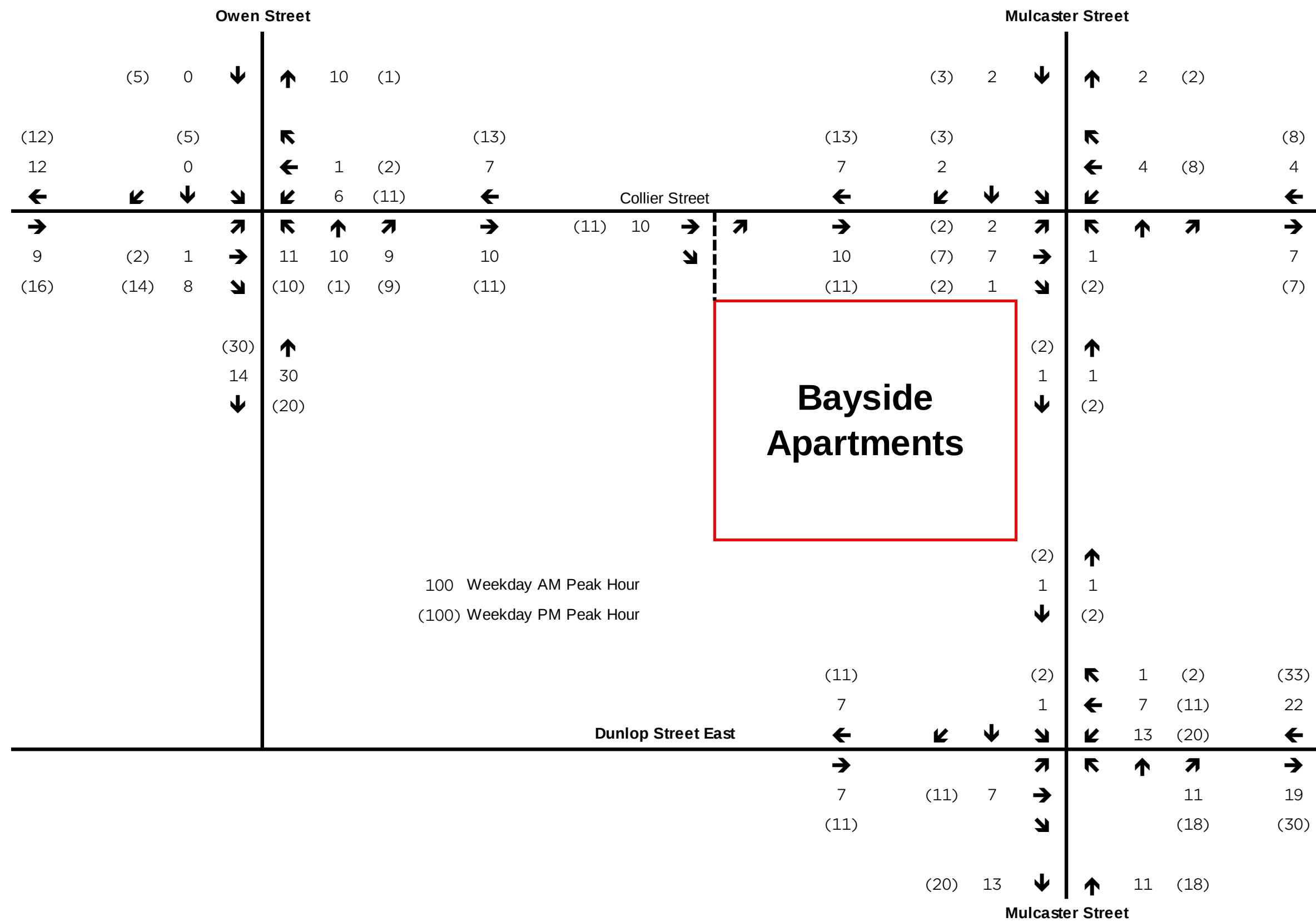
Figure 2C: Area Road Network





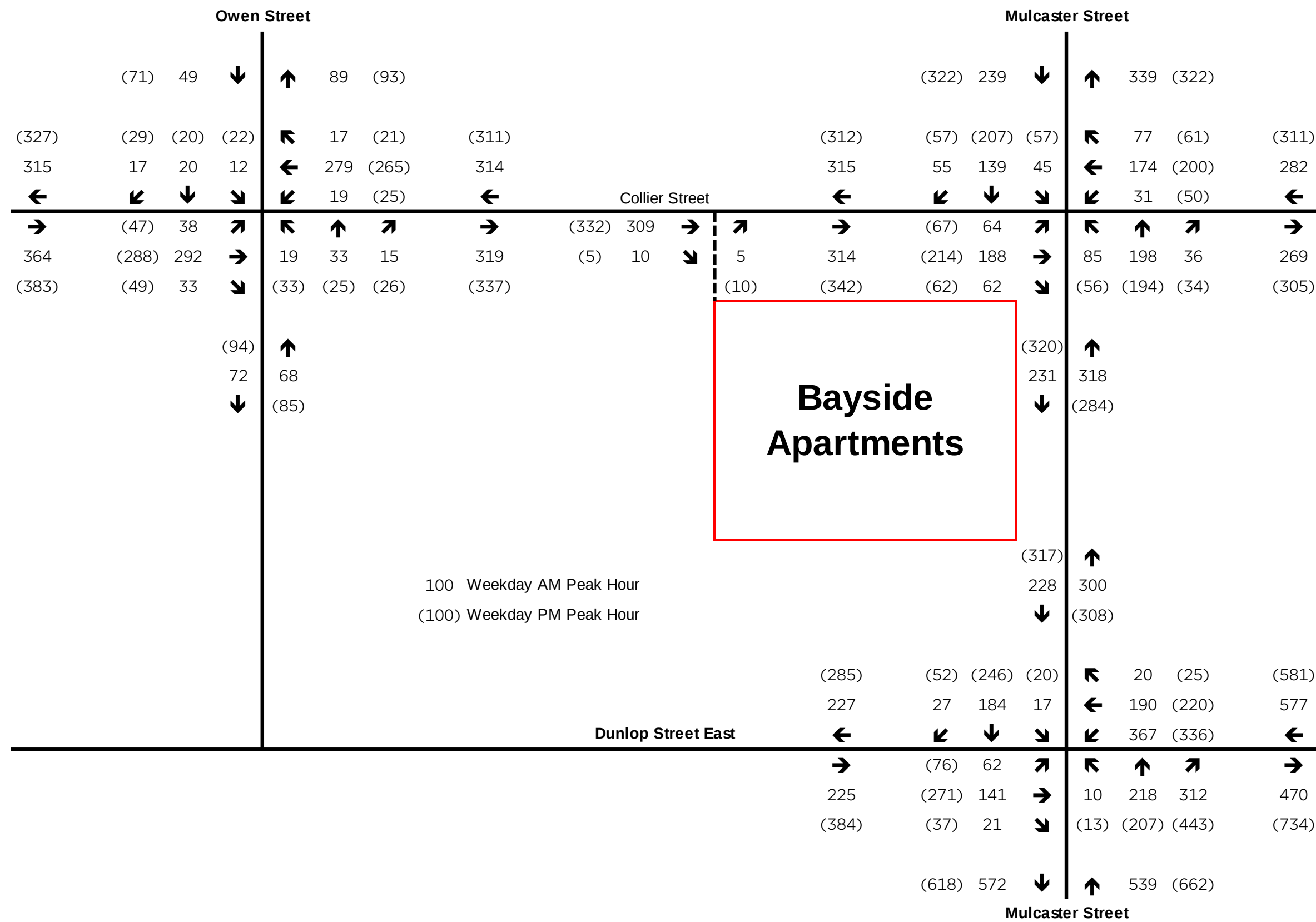
Bayside Apartments
Figure 3: 2020 Traffic Volumes





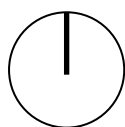
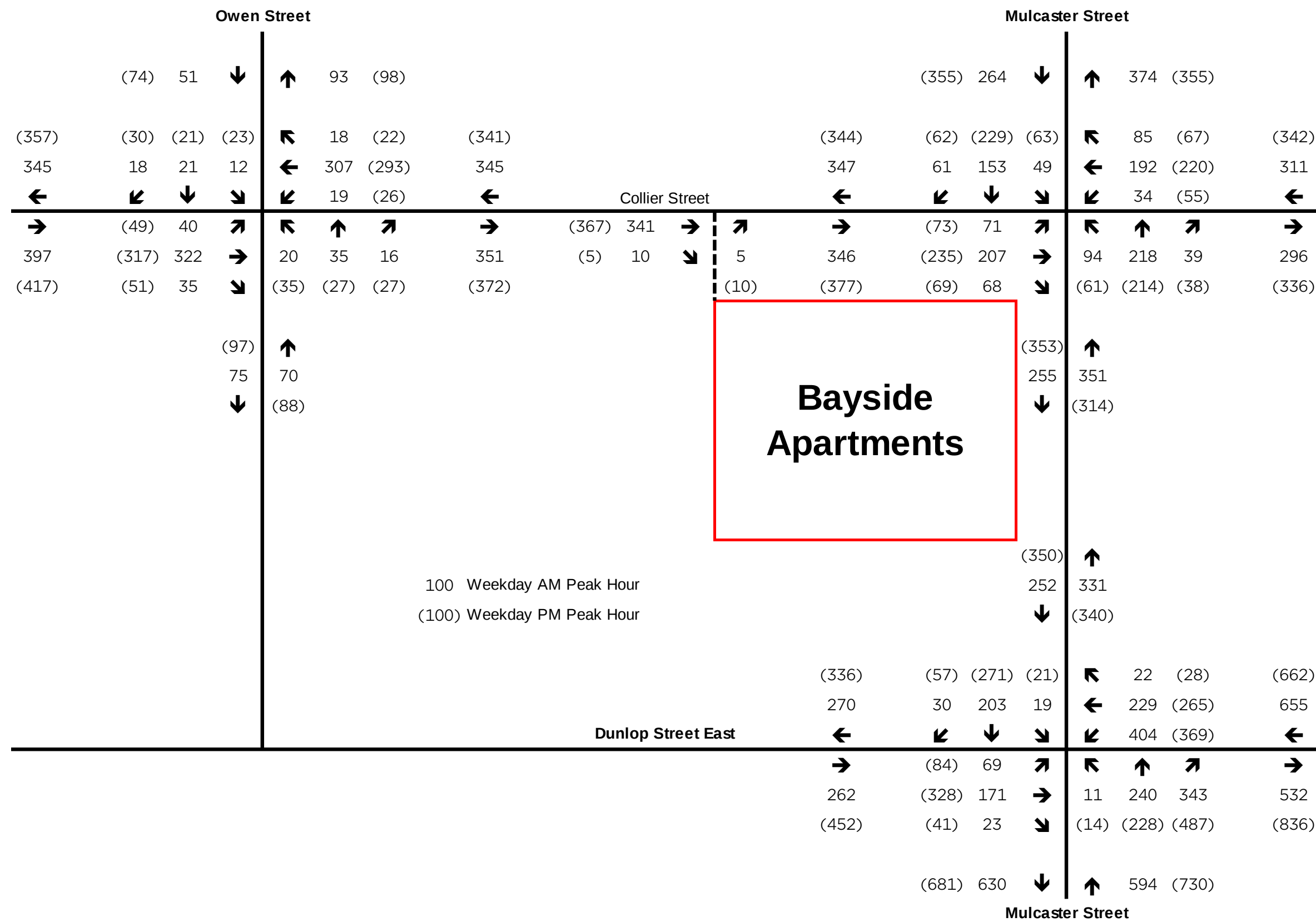
Bayside Apartments
Figure 4: Background Development Traffic - Total





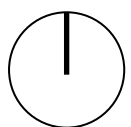
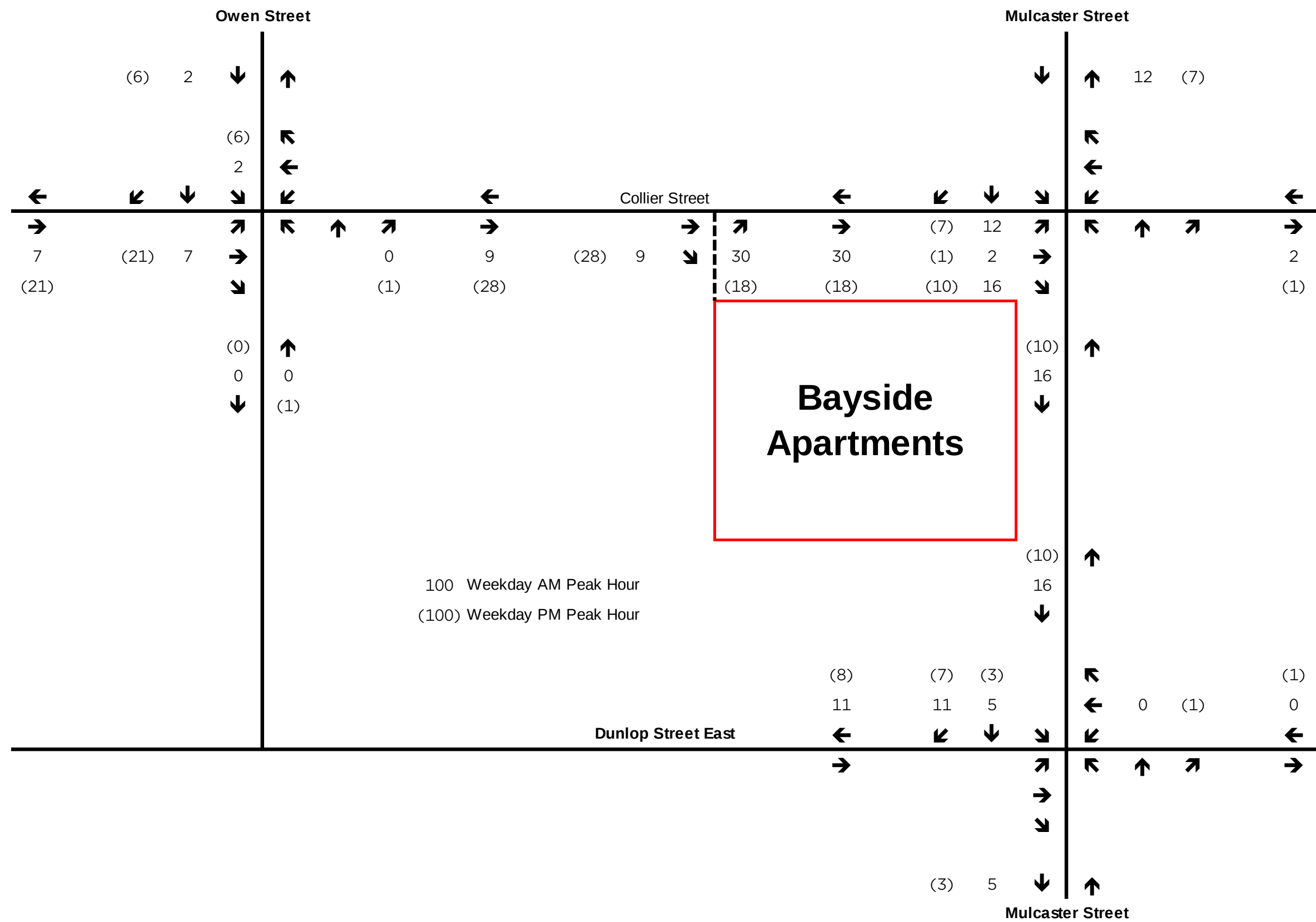
Bayside Apartments
Figure 5: 2023 Background Traffic Volumes





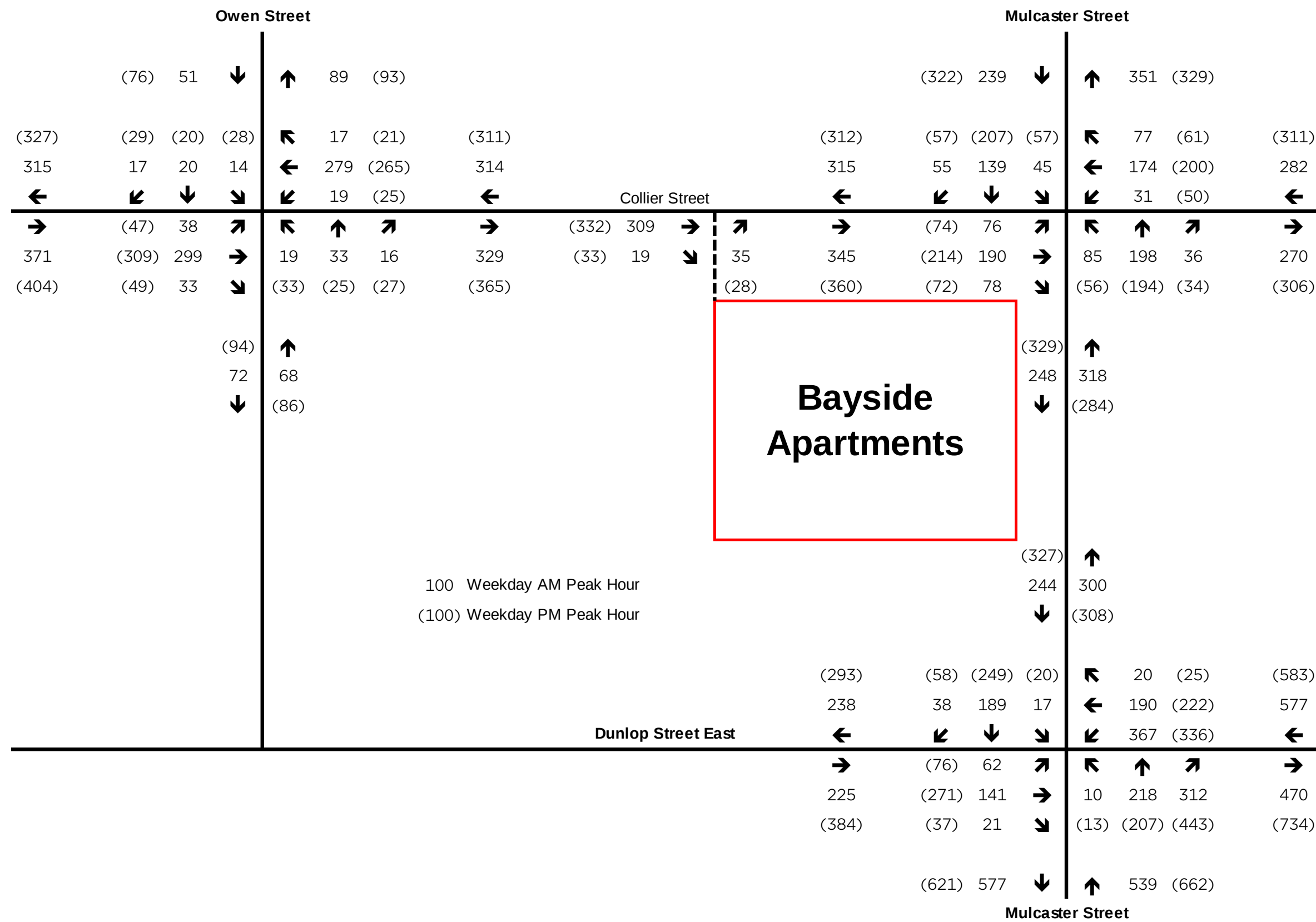
Bayside Apartments
Figure 6: 2028 Background Traffic Volumes





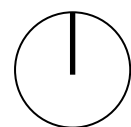
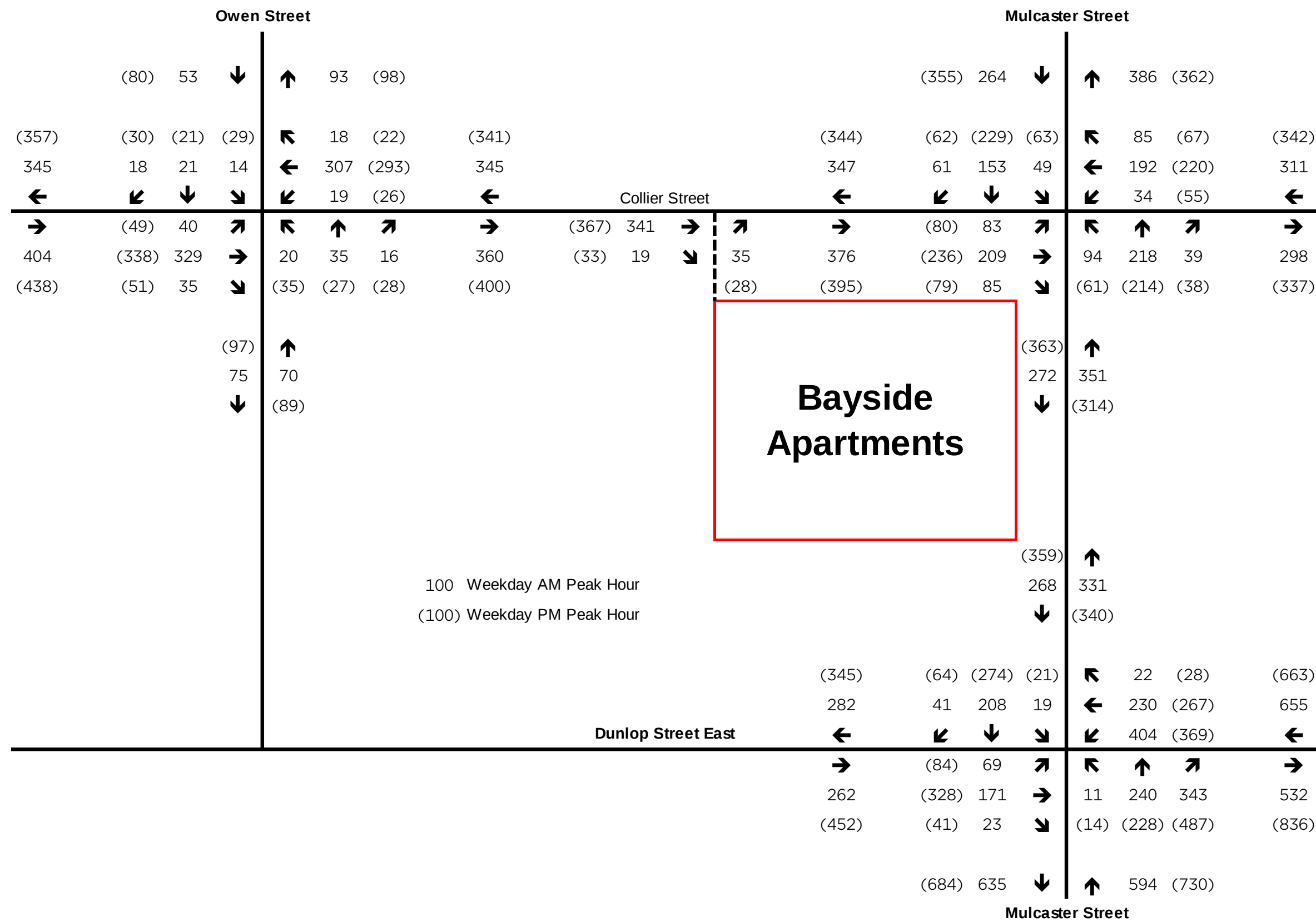
Bayside Apartments
Figure 8: Site Generated Traffic





Bayside Apartments
Figure 9: 2023 Total Traffic Volumes





Bayside Apartments
Figure 10: 2028 Total Traffic Volumes





Bayside Apartments

Figure 11: Sight Lines



Appendix A: Traffic Count Data

Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 7:00:00 To: 9:00:00	One Hour Peak From: 8:00:00 To: 9:00:00
Municipality: Barrie Site #: 1600200002 Intersection: Mulcaster St & Collier St TFR File #: 1 Count date: 1-Jun-16	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **	Major Road: Mulcaster St runs N/S	

North Leg Total: 564 North Entering: 257 North Peds: 20 Peds Cross:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cyclists</td> <td style="text-align: right;">0</td> <td style="text-align: right;">3</td> <td style="text-align: right;">0</td> <td style="text-align: right;">3</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">2</td> <td style="text-align: right;">4</td> <td style="text-align: right;">1</td> <td style="text-align: right;">7</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">42</td> <td style="text-align: right;">166</td> <td style="text-align: right;">39</td> <td style="text-align: right;">247</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">44</td> <td style="text-align: right;">173</td> <td style="text-align: right;">40</td> <td style="text-align: right;">267</td> </tr> </table>	Cyclists	0	3	0	3	Trucks	2	4	1	7	Cars	42	166	39	247	Totals	44	173	40	267	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cyclists</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">10</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">297</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">307</td> </tr> </table>	Cyclists	0	Trucks	10	Cars	297	Totals	307	East Leg Total: 388 East Entering: 210 East Peds: 16 Peds Cross:
Cyclists	0	3	0	3																											
Trucks	2	4	1	7																											
Cars	42	166	39	247																											
Totals	44	173	40	267																											
Cyclists	0																														
Trucks	10																														
Cars	297																														
Totals	307																														

Cyclists	Trucks	Cars	Totals
1	11	200	212

Mulcaster St

N
S
W
E

Cars	Trucks	Cyclists	Totals
52	2	0	54
124	8	1	133
22	1	0	23
198	11	1	

Collier St

Collier St

Cyclists	Trucks	Cars	Totals
0	4	33	37
2	5	101	108
0	1	30	31
2	10	164	

Mulcaster St

Cars	Trucks	Cyclists	Totals
170	6	2	178

Peds Cross: West Peds: 16 West Entering: 176 West Leg Total: 388	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">218</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">6</td> </tr> <tr> <td style="text-align: right;">Cyclists</td> <td style="text-align: right;">3</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">227</td> </tr> </table>	Cars	218	Trucks	6	Cyclists	3	Totals	227	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">34</td> <td style="text-align: right;">212</td> <td style="text-align: right;">30</td> <td style="text-align: right;">276</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">1</td> <td style="text-align: right;">4</td> <td style="text-align: right;">0</td> <td style="text-align: right;">5</td> </tr> <tr> <td style="text-align: right;">Cyclists</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">35</td> <td style="text-align: right;">216</td> <td style="text-align: right;">30</td> <td style="text-align: right;">281</td> </tr> </table>	Cars	34	212	30	276	Trucks	1	4	0	5	Cyclists	0	0	0	0	Totals	35	216	30	281	Peds Cross: South Peds: 24 South Entering: 281 South Leg Total: 508
Cars	218																														
Trucks	6																														
Cyclists	3																														
Totals	227																														
Cars	34	212	30	276																											
Trucks	1	4	0	5																											
Cyclists	0	0	0	0																											
Totals	35	216	30	281																											

Comments



Comments

Accu-Traffic Inc.

Afternoon Peak Diagram		Specified Period From: 15:00:00 To: 18:00:00	One Hour Peak From: 16:30:00 To: 17:30:00
Municipality: Barrie Site #: 1600200002 Intersection: Mulcaster St & Collier St TFR File #: 1 Count date: 1-Jun-16		Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **		Major Road: Mulcaster St runs N/S	

North Leg Total: 608 North Entering: 330 North Peds: 25 Peds Cross:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cyclists</td> <td style="text-align: right;">0</td> <td style="text-align: right;">6</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">6</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">1</td> <td style="text-align: right;">3</td> <td style="text-align: right;">1</td> <td style="border-left: 1px solid black; text-align: right;">5</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">46</td> <td style="text-align: right;">224</td> <td style="text-align: right;">49</td> <td style="border-left: 1px solid black; text-align: right;">319</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">47</td> <td style="text-align: right;">233</td> <td style="text-align: right;">50</td> <td style="border-left: 1px solid black;"></td> </tr> </table>	Cyclists	0	6	0	6	Trucks	1	3	1	5	Cars	46	224	49	319	Totals	47	233	50		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cyclists</td> <td style="text-align: right;">4</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">4</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">270</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">278</td> </tr> </table>	Cyclists	4	Trucks	4	Cars	270	Totals	278	East Leg Total: 527 East Entering: 267 East Peds: 23 Peds Cross:
Cyclists	0	6	0	6																											
Trucks	1	3	1	5																											
Cars	46	224	49	319																											
Totals	47	233	50																												
Cyclists	4																														
Trucks	4																														
Cars	270																														
Totals	278																														

Cyclists	Trucks	Cars	Totals
3	4	254	261

Mulcaster St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
45	1	1	47
259	4	4	

Collier St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
256	3	1	260

Cyclists	Trucks	Cars	Totals
0	1	55	56
1	2	177	180
0	0	53	53
1	3	285	

Mulcaster St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
45	1	1	47
259	4	4	

Collier St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
256	3	1	260

Cyclists	Trucks	Cars	Totals
0	1	55	56
1	2	177	180
0	0	53	53
1	3	285	

Mulcaster St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
45	1	1	47
259	4	4	

Collier St

Mulcaster St

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Cars	Trucks	Cyclists	Totals
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0	0	53	53
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Mulcaster St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
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Cars	Trucks	Cyclists	Totals
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0	0	53	53
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Mulcaster St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
45	1	1	47
259	4	4	

Collier St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
256	3	1	260

Cyclists	Trucks	Cars	Totals
0	1	55	56
1	2	177	180
0	0	53	53
1	3	285	

Mulcaster St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
45	1	1	47
259	4	4	

Collier St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
256	3	1	260

Cyclists	Trucks	Cars	Totals
0	1	55	56
1	2	177	180
0	0	53	53
1	3	285	

Mulcaster St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals
53	0	0	53
161	3	3	167
45	1	1	47
259	4	4	

Collier St

Mulcaster St

Collier St

Cars	Trucks	Cyclists	Totals

Accu-Traffic Inc.

Total Count Diagram

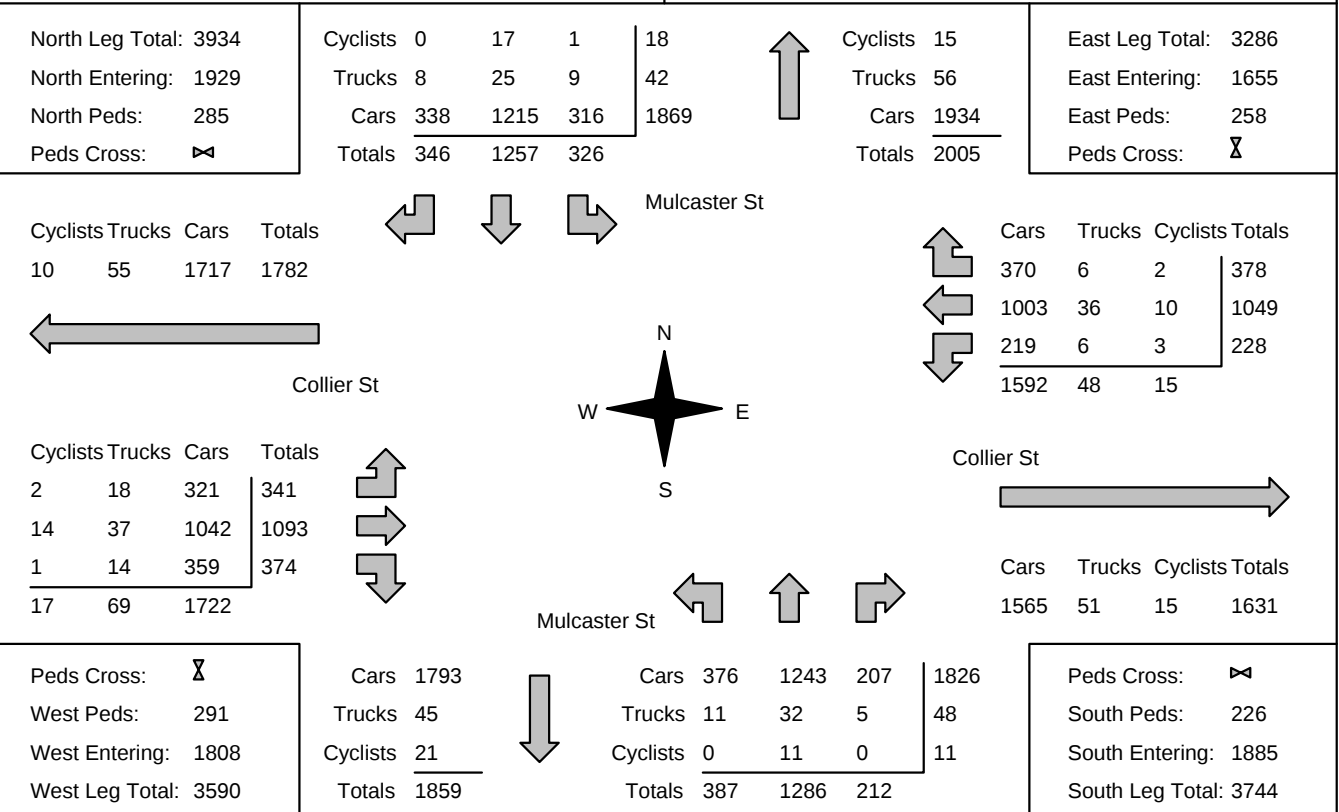
Municipality: Barrie
Site #: 1600200002
Intersection: Mulcaster St & Collier St
TFR File #: 1
Count date: 1-Jun-16

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: Mulcaster St runs N/S



Comments

Accu-Traffic Inc.

Traffic Count Summary

Intersection: Mulcaster St & Collier St					Count Date: 1-Jun-16		Municipality: Barrie					
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	24	113	12	149	8	326	8:00:00	21	138	18	177	7
9:00:00	40	173	44	257	20	538	9:00:00	35	216	30	281	24
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	43	153	64	260	46	467	12:00:00	48	135	24	207	33
13:00:00	38	123	40	201	56	447	13:00:00	61	162	23	246	58
14:00:00	49	133	55	237	66	503	14:00:00	68	162	36	266	35
15:00:00	0	0	0	0	0	1	15:00:00	0	1	0	1	0
16:00:00	53	163	52	268	48	516	16:00:00	56	163	29	248	27
17:00:00	49	221	47	317	23	563	17:00:00	53	165	28	246	25
18:00:00	30	178	32	240	18	453	18:00:00	45	144	24	213	17
						</						

Accu-Traffic Inc.

Count Date: 1-Jun-16 Site #: 1600200002

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	2	2	26	26	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4	4
7:30:00	9	7	45	19	3	2	0	0	1	1	0	0	0	0	0	0	0	0	6	2
7:45:00	13	4	72	27	6	3	1	1	1	0	0	0	0	0	1	1	0	0	7	1
8:00:00	23	10	109	37	12	6	1	0	2	1	0	0	0	0	2	1	0	0	8	1
8:15:00	31	8	147	38	17	5	1	0	2	0	1	1	0	0	3	1	0	0	13	5
8:30:00	45	14	189	42	28	11	1	0	2	0	1	0	0	0	3	0	0	0	16	3
8:45:00	50	5	226	37	33	5	2	1	3	1	1	0	0	0	4	1	0	0	22	6
9:00:00	62	12	275	49	54	21	2	0	6	3	2	1	0	0	5	1	0	0	28	6
9:15:00	62	0	275	0	54	0	2	0	6	0	2	0	0	0	5	0	0	0	28	0
11:00:00	62	0	275	0	54	0	2	0	6	0	2	0	0	0	5	0	0	0	28	0
11:15:00	72	10	315	40	68	14	2	0	7	1	2	0	0	0	5	0	0	0	37	9
11:30:00	80	8	354	39	84	16	2	0	7	0	2	0	0	0	8	3	0	0	53	16
11:45:00	91	11	388	34	107	23	2	0	8	1	2	0	1	1	8	0	0	0	61	8
12:00:00	104	13	422	34	118	11	2	0	9	1	2	0	1	0	8	0	0	0	74	13
12:15:00	114	10	442	20	126	8	2	0	10	1	3	1	1	0	8	0	0	0	85	11
12:30:00	124	10	484	42	136	10	2	0	11	1	3	0	1	0	8	0	0	0	100	15
12:45:00	135	11	507	23	145	9	2	0	11	0	3	0	1	0	8	0	0	0	115	15
13:00:00	142	7	542	35	157	12	2	0	12	1	3	0	1	0	8	0	0	0	130	15
13:15:00	152	10	572	30	170	13	4	2	12	0	3	0	1	0	8	0	0	0	146	16
13:30:00	160	8	610	38	182	12	5	1	13	1	4	1	1	0	8	0	0	0	155	9
13:45:00	172	12	638	28	197	15	5	0	13	0	5	1	1	0	8	0	0	0	176	21
14:00:00	188	16	674	36	210	13	5	0	13	0	5	0	1	0	8	0	0	0	196	20
14:15:00	188	0	674	0	210	0	5	0	13	0	5	0	1	0	8	0	0	0	196	0
15:00:00	188	0	674	0	210	0	5	0	13	0	5	0	1	0	8	0	0	0	196	0
15:15:00	199	11	716	42	221	11	6	1	14	1	5	0	1	0	9	1	0	0	208	12
15:30:00	215	16	749	33	233	12	6	0	16	2	5	0	1	0	9	0	0	0	226	18
15:45:00	225	10	785	36	245	12	7	1	17	1	6	1	1	0	9	0	0	0	232	6
16:00:00	239	14	830	45	261	16	7	0	18	1	6	0	1	0	10	1	0	0	244	12
16:15:00	249	10	880	50	274	13	8	1	21	3	7	1	1	0	11	1	0	0	253	9
16:30:00	255	6	928	48	281	7	8	0	22	1	7	0	1	0	11	0	0	0	254	1
16:45:00	268	13	983	55	295	14	9	1	22	0	7	0	1	0	11	0	0	0	261	7
17:00:00	286	18	1043	60	306	11	9	0	23	1	8	1	1	0	13	2	0	0	267	6
17:15:00	297	11	1115	72	313	7	9	0	24	1	8	0	1	0	16	3	0	0	276	9
17:30:00	304	7	1152	37	327	14	9	0	25	1	8	0	1	0	17	1	0	0	279	3
17:45:00	310	6	1186	34	336	9	9	0	25	0	8	0	1	0	17	0	0	0	285	6
18:00:00	316	6	1215	29	338	2	9	0	25	0	8	0	1	0	17	0	0	0	285	0
18:15:00	316	0	1215	0	338	0	9	0	25	0	8	0	1	0	17	0	0	0	285	0
18:15:15	316	0	1215	0	338	0	9	0	25	0	8	0	1	0	17	0	0	0	285	0

Accu-Traffic Inc.

Count Date: 1-Jun-16 Site #: 1600200002

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	3	3	24	24	5	5	0	0	1	1	0	0	0	0	0	0	0	0	2	2
7:30:00	4	1	41	17	11	6	0	0	1	0	0	0	0	0	0	0	0	0	3	1
7:45:00	7	3	60	19	22	11	0	0	2	1	0	0	0	0	0	0	0	0	6	3
8:00:00	11	4	83	23	34	12	0	0	2	0	0	0	0	0	1	1	0	0	9	3
8:15:00	14	3	103	20	49	15	0	0	3	1	0	0	0	0	1	0	0	0	13	4
8:30:00	23	9	132	29	59	10	1	1	5	2	2	2	0	0	2	1	0	0	16	3
8:45:00	28	5	170	38	70	11	1	0	6	1	2	0	0	0	2	0	0	0	22	6
9:00:00	33	5	207	37	86	16	1	0	10	4	2	0	0	0	2	0	0	0	25	3
9:15:00	33	0	207	0	86	0	1	0	10	0	2	0	0	0	2	0	0	0	25	0
11:00:00	33	0	207	0	86	0	1	0	10	0	2	0	0	0	2	0	0	0	25	0
11:15:00	36	3	243	36	100	14	2	1	10	0	2	0	0	0	2	0	1	1	35	10
11:30:00	47	11	273	30	113	13	2	0	12	2	2	0	0	0	2	0	1	0	45	10
11:45:00	54	7	301	28	124	11	3	1	15	3	2	0	0	0	2	0	1	0	53	8
12:00:00	65	11	334	33	141	17	3	0	17	2	2	0	0	0	2	0	2	1	69	16
12:15:00	67	2	363	29	147	6	3	0	18	1	2	0	0	0	2	0	2	0	79	10
12:30:00	77	10	401	38	162	15	3	0	19	1	3	1	0	0	3	1	2	0	92	13
12:45:00	83	6	441	40	174	12	3	0	22	3	4	1	0	0	3	0	2	0	111	19
13:00:00	91	8	468	27	189	15	3	0	22	0	4	0	0	0	4	1	2	0	122	11
13:15:00	97	6	503	35	205	16	3	0	23	1	4	0	0	0	4	0	2	0	139	17
13:30:00	106	9	543	40	228	23	3	0	24	1	4	0	0	0	4	0	2	0	152	13
13:45:00	117	11	569	26	243	15	3	0	25	1	4	0	1	1	5	1	2	0	161	9
14:00:00	128	11	597	28	249	6	3	0	27	2	4	0	1	0	5	0	2	0	180	19
14:15:00	128	0	597	0	249	0	3	0	27	0	4	0	1	0	5	0	2	0	180	0
15:00:00	128	0	597	0	249	0	3	0	27	0	4	0	1	0	5	0	2	0	180	0
15:15:00	132	4	625	28	264	15	3	0	28	1	4	0	1	0	6	1	2	0	194	14
15:30:00	139	7	667	42	272	8	3	0	28	0	4	0	1	0	6	0	2	0	199	5
15:45:00	144	5	695	28	282	10	5	2	28	0	6	2	2	1	6	0	2	0	204	5
16:00:00	156	12	723	28	291	9	5	0	29	1	6	0	2	0	6	0	2	0	214	10
16:15:00	160	4	754	31	301	10	5	0	31	2	6	0	2	0	6	0	2	0	224	10
16:30:00	165	5	787	33	309	8	5	0	32	1	6	0	2	0	7	1	2	0	228	4
16:45:00	178	13	824	37	324	15	5	0	34	2	6	0	3	1	8	1	2	0	235	7
17:00:00	191	13	873	49	334	10	5	0	34	0	6	0	3	0	8	0	2	0	242	7
17:15:00	202	11	914	41	351	17	6	1	34	0	6	0	3	0	8	0	2	0	248	6
17:30:00	210	8	948	34	362	11	6	0	35	1	6	0	3	0	10	2	2	0	251	3
17:45:00	214	4	977	29	367	5	6	0	36	1	6	0	3	0	10	0	2	0	253	2
18:00:00	219	5	1003	26	369	2	6	0	36	0	6	0	3	0	10	0	2	0	258	5
18:15:00	219	0	1003	0	370	1	6	0	36	0	6	0	3	0	10	0	2	0	258	0
18:15:15	219	0	1003	0	370	0	6	0	36	0	6	0	3	0	10	0	2	0	258	0

Accu-Traffic Inc.

Count Date: 1-Jun-16 Site #: 1600200002

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	5	5	28	28	1	1	2	2	0	0	0	0	0	0	1	1	0	0	0	0
7:30:00	10	5	64	36	8	7	3	1	1	1	0	0	0	0	2	1	0	0	2	2
7:45:00	14	4	97	33	11	3	3	0	1	0	0	0	0	0	2	0	0	0	5	3
8:00:00	18	4	134	37	18	7	3	0	2	1	0	0	0	0	2	0	0	0	7	2
8:15:00	20	2	191	57	21	3	3	0	2	0	0	0	0	0	2	0	0	0	13	6
8:30:00	27	7	247	56	31	10	3	0	4	2	0	0	0	0	2	0	0	0	18	5
8:45:00	38	11	295	48	35	4	4	1	6	2	0	0	0	0	2	0	0	0	26	8
9:00:00	52	14	346	51	48	13	4	0	6	0	0	0	0	0	2	0	0	0	31	5
9:15:00	52	0	346	0	48	0	4	0	6	0	0	0	0	0	2	0	0	0	31	0
11:00:00	52	0	346	0	48	0	4	0	6	0	0	0	0	0	2	0	0	0	31	0
11:15:00	60	8	382	36	54	6	4	0	6	0	0	0	0	0	2	0	0	0	39	8
11:30:00	78	18	408	26	56	2	5	1	8	2	0	0	0	0	2	0	0	0	45	6
11:45:00	87	9	443	35	60	4	5	0	9	1	1	1	0	0	2	0	0	0	54	9
12:00:00	98	11	477	34	71	11	6	1	10	1	1	0	0	0	2	0	0	0	64	10
12:15:00	105	7	510	33	76	5	7	1	12	2	1	0	0	0	2	0	0	0	76	12
12:30:00	117	12	539	29	81	5	8	1	15	3	1	0	0	0	2	0	0	0	97	21
12:45:00	133	16	587	48	86	5	10	2	16	1	1	0	0	0	2	0	0	0	109	12
13:00:00	155	22	632	45	94	8	10	0	16	0	1	0	0	0	3	1	0	0	122	13
13:15:00	176	21	674	42	105	11	10	0	16	0	1	0	0	0	3	0	0	0	134	12
13:30:00	188	12	708	34	111	6	10	0	17	1	2	1	0	0	3	0	0	0	142	8
13:45:00	203	15	735	27	121	10	10	0	20	3	3	1	0	0	4	1	0	0	148	6
14:00:00	223	20	789	54	126	5	10	0	20	0	5	2	0	0	4	0	0	0	157	9
14:15:00	223	0	790	1	126	0	10	0	20	0	5	0	0	0	4	0	0	0	157	0
15:00:00	223	0	790	0	126	0	10	0	20	0	5	0	0	0	4	0	0	0	157	0
15:15:00	235	12	823	33	130	4	10	0	23	3	5	0	0	0	4	0	0	0	164	7
15:30:00	246	11	859	36	140	10	11	1	24	1	5	0	0	0	4	0	0	0	173	9
15:45:00	257	11	898	39	149	9	11	0	25	1	5	0	0	0	6	2	0	0	177	4
16:00:00	278	21	944	46	155	6	11	0	27	2	5	0	0	0	6	0	0	0	184	7
16:15:00	289	11	984	40	167	12	11	0	28	1	5	0	0	0	6	0	0	0	192	8
16:30:00	307	18	1020	36	170	3	11	0	28	0	5	0	0	0	6	0	0	0	197	5
16:45:00	323	16	1063	43	175	5	11	0	28	0	5	0	0	0	6	0	0	0	200	3
17:00:00	331	8	1106	43	183	8	11	0	30	2	5	0	0	0	6	0	0	0	209	9
17:15:00	342	11	1143	37	194	11	11	0	31	1	5	0	0	0	7	1	0	0	213	4
17:30:00	354	12	1182	39	200	6	11	0	31	0	5	0	0	0	10	3	0	0	221	8
17:45:00	367	13	1220	38	205	5	11	0	31	0	5	0	0	0	11	1	0	0	226	5
18:00:00	376	9	1243	23	207	2	11	0	32	1	5	0	0	0	11	0	0	0	226	0
18:15:00	376	0	1243	0	207	0	11	0	32	0	5	0	0	0	11	0	0	0	226	0
18:15:15	376	0	1243	0	207	0	11	0	32	0	5	0	0	0	11	0	0	0	226	0

Accu-Traffic Inc.

Count Date: 1-Jun-16 Site #: 1600200002

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	6	6	7	7	1	1	0	0	0	0	2	2	0	0	0	0	0	0	4	4
7:30:00	11	5	21	14	4	3	1	1	2	2	3	1	0	0	0	0	0	0	4	0
7:45:00	14	3	33	12	5	1	1	0	2	0	3	0	0	0	0	0	0	0	6	2
8:00:00	18	4	48	15	8	3	2	1	4	2	3	0	0	0	1	1	0	0	8	2
8:15:00	29	11	67	19	15	7	3	1	4	0	3	0	0	0	1	0	0	0	11	3
8:30:00	33	4	93	26	21	6	5	2	6	2	3	0	0	0	1	0	0	0	19	8
8:45:00	40	7	120	27	29	8	6	1	7	1	4	1	0	0	2	1	0	0	20	1
9:00:00	51	11	149	29	38	9	6	0	9	2	4	0	0	0	3	1	0	0	24	4
9:15:00	51	0	149	0	38	0	6	0	9	0	4	0	0	0	3	0	0	0	24	0
11:00:00	51	0	149	0	38	0	6	0	9	0	4	0	0	0	3	0	0	0	24	0
11:15:00	60	9	181	32	52	14	7	1	9	0	4	0	0	0	4	1	0	0	28	4
11:30:00	70	10	209	28	65	13	7	0	11	2	7	3	0	0	4	0	0	0	36	8
11:45:00	86	16	242	33	75	10	9	2	11	0	7	0	0	0	4	0	0	0	45	9
12:00:00	96	10	279	37	92	17	9	0	13	2	9	2	1	1	4	0	0	0	53	8
12:15:00	105	9	303	24	111	19	9	0	13	0	10	1	1	0	4	0	0	0	55	2
12:30:00	112	7	338	35	124	13	10	1	15	2	10	0	1	0	4	0	0	0	83	28
12:45:00	127	15	374	36	134	10	10	0	16	1	10	0	1	0	4	0	0	0	100	17
13:00:00	139	12	413	39	152	18	11	1	17	1	11	1	1	0	4	0	0	0	117	17
13:15:00	152	13	456	43	160	8	12	1	18	1	11	0	1	0	4	0	0	0	132	15
13:30:00	163	11	491	35	176	16	13	1	20	2	11	0	1	0	4	0	0	0	138	6
13:45:00	173	10	519	28	188	12	13	0	21	1	11	0	2	1	5	1	0	0	153	15
14:00:00	183	10	548	29	200	12	14	1	23	2	14	3	2	0	5	0	0	0	167	14
14:15:00	183	0	548	0	201	1	14	0	23	0	14	0	2	0	5	0	0	0	167	0
15:00:00	183	0	548	0	201	0	14	0	23	0	14	0	2	0	5	0	0	0	167	0
15:15:00	191	8	587	39	214	13	15	1	23	0	14	0	2	0	7	2	0	0	181	14
15:30:00	202	11	624	37	230	16	16	1	25	2	14	0	2	0	9	2	0	0	201	20
15:45:00	216	14	677	53	242	12	16	0	26	1	14	0	2	0	9	0	0	0	213	12
16:00:00	229	13	716	39	252	10	16	0	30	4	14	0	2	0	10	1	0	0	224	11
16:15:00	239	10	757	41	273	21	16	0	31	1	14	0	2	0	10	0	0	0	233	9
16:30:00	248	9	795	38	282	9	16	0	33	2	14	0	2	0	11	1	1	1	237	4
16:45:00	266	18	838	43	288	6	16	0	33	0	14	0	2	0	12	1	1	0	241	4
17:00:00	280	14	886	48	309	21	16	0	33	0	14	0	2	0	12	0	1	0	258	17
17:15:00	294	14	930	44	320	11	17	1	34	1	14	0	2	0	12	0	1	0	273	15
17:30:00	303	9	972	42	335	15	17	0	35	1	14	0	2	0	12	0	1	0	280	7
17:45:00	314	11	1006	34	352	17	18	1	36	1	14	0	2	0	14	2	1	0	287	7
18:00:00	321	7	1042	36	359	7	18	0	37	1	14	0	2	0	14	0	1	0	291	4
18:15:00	321	0	1042	0	359	0	18	0	37	0	14	0	2	0	14	0	1	0	291	0
18:15:15	321	0	1042	0	359	0	18	0	37	0	14	0	2	0	14	0	1	0	291	0

Trans-Plan Transportation Inc.

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

Dunlop Street & Mulcaster Street
Barrie, Ontario
Tuesday March 19, 2019
Partly Sunny, 4 Degrees
TP

AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds													
	L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R														
7:00	2	18	7	0	0	0	0	0	0	0	27	48	30	3	1	0	0	0	0	0	0	82	0	11	16	0	0	0	0	0	0	2	29	6	11	0	0	0	0	0	0	17	155		
7:15	1	19	7	0	0	0	0	1	0	0	28	47	34	5	1	0	0	0	0	0	1	88	0	46	54	0	1	1	0	0	0	3	105	8	13	1	0	0	0	0	0	1	23	244	
7:30	1	33	3	0	3	0	0	0	0	0	40	70	50	7	1	0	1	0	0	0	2	131	1	44	74	0	0	0	0	0	0	1	120	6	13	4	0	1	0	0	0	2	26	317	
7:45	0	34	5	0	0	0	0	0	0	0	39	88	27	1	0	1	0	0	0	0	5	122	2	49	62	0	0	1	0	0	0	1	115	9	20	2	0	2	0	0	0	2	35	311	
8:00	0	34	6	0	0	0	0	0	0	0	40	84	37	3	1	2	0	0	0	0	2	129	1	42	54	0	0	2	0	0	0	5	104	16	23	8	0	2	0	0	0	5	54	327	
8:15	1	28	11	0	1	0	0	0	0	0	41	83	39	5	0	0	0	0	0	0	3	130	5	62	85	0	0	0	0	0	0	5	157	17	23	2	1	1	0	0	0	4	48	376	
8:30	1	27	8	0	1	0	0	0	0	0	37	70	40	3	1	0	0	0	0	0	4	118	1	36	71	0	3	2	0	0	0	4	117	10	12	6	0	0	1	0	0	1	30	302	
8:45	0	26	8	1	1	0	0	0	0	0	36	75	22	5	0	3	0	0	0	0	2	107	0	55	72	0	0	0	0	0	0	4	131	10	22	7	0	2	0	0	0	5	46	320	
MD																																													
11:00	1	35	9	0	0	0	0	0	0	0	45	47	30	2	4	1	0	0	0	0	6	90	0	28	52	0	2	0	0	0	0	6	88	8	29	7	1	3	1	0	0	0	8	57	280
11:15	3	31	13	0	1	0	0	0	0	0	48	37	33	5	0	1	0	0	0	0	9	85	5	25	63	0	0	2	0	0	0	8	103	16	37	7	1	0	0	0	0	5	66	302	
11:30	7	25	14	0	0	1	0	0	0	0	47	55	32	9	3	2	0	0	0	0	11	112	2	16	53	0	1	0	0	0	0	3	75	9	29	11	0	0	0	0	0	12	61	295	
11:45	0	36	12	0	3	0	0	0	0	0	51	60	34	3	1	1	0	0	0	0	10	109	4	33	62	0	0	0	0	0	0	8	107	14	38	11	0	0	0	0	0	19	82	349	
12:00	2	47	21	0	0	0	0	0	0	11	81	67	29	9	1	0	0	0	0	0	9	115	5	30	63	0	2	1	0	0	0	5	106	18	27	9	1	0	0	0	0	11	66	368	
12:15	5	41	20	0	0	0	0	0	0	9	75	46	40	5	0	0	0	0	0	0	13	104	9	32	48	0	0	3	0	0	0	10	102	14	33	11	0	3	0	0	0	12	73	354	
12:30	8	35	11	1	0	0	0	0	0	8	63	58	36	6	1	1	1	0	0	0	7	110	7	44	70	0	0	0	0	0	0	7	128	11	30	7	0	1	0	0	0	13	62	363	
12:45	5	40	19	0	0	0	0	0	0	13	77	68	57	8	2	1	0	0	0	0	10	146	7	32	76	0	0	0	0	0	0	8	123	9	28	9	0	3	0	0	0	20	69	415	
13:00	9	33	17	0	1	1	0	0	0	0	61	59	33	8	2	0	1	0	0	0	7	110	6	30	71	0	0	0	0	0	0	7	114	15	35	7	1	0	0	0	0	6	64	349	
13:15	2	40	12	0	1	1	0	0	0	0	56	72	43	7	2	2	0	0	0	0	10	136	3	36	73	0	0	1	0	0	0	8	121	13	37	9	1	2	1	0	0	7	70	383	
13:30	6	28	13	0	1	1	0	0	0	0	49	53	44	7	2	0	0	0	0	0	7	113	4	43	52	0	2	1	0	0	0	8	110	18	24	6	0	1	1	0	0	11	61	333	
13:45	3	35	19	0	0	0	0	0	0	0	57	60	40	6	1	1	0	0	0	0	10	118	4	35	73	0	0	1	0	0	0	13	126	16	42	4	1	1	0	0	0	8	72	373	
PM																																													
15:00	3	38	13	0	1	2	0	0	0	0	57	54	42	3	1	1	0	0	0	0	7	108	5	35	78	0	0	0	0	0	0	9	127	18	33	9	0	3	0	0	0	11	74	366	
15:15	3	44	13	0	1	0	0	0	0	0	61	76	39	3	1	1	0	0	0	0	8	128	2	35	79	0	0	0	0	0	0	4	120	15	41	4	0	0	0	0	0	8	68	377	
15:30	6	49	11	0	1	0	0	0	0	0	67	74	30	5	1	0	0	0	0	0	5	115	1	30	72	0	0	2	0	0	0	2	107	22	38	6	0	0	1	0	0	6	73	362	
15:45	3	52	17	0	0	0	0	0	0	0	72	67	33	2	3	0	0	0	0	0	9	114	6	35	94	0	0	0	0	0	0	8	143	16	28	9	0	2	1	0	0	8	64	393	
16:00	5	54	13	0	0	0	0	0	0	0	72	62	40	5	2	1	0	0	0	0	10	120	1	258	99	0	0	0	0	0	0	8	366	10	49	10	0	1	0	0	0	2	72	630	
16:15	3	53	6	0	1	0	0	0	0	0	63	75	37	5	3	0	0	0	0	0	6	126	3	47	77	0	0	0	0	0	0	3	130	14	45	6	0	1	0	0	0	8	74	393	
16:30	4	57	7	0	0	0	0	0	0	0	68	79	31	5	1	2	0	0	0	0	1	119	1	33	102	0	0	0	0	0	0	4	140	12	37	5	1	0	0	0	0	5	60	387	
16:45	5	61	11	0	0	1	0	1	0	0	79	70	29	7	0	0	0	0	0	0	8	114	3	48	115	0	0	1	0	0	0	5	172	21	51	7	0	0	0	0	0	4	83	448	
17:00	5	59	14	0	1	0	0	0	0	1	80	61	30	1	2	0	0	0	0	0	14	108	3	57	115	0	0	3	0	0	0	8	186	19	36	5	0	0	0	0	0	5	65	439	
17:15	2	49	6	0	0	0	0	0	0	0	57	57	40	3	0	1	0	0	0	0	11	112	1	46	102	0	0	1	0	0	0	2	152	6	43	10	0	1	0	0	0	6	66	387	
17:30	5	43	8	0	0	0	0	0	0	0	56	60	28	5	1	1	0	0	0	0	6	101	3	37	103	0	0	0	0	0	0	5	148	11	31	6	0	0	0	0	0	3	51	356	
17:45	2	43	5	0	0	0	0	0	0	0	50	49	34	3	0	0	0	0	0	0	4	90	1	38	93	0	0	0	0	0	0	10	142	12	37	5	0	0	0	0	0	4	58	340	



Turning Movement Count Diagram

Intersection: Dunlop Street & Mulcaster Street

Municipality: Barrie, Ontario

Intersection ID:

Date: Tuesday March 19, 2019

AM Peak Hour: 7:30 to 8:30

Mulcaster Street									
North Total 423						East Total 865			
North Entering 160	Cyclists	0	0	0		East Entering 500			
North Receiving 263	Truck	0	4	0		East Receiving 365			
North Peds 0	Cars	25	129	2		East Peds 12			
		←	↓	→					
Dunlop Street	0	1	48	↑		16	1	0	
	0	6	79	→		←	153	3	0
	0	0	16	↓		↓	325	2	0
		←	↑	→					
West Total 340			9	197	275	South Total 960			
West Entering 150		0	0	3		South Entering 484			
West Receiving 190		0	0	0		South Receiving 476			
West Peds 13						South Peds 12			

MD Peak Hour: 12:30 to 13:30

Mulcaster Street									
North Total 459							East Total 920		
North Entering 236		Cyclists	0	0	0			East Entering 468	
North Receiving 223		Truck	2	2	1			East Receiving 452	
North Peds 21		Cars	59	148	24			East Peds 34	
			←	↓	↘				
Dunlop Street	0	2	48	↗	↗ 29 2 0				
	0	6	130	→	← 169 4 0				
	0	1	32	↘	↘ 257 7 0				
			←	↑	↗				
West Total 476				23	142	290	South Total 903		
West Entering 219				0	0	1	South Entering 456		
West Receiving 257				0	0	0	South Receiving 447		
West Peds 46							South Peds 30		

PM Peak Hour: 16:00 to 17:00

Mulcaster Street									
North Total 748						East Total 1049			
North Entering 282	Cyclists	0	1	0		East Entering 454			
North Receiving 466	Truck	1	1	0		East Receiving 595			
North Peds 0	Cars	37	225	17		East Peds 25			
		⬅	⬇	➡					
Dunlop Street	0	1	57	⬆		⬆	22	0	0
	0	2	182	➡		⬅	137	3	0
	0	0	28	⬇		⬇	286	6	0
		⬅	⬆	➡					
West Total 456		8	386	393		South Total 1335			
West Entering 270		0	0	1		South Entering 788			
West Receiving 186		0	0	0		South Receiving 547			
West Peds 19						South Peds 20			

Total 8-Hour Count

Mulcaster Street													
North Total 3762						East Total 6918							
North Entering 1739		Cyclists	1	2	0	East Entering 3393							
North Receiving 2023		Truck	7	18	2	East Receiving 3525							
North Peds 41		Cars	359	1247	103	East Peds 217							
			⬅	⬇	➡								
Dunlop Street	0	8	419	⬆						⬆	154	3	0
	0	30	995	➡						➡	1143	23	0
	0	6	210	⬇						⬇	2031	39	0
			⬅	⬆	➡								
West Total 3297				96	1428	2373	South Total 7483						
West Entering 1668				0	11	22	South Entering 3930						
West Receiving 1629				0	0	0	South Receiving 3553						
West Peds 222				South Peds 184									

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period

From: 6:00:00

To: 9:00:00

One Hour Peak

From: 8:00:00

To: 9:00:00

Municipality: Barrie
Site #: 1721300001
Intersection: Dunlop St & Owen St
TFR File #: 1
Count date: 11-Oct-17

Weather conditions:

Person counted:
Person prepared:
Person checked:

** Non-Signalized Intersection **

Major Road: Dunlop St runs W/E

North Leg Total: 77

North Entering: 41

North Peds: 39

Peds Cross: 

Heavys	2	0	2
Trucks	1	0	1
Cars	30	8	38
Totals	33	8	



Heavys 1

Trucks 0

Cars 35

Totals 36

East Leg Total: 371

East Entering: 179

East Peds: 2

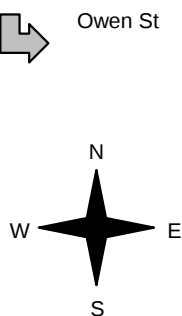
Peds Cross: 

Heavys	Trucks	Cars	Totals
4	3	190	197



Dunlop St

Heavys	Trucks	Cars	Totals
1	0	20	21
8	3	173	184
9	3	193	



Cars	Trucks	Heavys	Totals
15	0	0	15
160	2	2	164
175	2	2	



Dunlop St



Cars	Trucks	Heavys	Totals
181	3	8	192

Peds Cross: 

West Peds: 2

West Entering: 205

West Leg Total: 402

Comments

Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 16:00:00

To: 19:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Barrie

Site #: 1721300001

Intersection: Dunlop St & Owen St

TFR File #: 1

Count date: 11-Oct-17

Weather conditions:

Person counted:

Person prepared:

Person checked:

** Non-Signalized Intersection **

Major Road: Dunlop St runs W/E

North Leg Total: 143

North Entering: 70

North Peds: 118

Peds Cross: 

	Heavys	Trucks	Cars	Totals
North Leg	0	0	70	70
North Entering	0	0	70	70
North Peds	0	0	118	118
Peds Cross	0	0	118	118

	Heavys	Trucks	Cars	Totals
North Leg	0	0	73	73
North Entering	0	0	73	73
North Peds	0	0	118	118
Peds Cross	0	0	118	118

East Leg Total: 565

East Entering: 238

East Peds: 1

Peds Cross: 

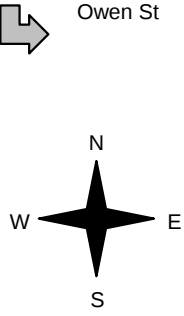
Heavys	Trucks	Cars	Totals
0	2	273	275



Dunlop St

Heavys	Trucks	Cars	Totals
0	0	48	48
1	1	317	319
1	1	365	365



Cars	Trucks	Heavys	Totals
25	0	0	25
211	2	0	213
236	2	0	238

Dunlop St 

Cars	Trucks	Heavys	Totals
325	1	1	327

Peds Cross: 

West Peds: 0

West Entering: 367

West Leg Total: 642

Comments

Accu-Traffic Inc.

Traffic Count Summary

Intersection: Dunlop St & Owen St					Count Date: 11-Oct-17		Municipality: Barrie					
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	3	0	10	13	4	13	7:00:00	0	0	0	0	0
8:00:00	3	0	22	25	26	25	8:00:00	0	0	0	0	0
9:00:00	8	0	33	41	39	41	9:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0	0	16:00:00	0	0	0	0	0
17:00:00	11	0	57	68	83	68	17:00:00	0	0	0	0	0
18:00:00	16	0	57	73	111	73	18:00:00	0	0	0	0	0
19:00:00	19	0	55	74	94	74	19:00:00	0	0	0	0	0



Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Heavys - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15:00	0	0	0	0	2	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0
6:30:00	1	1	0	0	3	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1
6:45:00	2	1	0	0	6	3	0	0	0	0	0	0	1	0	0	0	1	1	3	2
7:00:00	2	0	0	0	9	3	0	0	0	0	0	0	1	0	0	0	1	0	4	1
7:15:00	2	0	0	0	10	1	0	0	0	0	0	0	1	0	0	0	1	0	12	8
7:30:00	3	1	0	0	19	9	0	0	0	0	0	0	1	0	0	0	1	0	17	5
7:45:00	4	1	0	0	26	7	0	0	0	0	0	0	1	0	0	0	1	0	28	11
8:00:00	5	1	0	0	31	5	0	0	0	0	0	0	1	0	0	0	1	0	30	2
8:15:00	10	5	0	0	36	5	0	0	0	0	0	0	1	0	0	0	1	0	38	8
8:30:00	10	0	0	0	46	10	0	0	0	0	0	0	1	0	0	0	1	0	42	4
8:45:00	10	0	0	0	56	10	0	0	0	0	0	0	1	0	0	0	2	1	48	6
9:00:00	13	3	0	0	61	5	0	0	0	0	1	1	1	0	0	0	3	1	69	21
9:15:00	13	0	0	0	61	0	0	0	0	0	1	0	1	0	0	0	3	0	69	0
16:00:00	13	0	0	0	61	0	0	0	0	0	1	0	1	0	0	0	3	0	69	0
16:15:00	15	2	0	0	74	13	0	0	0	0	1	0	1	0	0	0	3	0	80	11
16:30:00	19	4	0	0	85	11	0	0	0	0	3	2	1	0	0	0	3	0	95	15
16:45:00	21	2	0	0	100	15	0	0	0	0	3	0	1	0	0	0	3	0	124	29
17:00:00	24	3	0	0	116	16	0	0	0	0	3	0	1	0	0	0	3	0	152	28
17:15:00	26	2	0	0	133	17	0	0	0	0	3	0	1	0	0	0	3	0	188	36
17:30:00	27	1	0	0	147	14	0	0	0	0	3	0	1	0	0	0	3	0	213	25
17:45:00	31	4	0	0	155	8	0	0	0	0	3	0	1	0	0	0	3	0	244	31
18:00:00	40	9	0	0	172	17	0	0	0	0	4	1	1	0	0	0	3	0	263	19
18:15:00	48	8	0	0	182	10	0	0	0	0	4	0	1	0	0	0	3	0	294	31
18:30:00	49	1	0	0	198	16	0	0	0	0	4	0	1	0	0	0	3	0	312	18
18:45:00	53	4	0	0	213	15	0	0	0	0	4	0	1	0	0	0	3	0	337	25
19:00:00	59	6	0	0	227	14	0	0	0	0	4	0	1	0	0	0	3	0	357	20
19:15:																				



Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Heavys - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15:00	0	0	20	20	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
6:30:00	0	0	42	22	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0
6:45:00	0	0	67	25	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
7:00:00	0	0	102	35	1	1	0	0	1	0	0	0	0	0	2	0	0	0	0	0
7:15:00	0	0	127	25	1	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
7:30:00	0	0	164	37	2	1	0	0	2	1	0	0	0	0	2	0	0	0	0	0
7:45:00	0	0	199	35	5	3	0	0	2	0	0	0	0	0	3	1	0	0	0	0
8:00:00	0	0	236	37	9	4	0	0	2	0	0	0	0	0	5	2	0	0	0	0
8:15:00	0	0	271	35	10	1	0	0	2	0	0	0	0	0	7	2	0	0	0	0
8:30:00	0	0	316	45	15	5	0	0	2	0	0	0	0	0	7	0	0	0	0	0
8:45:00	0	0	356	40	18	3	0	0	4	2	0	0	0	0	7	0	0	0	1	1
9:00:00	0	0	396	40	24	6	0	0	4	0	0	0	0	0	7	0	0	0	2	1
9:15:00	0	0	396	0	24	0	0	0	4	0	0	0	0	0	7	0	0	0	2	0
16:00:00	0	0	396	0	24	0	0	0	4	0	0	0	0	0	7	0	0	0	2	0
16:15:00	0	0	439	43	27	3	0	0	5	1	0	0	0	0	7	0	0	0	2	0
16:30:00	0	0	487	48	33	6	0	0	7	2	0	0	0	0	8	1	0	0	2	0
16:45:00	0	0	540	53	37	4	0	0	8	1	0	0	0	0	8	0	0	0	2	0
17:00:00	0	0	589	49	45	8	0	0	9	1	0	0	0	0	8	0	0	0	2	0
17:15:00	0	0	652	63	50	5	0	0	9	0	0	0	0	0	8	0	0	0	2	0
17:30:00	0	0	698	46	58	8	0	0	9	0	0	0	0	0	8	0	0	0	3	1
17:45:00	0	0	746	48	65	7	0	0	9	0	0	0	0	0	8	0	0	0	3	0
18:00:00	0	0	801	55	70	5	0	0	9	0	0	0	0	0	8	0	0	0	3	0
18:15:00	0	0	860	59	73	3	0	0	9	0	0	0	0	0	8	0	0	0	3	0
18:30:00	0	0	905	45	78	5	0	0	9	0	0	0	0	0	8	0	0	0	3	0
18:45:00	0	0	959	54	85	7	0	0	9	0	0	0	0	0	8	0	0	0	3	0
19:00:00	0	0	1005	46	94	9	0	0	9	0	0	0	0	0	8	0	0	0	4	1
19:15:00	0	0																		

[illegible]



Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Heavys - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15:00	1	1	5	5	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
6:30:00	2	1	17	12	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
6:45:00	3	1	36	19	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
7:00:00	4	1	50	14	0	0	0	0	0	0	0	0	2	0	2	2	0	0	0	0
7:15:00	5	1	70	20	0	0	0	0	1	1	0	0	2	0	2	0	0	0	0	0
7:30:00	6	1	85	15	0	0	0	0	2	1	0	0	2	0	3	1	0	0	0	0
7:45:00	13	7	114	29	0	0	0	0	2	0	0	0	2	0	3	0	0	0	0	0
8:00:00	16	3	150	36	0	0	0	0	2	0	0	0	2	0	5	2	0	0	0	0
8:15:00	21	5	186	36	0	0	0	0	3	1	0	0	2	0	7	2	0	0	0	0
8:30:00	26	5	230	44	0	0	0	0	3	0	0	0	2	0	9	2	0	0	0	0
8:45:00	31	5	281	51	0	0	0	0	3	0	0	0	3	1	11	2	0	0	1	1
9:00:00	36	5	323	42	0	0	0	0	5	2	0	0	3	0	13	2	0	0	2	1
9:15:00	36	0	323	0	0	0	0	0	5	0	0	0	3	0	13	0	0	0	2	0
16:00:00	36	0	323	0	0	0	0	0	5	0	0	0	3	0	13	0	0	0	2	0
16:15:00	43	7	380	57	0	0	0	0	5	0	0	0	3	0	14	1	0	0	2	0
16:30:00	55	12	434	54	0	0	0	0	5	0	0	0	4	1	14	0	0	0	2	0
16:45:00	65	10	514	80	0	0	0	0	5	0	0	0	4	0	15	1	0	0	2	0
17:00:00	78	13	598	84	0	0	0	0	5	0	0	0	4	0	15	0	0	0	2	0
17:15:00	89	11	673	75	0	0	0	0	6	1	0	0	4	0	15	0	0	0	2	0
17:30:00	103	14	751	78	0	0	0	0	6	0	0	0	4	0	15	0	0	0	2	0
17:45:00	115	12	821	70	0	0	0	0	7	1	0	0	4	0	15	0	0	0	2	0
18:00:00	121	6	887	66	0	0	0	0	8	1	0	0	4	0	15	0	0	0	2	0
18:15:00	129	8	944	57	0	0	0	0	8	0	0	0	4	0	15	0	0	0	2	0
18:30:00	141	12	1002	58	0	0	0	0	8	0	0	0	4	0	15	0	0	0	2	0
18:45:00	155	14	1075	73	0	0	0	0	8	0	0	0	4	0	15	0	0	0	2	0
19:00:00	170	15	1127	52	0	0	0	0	8	0	0	0	4	0	15	0	0	0	4	2</

Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 6:00:00 To: 9:00:00	One Hour Peak From: 8:00:00 To: 9:00:00
Municipality: Barrie Site #: 1721300002 Intersection: Collier St & Owen St TFR File #: 1 Count date: 11-Oct-17	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **		Major Road: Collier St runs W/E

North Leg Total: 120 North Entering: 46 North Peds: 16 Peds Cross:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px;">Heavys</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">3</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Trucks</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Cars</td> <td style="padding: 2px;">14</td> <td style="padding: 2px;">18</td> <td style="padding: 2px;">11</td> <td style="padding: 2px;">43</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Totals</td> <td style="padding: 2px;">16</td> <td style="padding: 2px;">19</td> <td style="padding: 2px;">11</td> <td style="padding: 2px;"></td> </tr> </table>	Heavys	2	1	0	3	Trucks	0	0	0	0	Cars	14	18	11	43	Totals	16	19	11		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px;">Heavys</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Trucks</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Cars</td> <td style="padding: 2px;">74</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">74</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Totals</td> <td style="padding: 2px;">74</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">74</td> </tr> </table>	Heavys	0	0	0	0	Trucks	0	0	0	0	Cars	74	0	0	74	Totals	74	0	0	74	East Leg Total: 339 East Entering: 165 East Peds: 20 Peds Cross:
Heavys	2	1	0	3																																							
Trucks	0	0	0	0																																							
Cars	14	18	11	43																																							
Totals	16	19	11																																								
Heavys	0	0	0	0																																							
Trucks	0	0	0	0																																							
Cars	74	0	0	74																																							
Totals	74	0	0	74																																							

Heavys	Trucks	Cars	Totals
5	0	156	161

Collier St

Owen St

Collier St

Owen St

Cars	Trucks	Heavys	Totals
16	0	0	16
134	0	3	137
12	0	0	12
162	0	3	

Peds Cross: West Peds: 36 West Entering: 217 West Leg Total: 378	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px;">Cars</td> <td style="padding: 2px;">52</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">22</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">36</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Trucks</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Heavys</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">0</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px;">Totals</td> <td style="padding: 2px;">55</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">22</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;"></td> </tr> </table>	Cars	52	8	22	6	36	Trucks	1	0	0	0	0	Heavys	2	0	0	0	0	Totals	55	8	22	6		Peds Cross: South Peds: 33 South Entering: 36 South Leg Total: 91
Cars	52	8	22	6	36																					
Trucks	1	0	0	0	0																					
Heavys	2	0	0	0	0																					
Totals	55	8	22	6																						

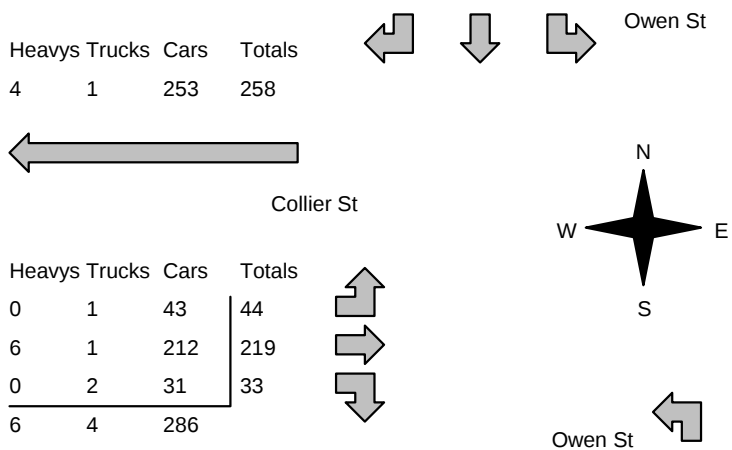
Comments

Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 16:00:00 To: 19:00:00	One Hour Peak From: 16:15:00 To: 17:15:00
Municipality: Barrie Site #: 1721300002 Intersection: Collier St & Owen St TFR File #: 1 Count date: 11-Oct-17	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **		Major Road: Collier St runs W/E

North Leg Total: 149 North Entering: 62 North Peds: 24 Peds Cross:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">2</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">2</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">25</td> <td style="text-align: right;">14</td> <td style="text-align: right;">21</td> <td style="border-left: 1px solid black; text-align: right;">60</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">27</td> <td style="text-align: right;">14</td> <td style="text-align: right;">21</td> <td style="border-left: 1px solid black;"></td> </tr> </table>	Heavys	2	0	0	2	Trucks	0	0	0	0	Cars	25	14	21	60	Totals	27	14	21		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">85</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">87</td> </tr> </table>	Heavys	1	Trucks	1	Cars	85	Totals	87	East Leg Total: 498 East Entering: 242 East Peds: 29 Peds Cross:
Heavys	2	0	0	2																											
Trucks	0	0	0	0																											
Cars	25	14	21	60																											
Totals	27	14	21																												
Heavys	1																														
Trucks	1																														
Cars	85																														
Totals	87																														

Heavys	Trucks	Cars	Totals
4	1	253	258

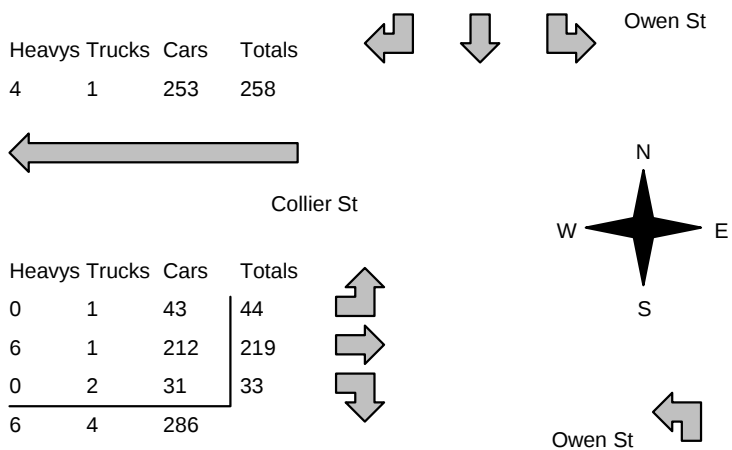


Collier St

Owen St

Cars	Trucks	Heavys	Totals
20	0	0	20
206	1	2	209
13	0	0	13
239	1	2	

Heavys	Trucks	Cars	Totals
0	1	43	44
6	1	212	219
0	2	31	33
6	4	286	



Collier St

Owen St

Cars	Trucks	Heavys	Totals
249	1	6	256

Peds Cross: West Peds: 76 West Entering: 296 West Leg Total: 554	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">58</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">2</td> </tr> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">60</td> </tr> </table>	Cars	58	Trucks	2	Heavys	0	Totals	60	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">22</td> <td style="text-align: right;">22</td> <td style="text-align: right;">16</td> <td style="border-left: 1px solid black; text-align: right;">60</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">0</td> <td style="text-align: right;">1</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">22</td> <td style="text-align: right;">23</td> <td style="text-align: right;">16</td> <td style="border-left: 1px solid black;"></td> </tr> </table>	Cars	22	22	16	60	Trucks	0	0	0	0	Heavys	0	1	0	1	Totals	22	23	16		Peds Cross: South Peds: 31 South Entering: 61 South Leg Total: 121
Cars	58																														
Trucks	2																														
Heavys	0																														
Totals	60																														
Cars	22	22	16	60																											
Trucks	0	0	0	0																											
Heavys	0	1	0	1																											
Totals	22	23	16																												

Comments

Accu-Traffic Inc.

Total Count Diagram

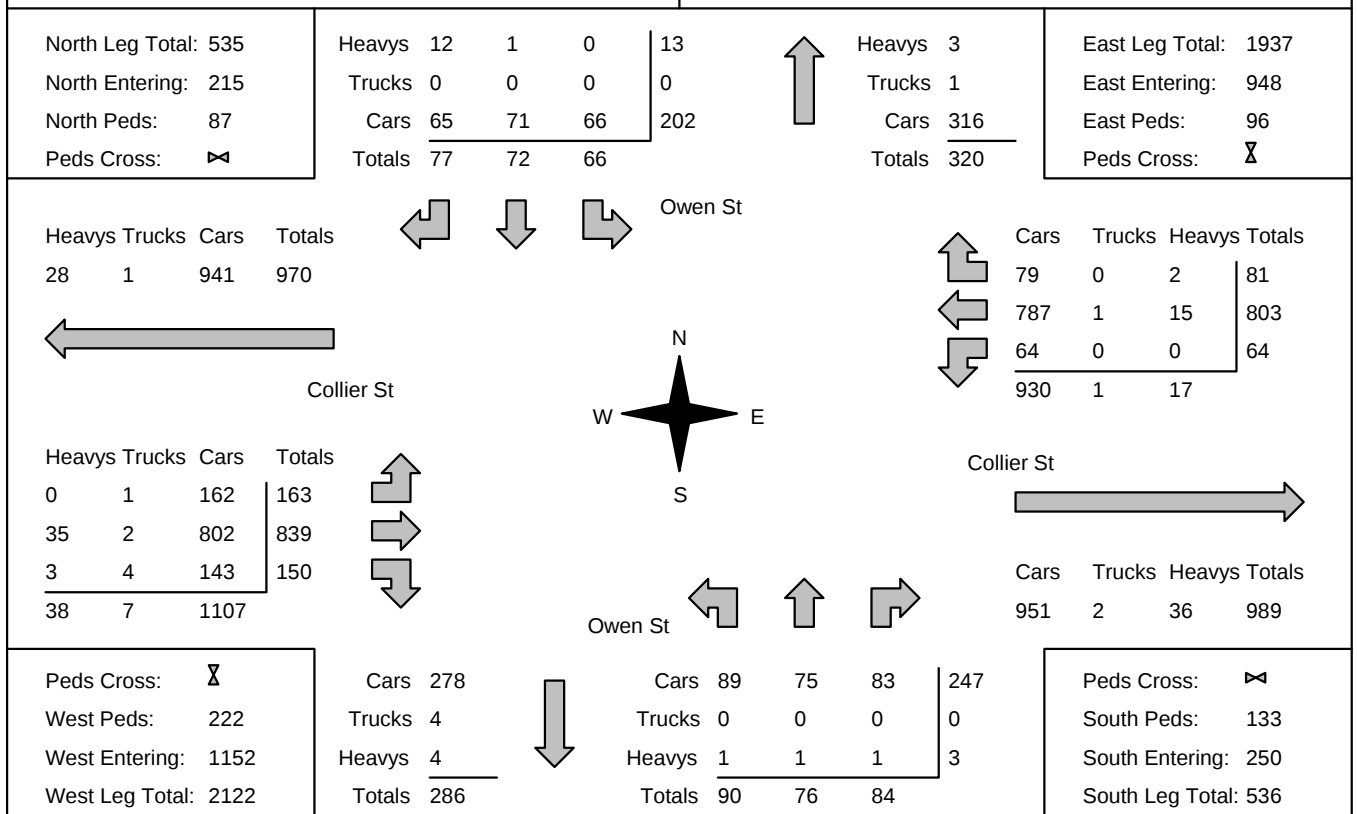
Municipality: Barrie
Site #: 1721300002
Intersection: Collier St & Owen St
TFR File #: 1
Count date: 11-Oct-17

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: Collier St runs W/E



Comments

Accu-Traffic Inc.

Traffic Count Summary

Intersection: Collier St & Owen St						Count Date: 11-Oct-17		Municipality: Barrie				
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
6:00:00	0	0	0	0	0	0	6:00:00	0	0	0	0	0
7:00:00	0	3	3	6	1	13	7:00:00	4	2	1	7	4
8:00:00	4	4	4	12	6	32	8:00:00	9	5	6	20	6
9:00:00	11	19	16	46	16	82	9:00:00	8	22	6	36	33
16:00:00	0	0	0	0	0	0	16:00:00	0	0	0	0	0
17:00:00	21	15	26	62	29	121	17:00:00	22	22	15	59	45
18:00:00	20	17	17	54	18	120	18:00:00	19	16	31	66	27
19:00:00	10	14	11	35	17	97	19:00:00	28	9	25	62	18



Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Heavys - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
6:30:00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
6:45:00	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1
7:00:00	0	0	3	1	1	1	0	0	0	0	0	0	0	0	0	0	2	0	1	0
7:15:00	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	3	1	2	1
7:30:00	0	0	4	1	2	1	0	0	0	0	0	0	0	0	0	0	3	0	4	2
7:45:00	0	0	6	2	2	0	0	0	0	0	0	0	0	0	0	0	4	1	7	3
8:00:00	4	4	7	1	3	1	0	0	0	0	0	0	0	0	0	0	4	0	7	0
8:15:00	6	2	14	7	6	3	0	0	0	0	0	0	0	0	0	0	5	1	9	2
8:30:00	9	3	19	5	10	4	0	0	0	0	0	0	0	0	0	0	5	0	17	8
8:45:00	13	4	22	3	14	4	0	0	0	0	0	0	0	0	0	0	6	1	20	3
9:00:00	15	2	25	3	17	3	0	0	0	0	0	0	0	0	1	1	6	0	23	3
9:15:00	15	0	25	0	17	0	0	0	0	0	0	0	0	0	1	0	6	0	23	0
16:00:00	15	0	25	0	17	0	0	0	0	0	0	0	0	0	1	0	6	0	23	0
16:15:00	19	4	29	4	21	4	0	0	0	0	0	0	0	0	1	0	7	1	31	8
16:30:00	26	7	34	5	28	7	0	0	0	0	0	0	0	0	1	0	7	0	41	10
16:45:00	31	5	37	3	34	6	0	0	0	0	0	0	0	0	1	0	8	1	48	7
17:00:00	36	5	40	3	41	7	0	0	0	0	0	0	0	0	1	0	8	0	52	4
17:15:00	40	4	43	3	46	5	0	0	0	0	0	0	0	0	1	0	9	1	55	3
17:30:00	45	5	45	2	50	4	0	0	0	0	0	0	0	0	1	0	9	0	67	12
17:45:00	52	7	49	4	54	4	0	0	0	0	0	0	0	0	1	0	10	1	68	1
18:00:00	56	4	57	8	56	2	0	0	0	0	0	0	0	0	1	0	10	0	70	2
18:15:00	61	5	59	2	56	0	0	0	0	0	0	0	0	0	1	0	11	1	75	5
18:30:00	63	2	61	2	60	4	0	0	0	0	0	0	0	0	1	0	11	0	81	6
18:45:00	63	0	68	7	61	1	0	0	0	0	0	0	0	0	1	0	12	1	85	4
19:00:00	66	3	71	3	65	4	0	0	0	0	0	0	0	0	1	0	12	0	87	2
19:15:00	66	0	71	0																



Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Heavys - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15:00	1	1	7	7	0	0	0	0	0	0	0	0	0	0	1	1	2	2	0	0
6:30:00	1	0	22	15	0	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0
6:45:00	2	1	35	13	2	2	0	0	0	0	0	0	0	0	2	0	2	0	0	0
7:00:00	2	0	39	4	3	1	0	0	0	0	0	0	0	0	4	2	2	0	0	0
7:15:00	3	1	57	18	4	1	0	0	0	0	0	0	0	0	4	0	2	0	1	1
7:30:00	3	0	74	17	4	0	0	0	0	0	0	0	0	0	5	1	2	0	1	0
7:45:00	4	1	96	22	5	1	0	0	0	0	0	0	0	0	5	0	2	0	4	3
8:00:00	4	0	121	25	11	6	0	0	0	0	0	0	0	0	6	1	2	0	6	2
8:15:00	4	0	146	25	18	7	0	0	0	0	0	0	0	0	7	1	2	0	10	4
8:30:00	5	1	176	30	21	3	0	0	0	0	0	0	0	0	7	0	2	0	16	6
8:45:00	12	7	209	33	22	1	0	0	0	0	0	0	0	0	8	1	2	0	18	2
9:00:00	16	4	255	46	27	5	0	0	0	0	0	0	0	0	9	1	2	0	26	8
9:15:00	16	0	255	0	27	0	0	0	0	0	0	0	0	0	9	0	2	0	26	0
16:00:00	16	0	255	0	27	0	0	0	0	0	0	0	0	0	9	0	2	0	26	0
16:15:00	19	3	307	52	31	4	0	0	0	0	0	0	0	0	9	0	2	0	33	7
16:30:00	22	3	352	45	35	4	0	0	0	0	0	0	0	0	10	1	2	0	41	8
16:45:00	23	1	409	57	40	5	0	0	1	1	0	0	0	0	10	0	2	0	46	5
17:00:00	30	7	458	49	44	4	0	0	1	0	0	0	0	0	11	1	2	0	56	10
17:15:00	32	2	513	55	51	7	0	0	1	0	0	0	0	0	11	0	2	0	62	6
17:30:00	39	7	561	48	53	2	0	0	1	0	0	0	0	0	12	1	2	0	66	4
17:45:00	42	3	598	37	60	7	0	0	1	0	0	0	0	0	12	0	2	0	73	7
18:00:00	48	6	642	44	64	4	0	0	1	0	0	0	0	0	13	1	2	0	82	9
18:15:00	52	4	684	42	69	5	0	0	1	0	0	0	0	0	13	0	2	0	83	1
18:30:00	55	3	719	35	73	4	0	0	1	0	0	0	0	0	14	1	2	0	85	2
18:45:00	60	5	760	41	76	3	0	0	1	0	0	0	0	0	15	1	2	0	90	5
19:00:00	64	4	787	27	79	3	0	0	1	0	0	0	0	0	15	0	2	0	9	



Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Heavys - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15:00	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
6:30:00	2	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0
6:45:00	2	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0
7:00:00	3	1	2	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	4	3
7:15:00	4	1	2	0	2	2	0	0	0	0	0	0	1	0	0	0	1	0	4	0
7:30:00	5	1	2	0	3	1	0	0	0	0	0	0	1	0	0	0	1	0	6	2
7:45:00	11	6	3	1	5	2	0	0	0	0	0	0	1	0	0	0	1	0	6	0
8:00:00	12	1	7	4	6	1	0	0	0	0	0	0	1	0	0	0	1	0	10	4
8:15:00	14	2	10	3	7	1	0	0	0	0	0	0	1	0	0	0	1	0	16	6
8:30:00	14	0	19	9	8	1	0	0	0	0	0	0	1	0	0	0	1	0	27	11
8:45:00	17	3	27	8	9	1	0	0	0	0	0	0	1	0	0	0	1	0	33	6
9:00:00	20	3	29	2	12	3	0	0	0	0	0	0	1	0	0	0	1	0	43	10
9:15:00	20	0	29	0	12	0	0	0	0	0	0	0	1	0	0	0	1	0	43	0
16:00:00	20	0	29	0	12	0	0	0	0	0	0	0	1	0	0	0	1	0	43	0
16:15:00	25	5	32	3	16	4	0	0	0	0	0	0	1	0	0	0	1	0	60	17
16:30:00	33	8	37	5	21	5	0	0	0	0	0	0	1	0	1	1	1	0	75	15
16:45:00	37	4	42	5	22	1	0	0	0	0	0	0	1	0	1	0	1	0	82	7
17:00:00	42	5	50	8	27	5	0	0	0	0	0	0	1	0	1	0	1	0	88	6
17:15:00	47	5	54	4	32	5	0	0	0	0	0	0	1	0	1	0	1	0	91	3
17:30:00	52	5	60	6	44	12	0	0	0	0	0	0	1	0	1	0	1	0	100	9
17:45:00	57	5	64	4	54	10	0	0	0	0	0	0	1	0	1	0	1	0	107	7
18:00:00	61	4	66	2	58	4	0	0	0	0	0	0	1	0	1	0	1	0	115	8
18:15:00	64	3	70	4	61	3	0	0	0	0	0	0	1	0	1	0	1	0	118	3
18:30:00	68	4	73	3	68	7	0	0	0	0	0	0	1	0	1	0	1	0	121	3
18:45:00	78	10	73	0	75	7	0	0	0	0	0	0	1	0	1	0	1	0	131	10
19:00:00	89	11	75	2	83	8	0	0	0	0	0	0	1	0	1	0	1	0	133	2
19:15:00	89	0	7																	



Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Heavys - West Approach						Pedestrians		
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross		
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	
6:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:15:00	0	0	4	4	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
6:30:00	2	2	9	5	2	1	0	0	0	0	0	0	0	0	2	2	1	0	1	1	
6:45:00	2	0	15	6	6	4	0	0	0	0	0	0	0	0	2	0	2	1	2	1	
7:00:00	3	1	26	11	9	3	0	0	0	0	0	0	0	0	5	3	2	0	3	1	
7:15:00	4	1	31	5	11	2	0	0	0	0	0	0	0	0	5	0	2	0	5	2	
7:30:00	6	2	46	15	18	7	0	0	0	0	0	0	0	0	8	3	2	0	6	1	
7:45:00	8	2	62	16	23	5	0	0	0	0	0	0	0	0	8	0	2	0	10	4	
8:00:00	13	5	86	24	27	4	0	0	0	0	0	0	0	0	11	3	2	0	10	0	
8:15:00	22	9	106	20	34	7	0	0	0	0	0	0	0	0	12	1	3	1	12	2	
8:30:00	29	7	148	42	39	5	0	0	0	0	0	0	0	0	15	3	3	0	25	13	
8:45:00	41	12	188	40	41	2	0	0	0	0	0	1	1	0	0	16	1	3	0	31	6
9:00:00	49	8	234	46	49	8	0	0	1	1	1	0	0	0	19	3	3	0	46	15	
9:15:00	49	0	234	0	49	0	0	0	1	0	1	0	0	0	19	0	3	0	46	0	
16:00:00	49	0	234	0	49	0	0	0	1	0	1	0	0	0	19	0	3	0	46	0	
16:15:00	62	13	275	41	55	6	0	0	1	0	1	0	0	0	19	0	3	0	67	21	
16:30:00	73	11	333	58	63	8	0	0	1	0	3	2	0	0	21	2	3	0	95	28	
16:45:00	81	8	379	46	71	8	1	1	2	1	3	0	0	0	22	1	3	0	112	17	
17:00:00	90	9	432	53	78	7	1	0	2	0	3	0	0	0	24	2	3	0	126	14	
17:15:00	105	15	487	55	86	8	1	0	2	0	3	0	0	0	25	1	3	0	143	17	
17:30:00	115	10	544	57	91	5	1	0	2	0	3	0	0	0	26	1	3	0	161	18	
17:45:00	127	12	595	51	94	3	1	0	2	0	3	0	0	0	27	1	3	0	165	4	
18:00:00	134	7	652	57	104	10	1	0	2	0	4	1	0	0	31	4	3	0	182	17	
18:15:00	144	10	693	41	115	11	1	0	2	0	4	0	0	0	31	0	3	0	195	13	
18:30:00	149	5	729	36	123	8	1	0	2	0	4	0	0	0	33	2	3	0	209	14	
18:45:00	155	6	764	35	132	9	1	0	2	0	4	0	0	0	34	1	3	0	216	7	
19:00:00	162	7	802	38	143	11	1	0	2</												

Appendix B: Existing Operations

HCM Signalized Intersection Capacity Analysis

2020 Existing Conditions

1: Mulcaster Street & Collier Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	171	57	29	160	73	79	186	34	42	131	51
Future Volume (vph)	58	171	57	29	160	73	79	186	34	42	131	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.95			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3346		1738	3313			1803	1555		3327	
Flt Permitted	0.53	1.00		0.60	1.00			0.81	1.00		0.84	
Satd. Flow (perm)	975	3346		1094	3313			1477	1555		2821	
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)	63	186	62	32	174	79	86	202	37	46	142	55
RTOR Reduction (vph)	0	31	0	0	54	0	0	0	27	0	40	0
Lane Group Flow (vph)	63	217	0	32	199	0	0	288	10	0	203	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			15.2	15.2		15.2	
Effective Green, g (s)	27.2	27.2		17.1	17.1			15.2	15.2		15.2	
Actuated g/C Ratio	0.50	0.50		0.31	0.31			0.28	0.28		0.28	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	601	1673		343	1041			412	434		788	
v/s Ratio Prot	0.02	c0.06			c0.06							
v/s Ratio Perm	0.04			0.03				c0.19	0.01		0.07	
v/c Ratio	0.10	0.13		0.09	0.19			0.70	0.02		0.26	
Uniform Delay, d1	7.1	7.3		13.2	13.6			17.6	14.2		15.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.4	0.2		0.5	0.4			5.1	0.0		0.2	
Delay (s)	7.4	7.4		13.7	14.0			22.7	14.2		15.4	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		7.4			14.0			21.7			15.4	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.7			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			54.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			50.5%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2020 Existing Conditions

2: Mulcaster Street & Dunlop Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	59	120	20	334	162	17	9	205	284	15	173	26
Future Volume (vph)	59	120	20	334	162	17	9	205	284	15	173	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1778		1738	1804			1826	1555		1794	
Flt Permitted		0.85		0.62	1.00			0.98	1.00		0.96	
Satd. Flow (perm)		1537		1134	1804			1795	1555		1729	
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)	64	130	22	363	176	18	10	223	309	16	188	28
RTOR Reduction (vph)	0	6	0	0	6	0	0	0	242	0	9	0
Lane Group Flow (vph)	0	210	0	363	188	0	0	233	67	0	223	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		20.1		32.1	32.1			12.2	12.2		12.2	
Effective Green, g (s)		20.1		32.1	32.1			12.2	12.2		12.2	
Actuated g/C Ratio		0.36		0.57	0.57			0.22	0.22		0.22	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		548		753	1028			388	336		374	
v/s Ratio Prot				c0.09	0.10							
v/s Ratio Perm		c0.14		0.19				c0.13	0.04		0.13	
v/c Ratio		0.38		0.48	0.18			0.60	0.20		0.60	
Uniform Delay, d1		13.5		6.8	5.8			19.9	18.1		19.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.0		2.2	0.4			2.6	0.3		2.6	
Delay (s)		15.5		9.0	6.2			22.5	18.3		22.4	
Level of Service		B		A	A			C	B		C	
Approach Delay (s)		15.5			8.0			20.1			22.4	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			15.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			56.3			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			67.6%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2020 Existing Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	274	25	12	261	16	8	23	6	11	20	16
Future Volume (vph)	37	274	25	12	261	16	8	23	6	11	20	16
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.98			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1789	1808		1789	1867			1820			1701	
Flt Permitted	0.58	1.00		0.56	1.00			0.91			0.91	
Satd. Flow (perm)	1086	1808		1062	1867			1674			1560	
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)	40	298	27	13	284	17	9	25	7	12	22	17
RTOR Reduction (vph)	0	4	0	0	2	0	0	6	0	0	16	0
Lane Group Flow (vph)	40	321	0	13	299	0	0	35	0	0	35	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	36.2	36.2		36.2	36.2			3.9			3.9	
Effective Green, g (s)	36.2	36.2		36.2	36.2			3.9			3.9	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.07			0.07	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	754	1256		737	1297			125			116	
v/s Ratio Prot		c0.18			0.16							
v/s Ratio Perm	0.04			0.01				0.02			c0.02	
v/c Ratio	0.05	0.26		0.02	0.23			0.28			0.30	
Uniform Delay, d1	2.5	3.0		2.5	2.9			22.8			22.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.5		0.0	0.4			1.2			1.5	
Delay (s)	2.7	3.4		2.5	3.3			24.0			24.3	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		3.4			3.3			24.0			24.3	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			5.8									
HCM 2000 Volume to Capacity ratio			0.26									
Actuated Cycle Length (s)			52.1								12.0	
Intersection Capacity Utilization			49.1%								A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2020 Existing Conditions

AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	282	10	0	290	0	5
Future Volume (Veh/h)	282	10	0	290	0	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)	307	11	0	315	0	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)	134			53		
pX, platoon unblocked					1.00	
vC, conflicting volume			318		470	159
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			318		465	159
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1217		517	849
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	205	113	158	158	5	
Volume Left	0	0	0	0	0	
Volume Right	0	11	0	0	5	
cSH	1700	1700	1700	1700	849	
Volume to Capacity	0.12	0.07	0.09	0.09	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.3	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.3	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			18.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2020 Existing Conditions

1: Mulcaster Street & Collier Street

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	195	57	47	181	57	51	183	32	54	195	51
Future Volume (vph)	61	195	57	47	181	57	51	183	32	54	195	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.97		1.00	0.96			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3358		1738	3351			1810	1555		3358	
Flt Permitted	0.53	1.00		0.58	1.00			0.83	1.00		0.83	
Satd. Flow (perm)	969	3358		1067	3351			1521	1555		2802	
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)	66	212	62	51	197	62	55	199	35	59	212	55
RTOR Reduction (vph)	0	30	0	0	42	0	0	0	26	0	26	0
Lane Group Flow (vph)	66	244	0	51	217	0	0	254	9	0	300	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.1	27.1		17.1	17.1			13.4	13.4		13.4	
Effective Green, g (s)	27.1	27.1		17.1	17.1			13.4	13.4		13.4	
Actuated g/C Ratio	0.52	0.52		0.33	0.33			0.26	0.26		0.26	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	617	1733		347	1091			388	396		715	
v/s Ratio Prot	0.02	c0.07			c0.06							
v/s Ratio Perm	0.04			0.05				c0.17	0.01		0.11	
v/c Ratio	0.11	0.14		0.15	0.20			0.65	0.02		0.42	
Uniform Delay, d1	6.4	6.6		12.5	12.8			17.5	14.6		16.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.3	0.2		0.9	0.4			3.9	0.0		0.4	
Delay (s)	6.8	6.8		13.4	13.2			21.4	14.7		16.7	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		6.8			13.2			20.6			16.7	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.1			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			52.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			51.6%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2020 Existing Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	232	35	298	186	22	12	195	401	17	232	49
Future Volume (vph)	72	232	35	298	186	22	12	195	401	17	232	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1785		1738	1800			1824	1555		1784	
Flt Permitted		0.88		0.48	1.00			0.97	1.00		0.97	
Satd. Flow (perm)		1580		878	1800			1777	1555		1736	
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)	78	252	38	324	202	24	13	212	436	18	252	53
RTOR Reduction (vph)	0	7	0	0	7	0	0	0	329	0	12	0
Lane Group Flow (vph)	0	361	0	324	219	0	0	225	107	0	311	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		21.1		31.1	31.1			14.1	14.1		14.1	
Effective Green, g (s)		21.1		31.1	31.1			14.1	14.1		14.1	
Actuated g/C Ratio		0.37		0.54	0.54			0.25	0.25		0.25	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		582		597	978			438	383		427	
v/s Ratio Prot				c0.08	0.12							
v/s Ratio Perm		c0.23		0.22				0.13	0.07		c0.18	
v/c Ratio		0.62		0.54	0.22			0.51	0.28		0.73	
Uniform Delay, d1		14.8		8.0	6.8			18.6	17.4		19.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		4.9		3.5	0.5			1.0	0.4		6.1	
Delay (s)		19.7		11.5	7.3			19.6	17.8		25.9	
Level of Service		B		B	A			B	B		C	
Approach Delay (s)		19.7			9.8			18.4			25.9	
Approach LOS		B			A			B			C	
Intersection Summary												
HCM 2000 Control Delay			17.4			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			57.2			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			79.3%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2020 Existing Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	270	34	13	249	21	23	24	16	22	14	28
Future Volume (vph)	45	270	34	13	249	21	23	24	16	22	14	28
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.99			0.97			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1789	1801		1789	1861			1787			1661	
Flt Permitted	0.58	1.00		0.56	1.00			0.85			0.86	
Satd. Flow (perm)	1093	1801		1057	1861			1547			1449	
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)	49	293	37	14	271	23	25	26	17	24	15	30
RTOR Reduction (vph)	0	6	0	0	4	0	0	15	0	0	27	0
Lane Group Flow (vph)	49	324	0	14	290	0	0	53	0	0	42	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.5	33.5		33.5	33.5			5.9			5.9	
Effective Green, g (s)	33.5	33.5		33.5	33.5			5.9			5.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.11			0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	712	1173		688	1212			177			166	
v/s Ratio Prot		c0.18			0.16							
v/s Ratio Perm	0.04			0.01				c0.03			0.03	
v/c Ratio	0.07	0.28		0.02	0.24			0.30			0.26	
Uniform Delay, d1	3.3	3.8		3.2	3.7			20.9			20.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.6		0.1	0.5			1.0			0.8	
Delay (s)	3.4	4.4		3.2	4.2			21.8			21.6	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.3			4.1			21.8			21.6	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.1			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.28									
Actuated Cycle Length (s)			51.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			55.7%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2020 Existing Conditions
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	303	5	0	283	0	10
Future Volume (Veh/h)	303	5	0	283	0	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)	329	5	0	308	0	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.98	
vC, conflicting volume				334		486 167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				334		439 167
tC, single (s)				4.2		6.9 7.0
tC, 2 stage (s)						
tF (s)				2.2		3.5 3.3
p0 queue free %				100		100 99
cM capacity (veh/h)				1201		529 839
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	219	115	154	154	11	
Volume Left	0	0	0	0	0	
Volume Right	0	5	0	0	11	
cSH	1700	1700	1700	1700	839	
Volume to Capacity	0.13	0.07	0.09	0.09	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.3	
Control Delay (s)	0.0	0.0	0.0	0.0	9.4	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.4	
Approach LOS					A	
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			18.5%		ICU Level of Service A	
Analysis Period (min)			15			

Appendix C: Background Development



Enhancing our communities



Downtown Barrie Retirement Residence

TRAFFIC IMPACT STUDY

Revera Inc.

4 Proposed Development

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

4.1 SITE LOCATION

The subject site is located on the southeast corner of the intersection of Collier Street with Owen Street in the City of Barrie (as per Figure 1). The property is bounded by Collier Street to the north, Owen Street to the west, a public laneway to the south and existing commercial development to the east.

4.2 PROPOSED LAND-USE & PHASING

The proposed retirement development will consist of the following:

- 252 retirement residence units (1 & 2 bedrooms);
- 62 assisted living units (studio & 1 bedroom);
- 171 m² (1841 ft²) of commercial space; and
- a 65-space parking garage.

Access to the parking garage is provided via the existing public laneway which connects to Owen Street.

A site plan is provided in Figure 7. Full build-out has been assumed by 2021.

4.3 SITE ACCESS

As illustrated in Figure 7, access to the parking garage will be located on the south side of the building via the public lane, which connects to Owen Street. The parking garage access provides two-way operations (i.e. one inbound lane and one outbound lane). Full moves are permitted at the public laneway access on Owen Street.

The loading area and garbage enclosure, both located to the rear of the building, will be accessed via the existing public laneway. Furthermore, an internal garage space is also located at the rear of the building (adjacent to the garbage enclosure) for tour bus operations serving the residents of the development.



4.5 SITE TRAFFIC

4.5.1 Trip Generation

The number of vehicle trips to be generated by the proposed development has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual*⁸ 9th Edition. Based on the proposed development, the following ITE land-uses have been considered:

- senior adult housing – attached (ITE code 252);
- assisted living (ITE code 254); and
- shopping centre (ITE code 820).

The *ITE Trip Generation Manual* notes that the peak trip generation for the *senior adult housing (attached)* and *assisted living* land uses do not typically coincide with the peak hour of the adjacent street (i.e. trips to/from these developments will be greatest during the off-peak period of the road). However, for the purpose of this study, the trip generation rates associated with the peak hour of the proposed land use have been assumed to coincide with the peak hour of the adjacent road. This approach considers a conservative or “worst case” scenario as both peaks are assumed to occur simultaneously.

A specific commercial use has not been identified at this time, but it is anticipated to be consistent with other specialty retail shops located along Collier Street and Dunlop Street. As such, the *shopping centre* trip rates have been applied.

The associated trip rates and trip estimates are provided in Table 6 and Table 7.

Table 6: Trip Generation Rates

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
senior adult housing – attached	units	0.18	0.21	0.39	0.19	0.16	0.35
assisted living	units	0.12	0.06	0.18	0.16	0.19	0.35
shopping centre	1000 ft ² GLA	0.60	0.36	0.96	1.78	1.93	3.71

⁸ *ITE Trip Generation Manual, 9th Edition*. Institute of Transportation Engineers, 2012.



Table 7: Trip Generation Estimates

LAND USE	SIZE	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
senior adult housing - attached	252 units	17	31	48	35	23	58
assisted living	62 units	6	3	9	6	8	14
shopping centre	1,841 ft ²	1	1	2	3	4	7
Total		24	35	59	44	35	79

Overall, the proposed development is expected to generate 59 trips during the weekday AM peak hour and 79 trips during the weekday PM peak hour (total of inbound and outbound trips). It is reiterated that the trip estimates for the senior related uses reflect the peak hours of the specific uses (based on ITE trip generation data) rather than the peak hour of the adjacent street. Thus, the approach employed in this study is conservative.

4.5.2 Trip Distribution & Assignment

The distribution of the new trips generated by the site has been developed based on the results of the *Transportation Tomorrow Survey* (TTS) completed in 2016. The TTS is a survey of a random sampling of 5% of the households in the Greater Toronto Area and surrounding area of Central Ontario, including the City of Barrie. Based on a review of the TTS data with respect to trips to/from Barrie, the following trip distribution was identified:

- to/from locations within Barrie – 70%;
- to/from the east beyond Barrie – 5%;
- to/from the west beyond Barrie – 5%;
- to/from the north beyond Barrie – 10%; and
- to/from the south beyond Barrie – 10%.

As indicated, 70% of the trips remain wholly within Barrie whereas only 30% originate from, or are destined to, areas outside of the City. The trips that remain within Barrie were distributed based on additional TTS trip data for the traffic zone within which the development is located. When considering the distribution of trips that remain within the City, the ultimate trip distribution for the site is as follows:

- to/from the east – 5%;

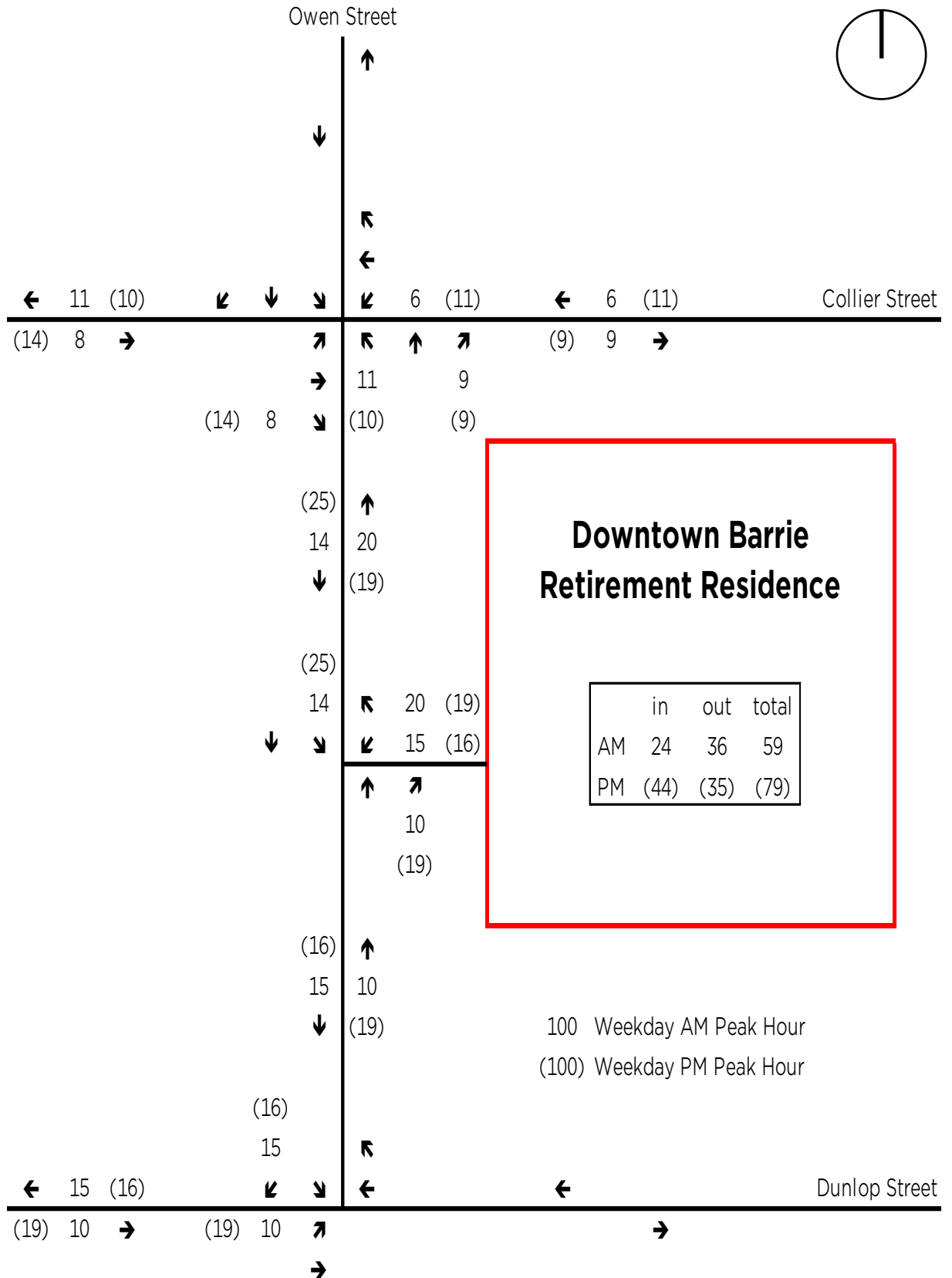


- to/from the west – 20%;
- to/from the north – 40%; and
- to/from the south – 35%.

The assignment of the trips generated by the development to the area road network is based on the trip distribution noted above with consideration given to the expected travel routes. It is noted that the commercial generated trips made by private automobile will not utilize the site access (i.e. the commercial trips will be dispersed along the adjacent road network based on the location of available municipal parking). However, to ensure a conservative approach, it has been assumed that the commercial trips will use the site access (i.e. all site generated trips are assumed to be vehicle trips concentrated at the access to the parking garage).

The resulting site generated traffic volumes assigned to the road network, are illustrated in Figure 8.





Downtown Barrie Retirement Residence

Figure 8: Site Traffic





Owen Street

City of Barrie

Traffic Impact Study for Barrie Owen Service Inc.

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Project Number:
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Table 8 – Background (2031) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour			Weekday PM Peak Hour		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Owen Street / McDonald Street (signalized)	0.26	12.5	B	0.40	13.6	B
EB	0.39	12.2	B	0.47	12.9	B
WB	0.39	12.3	B	0.52	13.5	B
NB	0.07	13.9	B	0.24	15.7	B
SB	0.09	14.1	B	0.04	13.7	B
Owen Street / Worsley Street (unsignalized)	-	8.6	A	-	9.3	A
EB	0.25	8.9	A	0.17	8.8	A
WB	0.13	8.3	A	0.29	9.7	A
NB	0.13	8.3	A	0.23	9.4	A
SB	0.15	8.6	A	0.15	8.8	A

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.1.

For right turn movements at the Owen Street / Worsley Street intersection, the criteria outlined in Section E.7 of the MTO GDSOH (60 vph minimum right turn volume warrant) were applied. Based on the above-noted criteria, no right turn lanes are warranted.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the unsignalized study area intersections (results are provided in **Appendix D**).

No improvements are recommended within the study area.

4 Proposed Development Traffic Generation and Assignment

4.1 Existing Municipal Parking Lot

The subject site is to be built at the same location as the existing municipal parking lot. The current plan for the development of the site involves the removal of the municipal parking lot (and consequently traffic associated with that facility) prior to the 2021 horizon year. The traffic distribution for the trips generated by the existing municipal parking lot during the AM and PM peak hour is assumed to follow the distribution of the existing traffic volumes within the study area. The traffic assignment for the existing municipal parking lot was calculated for the AM and PM peak hour and has been illustrated in **Figure 8**.

Additional traffic generated by the existing development in the south half of the site also generates traffic that would be captured in the existing traffic counts; however, for the purpose of our analysis we have ignored this traffic reduction, as it is anticipated to be relatively minor.

4.2 Traffic Generation

The traffic generation for the subject site has been based on the ITE Trip Generation Manual. The following ITE land use has been applied to estimate the traffic from the proposed development:

- ITE land use 231 (Mid-Rise Residential with 1st-Floor Commercial)
 - o Dense Multi-Use Urban Setting

The estimated trip generation of the proposed development for Phase 1 and the ultimate development is illustrated below in **Table 9**. The AM and PM peak traffic generation for the proposed development is not anticipated to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

Table 9 – Estimated Traffic Generation of Proposed Development

Phase	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
Ultimate Development	Mid-Rise Residential with 1 st -Floor Commercial ITE Land Use: 231	307 units	39	56	95	63	81	144

No transportation modal split has been applied to the above-noted traffic generation calculation.

4.3 Traffic Assignment

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

The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. The distribution of traffic has been calculated based on the 2011 Transportation Tomorrow Survey [TTS] data for traffic zone 8501 retrieved using the TTS Internet Data Retrieval System [IDRS] (output attached as **Appendix F**). TTS data provides historical origin and destination work trip percentages for specific areas within the County and the Greater Toronto and Hamilton Area [GTHA].

Traffic distribution for the trips generated by the subject site during the AM and PM peak hour is expected to generally follow commuter travel patterns. Our analysis is based on egress traffic during the AM peak hour. Logically, the distribution of ingress traffic will follow the inverse of the exiting traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

The distribution of trips is illustrated in **Table 10** using the methodology outlined above.

Table 10 – Proposed Development Traffic Distribution

Travel Direction (to / from)	Percentage of Total Traffic Generation
East via McDonald Street	4.4%
West via McDonald Street	52.4%
East via Worsley Street	1.6%
West via Worsley Street	17.5%
North via Owen Street	13.7%
South via Owen Street	10.4%
TOTAL	100%

Using the traffic distribution pattern noted above, the site traffic assignment for the and ultimate buildout of the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figures 9**.

The net site traffic assignment, the site traffic minus the existing municipal parking lot traffic volumes, for the ultimate buildout of the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figures 10**.

4.4 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2021, 2026 and 2031) horizon year traffic volumes, the proposed development traffic was added to the background (2021, 2026 and 2031) traffic volumes. The resulting total (2021, 2026 and 2031) horizon year traffic volume for the AM and PM peak hour are illustrated in **Figures 11, 12 and 13**.

Figure 8 – Existing Municipal Parking Lot Traffic Volumes

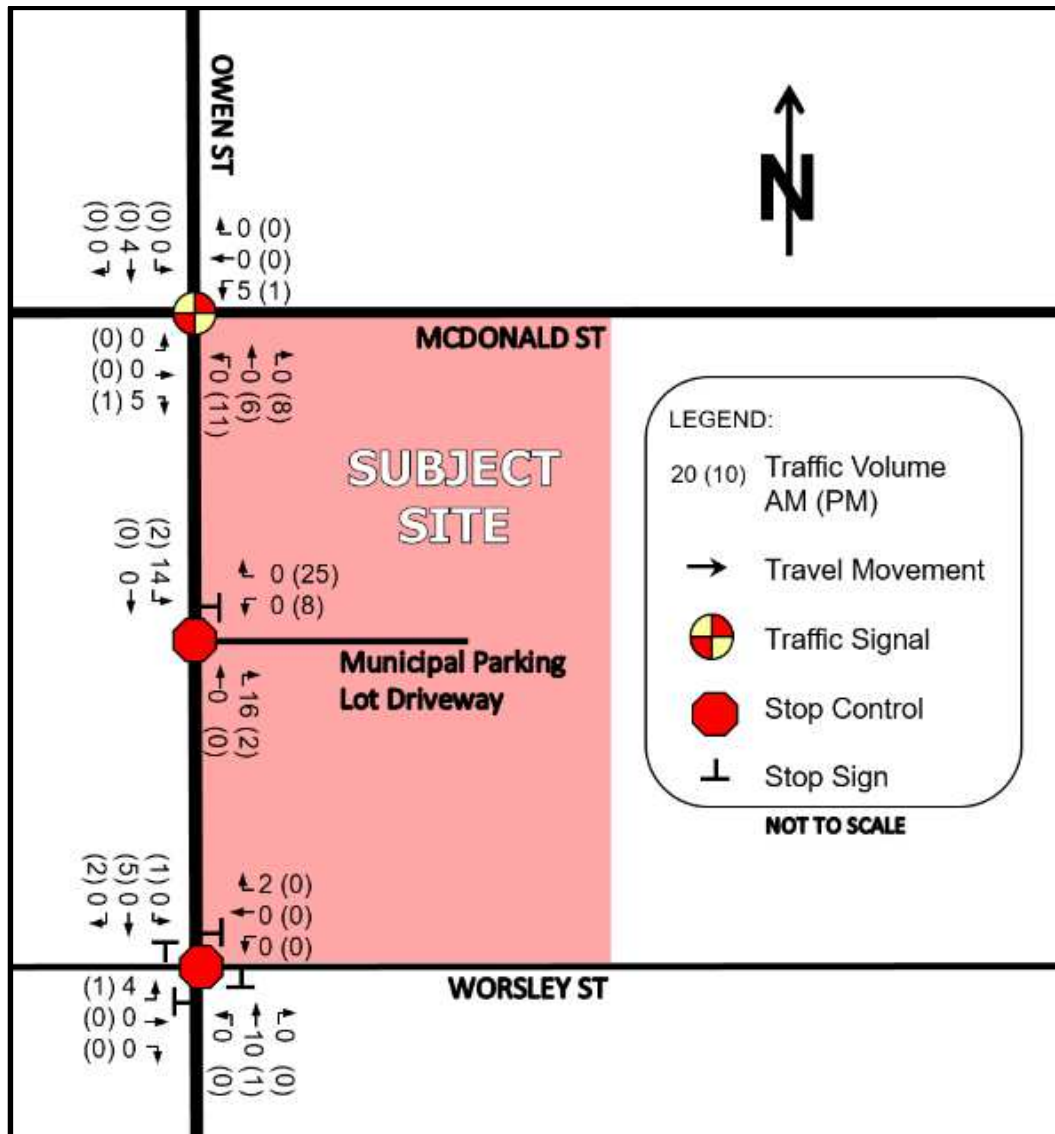


Figure 9 –Site Traffic Assignment – Ultimate Buildout

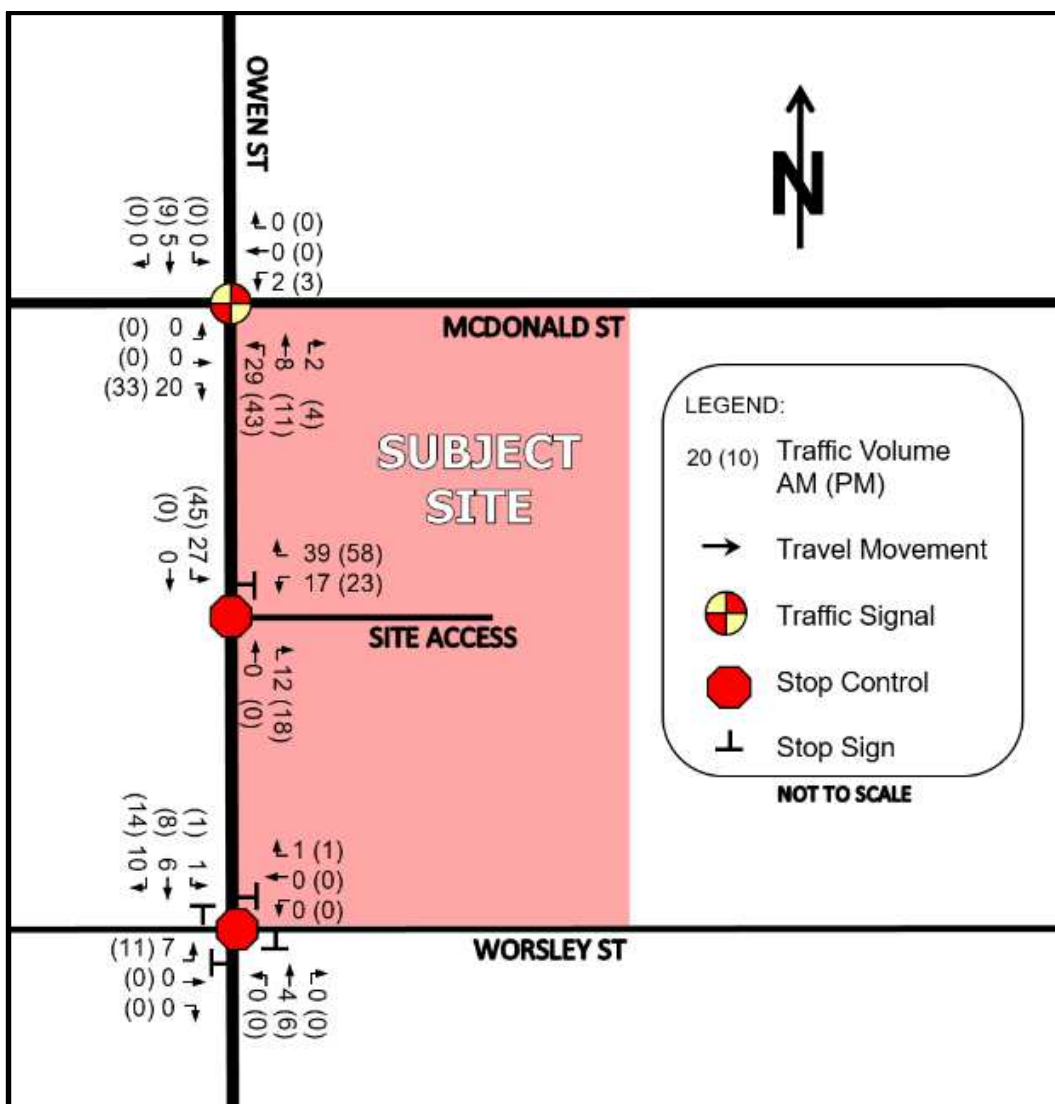
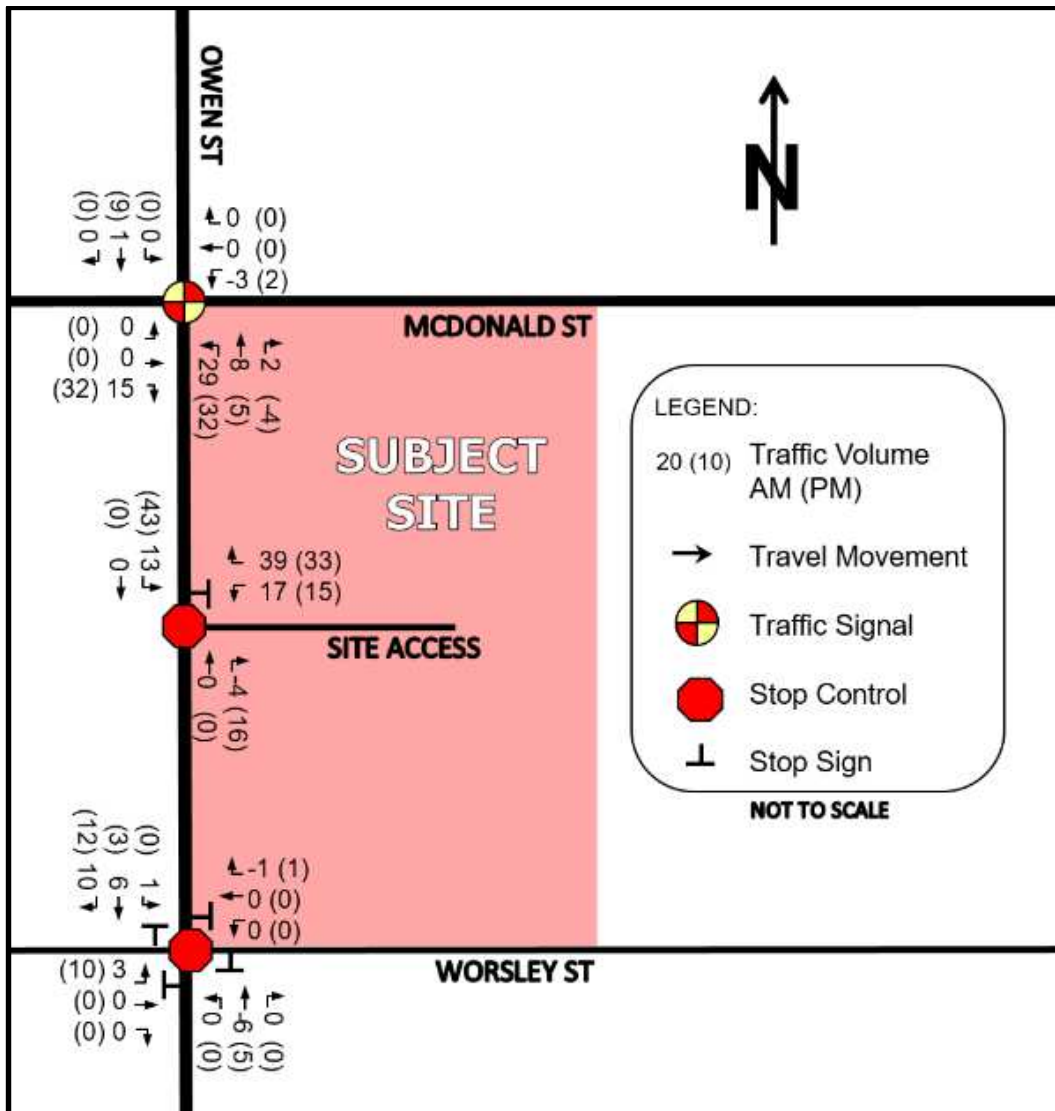


Figure 10 – Net Site Traffic Assignment – Ultimate Buildout





October 31st, 2019

JDE Project 17124

Aalto Developments Inc.

190 Dunlop Street East
Barrie, ON L4M 1B3

**RE: Traffic Impact Study – Revised Addendum
185 Dunlop Street, City of Barrie**

This letter was prepared by **JD Northcote Engineering Inc.** [JD Engineering] for the account of the **AALTO Developments Inc.** [The Developer].

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. JD Engineering accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

1.0 BACKGROUND

JD Engineering prepared a traffic impact study for the proposed 185 Dunlop Street mixed-use development [Subject Site], located in the City of Barrie [City] (dated December 21, 2017) [TIS]. The above noted TIS assessed the traffic-related impact of the proposed development on the adjacent roadway and provided recommendations to accommodate this traffic in a safe and efficient manner.

A development proposal is now underway for the property located directly west of the Subject Site [New Adjacent Development]. The New Adjacent Development extends from Dunlop Street East to the lake, between Mulcaster Street and the Subject Site. The New Adjacent Development will include one access onto Mulcaster Street [Mulcaster Access] and one access onto a proposed extension of Poyntz Street, south of Dunlop Street East [Adjacent Development Access], directly across from the proposed access for the Subject Site [West P1 Access]. To accommodate the New Adjacent Development, the proposed extension of Poyntz Street has been redesigned to accommodate traffic from the New Adjacent Development. The City has requested an update letter to the TIS to review the impact of the additional traffic volumes from the New Adjacent Development at the future Poyntz Street / Dunlop Street East intersection.

Furthermore, following the completion of the TIS, the Site Plan for the Subject Site has been revised to include 178 residential units and approximately 1,764 sq.m. commercial space (site plan provided in the **Appendix**). Included in the 1,764 sq.m. of commercial space will be a 5,600 sq.ft. health and fitness club.

This revised addendum also addresses Item #2 from the City Traffic and Parking Services' Comments from July 31, 2019 (Excerpt in **Appendix**).



JD Engineering Inc.
Phone: 705.725.4035
Email: Info@JDEngineering.ca

2.0 PROPOSED DEVELOPMENT – REVISED TRAFFIC GENERATION

The revised traffic generation for the Subject Site has been based on the Institute of Transportation Engineers [ITE] *Trip Generation Manual* (10th Edition) [ITE Trip Generation Manual]. The following ITE land use has been applied to estimate the revised traffic from the proposed development:

- ITE land use 231 (Mid-Rise Residential with 1st-Floor Commercial)
 - Dense Multi-Use Urban Setting
- ITE land use 492 (Health/Fitness Club)
 - General Urban / Suburban Setting

The estimated trip generation for the proposed development is illustrated below in **Table 1**. The AM and PM peak traffic generation for the proposed development is not anticipated to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

Table 1 – Estimated Traffic Generation of Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Mid-Rise Residential with 1 st -Floor Commercial ITE Land Use: 231	178 units	23	32	55	37	47	84
Health/Fitness Club ITE Land Use: 492	5,600 sq.ft.	4	3	7	11	8	19
TOTAL TRIP GENERATION		27	35	62	48	55	103
Internal Capture		0	0	0	-3	-3	-6
NET TRIP GENERATION		27	35	62	45	52	97

It is noted that ITE land use 231 accounts for commercial space within a mixed-use building; however, we have accounted for additional traffic for the Health and Fitness Club as the commercial space in ITE land use 231 is typically considered to be retail.

No transportation modal split has been applied to the above-noted traffic generation calculation.

3.0 PROPOSED DEVELOPMENT – REVISED TRAFFIC ASSIGNMENT

The distribution of residential traffic for the proposed development is assumed to follow the trip distribution calculated for residential traffic as illustrated in Table 10 in Section 4.2 in the TIS.

The distribution of health and fitness club traffic for the proposed development is assumed to follow the existing trip distribution in the study area as illustrated in Table 11 in Section 4.2 in the TIS.

The distribution of traffic entering at each site access driveway is based on our review of the internal parking and building layout, in conjunction with the external traffic distribution.

Using the traffic distribution patterns noted above, the residential and health and fitness club traffic assignments for the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figures 1 and 2**, respectively.

Figure 1 – Proposed Development – Residential Traffic Assignment

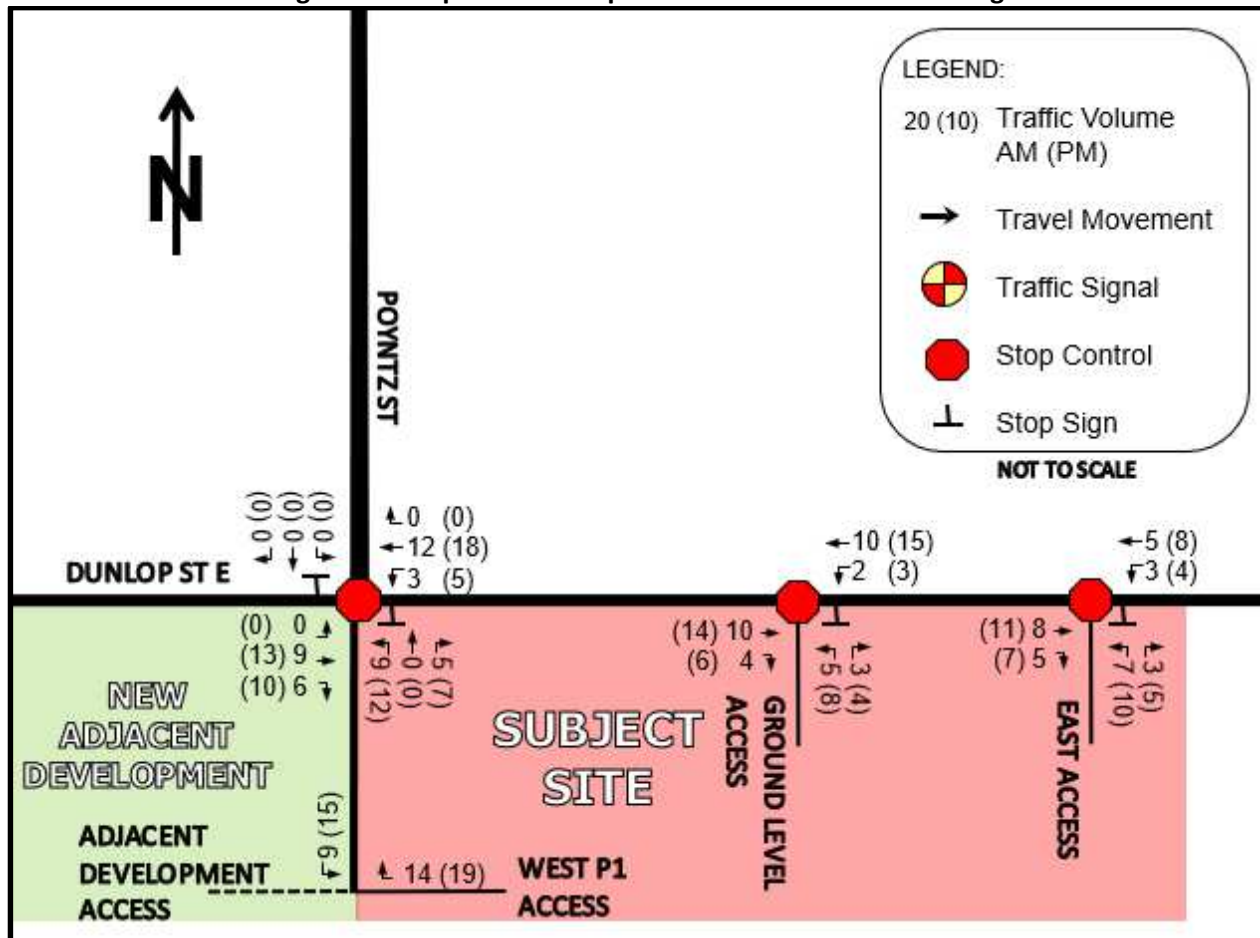
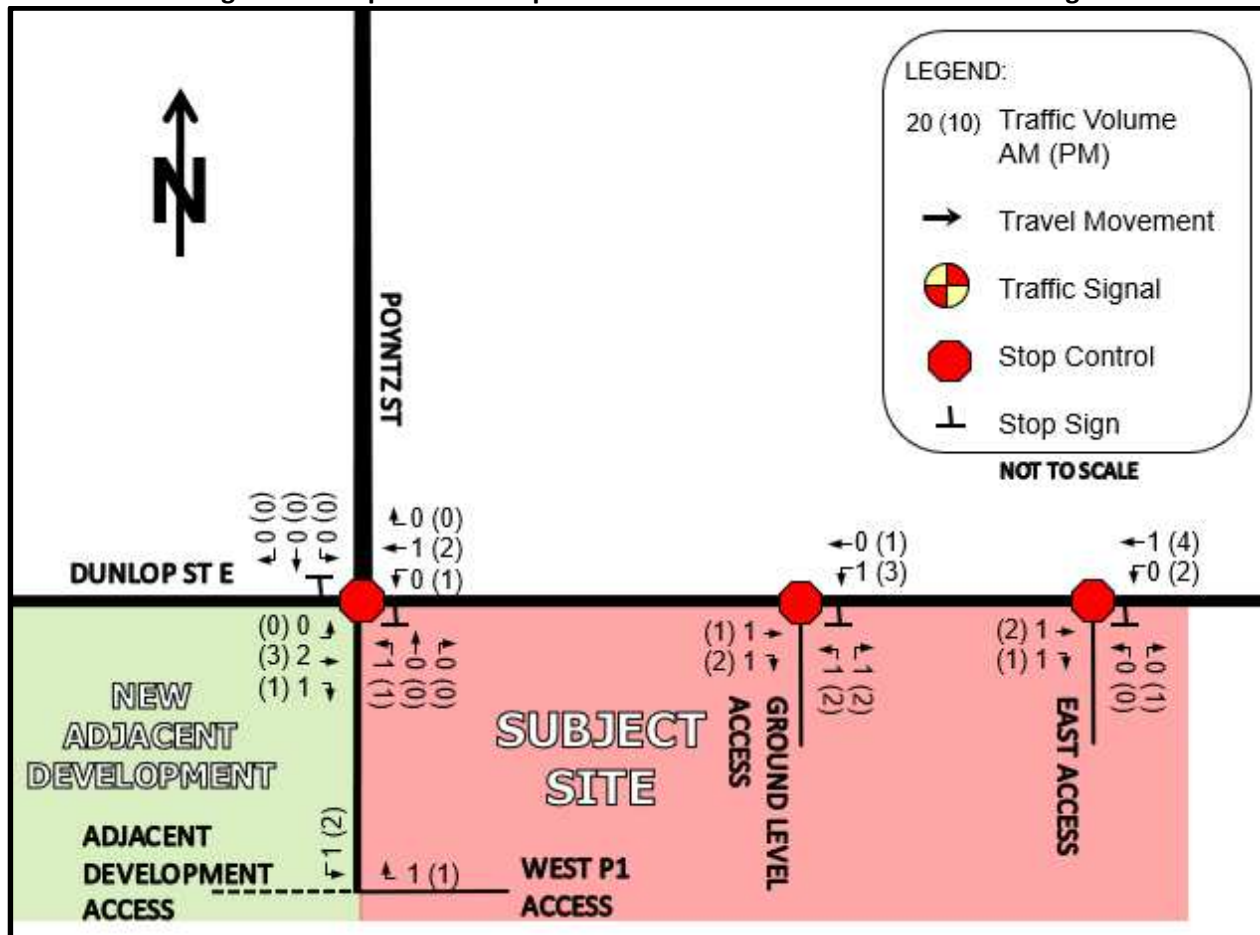


Figure 2 – Proposed Development – Health and Fitness Club Traffic Assignment



4.0 NEW ADJACENT DEVELOPMENT TRAFFIC GENERATION

The New Adjacent Development includes 130 hotel rooms, 136 condominium units and 500 sq.m. of commercial space. It has been assumed that this development will be occupied prior to the 2027 horizon year.

A traffic impact study is not available for the New Adjacent Development. The traffic generation for the New Adjacent Development has been calculated based on the data provided in the ITE Trip Generation Manual. The following ITE land uses have been applied to estimate the traffic from the New Adjacent Development:

- ITE land use 231 (Mid-Rise Residential with 1st-Floor Commercial) –
 - Dense Multi-Use Urban Setting
- ITE land use 310 (Hotel) – General Urban/Suburban Setting

The AM and PM peak hour traffic generation for the New Adjacent Development does not exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

The estimated trip generation of the New Adjacent Development is illustrated below in **Table 2**.

Table 2 – Estimated Traffic Generation for the New Adjacent Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Mid-Rise Residential with 1 st -Floor Commercial ITE Land Use: 231	136 units	17	25	42	28	36	64
Hotel ITE Land Use: 310	130 units	36	25	61	40	38	78
TOTAL TRIP GENERATION		53	50	103	68	74	142

No transportation modal split has been applied to the above-noted traffic generation calculation.

5.0 NEW ADJACENT DEVELOPMENT TRAFFIC ASSIGNMENT

The distribution of residential traffic for the New Adjacent Development is assumed to follow the trip distribution calculated for residential traffic as illustrated in Table 10 in Section 4.2 in the TIS.

The distribution of hotel traffic for the New Adjacent Development is assumed to follow the existing trip distribution in the study area traffic as illustrated in Table 11 in Section 4.2 in the TIS.

The distribution of traffic entering at each access driveway for the New Adjacent Development is based on our review of the internal parking and building layout, in conjunction with the external traffic distribution.

Using the traffic distribution patterns noted above, the residential and hotel traffic assignments for the New Adjacent Development was calculated for the AM and PM peak hour within the study area and is illustrated in **Figures 3 and 4**, respectively. It is noted that some of the New Adjacent Development traffic will not be within the study area due to the use of the Mulcaster Access.

Figure 3 – New Adjacent Development – Residential Traffic Assignment

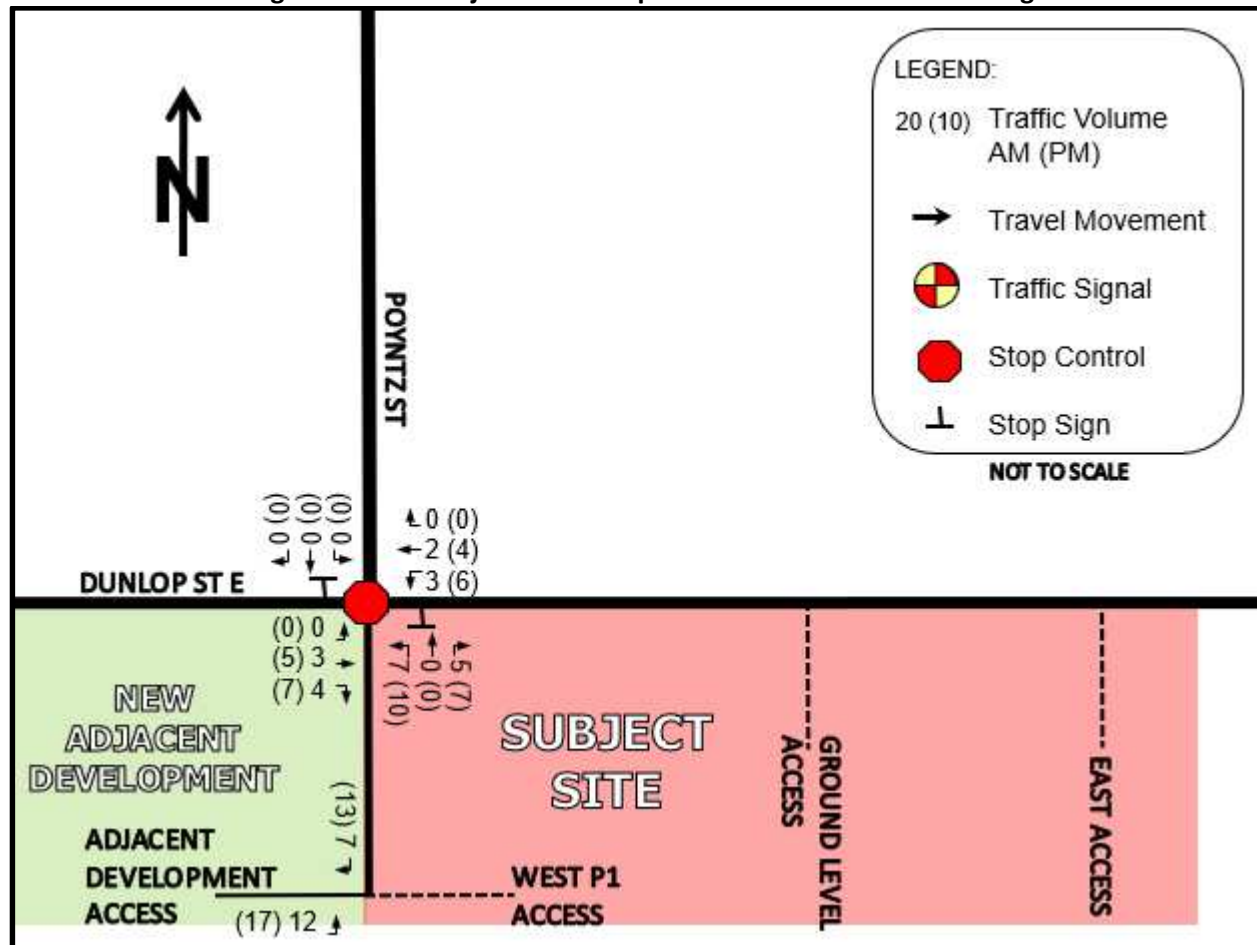
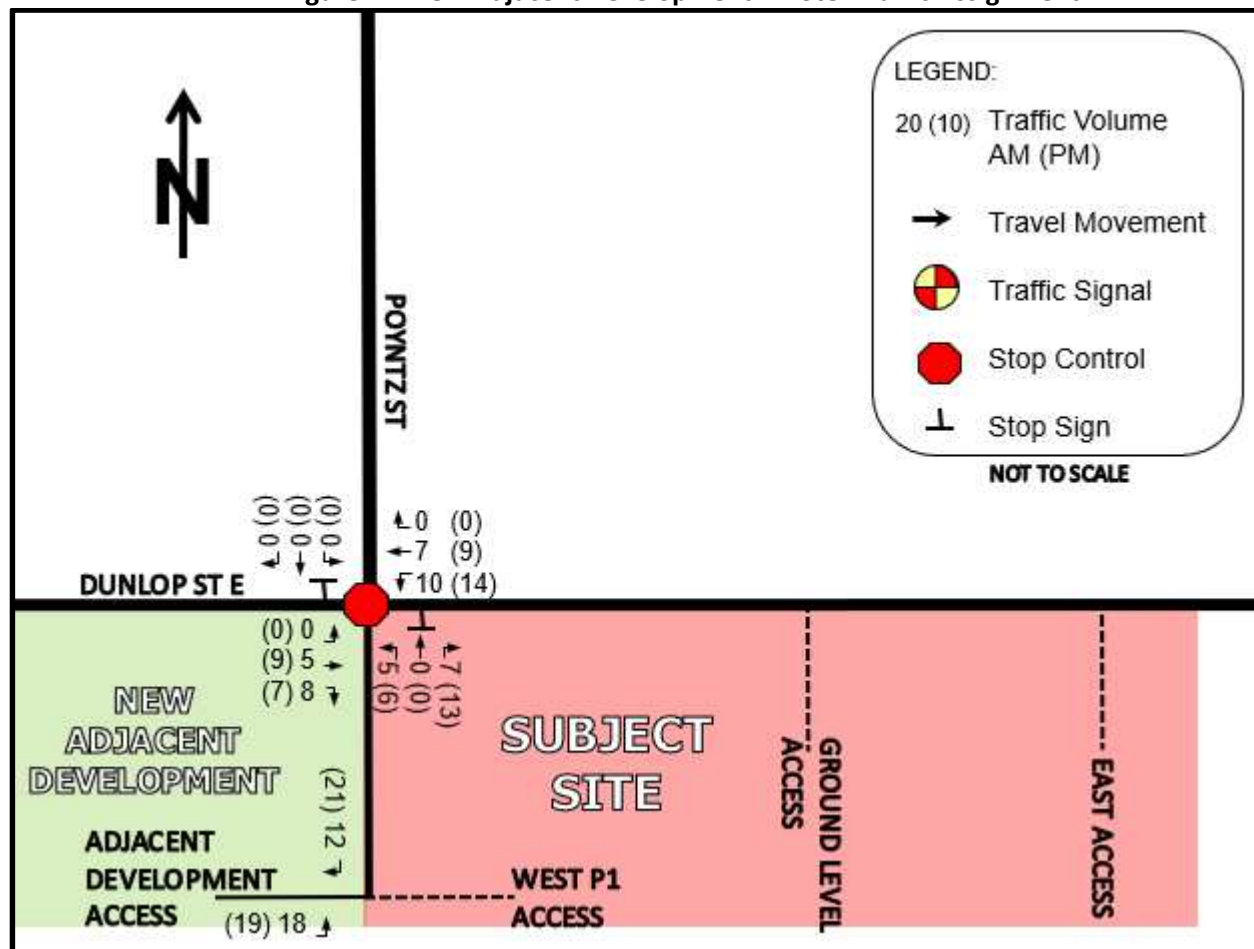
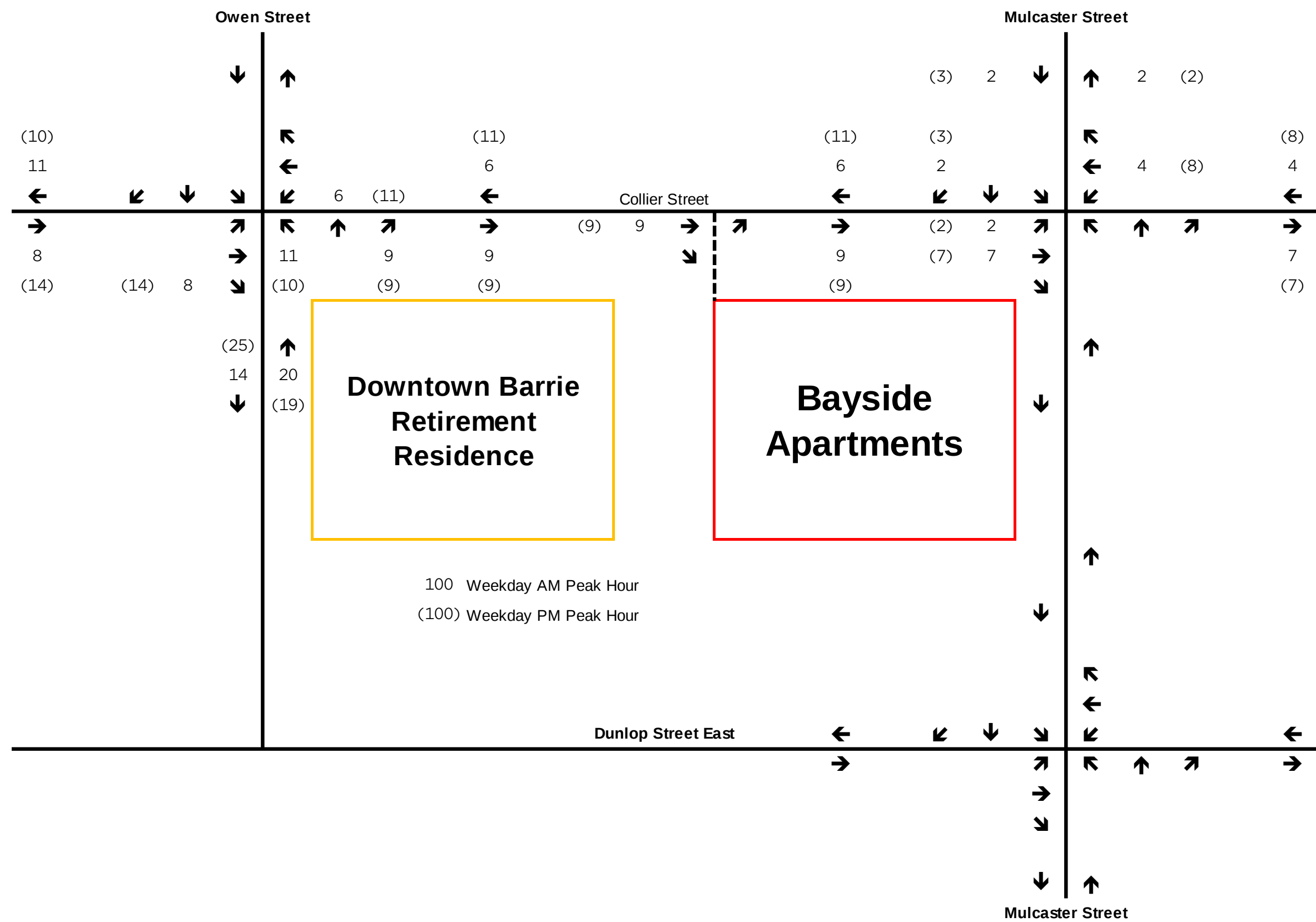


Figure 4 – New Adjacent Development – Hotel Traffic Assignment



6.0 TOTAL HORIZON YEAR TRAFFIC VOLUMES WITH THE PROPOSED DEVELOPMENT

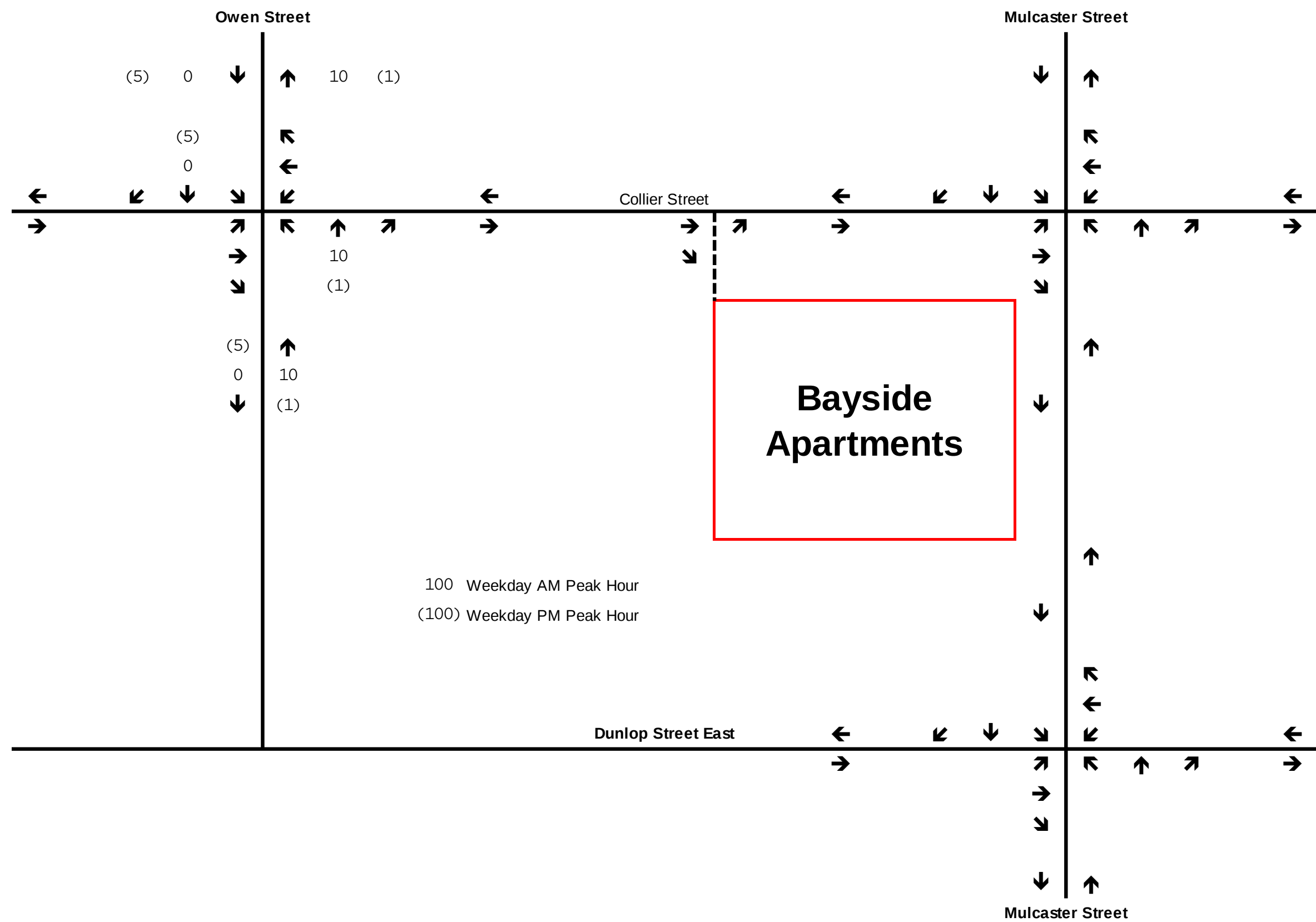
For the revised total (2027) horizon year traffic volumes, the revised proposed development traffic and New Adjacent Development traffic was added to the background (2027) traffic volumes from the TIS. The resulting total (2027) horizon year traffic volumes for the AM and PM peak hour are illustrated in **Figure 5**.



Bayside Apartments

Appendix C: Background Development Volumes - Downtown Barrie Retirement Residences

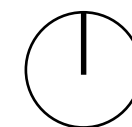
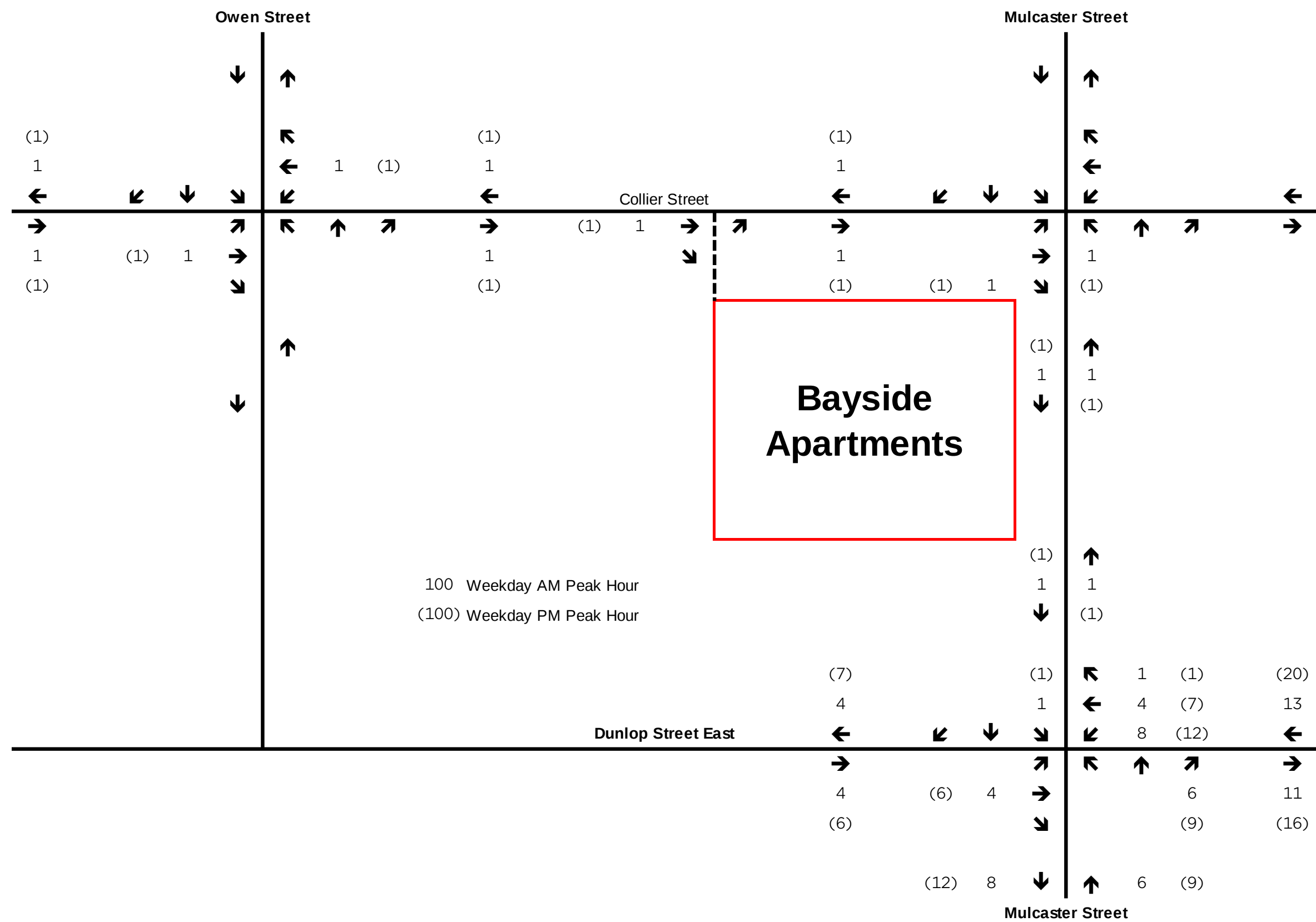


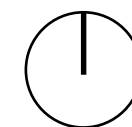
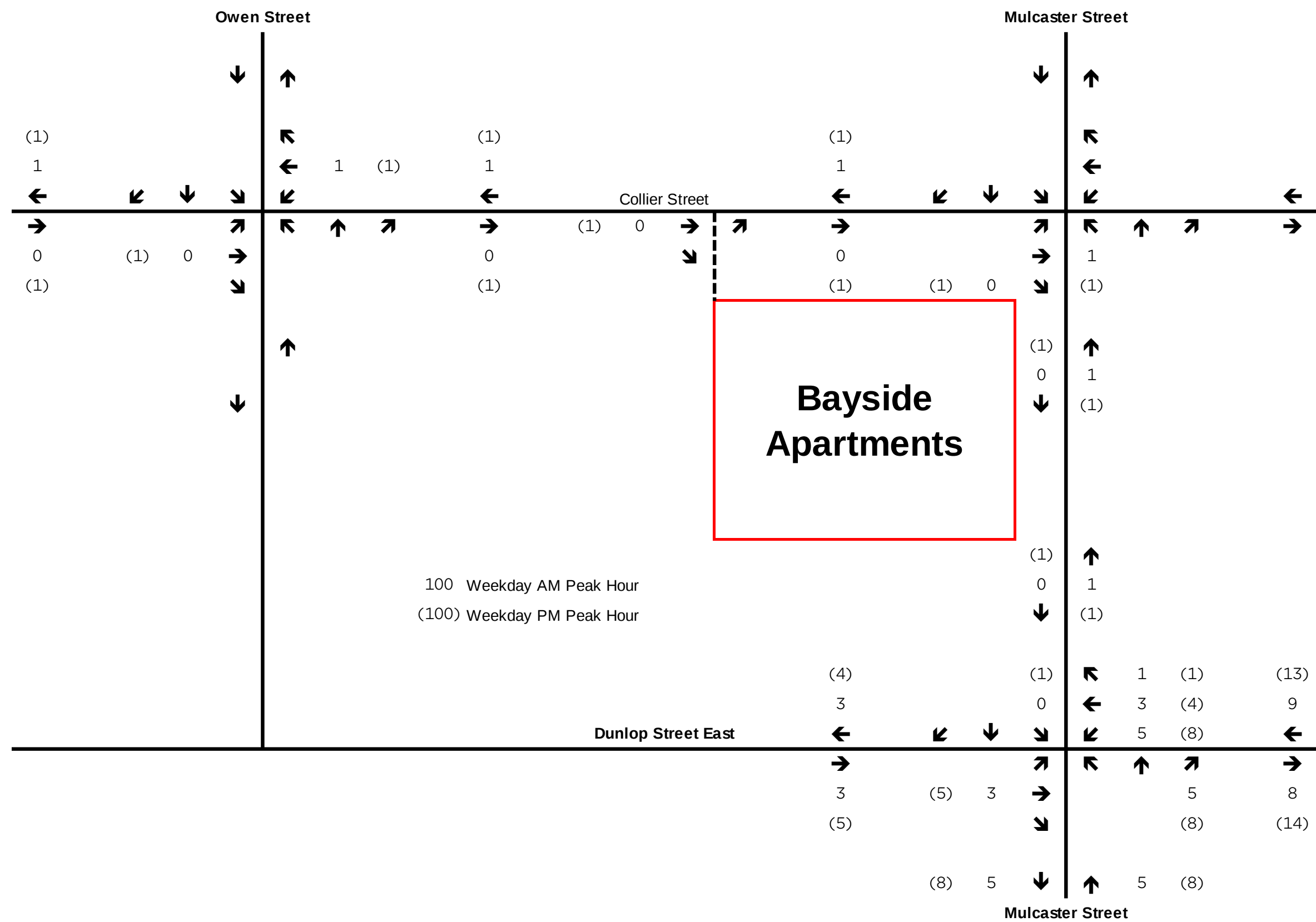


Bayside Apartments

Appendix C: Background Development Volumes - Owen Street & Worsley Street Mixed-Use Development







Appendix D: Future Background Operations

HCM Signalized Intersection Capacity Analysis

2023 Background Conditions

1: Mulcaster Street & Collier Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	188	62	31	174	77	85	198	36	45	139	55
Future Volume (vph)	64	188	62	31	174	77	85	198	36	45	139	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.95			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3347		1738	3316			1803	1555		3325	
Flt Permitted	0.52	1.00		0.58	1.00			0.80	1.00		0.83	
Satd. Flow (perm)	956	3347		1070	3316			1465	1555		2795	
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)	70	204	67	34	189	84	92	215	39	49	151	60
RTOR Reduction (vph)	0	34	0	0	58	0	0	0	28	0	40	0
Lane Group Flow (vph)	70	237	0	34	215	0	0	307	11	0	220	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			16.3	16.3		16.3	
Effective Green, g (s)	27.2	27.2		17.1	17.1			16.3	16.3		16.3	
Actuated g/C Ratio	0.49	0.49		0.31	0.31			0.29	0.29		0.29	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	582	1640		329	1021			430	456		820	
v/s Ratio Prot	0.02	c0.07			c0.06							
v/s Ratio Perm	0.04			0.03				c0.21	0.01		0.08	
v/c Ratio	0.12	0.14		0.10	0.21			0.71	0.03		0.27	
Uniform Delay, d1	7.6	7.8		13.7	14.2			17.5	13.9		15.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.4	0.2		0.6	0.5			5.5	0.0		0.2	
Delay (s)	8.0	7.9		14.4	14.7			23.1	14.0		15.2	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		8.0			14.6			22.0			15.2	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			15.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			55.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			52.5%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2023 Background Conditions

2: Mulcaster Street & Dunlop Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	141	21	367	190	20	10	218	312	17	184	27
Future Volume (vph)	62	141	21	367	190	20	10	218	312	17	184	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1782		1738	1803			1826	1555		1794	
Flt Permitted		0.85		0.58	1.00			0.98	1.00		0.96	
Satd. Flow (perm)		1527		1069	1803			1794	1555		1723	
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)	67	153	23	399	207	22	11	237	339	18	200	29
RTOR Reduction (vph)	0	6	0	0	6	0	0	0	264	0	9	0
Lane Group Flow (vph)	0	237	0	399	223	0	0	248	75	0	238	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		19.1		32.1	32.1			12.6	12.6		12.6	
Effective Green, g (s)		19.1		32.1	32.1			12.6	12.6		12.6	
Actuated g/C Ratio		0.34		0.57	0.57			0.22	0.22		0.22	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		514		734	1020			398	345		382	
v/s Ratio Prot				c0.11	0.12							
v/s Ratio Perm		c0.16		0.20				0.14	0.05		c0.14	
v/c Ratio		0.46		0.54	0.22			0.62	0.22		0.62	
Uniform Delay, d1		14.8		7.2	6.1			19.9	18.0		19.9	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		3.0		2.9	0.5			3.0	0.3		3.2	
Delay (s)		17.7		10.1	6.6			22.9	18.3		23.1	
Level of Service		B		B	A			C	B		C	
Approach Delay (s)		17.7			8.8			20.3			23.1	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			16.1			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			56.7			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			73.0%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2023 Background Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	292	33	19	279	17	19	33	15	12	20	17
Future Volume (vph)	38	292	33	19	279	17	19	33	15	12	20	17
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.99			0.97			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1789	1803		1789	1868			1802			1698	
Flt Permitted	0.57	1.00		0.55	1.00			0.88			0.89	
Satd. Flow (perm)	1066	1803		1035	1868			1616			1536	
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)	41	317	36	21	303	18	21	36	16	13	22	18
RTOR Reduction (vph)	0	5	0	0	3	0	0	14	0	0	16	0
Lane Group Flow (vph)	41	348	0	21	318	0	0	59	0	0	37	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.9	33.9		33.9	33.9			5.9			5.9	
Effective Green, g (s)	33.9	33.9		33.9	33.9			5.9			5.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.11			0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	697	1179		677	1222			184			174	
v/s Ratio Prot		c0.19			0.17							
v/s Ratio Perm	0.04			0.02				c0.04			0.02	
v/c Ratio	0.06	0.30		0.03	0.26			0.32			0.21	
Uniform Delay, d1	3.2	3.8		3.2	3.7			21.1			20.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.6		0.1	0.5			1.0			0.6	
Delay (s)	3.4	4.5		3.2	4.2			22.1			21.5	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.4			4.2			22.1			21.5	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			6.8									
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			51.8									
Intersection Capacity Utilization			49.9%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2023 Background Conditions
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	309	10	0	315	0	5
Future Volume (Veh/h)	309	10	0	315	0	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)	336	11	0	342	0	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)	134			53		
pX, platoon unblocked					0.99	
vC, conflicting volume			347		512	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			347		486	174
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1187		498	830
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	224	123	171	171	5	
Volume Left	0	0	0	0	0	
Volume Right	0	11	0	0	5	
cSH	1700	1700	1700	1700	830	
Volume to Capacity	0.13	0.07	0.10	0.10	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.4	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.4	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			18.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2023 Background Conditions

1: Mulcaster Street & Collier Street

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	214	62	50	200	61	56	194	34	57	207	57
Future Volume (vph)	67	214	62	50	200	61	56	194	34	57	207	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.97		1.00	0.97			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3360		1738	3355			1809	1555		3354	
Flt Permitted	0.52	1.00		0.57	1.00			0.82	1.00		0.81	
Satd. Flow (perm)	948	3360		1041	3355			1498	1555		2750	
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)	73	233	67	54	217	66	61	211	37	62	225	62
RTOR Reduction (vph)	0	33	0	0	41	0	0	0	27	0	27	0
Lane Group Flow (vph)	73	267	0	54	242	0	0	272	10	0	322	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.2	17.2			14.2	14.2		14.2	
Effective Green, g (s)	27.2	27.2		17.2	17.2			14.2	14.2		14.2	
Actuated g/C Ratio	0.51	0.51		0.32	0.32			0.27	0.27		0.27	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	601	1711		335	1080			398	413		731	
v/s Ratio Prot	0.02	c0.08			c0.07							
v/s Ratio Perm	0.04			0.05				c0.18	0.01		0.12	
v/c Ratio	0.12	0.16		0.16	0.22			0.68	0.02		0.44	
Uniform Delay, d1	6.7	7.0		12.9	13.2			17.6	14.5		16.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.4	0.2		1.0	0.5			4.8	0.0		0.4	
Delay (s)	7.2	7.2		14.0	13.7			22.4	14.5		16.7	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		7.2			13.7			21.4			16.7	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			53.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			53.7%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2023 Background Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	271	37	336	220	25	13	207	443	20	246	52
Future Volume (vph)	76	271	37	336	220	25	13	207	443	20	246	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1788		1738	1802			1824	1555		1783	
Flt Permitted		0.87		0.44	1.00			0.97	1.00		0.96	
Satd. Flow (perm)		1574		812	1802			1768	1555		1724	
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)	83	295	40	365	239	27	14	225	482	22	267	57
RTOR Reduction (vph)	0	6	0	0	7	0	0	0	363	0	12	0
Lane Group Flow (vph)	0	412	0	365	259	0	0	239	119	0	334	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		22.0		32.0	32.0			14.4	14.4		14.4	
Effective Green, g (s)		22.0		32.0	32.0			14.4	14.4		14.4	
Actuated g/C Ratio		0.38		0.55	0.55			0.25	0.25		0.25	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		592		571	987			435	383		425	
v/s Ratio Prot				c0.09	0.14							
v/s Ratio Perm		c0.26		0.26				0.14	0.08		c0.19	
v/c Ratio		0.70		0.64	0.26			0.55	0.31		0.79	
Uniform Delay, d1		15.4		8.5	7.0			19.2	17.9		20.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		6.6		5.4	0.6			1.4	0.5		9.2	
Delay (s)		22.0		13.9	7.6			20.6	18.4		29.8	
Level of Service		C		B	A			C	B		C	
Approach Delay (s)		22.0			11.3			19.1			29.8	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM 2000 Control Delay			19.1			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			58.4			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			87.2%			ICU Level of Service			E			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2023 Background Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	288	49	25	265	21	33	25	26	22	20	29
Future Volume (vph)	47	288	49	25	265	21	33	25	26	22	20	29
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.99			0.96			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1789	1792		1789	1863			1770			1671	
Flt Permitted	0.57	1.00		0.54	1.00			0.84			0.86	
Satd. Flow (perm)	1076	1792		1023	1863			1510			1465	
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)	51	313	53	27	288	23	36	27	28	24	22	32
RTOR Reduction (vph)	0	8	0	0	4	0	0	25	0	0	28	0
Lane Group Flow (vph)	51	358	0	27	307	0	0	66	0	0	50	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.1	33.1		33.1	33.1			6.0			6.0	
Effective Green, g (s)	33.1	33.1		33.1	33.1			6.0			6.0	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.12			0.12	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	696	1160		662	1206			177			172	
v/s Ratio Prot		c0.20			0.17							
v/s Ratio Perm	0.05			0.03				c0.04			0.03	
v/c Ratio	0.07	0.31		0.04	0.25			0.37			0.29	
Uniform Delay, d1	3.3	4.0		3.3	3.8			20.8			20.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.7		0.1	0.5			1.3			0.9	
Delay (s)	3.5	4.7		3.4	4.3			22.2			21.5	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.5			4.2			22.2			21.5	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.6			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			51.1			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			57.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2023 Background Conditions
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	332	5	0	312	0	10
Future Volume (Veh/h)	332	5	0	312	0	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)	361	5	0	339	0	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.97	
vC, conflicting volume			366		533	183
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			366		466	183
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1168		504	819
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	241	125	170	170	11	
Volume Left	0	0	0	0	0	
Volume Right	0	5	0	0	11	
cSH	1700	1700	1700	1700	819	
Volume to Capacity	0.14	0.07	0.10	0.10	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.3	
Control Delay (s)	0.0	0.0	0.0	0.0	9.5	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.5	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			19.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2028 Background Conditions

1: Mulcaster Street & Collier Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	207	68	34	192	85	94	218	39	49	153	61
Future Volume (vph)	71	207	68	34	192	85	94	218	39	49	153	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.95			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3347		1738	3317			1803	1555		3325	
Flt Permitted	0.51	1.00		0.57	1.00			0.79	1.00		0.81	
Satd. Flow (perm)	931	3347		1042	3317			1446	1555		2733	
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)	77	225	74	37	209	92	102	237	42	53	166	66
RTOR Reduction (vph)	0	39	0	0	65	0	0	0	29	0	40	0
Lane Group Flow (vph)	77	260	0	37	236	0	0	339	13	0	245	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			18.2	18.2		18.2	
Effective Green, g (s)	27.2	27.2		17.1	17.1			18.2	18.2		18.2	
Actuated g/C Ratio	0.47	0.47		0.30	0.30			0.32	0.32		0.32	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	555	1586		310	988			458	493		866	
v/s Ratio Prot	0.02	c0.08			c0.07							
v/s Ratio Perm	0.05			0.04				c0.23	0.01		0.09	
v/c Ratio	0.14	0.16		0.12	0.24			0.74	0.03		0.28	
Uniform Delay, d1	8.4	8.6		14.7	15.2			17.5	13.5		14.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	0.2		0.8	0.6			6.3	0.0		0.2	
Delay (s)	8.9	8.8		15.5	15.8			23.8	13.5		14.9	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		8.8			15.8			22.7			14.9	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			15.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			57.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			55.5%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2028 Background Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	171	23	404	229	22	11	240	343	19	203	30
Future Volume (vph)	69	171	23	404	229	22	11	240	343	19	203	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1785		1738	1806			1826	1555		1793	
Flt Permitted		0.83		0.54	1.00			0.98	1.00		0.95	
Satd. Flow (perm)		1507		986	1806			1793	1555		1714	
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)	75	186	25	439	249	24	12	261	373	21	221	33
RTOR Reduction (vph)	0	5	0	0	5	0	0	0	287	0	8	0
Lane Group Flow (vph)	0	281	0	439	268	0	0	273	86	0	267	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		19.1		32.1	32.1			13.2	13.2		13.2	
Effective Green, g (s)		19.1		32.1	32.1			13.2	13.2		13.2	
Actuated g/C Ratio		0.33		0.56	0.56			0.23	0.23		0.23	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		502		696	1011			413	358		394	
v/s Ratio Prot				c0.12	0.15							
v/s Ratio Perm		c0.19		0.23				0.15	0.06		c0.16	
v/c Ratio		0.56		0.63	0.26			0.66	0.24		0.68	
Uniform Delay, d1		15.6		7.9	6.5			20.0	18.0		20.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		4.4		4.3	0.6			3.9	0.3		4.6	
Delay (s)		20.1		12.2	7.1			24.0	18.3		24.7	
Level of Service		C		B	A			C	B		C	
Approach Delay (s)		20.1			10.3			20.7			24.7	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			57.3			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			80.1%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2028 Background Conditions

3: Owen Street & Collier Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	322	35	19	307	18	20	35	16	12	21	18
Future Volume (vph)	40	322	35	19	307	18	20	35	16	12	21	18
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.97			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1789	1804		1789	1867			1802			1692	
Flt Permitted	0.55	1.00		0.53	1.00			0.88			0.90	
Satd. Flow (perm)	1034	1804		1003	1867			1615			1536	
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)	43	350	38	21	334	20	22	38	17	13	23	20
RTOR Reduction (vph)	0	5	0	0	3	0	0	15	0	0	18	0
Lane Group Flow (vph)	43	383	0	21	351	0	0	62	0	0	38	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.6	33.6		33.6	33.6			5.9			5.9	
Effective Green, g (s)	33.6	33.6		33.6	33.6			5.9			5.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.11			0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	674	1176		654	1218			185			175	
v/s Ratio Prot		c0.21			0.19							
v/s Ratio Perm	0.04			0.02				c0.04			0.02	
v/c Ratio	0.06	0.33		0.03	0.29			0.33			0.22	
Uniform Delay, d1	3.2	4.0		3.2	3.8			21.0			20.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.7		0.1	0.6			1.1			0.6	
Delay (s)	3.4	4.7		3.3	4.4			22.1			21.3	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.6			4.4			22.1			21.3	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			6.9			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			51.5			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			51.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2028 Background Conditions
AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↑
Traffic Volume (veh/h)	341	10	0	347	0	5
Future Volume (Veh/h)	341	10	0	347	0	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)	371	11	0	377	0	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)	134			53		
pX, platoon unblocked					0.98	
vC, conflicting volume			382		565	191
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			382		511	191
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1152		474	809
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	247	135	188	188	5	
Volume Left	0	0	0	0	0	
Volume Right	0	11	0	0	5	
cSH	1700	1700	1700	1700	809	
Volume to Capacity	0.15	0.08	0.11	0.11	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.5	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.5	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			19.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2028 Background Conditions

1: Mulcaster Street & Collier Street

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	235	69	55	220	67	61	214	38	63	229	62
Future Volume (vph)	73	235	69	55	220	67	61	214	38	63	229	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.97		1.00	0.96			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3358		1738	3354			1810	1555		3356	
Flt Permitted	0.50	1.00		0.55	1.00			0.81	1.00		0.79	
Satd. Flow (perm)	921	3358		1011	3354			1487	1555		2670	
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)	79	255	75	60	239	73	66	233	41	68	249	67
RTOR Reduction (vph)	0	36	0	0	41	0	0	0	29	0	26	0
Lane Group Flow (vph)	79	294	0	60	271	0	0	299	12	0	358	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			15.5	15.5		15.5	
Effective Green, g (s)	27.2	27.2		17.1	17.1			15.5	15.5		15.5	
Actuated g/C Ratio	0.50	0.50		0.31	0.31			0.28	0.28		0.28	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	578	1669		316	1048			421	440		756	
v/s Ratio Prot	0.02	c0.09			c0.08							
v/s Ratio Perm	0.05			0.06				c0.20	0.01		0.13	
v/c Ratio	0.14	0.18		0.19	0.26			0.71	0.03		0.47	
Uniform Delay, d1	7.3	7.6		13.7	14.1			17.6	14.2		16.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	0.2		1.3	0.6			5.6	0.0		0.5	
Delay (s)	7.8	7.8		15.1	14.7			23.2	14.2		16.7	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		7.8			14.7			22.1			16.7	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			15.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			54.7			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			56.8%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2028 Background Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	328	41	369	265	28	14	228	487	21	271	57
Future Volume (vph)	84	328	41	369	265	28	14	228	487	21	271	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1791		1738	1804			1824	1555		1784	
Flt Permitted		0.86		0.39	1.00			0.96	1.00		0.96	
Satd. Flow (perm)		1561		713	1804			1761	1555		1725	
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)	91	357	45	401	288	30	15	248	529	23	295	62
RTOR Reduction (vph)	0	6	0	0	6	0	0	0	385	0	12	0
Lane Group Flow (vph)	0	487	0	401	312	0	0	263	144	0	368	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		22.0		32.0	32.0			15.1	15.1		15.1	
Effective Green, g (s)		22.0		32.0	32.0			15.1	15.1		15.1	
Actuated g/C Ratio		0.37		0.54	0.54			0.26	0.26		0.26	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		581		524	976			449	397		440	
v/s Ratio Prot				c0.10	0.17							
v/s Ratio Perm		c0.31		0.31				0.15	0.09		c0.21	
v/c Ratio		0.84		0.77	0.32			0.59	0.36		0.84	
Uniform Delay, d1		16.9		9.6	7.5			19.3	18.1		20.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		13.5		10.2	0.9			2.0	0.6		13.0	
Delay (s)		30.4		19.8	8.4			21.2	18.6		33.8	
Level of Service		C		B	A			C	B		C	
Approach Delay (s)		30.4			14.8			19.5			33.8	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM 2000 Control Delay			22.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			59.1			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			95.2%			ICU Level of Service			F			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2028 Background Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	317	51	26	293	22	35	27	27	23	21	30
Future Volume (vph)	49	317	51	26	293	22	35	27	27	23	21	30
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.99			0.96			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1789	1794		1789	1864			1772			1672	
Flt Permitted	0.56	1.00		0.53	1.00			0.83			0.86	
Satd. Flow (perm)	1046	1794		992	1864			1508			1462	
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)	53	345	55	28	318	24	38	29	29	25	23	33
RTOR Reduction (vph)	0	7	0	0	4	0	0	26	0	0	29	0
Lane Group Flow (vph)	53	393	0	28	338	0	0	70	0	0	52	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.1	33.1		33.1	33.1			6.1			6.1	
Effective Green, g (s)	33.1	33.1		33.1	33.1			6.1			6.1	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.12			0.12	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	676	1159		641	1205			179			174	
v/s Ratio Prot		c0.22			0.18							
v/s Ratio Perm	0.05			0.03				c0.05			0.04	
v/c Ratio	0.08	0.34		0.04	0.28			0.39			0.30	
Uniform Delay, d1	3.4	4.1		3.3	3.9			20.8			20.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.8		0.1	0.6			1.4			1.0	
Delay (s)	3.6	4.9		3.4	4.5			22.3			21.6	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.7			4.4			22.3			21.6	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.7			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			51.2			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			59.1%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

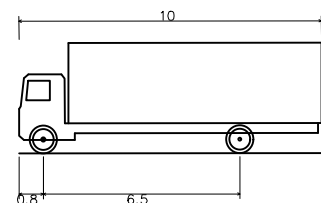
HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2028 Background Conditions
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	367	5	0	344	0	10
Future Volume (Veh/h)	367	5	0	344	0	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)	399	5	0	374	0	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.96	
vC, conflicting volume			404		588	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			404		497	202
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1130		477	796
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	266	138	187	187	11	
Volume Left	0	0	0	0	0	
Volume Right	0	5	0	0	11	
cSH	1700	1700	1700	1700	796	
Volume to Capacity	0.16	0.08	0.11	0.11	0.01	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.3	
Control Delay (s)	0.0	0.0	0.0	0.0	9.6	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.6	
Approach LOS					A	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			20.3%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix E: AutoTurn Assessment



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

EX. PARKING STALLS

CLF ON WALL

MSU - Medium Single Unit Truck

3.66' WIDE LANE

OHW

C/L LANE±

AC UNIT

EXISTING HERITAGE
STRUCTURE
(FOUNDATION)

FRIEGHT
ELEV.

(UNEXCAVATED
AREA)

PAY
STATION

UNDERGROUND HYDRO



79 COLLIER STREET
CITY OF BARRIE
MEDIUM SINGLE UNIT TRUCK (IN MOVEMENT)

SCALE: 1:150

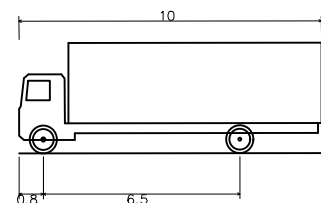
DRAWN: LCG

DATE: JULY/20

DWG. No.

FIG. 1A

JOB NO. 420373



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

EX. PARKING STALLS

CLF ON WALL

FRIEHT ELEV.

(UNEXCAVATED AREA)

EXISTING HERITAGE STRUCTURE (FOUNDATION)

AC UNIT

PAY STATION

UNDERGROUND HYDRO

3.66 WIDE LANE

C/L LANE±

UP

OHW

UP



79 COLLIER STREET
CITY OF BARRIE
MEDIUM SINGLE UNIT TRUCK (OUT MOVEMENT)

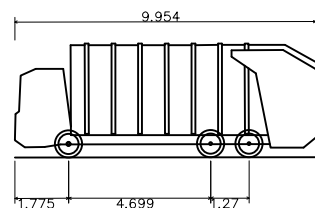
DWG. No.
FIG. 1B

SCALE: 1:150

DRAWN: LCG

DATE: JULY/20

JOB NO. 420373



GARBAGE TRUCK 2
 Overall Length 9.954m
 Overall Width 2.553m
 Overall Body Height 3.760m
 Min Body Ground Clearance 0.313m
 Track Width 2.553m
 Lock-to-lock time 6.00s
 Curb to Curb Turning Radius 12.436m

EX. PARKING STALLS

CLF ON WALL

GARBAGE TRUCK 2

3.66 WIDE LANE

OHW

C/L LANE±

AC UNIT

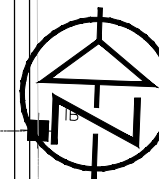
FRIEHT ELEV.

(UNEXCAVATED AREA)

EXISTING HERITAGE STRUCTURE (FOUNDATION)

PAY STATION

UNDERGROUND HYDRO



79 COLLIER STREET
 CITY OF BARRIE
 GARBAGE TRUCK (IN MOVEMENT)

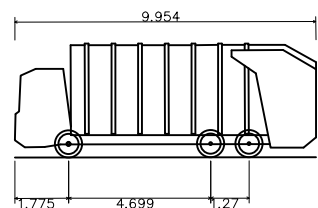
DWG. No.
FIG. 2A

SCALE: 1:150

DRAWN: LCG

DATE: JULY/20

JOB NO. 420373



GARBAGE TRUCK 2
 Overall Length 9.954m
 Overall Width 2.553m
 Overall Body Height 3.760m
 Min Body Ground Clearance 0.313m
 Track Width 2.553m
 Lock-to-lock time 6.00s
 Curb to Curb Turning Radius 12.436m

EX. PARKING STALLS

CLF ON WALL

FRIEGHT ELEV.

(UNEXCAVATED AREA)

EXISTING HERITAGE STRUCTURE (FOUNDATION)

AC UNIT

PAY STATION

UNDERGROUND HYDRO

3.66' WIDE LANE

C/L LANE±

UP

OHW

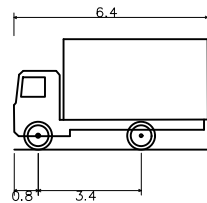
UP



79 COLLIER STREET
 CITY OF BARRIE
 GARBAGE TRUCK (OUT MOVEMENT)

DWG. No.
FIG. 2B

SCALE: 1:150 DRAWN: LCG DATE: JULY/20 JOB NO. 420373



LSU - Light Single Unit Truck
Overall Length 6.400m
Overall Width 2.600m
Overall Body Height 3.650m
Min Body Ground Clearance 0.445m
Track Width 2.600m
Lock-to-lock time 4.00s
Curb to Curb Turning Radius 6.300m

EX. PARKING STALLS

CLF ON WALL

LSU - Light Single Unit Truck

UP

OHW

FRIEIGHT ELEV.

UP

3.66 WIDE LANE

OHW

C/L LANE±

AC UNIT

(UNEXCAVATED AREA)

EXISTING HERITAGE STRUCTURE (FOUNDATION)

PAY STATION

UNDERGROUND HYDRO



79 COLLIER STREET
CITY OF BARRIE
LIGHT SINGLE UNIT TRUCK

SCALE: 1:150

DRAWN: LCG

DATE: JULY/20

DWG. No.

FIG. 3

JOB NO. 420373

Appendix F: Future Total Operations

HCM Signalized Intersection Capacity Analysis

2023 Total Conditions

1: Mulcaster Street & Collier Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	190	78	31	174	77	85	198	36	45	139	55
Future Volume (vph)	76	190	78	31	174	77	85	198	36	45	139	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.95			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3325		1738	3316			1803	1555		3325	
Flt Permitted	0.52	1.00		0.57	1.00			0.80	1.00		0.83	
Satd. Flow (perm)	956	3325		1049	3316			1465	1555		2795	
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)	83	207	85	34	189	84	92	215	39	49	151	60
RTOR Reduction (vph)	0	43	0	0	58	0	0	0	28	0	40	0
Lane Group Flow (vph)	83	249	0	34	215	0	0	307	11	0	220	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			16.3	16.3		16.3	
Effective Green, g (s)	27.2	27.2		17.1	17.1			16.3	16.3		16.3	
Actuated g/C Ratio	0.49	0.49		0.31	0.31			0.29	0.29		0.29	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	582	1629		323	1021			430	456		820	
v/s Ratio Prot	0.02	c0.07			c0.06							
v/s Ratio Perm	0.05			0.03				c0.21	0.01		0.08	
v/c Ratio	0.14	0.15		0.11	0.21			0.71	0.03		0.27	
Uniform Delay, d1	7.6	7.8		13.7	14.2			17.5	13.9		15.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	0.2		0.7	0.5			5.5	0.0		0.2	
Delay (s)	8.1	8.0		14.4	14.7			23.1	14.0		15.2	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		8.0			14.6			22.0			15.2	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.8			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			55.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			53.1%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2023 Total Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	141	21	367	190	20	10	218	312	17	189	38
Future Volume (vph)	62	141	21	367	190	20	10	218	312	17	189	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1782		1738	1803			1826	1555		1785	
Flt Permitted		0.85		0.58	1.00			0.98	1.00		0.96	
Satd. Flow (perm)		1527		1068	1803			1794	1555		1719	
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)	67	153	23	399	207	22	11	237	339	18	205	41
RTOR Reduction (vph)	0	6	0	0	6	0	0	0	263	0	12	0
Lane Group Flow (vph)	0	237	0	399	223	0	0	248	76	0	252	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		19.1		32.1	32.1			12.7	12.7		12.7	
Effective Green, g (s)		19.1		32.1	32.1			12.7	12.7		12.7	
Actuated g/C Ratio		0.34		0.57	0.57			0.22	0.22		0.22	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		513		733	1018			401	347		384	
v/s Ratio Prot				c0.11	0.12							
v/s Ratio Perm		c0.16		0.20				0.14	0.05		c0.15	
v/c Ratio		0.46		0.54	0.22			0.62	0.22		0.66	
Uniform Delay, d1		14.8		7.3	6.1			19.9	18.0		20.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		3.0		2.9	0.5			2.8	0.3		4.0	
Delay (s)		17.8		10.2	6.6			22.7	18.3		24.1	
Level of Service		B		B	A			C	B		C	
Approach Delay (s)		17.8			8.9			20.2			24.1	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			16.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			56.8			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			74.0%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2023 Total Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	299	33	19	279	17	19	33	16	14	20	17
Future Volume (vph)	38	299	33	19	279	17	19	33	16	14	20	17
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.97			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1789	1804		1789	1868			1799			1701	
Flt Permitted	0.57	1.00		0.55	1.00			0.88			0.88	
Satd. Flow (perm)	1066	1804		1028	1868			1615			1522	
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)	41	325	36	21	303	18	21	36	17	15	22	18
RTOR Reduction (vph)	0	5	0	0	3	0	0	15	0	0	16	0
Lane Group Flow (vph)	41	356	0	21	318	0	0	59	0	0	39	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.8	33.8		33.8	33.8			5.9			5.9	
Effective Green, g (s)	33.8	33.8		33.8	33.8			5.9			5.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.11			0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	696	1179		672	1221			184			173	
v/s Ratio Prot		c0.20			0.17							
v/s Ratio Perm	0.04			0.02				c0.04			0.03	
v/c Ratio	0.06	0.30		0.03	0.26			0.32			0.23	
Uniform Delay, d1	3.2	3.9		3.2	3.7			21.1			20.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.7		0.1	0.5			1.0			0.7	
Delay (s)	3.4	4.5		3.2	4.3			22.1			21.5	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.4			4.2			22.1			21.5	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			6.9									
HCM 2000 Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			51.7								12.0	
Intersection Capacity Utilization			49.9%								A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Access & Collier Street

2023 Total Conditions

AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	309	19	0	315	0	35
Future Volume (Veh/h)	309	19	0	315	0	35
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)	336	21	0	342	0	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.99	
vC, conflicting volume			357		518	178
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			357		491	178
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			1177		494	824
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	224	133	171	171	38	
Volume Left	0	0	0	0	0	
Volume Right	0	21	0	0	38	
cSH	1700	1700	1700	1700	824	
Volume to Capacity	0.13	0.08	0.10	0.10	0.05	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.6	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.6	
Approach LOS					A	
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			19.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2023 Total Conditions

1: Mulcaster Street & Collier Street

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	214	72	50	200	61	56	194	34	57	207	57
Future Volume (vph)	74	214	72	50	200	61	56	194	34	57	207	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.97			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3346		1738	3355			1809	1555		3354	
Flt Permitted	0.52	1.00		0.56	1.00			0.82	1.00		0.81	
Satd. Flow (perm)	948	3346		1030	3355			1498	1555		2750	
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)	80	233	78	54	217	66	61	211	37	62	225	62
RTOR Reduction (vph)	0	38	0	0	41	0	0	0	27	0	27	0
Lane Group Flow (vph)	80	273	0	54	242	0	0	272	10	0	322	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.2	17.2			14.2	14.2		14.2	
Effective Green, g (s)	27.2	27.2		17.2	17.2			14.2	14.2		14.2	
Actuated g/C Ratio	0.51	0.51		0.32	0.32			0.27	0.27		0.27	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	601	1704		331	1080			398	413		731	
v/s Ratio Prot	0.02	c0.08			c0.07							
v/s Ratio Perm	0.05			0.05				c0.18	0.01		0.12	
v/c Ratio	0.13	0.16		0.16	0.22			0.68	0.02		0.44	
Uniform Delay, d1	6.8	7.0		13.0	13.2			17.6	14.5		16.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	0.2		1.1	0.5			4.8	0.0		0.4	
Delay (s)	7.2	7.2		14.0	13.7			22.4	14.5		16.7	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		7.2			13.8			21.4			16.7	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.4			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			53.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			54.1%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2023 Total Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	271	37	336	222	25	13	207	443	20	249	58
Future Volume (vph)	76	271	37	336	222	25	13	207	443	20	249	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1788		1738	1802			1824	1555		1780	
Flt Permitted		0.87		0.44	1.00			0.97	1.00		0.96	
Satd. Flow (perm)		1573		810	1802			1766	1555		1723	
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)	83	295	40	365	241	27	14	225	482	22	271	63
RTOR Reduction (vph)	0	6	0	0	6	0	0	0	362	0	14	0
Lane Group Flow (vph)	0	412	0	365	262	0	0	239	120	0	342	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		22.0		32.0	32.0			14.6	14.6		14.6	
Effective Green, g (s)		22.0		32.0	32.0			14.6	14.6		14.6	
Actuated g/C Ratio		0.38		0.55	0.55			0.25	0.25		0.25	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		590		569	984			439	387		429	
v/s Ratio Prot				c0.09	0.15							
v/s Ratio Perm		c0.26		0.26				0.14	0.08		c0.20	
v/c Ratio		0.70		0.64	0.27			0.54	0.31		0.80	
Uniform Delay, d1		15.5		8.6	7.1			19.1	17.9		20.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		6.7		5.5	0.7			1.4	0.5		10.0	
Delay (s)		22.2		14.1	7.7			20.5	18.4		30.6	
Level of Service		C		B	A			C	B		C	
Approach Delay (s)		22.2			11.4			19.1			30.6	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM 2000 Control Delay			19.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			58.6			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			87.8%			ICU Level of Service			E			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2023 Total Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	309	49	25	265	21	33	25	27	28	20	29
Future Volume (vph)	47	309	49	25	265	21	33	25	27	28	20	29
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.99			0.96			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1789	1795		1789	1863			1769			1680	
Flt Permitted	0.57	1.00		0.53	1.00			0.84			0.84	
Satd. Flow (perm)	1076	1795		1002	1863			1506			1443	
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)	51	336	53	27	288	23	36	27	29	30	22	32
RTOR Reduction (vph)	0	7	0	0	4	0	0	26	0	0	28	0
Lane Group Flow (vph)	51	382	0	27	307	0	0	66	0	0	56	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.1	33.1		33.1	33.1			6.0			6.0	
Effective Green, g (s)	33.1	33.1		33.1	33.1			6.0			6.0	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.12			0.12	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	696	1162		649	1206			176			169	
v/s Ratio Prot		c0.21			0.17							
v/s Ratio Perm	0.05			0.03				c0.04			0.04	
v/c Ratio	0.07	0.33		0.04	0.25			0.38			0.33	
Uniform Delay, d1	3.3	4.0		3.3	3.8			20.8			20.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.8		0.1	0.5			1.4			1.1	
Delay (s)	3.5	4.8		3.4	4.3			22.2			21.9	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.6			4.2			22.2			21.9	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.7									
HCM 2000 Volume to Capacity ratio			0.34									
Actuated Cycle Length (s)			51.1									
Intersection Capacity Utilization			57.4%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2023 Total Conditions

4: Access & Collier Street

PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	332	33	0	312	0	28
Future Volume (Veh/h)	332	33	0	312	0	28
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)	361	36	0	339	0	30
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.97	
vC, conflicting volume			397		548	198
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			397		482	198
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			1137		492	800
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	241	156	170	170	30	
Volume Left	0	0	0	0	0	
Volume Right	0	36	0	0	30	
cSH	1700	1700	1700	1700	800	
Volume to Capacity	0.14	0.09	0.10	0.10	0.04	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.9	
Control Delay (s)	0.0	0.0	0.0	0.0	9.7	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.7	
Approach LOS					A	
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			20.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2028 Total Conditions

1: Mulcaster Street & Collier Street

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	209	85	34	192	85	94	218	39	49	153	61
Future Volume (vph)	83	209	85	34	192	85	94	218	39	49	153	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.95			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3326		1738	3317			1803	1555		3325	
Flt Permitted	0.51	1.00		0.56	1.00			0.79	1.00		0.81	
Satd. Flow (perm)	931	3326		1022	3317			1446	1555		2733	
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)	90	227	92	37	209	92	102	237	42	53	166	66
RTOR Reduction (vph)	0	48	0	0	65	0	0	0	29	0	40	0
Lane Group Flow (vph)	90	271	0	37	236	0	0	339	13	0	245	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			18.2	18.2		18.2	
Effective Green, g (s)	27.2	27.2		17.1	17.1			18.2	18.2		18.2	
Actuated g/C Ratio	0.47	0.47		0.30	0.30			0.32	0.32		0.32	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	555	1576		304	988			458	493		866	
v/s Ratio Prot	0.02	c0.08			c0.07							
v/s Ratio Perm	0.05			0.04				c0.23	0.01		0.09	
v/c Ratio	0.16	0.17		0.12	0.24			0.74	0.03		0.28	
Uniform Delay, d1	8.4	8.6		14.7	15.2			17.5	13.5		14.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.6	0.2		0.8	0.6			6.3	0.0		0.2	
Delay (s)	9.0	8.9		15.5	15.8			23.8	13.5		14.9	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		8.9			15.8			22.7			14.9	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			15.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			57.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			56.1%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2028 Total Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	171	23	404	230	22	11	240	343	19	208	41
Future Volume (vph)	69	171	23	404	230	22	11	240	343	19	208	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1785		1738	1806			1826	1555		1785	
Flt Permitted		0.83		0.54	1.00			0.98	1.00		0.95	
Satd. Flow (perm)		1506		985	1806			1791	1555		1711	
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)	75	186	25	439	250	24	12	261	373	21	226	45
RTOR Reduction (vph)	0	5	0	0	5	0	0	0	287	0	12	0
Lane Group Flow (vph)	0	281	0	439	269	0	0	273	86	0	280	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		19.1		32.1	32.1			13.3	13.3		13.3	
Effective Green, g (s)		19.1		32.1	32.1			13.3	13.3		13.3	
Actuated g/C Ratio		0.33		0.56	0.56			0.23	0.23		0.23	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		501		695	1009			414	360		396	
v/s Ratio Prot				c0.12	0.15							
v/s Ratio Perm		c0.19		0.23				0.15	0.06		c0.16	
v/c Ratio		0.56		0.63	0.27			0.66	0.24		0.71	
Uniform Delay, d1		15.7		8.0	6.6			20.0	17.9		20.3	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		4.5		4.3	0.6			3.8	0.3		5.7	
Delay (s)		20.2		12.3	7.2			23.8	18.3		26.0	
Level of Service		C		B	A			C	B		C	
Approach Delay (s)		20.2			10.3			20.6			26.0	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			17.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			57.4			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			81.0%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2028 Total Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	329	35	19	307	18	20	35	16	14	21	18
Future Volume (vph)	40	329	35	19	307	18	20	35	16	14	21	18
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.97			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1789	1805		1789	1867			1802			1696	
Flt Permitted	0.55	1.00		0.53	1.00			0.88			0.89	
Satd. Flow (perm)	1034	1805		995	1867			1614			1523	
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)	43	358	38	21	334	20	22	38	17	15	23	20
RTOR Reduction (vph)	0	5	0	0	3	0	0	15	0	0	18	0
Lane Group Flow (vph)	43	391	0	21	351	0	0	62	0	0	40	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.6	33.6		33.6	33.6			5.9			5.9	
Effective Green, g (s)	33.6	33.6		33.6	33.6			5.9			5.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.11			0.11	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	674	1177		649	1218			184			174	
v/s Ratio Prot		c0.22			0.19							
v/s Ratio Perm	0.04			0.02				c0.04			0.03	
v/c Ratio	0.06	0.33		0.03	0.29			0.34			0.23	
Uniform Delay, d1	3.2	4.0		3.2	3.8			21.0			20.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.8		0.1	0.6			1.1			0.7	
Delay (s)	3.4	4.7		3.3	4.4			22.1			21.4	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.6			4.4			22.1			21.4	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.0									
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			51.5								12.0	
Intersection Capacity Utilization			51.6%								A	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2028 Total Conditions

4: Access & Collier Street

AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	341	19	0	347	0	35
Future Volume (Veh/h)	341	19	0	347	0	35
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)	371	21	0	377	0	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.98	
vC, conflicting volume			392		570	196
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			392		516	196
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			1142		471	803
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	247	145	188	188	38	
Volume Left	0	0	0	0	0	
Volume Right	0	21	0	0	38	
cSH	1700	1700	1700	1700	803	
Volume to Capacity	0.15	0.09	0.11	0.11	0.05	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.7	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.7	
Approach LOS					A	
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			20.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2028 Total Conditions

1: Mulcaster Street & Collier Street

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	236	79	55	220	67	61	214	38	63	229	62
Future Volume (vph)	80	236	79	55	220	67	61	214	38	63	229	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		0.95	
Frt	1.00	0.96		1.00	0.96			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1738	3346		1738	3354			1810	1555		3356	
Flt Permitted	0.50	1.00		0.55	1.00			0.81	1.00		0.79	
Satd. Flow (perm)	921	3346		998	3354			1487	1555		2670	
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)	87	257	86	60	239	73	66	233	41	68	249	67
RTOR Reduction (vph)	0	43	0	0	41	0	0	0	29	0	26	0
Lane Group Flow (vph)	87	300	0	60	271	0	0	299	12	0	358	0
Turn Type	pm+pt	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	27.2	27.2		17.1	17.1			15.5	15.5		15.5	
Effective Green, g (s)	27.2	27.2		17.1	17.1			15.5	15.5		15.5	
Actuated g/C Ratio	0.50	0.50		0.31	0.31			0.28	0.28		0.28	
Clearance Time (s)	2.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	578	1663		311	1048			421	440		756	
v/s Ratio Prot	0.02	c0.09			c0.08							
v/s Ratio Perm	0.05			0.06				c0.20	0.01		0.13	
v/c Ratio	0.15	0.18		0.19	0.26			0.71	0.03		0.47	
Uniform Delay, d1	7.3	7.6		13.8	14.1			17.6	14.2		16.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.6	0.2		1.4	0.6			5.6	0.0		0.5	
Delay (s)	7.9	7.8		15.1	14.7			23.2	14.2		16.7	
Level of Service	A	A		B	B			C	B		B	
Approach Delay (s)		7.8			14.7			22.1			16.7	
Approach LOS		A			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.9			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			54.7			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			57.2%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Mulcaster Street & Dunlop Street

2028 Total Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	328	41	369	267	28	14	228	487	21	274	64
Future Volume (vph)	84	328	41	369	267	28	14	228	487	21	274	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)		1791		1738	1804			1824	1555		1780	
Flt Permitted		0.86		0.39	1.00			0.96	1.00		0.97	
Satd. Flow (perm)		1560		712	1804			1757	1555		1723	
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)	91	357	45	401	290	30	15	248	529	23	298	70
RTOR Reduction (vph)	0	6	0	0	6	0	0	0	384	0	13	0
Lane Group Flow (vph)	0	487	0	401	314	0	0	263	145	0	378	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		22.0		32.0	32.0			15.2	15.2		15.2	
Effective Green, g (s)		22.0		32.0	32.0			15.2	15.2		15.2	
Actuated g/C Ratio		0.37		0.54	0.54			0.26	0.26		0.26	
Clearance Time (s)		6.0		2.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		579		523	975			451	399		442	
v/s Ratio Prot				c0.10	0.17							
v/s Ratio Perm		c0.31		0.31				0.15	0.09		c0.22	
v/c Ratio		0.84		0.77	0.32			0.58	0.36		0.85	
Uniform Delay, d1		17.0		9.7	7.6			19.2	18.0		20.9	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		13.8		10.3	0.9			1.9	0.6		14.8	
Delay (s)		30.8		20.0	8.4			21.2	18.6		35.8	
Level of Service		C		C	A			C	B		D	
Approach Delay (s)		30.8			14.9			19.4			35.8	
Approach LOS		C			B			B			D	
Intersection Summary												
HCM 2000 Control Delay			23.1			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			59.2			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			95.8%			ICU Level of Service			F			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Owen Street & Collier Street

2028 Total Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	338	51	26	293	22	35	27	28	29	21	30
Future Volume (vph)	49	338	51	26	293	22	35	27	28	29	21	30
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.99			0.96			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1789	1796		1789	1864			1770			1681	
Flt Permitted	0.56	1.00		0.52	1.00			0.83			0.84	
Satd. Flow (perm)	1046	1796		972	1864			1504			1438	
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)	53	367	55	28	318	24	38	29	30	32	23	33
RTOR Reduction (vph)	0	7	0	0	4	0	0	26	0	0	29	0
Lane Group Flow (vph)	53	415	0	28	338	0	0	71	0	0	59	0
Heavy Vehicles (%)	2%	5%	4%	2%	2%	2%	2%	2%	2%	2%	5%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	32.9	32.9		32.9	32.9			6.0			6.0	
Effective Green, g (s)	32.9	32.9		32.9	32.9			6.0			6.0	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.12			0.12	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	676	1160		628	1204			177			169	
v/s Ratio Prot		c0.23			0.18							
v/s Ratio Perm	0.05			0.03				c0.05			0.04	
v/c Ratio	0.08	0.36		0.04	0.28			0.40			0.35	
Uniform Delay, d1	3.4	4.1		3.3	3.9			20.8			20.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.9		0.1	0.6			1.5			1.2	
Delay (s)	3.6	5.0		3.4	4.5			22.3			21.9	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.8			4.4			22.3			21.9	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			7.8			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.36									
Actuated Cycle Length (s)			50.9			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			59.1%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2028 Total Conditions

4: Access & Collier Street

PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	367	33	0	344	0	28
Future Volume (Veh/h)	367	33	0	344	0	28
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)	399	36	0	374	0	30
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	134			53		
pX, platoon unblocked					0.96	
vC, conflicting volume			435		604	218
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			435		513	218
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			1100		466	778
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	266	169	187	187	30	
Volume Left	0	0	0	0	0	
Volume Right	0	36	0	0	30	
cSH	1700	1700	1700	1700	778	
Volume to Capacity	0.16	0.10	0.11	0.11	0.04	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.9	
Control Delay (s)	0.0	0.0	0.0	0.0	9.8	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		9.8	
Approach LOS					A	
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			21.2%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix G: Construction Staging Plan

Legend

- Proposed construction staging area
- Proposed parking space removal
- Proposed sidewalk closure
- Proposed covered pedestrian walkway
- Proposed construction access

