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337 Sykes Street

TRAFFIC IMPACT STUDY

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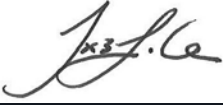
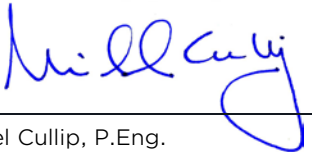
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1 Introduction

Tatham Engineering Limited was retained by Merchant & Merchant Inc. to address the traffic impacts associated with the proposed multi-use redevelopment of 337 Sykes Street in the Municipality of Meaford. The location of the subject site is illustrated in Figure 1.

The purpose of this study is to address the requirements of the Municipality of Meaford, the County of Grey and the Ministry of Transportation with respect to the potential transportation impacts of the development on the immediate road network. In particular, the following will be discussed:

- the operations of the road system through the study area prior to the proposed redevelopment;
- the growth in the traffic volumes not otherwise attributed to the redevelopment (i.e. from overall growth in the area and/or other developments);
- the number of new trips the proposed redevelopment is likely to generate;
- the operations of the study area road system upon completion of the redevelopment; 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 redevelopment, and the expected growth in the traffic levels and the resulting operating conditions. Chapters 4 and 5 address the proposed redevelopment, the ensuing vehicle trips that it will generate, and the associated impacts on the road system. Lastly, Chapter 6 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 Sykes Street (Highway 26), St. Vincent Street and their respective intersection. An aerial photo of the study area is provided in Figure 1 whereas photographs of the corresponding road system are provided in Figure 2.

2.1.1 Key Roads

Sykes Street

Sykes Street (Highway 26) is part of the Provincial highway system; however, through the Municipality of Meaford the highway falls under the jurisdiction of the Municipality as part of the Connecting Links program. The road is oriented northwest-southeast (referenced hereafter as east-west) through the study area with a posted speed limit of 50 km/h and an assumed design speed of 60 km/h (posted speed limit + 10 km/h on lower speed roads). Sykes Street has a 3-lane urban cross section (i.e. curb and gutter), providing one lane of travel per direction with a continuous centre two-way left turn lane. There is also a sidewalk on the south side of the road.

St. Vincent Street

St. Vincent Street is orientated north-south through the study area, providing a two-lane urban cross-section. North of Sykes Street, St. Vincent Street is classified as a local road and is under the jurisdiction of the Municipality of Meaford, whereas south of Sykes Street, the road is classified as an arterial road and is under the jurisdiction of Grey County (Grey Road 7). The posted speed limit is 50 km/h and thus a design speed of 60 km/h has been applied.

2.1.2 Key Intersections

Sykes Street with St. Vincent Street and McKibbin Drive

The intersection of Sykes Street with St. Vincent Street is a 5-leg signalized intersection with McKibbin Drive serving as the 5th leg. The intersection is configured as follows:

- north leg (St. Vincent Street): 1 shared left/thru/right turn lane;
- south leg (St. Vincent Street/Grey Road 7): 1 shared left/thru lane and 1 channelized right;
- northwest leg (Sykes Street): 1 left turn lane and 1 thru/right turn lane;
- southeast leg (Sykes Street): 1 left turn lane and 1 thru/right turn lane; and



- west leg (McKibbon Drive): 1 shared left/thru/right turn lane.

The intersection restricts right turns on red for all approaches, save for the northbound right turn movement on St. Vincent Street (Grey Road 7) which has a channelized right lane operating under yield control.

2.2 EXISTING TRAFFIC VOLUMES

To determine existing traffic volumes, traffic counts were obtained for the intersection of Sykes Street/St. Vincent Street, conducted on Wednesday December 5, 2018 between 7:15 and 9:15 and 14:00 and 18:00. The corresponding traffic count details are provided in Appendix A.

To reflect 2019 conditions, the 2018 traffic volumes were adjusted by the annual growth rates discussed in Section 3.2.1.

Given that the traffic counts were completed in December, additional consideration has been given to peak seasonal conditions along Sykes Street (Highway 26). The Annual Average Daily Traffic (AADT) and Summer Average Daily (SADT) Traffic volumes published by MTO for Highway 26 through the study area were reviewed to establish a seasonal adjustment factor. The available data indicates that no significant variation was observed between the SADT and AADT volumes for the period between 2012 to 2016. As such, the December counts are considered reflective of typical peak conditions.

The resulting 2019 traffic volumes are illustrated in Figure 3.

2.3 EXISTING TRAFFIC OPERATIONS

2.3.1 Intersection 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 operation of the key intersection. The analysis is based on the 2019 traffic volumes, the existing signal timing plans, control and configuration of the intersection and procedures outlined in the *2000 Highway Capacity Manual*¹ (using Synchro v.10 software). For signalized intersections, the analysis considers the average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for each approach and the overall intersection. 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.

¹ *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2000.



A summary of the existing traffic conditions analyses is provided in Table 1 whereas operations worksheets are included in Appendix B. Based on the existing volumes and intersection control, the subject intersection will provide satisfactory overall levels of service (LOS D or greater) with average delays during both peak hours. The exception occurs during the AM peak hour when the eastbound movement will experience a level of service F with higher delays.

Table 1: Intersection Operations – 2019 Conditions

INTERSECTION & MOVEMENT	CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		DELAY	LOS	V/C	DELAY	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	83	F	0.53	52	D	0.27
	NB	56	E	0.82	45	D	0.66
	SB	51	D	0.71	50	D	0.69
	SEB	48	D	0.88	23	C	0.64
	NWB	33	C	0.58	35	C	0.87
	overall	46	D	0.80	33	C	0.77

It is noted that under current signal timings the southbound and northbound phases on St. Vincent Street are operating individually. In efforts to improve traffic operations the phases were reprogrammed to operate in unison. Signal timing and cycle lengths were also optimized. Results of existing intersections operations with the signal timing improvements are summarized in Table 2, whereas detailed operations worksheets are included in Appendix B. As indicated, the intersection will provide good overall operating conditions (LOS B) with average delays when considering the existing 2019 traffic volumes and the aforementioned improvements.

Table 2: Intersection Operations – 2019 Conditions (with improvements)

INTERSECTION & MOVEMENT	CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		DELAY	LOS	V/C	DELAY	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	43	D	0.42	36	D	0.21
	NB	21	C	0.53	28	C	0.53
	SB	21	C	0.52	31	C	0.60
	SEB	22	C	0.76	12	B	0.53
	NWB	15	B	0.48	16	B	0.72
	overall	20	B	0.65	17	B	0.67



3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2022, 2027 and 2032. The 2022 horizon year has been adopted to reflect full build-out of the subject development, whereas the 2027 and 2032 horizons will address the longer-term impact (5 and 10 years beyond build-out).

3.1 ROAD NETWORK

3.1.1 Planned Improvements

It is noted that there are no improvements currently being considered by the Municipality or MTO for the study area road network. It is understood that the County may widen St. Vincent Street (Grey Road 7) to 9.5 metres to allow for the introduction of bicycle lanes on both sides (as there would be no change to the lane configuration, no improvements to the road capacity would result). As such, the road network as described in Section 2.1 has been maintained through the analyses of the future horizons.

3.2 BACKGROUND TRAFFIC VOLUMES

Future background traffic volumes expected for the 2022, 2027 and 2032 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

Historic Traffic Growth

Historic traffic volumes were obtained from MTO for the 9.8 km segment of Highway 26, east of the Town limits. The AADT volumes on Highway 26 for the 10-year period of 2006 to 2016 (with 2016 being the most current published data) indicate an average annual increase of 0.85%.

Population & Employment Growth

The *Grey County Growth Management Strategy*² indicates that the population of the Municipality of Meaford is forecasted to be 12,500 in 2016 growing to 13,500 in 2031, which translates to an annual growth rate of 0.51%. It also projects the employment of Meaford to grow from 3,500 in 2016 to 3,600 in 2031, translating to an annual growth rate of 0.2%.

² *Grey County Growth Management Strategy*. Malone Given Parsons, April 2008.



As per 2016 census data, the population of the Municipality decreased from 11,100 in 2011 to 10,991 in 2016, translating to an annual decrease of 0.2%.

Overall Background Growth

Notwithstanding the lower realized growth rates over the past years, a conservative background growth rate of 2.0% per annum has been applied to the traffic volumes on Sykes Street and St. Vincent Street. No growth has been applied to McKibbin Drive given that it is a built-out residential dead-end street.

3.2.2 Development Growth

Georgian Bay Community School

The proposed Georgian Bay Community School development is to be located south of the existing St. Vincent Euphrasia Elementary School, designed to be an amalgamation of three existing schools in the nearby area. The development will include a two-storey school accommodating elementary and secondary school students from junior kindergarten to Grade 12. The school will include 31 elementary classrooms, 7 secondary school classrooms, a variety of subject specific classrooms (science labs, music rooms etc.) and two gymnasiums. Access to the site will be provided via two new driveway connections to St. Vincent Street. For the purpose of this report it has been assumed that full buildout will occur by 2022. The trip estimates and distribution for the development are based on the *Georgian Bay Community School Transportation Impact Study*³, excerpts of which are provided in Appendix C.

It is noted that in developing the trip generation for the proposed Georgian Bay Community School, consideration was given to the reduction of traffic as a result of the closure to the amalgamating schools. Given the current location of the Georgian Bay Community School (at the intersection of St Vincent Street with Eliza Street, north of Sykes Street), the closure results in a net decrease to traffic volumes along St Vincent Street, north of Sykes Street. However, the subsequent opening of the new school results in a net increase to traffic volumes along the St. Vincent Street, south of Sykes Street.

The net traffic volumes associated with the proposed Georgian Bay Community School development, including the reductions associated with the closure of the existing schools, are illustrated in Figure 4. It is noted that only the AM peak hour volumes have been considered, recognizing that the PM peak hour of the school does not coincide with PM peak hour of the street. The *Georgian Bay Community School TIS* analysed a PM peak hour from 14:45 to 15:45 in order to capture the peak period of a typical school day, whereas the actual peak period of the

³ *Georgian Bay Community School Transportation Impact Study*, Paradigm Transportation Solutions Limited. April 2019.



intersection (as identified during the December 2018 traffic counts, and otherwise utilized in this study) occurs from 16:15 to 17:15. As such, the PM peak hour volumes on the road network are not expected to be impacted by the proposed Georgian Bay Community School development traffic. Consequently, the PM peak hour volumes associated with the school development have not been considered as part of the background traffic volumes.

Other Background Development

Through discussion with the Municipality's planning staff, it was acknowledged that additional development may occur within the greater study area including the potential for industrial/employment lands at both 81 Edwin Street East and the vacant lands fronting Muir Street between Grey Road 7 and Highway 26. For both properties it was noted that the possibility of development was conceptual in nature, with no concept plans or details currently provided. Moreover, the Edwin Street property is currently listed for sale with the potential for residential rezoning under the Municipality's 2020 Official Plan Review.

Given the uncertainty with respect to timing and overall development concepts, the noted lands have not been considered in the development of the background traffic. Regardless, the background growth rate applied (2.0% per annum) is conservative and assumed to consider development in the surrounding area that has not otherwise been explicitly included.

3.2.3 Background Traffic Volumes

The resulting 2022, 2027 and 2032 background traffic volumes are illustrated in Figure 5 through Figure 7. The background volumes are based on the 2019 traffic volumes, adjusted to reflect the noted annual background growth rate and the additional traffic volumes associated with the noted Georgian Bay Community School development.

3.3 BACKGROUND TRAFFIC OPERATIONS

3.3.1 Intersection Operations

The study area intersection was again analyzed for each horizon year given the projected background volumes. The improved phasing, as developed in Section 2.3.1, have been maintained in the analysis along with optimized signal timing through the horizons. The results of the operational assessment are summarized in Table 3 through Table 5 (detailed worksheets are provided in Appendix D).

As indicated, the intersection will continue to provide acceptable overall operating conditions (LOS D or greater) with average delays through the 2032 horizon year. As such, no intersection improvements are required to accommodate the future background conditions.



Table 3: Intersection Operations – 2022 Background Conditions

INTERSECTION & MOVEMENT	CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		DELAY	LOS	V/C	DELAY	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	52	D	0.42	36	D	0.16
	NB	31	C	0.69	28	C	0.54
	SB	27	C	0.38	35	C	0.65
	SEB	32	C	0.88	14	B	0.59
	NWB	13	B	0.46	20	B	0.80
	overall	27	C	0.77	20	B	0.72

Table 4: Intersection Operations – 2027 Background Conditions

INTERSECTION & MOVEMENT	CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		DELAY	LOS	V/C	DELAY	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	54	D	0.44	43	D	0.17
	NB	33	C	0.73	31	C	0.48
	SB	27	C	0.42	35	C	0.60
	SEB	42	D	0.94	15	B	0.58
	NWB	14	B	0.35	20	C	0.79
	overall	31	C	0.83	20	C	0.71

Table 5: Intersection Operations – 2032 Background Conditions

INTERSECTION & MOVEMENT	CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		DELAY	LOS	V/C	DELAY	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	65	E	0.47	44	D	0.18
	NB	47	D	0.85	31	C	0.52
	SB	34	C	0.53	37	D	0.63
	SEB	46	D	0.95	16	B	0.65
	NWB	15	B	0.35	27	C	0.88
	overall	37	D	0.87	24	C	0.78



4 Proposed Development

This chapter will provide additional details with respect to the proposed redevelopment of 337 Sykes Street, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 SITE LOCATION

As illustrated in Figure 1, the proposed development is to be located on the north side of Sykes Street, between Gray Avenue and St. Vincent Street.

4.2 EXISTING LAND USE

Currently, the existing site includes a 279 m² (3,000 ft²) two-tenant building housing a casual restaurant and dance studio. Access to the site is provided via a full-moves driveway on Sykes Street.

4.3 PROPOSED LAND USE & PHASING

The proposed development will include the demolition of the existing building and the construction of a 3-storey multi-use building. The new building will provide 931 m² (10,021 ft²) of ground floor commercial area and 20 residential units (total) on the second and third floors. A site plan is provided in Figure 8.

It is noted that the existing restaurant and dance centre will relocate to the new building and encompass slightly larger gross floor areas of 279 m² (3,000 ft²) and 186 m² (2,000 ft²), respectively. The remaining ground floor area will be comprised of general commercial/retail uses.

A single 3-year phase has been considered with full build-out and occupancy by 2022.

4.4 SITE ACCESS

The site will be served by two access points. The primary access will be via the existing full-moves driveway onto Sykes Street, shared with the existing Esso Gas station to the west. At the property line, the site access provides a throat width of 10.5 metres, narrowing to 6.0 metres within the site. As such, the access will readily accommodate two-way operations (i.e. 1 inbound lane and 1 outbound lane).

A secondary access is proposed on St. Vincent Street at the east limits of the site, also providing full moves access. This access will have a width of 9.0m, accommodating two-way operations and serving as the main access for truck delivery and loadings operations.



Given the proximity to the intersection of St. Vincent Street with Gray Avenue to the north, the access spacing was reviewed in context of guidelines provided in the Transportation Association of Canada's (TAC) *Geometric Design Guide for Canadian Roads*. For an access onto a local road, TAC recommends a minimum spacing of 15 metres measured from edge of access to edge of road. The proposed access location will provide approximately 30 metres of clearance from Gray Avenue, thus satisfying TAC guidelines. As such, the configuration and location of the proposed secondary access is considered appropriate.

4.5 ON-SITE CIRCULATION

The internal aisles serving the parking areas will provide two-way operations and maintain a minimum width of 6.0 metres (as per Municipality standards for parking areas with stall angles between 60° and 90°). The internal site layout as proposed is sufficient with respect to the circulation of site generated traffic and the manoeuvring requirements of the design vehicles accessing the parking areas (i.e. passenger cars, SUV's, vans, etc.).

It is further noted that the internal roadway will maintain the 6.0 metre clear route throughout the site, considered sufficient to accommodate manoeuvring requirements of an emergency response vehicle (i.e. a fire truck).

4.6 PEDESTRIAN & CYCLIST FACILITIES

The subject site will be served by internal pedestrian walkways through the landscaped areas, separating the parking aisles and adjoining the front of the building.

In context of the surrounding area, asphalt sidewalk is available for pedestrians accessing the site from Sykes Street South (this should be maintained across the frontage of the site). Pedestrian movements at the east access will be accommodated via the concrete sidewalk on the east side of St. Vincent Street. The signalized intersection of Sykes Street with St. Vincent Street includes crosswalks on all five approaches, facilitating pedestrian movements in the area.

No cyclist infrastructure is provided on the surrounding road network; however, it should be recognized that the Municipality of Meaford and County of Grey provide a variety of off-road cycling and hiking routes. This includes the Georgian Trail, a 34-km walking, cycling and skiing trail between Meaford and Collingwood which transverses St. Vincent street just north of the subject site. On-site cyclist activity can be readily accommodated and it is expected that bicycle stands will be provided in accordance with Municipal requirements.

4.7 SITE TRAFFIC

4.7.1 Trip Generation

The number of vehicle trips to be generated by the proposed redevelopment 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*⁴, 10th Edition. For the residential units, dance studio and restaurant, the following ITE land-uses have been considered:

- *multifamily housing - mid-rise* (ITE code 221);
- *athletic club* (ITE code 493); and
- *high turnover (sit down) restaurant* (ITE code 932).

Recognizing that development details and end uses have not yet been determined, trip generation for the remaining commercial/retail space has been established based on typical neighbourhood commercial uses and trip generation rates provided in the *ITE Trip Generation Manual*, 10th Edition. The following ITE land-uses have been considered:

- clinic (ITE code 630);
- small office building (ITE code 712);
- medical-dental office building (ITE code 720);
- variety store (ITE code 814);
- shopping centre (ITE code 820);
- pharmacy/drug store without drive-thru window (ITE code 880)
- hair salon (ITE code 918);
- copy, print and express ship store (ITE code 920); and
- fast food restaurant without drive-thru window (ITE code 933).

The associated ITE trip generation rates for the noted commercial/retail uses are provided in Table 6.

⁴ *ITE Trip Generation Manual, 10th Edition*. Institute of Transportation Engineers, September 2017.



Table 6: Trip Generation Rates – Commercial/Retail Uses

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
clinic	1000 ft² GFA	2.88	0.81	3.69	0.95	2.33	3.28
small office building	1000 ft² GFA	1.59	0.33	1.92	0.78	1.67	2.45
medical-dental office building	1000 ft² GFA	2.17	0.61	2.78	0.97	2.49	3.46
variety store	1000 ft² GFA	1.81	1.37	3.18	3.56	3.28	6.84
shopping centre	1000 ft² GFA	0.58	0.36	0.94	1.83	1.98	3.81
pharmacy/drug store w/o drive-thru window	1000 ft² GFA	1.91	1.03	2.94	4.17	4.34	8.51
hair salon	1000 ft² GFA	0.61	0.61	1.21	0.25	1.20	1.45
copy, print and express ship store	1000 ft² GFA	2.09	0.70	2.78	3.26	4.15	7.41
fast food restaurant w/o drive-thru window	1000 ft² GFA	15.06	10.04	25.10	14.17	14.17	28.34
average	1000 ft² GFA	3.19	1.76	4.95	3.3	3.96	7.28

As previously noted, development details for the remaining commercial/retail ground floor are not yet available. Therefore, the average trip rates, as established based on the trip rates for the above noted uses, have been applied to the remaining ground floor commercial area.

The associated trip rates and trip estimates are provided in Table 7 and Table 8.

Table 7: Trip Generation Rates

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
multifamily housing mid-rise (ITE 221)	units	0.09	0.27	0.36	0.27	0.17	0.44
athletic club (ITE 493)	1000 ft² GFA	1.93	1.23	3.16	3.90	2.39	6.29
high turnover restaurant (ITE 932)	1000 ft² GFA	5.47	4.47	9.94	6.06	3.71	9.77
commercial average	1000 ft² GFA	3.19	1.76	4.95	3.3	3.96	7.28



Table 8: Trip Estimates

LAND USE	UNITS/ SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
multifamily housing mid-rise	20 units	2	5	7	5	3	8
dance centre	2,000 ft ²	4	2	6	8	5	13
high turnover restaurant	3,000 ft ²	16	14	30	18	11	29
commercial area	5,021 ft ²	16	9	25	17	20	37
Total		38	30	68	48	39	87

As indicated, the proposed development is expected to generate 68 trips during the AM peak hour and 87 trips during the PM peak hour (total of inbound and outbound trips). However, as previously noted the dance centre and restaurant are existing uses on the site - thus, the volume of new trips generated by the site will be somewhat reduced.

4.7.2 Trip Distribution & Assignment

The distribution of the new trips generated by the site has been based on the location of the site in relation to surrounding development, attractions and Meaford's downtown core, with additional consideration of traffic patterns observed at the study intersection.

The following distribution has been assumed:

- 20% to/from the north (via St. Vincent Street);
- 10% to/from the south (via St. Vincent Street);
- 20% to/from the east (via Sykes Street);
- 50% to/from the west (via Sykes Street);

The assignment of the site 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.

The resulting site generated traffic volumes assigned to the road network are illustrated in Figure 9. Assignment to the site access points has been established based on the site layout and anticipated travel routes.



5 Transportation Impacts

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

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

5.1 FUTURE TRAFFIC VOLUMES

Esso Gas Station

Recognizing that the site access on Sykes Street also provides access for the existing Esso gas station, traffic volumes associated with the gas station have also been considered. The number of vehicle trips generated by the gas station has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual 10th Edition*. Based on the existing use, trip rates for the *gas station + convenience store* (ITE code 945) land-use have been applied. The corresponding trip rates and associated trip estimates are provided in Table 9.

Table 9: Trip Generation and Estimates – Esso Gas Station

LAND USE	RATE/ ESTIMATE	VARIABLE/ SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			IN	OUT	TOTAL	IN	OUT	TOTAL
gas station + convenience store	rate	fuel positions	6.36	6.11	12.47	7.13	6.86	13.99
	estimate	6	38	37	75	43	41	84
West access volumes (50%)			19	18	37	22	20	42
East access (shared) volumes (50%)			19	18	37	22	20	42

Overall, the exiting Esso gas station is assumed to be generating a total of 75 trips during the weekday AM peak hour and 84 trips during the PM peak hour. Taking into consideration the two access points serving the gas station, it has been assumed that 50% of the gas station trips (37 AM trips and 42 PM trips) will utilize the shared access with the subject site. The trips have been distributed to the east and west on Sykes Street based on the trip distribution assumptions detailed in Section 4.7.2 and are illustrated in Figure 10. No adjustments were made to the turning movements at the intersection of Sykes Street with St. Vincent Street, recognizing that trip volumes associated with the gas station would have been observed during the traffic counts.



Future Total Traffic

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site generated traffic was combined with the 2022, 2027 and 2032 background traffic volumes. Traffic volumes associated with the existing Esso Gas Station were also added to the shared access on Sykes Street to provide an accurate assessment of the stop-controlled intersection.

The resulting total traffic volumes are presented in Figure 11 through Figure 13.

5.2 FUTURE TRAFFIC OPERATIONS

5.2.1 Intersection Operations

The operations of the key intersections were again investigated considering the total traffic volumes for each horizon year. In addition to this, the site access operations have also been reviewed, assuming stop control upon exit of the site. The results of the operational review are provided in Table 10 and Table 12 (detailed worksheets are provided in Appendix E).

Table 10: Intersection Operations – 2022 Total Conditions

Intersection & Movement		Control	AM Peak Hour			PM Peak Hour		
			Delay	LOS	V/C	Delay	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	signal	52	D	0.42	36	D	0.16
	NB		32	C	0.70	28	C	0.53
	SB		27	C	0.39	36	D	0.67
	SEB		33	C	0.88	14	B	0.60
	NWB		13	B	0.46	21	C	0.81
	overall	signal	27	C	0.78	20	C	0.74
Sykes Street with West Access	SB	stop	12	B	0.08	14	B	0.11
St. Vincent St with East Access	EB	stop	9	A	0.01	10	A	0.02



Table 11: Intersection Operations – 2027 Total Conditions

Intersection & Movement		Control	AM Peak Hour			PM Peak Hour		
			Delay	LOS	V/C	Delay	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	signal	55	D	0.44	43	D	0.17
	NB		33	C	0.74	31	C	0.50
	SB		27	C	0.43	36	D	0.62
	SEB		45	D	0.95	15	B	0.59
	NWB		15	B	0.55	21	C	0.80
	overall	signal	33	C	0.84	21	C	0.72
Sykes Street with West Access	SB	stop	13	B	0.08	14	B	0.12
St. Vincent St with East Access	EB	stop	9	A	0.01	10	A	0.02

Table 12: Intersection Operations – 2032 Total Conditions

Intersection & Movement		Control	AM Peak Hour			PM Peak Hour		
			Delay	LOS	V/C	Delay	LOS	V/C
Sykes Street with St. Vincent Street & McKibbon Drive	EB	signal	65	E	0.47	44	D	0.18
	NB		47	D	0.86	32	C	0.53
	SB		34	C	0.55	37	D	0.64
	SEB		49	D	0.96	17	B	0.66
	NWB		16	B	0.53	29	C	0.89
	overall	signal	38	D	0.88	25	C	0.80
Sykes Street with West Access	SB	stop	13	B	0.09	16	C	0.13
St. Vincent St with East Access	EB	stop	10	A	0.01	10	A	0.02

As indicated, the signalized intersection of Sykes Street with St. Vincent Street and McKibbon Drive will provide acceptable overall operations (LOS D or better) with average delays through the 2032 horizon given the projected total volumes. It is noted that the intersection will operate



with comparable conditions to those experienced under background conditions (i.e. the proposed development has minimal impact on the intersection operations).

The site access points will also operate well below capacity during the noted peak hour conditions and provide good operations (LOS C or greater) with minimal delays (16 seconds or less). As such, no improvements are recommended to accommodate the future total conditions.

5.3 TURN LANE REQUIREMENTS

The need for exclusive right and left turn lanes on Sykes Street and St. Vincent Street at the site access points was reviewed in consideration of MTO warrants for exclusive left and right turn lanes at unsignalized intersections on a two-lane highway with a design speed of 60 km/h (posted speed + 10 km/h).

MTO guidelines suggest that exclusive right turn lanes be considered where right turn volumes exceed 60 vehicles per hour and impede the operations of through traffic. Based on the estimated volume of right turning traffic accessing the site (in the order of 10 to 16 vehicles per hour) exclusive right turn lanes are not warranted at either access.

With respect to a left turn lane to serve the St. Vincent Street access, the need for such is based on the volume of left turn traffic, the volume of advancing and opposing traffic and the design speed. Given the limited volume of left turns accessing the site (in the order of 6 to 7 vehicles per hour) a left turn lane is not warranted. It is noted that the access on Sykes Street is already served by the existing centre turn lane on Sykes Street.

5.4 SIGHT LINE ANALYSIS

As per the TAC *Geometric Design Guide for Canadian Roads*⁵, the minimum stopping sight distance for a design speed of 60 km/h (posted 50 km/h + 10 km/h) is 85 metres. This provides sufficient distance for an approaching motorist to observe a stationary hazard in the road (i.e. a vehicle slowing or stopped to turn into the subject site) and bring their vehicle to a complete stop prior to the hazard. The available sight lines along Sykes Street and St. Vincent Street at the proposed access points are provided in Table 13.

As indicated, the sight lines to/from the east and west along Sykes Street at the west access point satisfy the TAC stopping distance requirements for a design speed of 60 km/h.

⁵ *Geometric Design Guide for Canadian Roads*. Transportation Association of Canada. June 2017



Table 13: Sight Line Assessment

LOCATION	DESIGN SPEED	MINIMUM STOPPING SIGHT DISTANCE	AVAILABLE SIGHT LINES TO/FROM	
			EAST/NORTH	WEST/SOUTH
St. Vincent St Access	60 km/h	85 m	80 m	140 m
Sykes St Access	60 km/h	85 m	200 m +	300 m +

With respect to the St. Vincent Street access, the sight lines to/from the south along St. Vincent Street satisfy the minimum stopping sight distance requirements, whereas the sight lines to/from the north do not satisfy the minimum requirements as they are limited by the vertical alignment of the road. While it is generally acknowledged that minimum standards should be exceeded, there are instances where other controls prevent or cause restraint in applying the minimum standards. As per MTO geometric standards, isolated vertical curves that provide less than the minimum stopping sight distance may be tolerated where there is no evidence of geometric deficiency as indicated by accident records. Such vertical curves should have design speeds preferably not more than 10 km/h less than the desired design speed and, in any case, not more than 20 km/h less. While the available sight distance does not satisfy the requirements for a 60 km/h design speed, it does satisfy the minimum requirements for a 58 km/h design speed. In this respect, the available sight lines to/from the north are considered tolerable recognizing that they satisfy the minimum sight distance requirement for a design speed 2 km/h less than the desired design speed. Furthermore, the available sight distance satisfies the sight distance requirement for a design speed greater than the posted speed. In this instance, a vehicle approaching from the north and operating at the posted speed limit will have sufficient stopping distance. It is noted that MTO minimum stopping distances consider the required stopping distance on wet pavement (i.e. worst case scenario) and thus are inherently conservative. In considering the design speed of the existing vertical curve and the MTO guidelines regarding tolerable deviation from minimum design standards, the available stopping sight distance to the north of the proposed St. Vincent Street access is considered acceptable in that it satisfies the stopping distance required for a design speed of 58 km/h which, while less than the assumed 60 km/h design speed, is greater than the posted speed limit and within the noted tolerance.

As such, no improvements are required to address the available sight distances.



6 Summary

6.1 PROPOSED DEVELOPMENT

This study has addressed the transportation impacts associated with the proposed 3-storey multi-use building to be located at 337 Sykes Street in the Municipality of Meaford.

Upon completion, the site is expected to generate a total of 68 trips during the AM peak hour and 87 during the PM peak hour.

6.2 INTERSECTION OPERATIONS

In addressing the study area operations, the key intersections were analysed under existing conditions (2019) and for the 2022, 2027 and 2032 horizon periods.

The results of the operational analysis indicate that the study area intersection provides satisfactory overall levels under the existing conditions with the exception of the eastbound movement which experiences poor operating conditions (LOS F) with excessive delay during the AM peak hour. To address the poor operations, the signal timing plans were revised to allow the northbound and southbound phases on St. Vincent Street to operate simultaneously, with the signal timings and cycle lengths optimized. In consideration of the recommended improvements, the intersection will provide acceptable overall operating conditions (LOS D or greater) with average delays through the 2032 horizon year under both background and total conditions. Notwithstanding the signal timing plan revisions under existing conditions, no intersection improvements are required to support the proposed development.

It is noted that the additional traffic to be generated by the redevelopment of the site will have minimal impacts to the operations of the Sykes Street/St. Vincent Street intersection (evident by comparable operations under both future background and future total conditions).

The site access operations were also reviewed, assuming stop control upon exit of the site. The site access will provide good operation (LOS C) through the 2032 horizon.

6.3 TURN LANE REQUIREMENTS

The need for an exclusive right and left turn lanes at the site access points were reviewed in consideration of MTO guidelines for auxiliary turn lanes at unsignalized intersections. Based on this review, no additional turn lanes are considered necessary (an eastbound left turn lane is already provided on Sykes Street via the centre turn lane).



6.4 SIGHT LINES

The available sight lines along Sykes Street and St. Vincent Street at the proposed site access points were reviewed and are considered acceptable in consideration of the MTO design standards and minimum sight distance requirements. While the sight lines to/from the north along St. Vincent Street at the site do not satisfy the minimum sight distance requirement for a design speed of 60 km/h, the available sight lines do satisfy the requirements for a design speed of 58 km/h (the posted speed) and are within MTO guidelines regarding tolerable deviation from minimum design standards.





337 SYKES STREET

Figure 1: Site Location





Looking east & south at intersection of Sykes Street with St. Vincent Street/McKibbon Drive



Looking west along Sykes Street towards proposed shared access



Looking west & north at intersection of Sykes Street with St. Vincent Street/McKibbon Drive



Looking east along Sykes towards proposed shared access

337 SYKES STREET
Figure 2A: Area Road Network





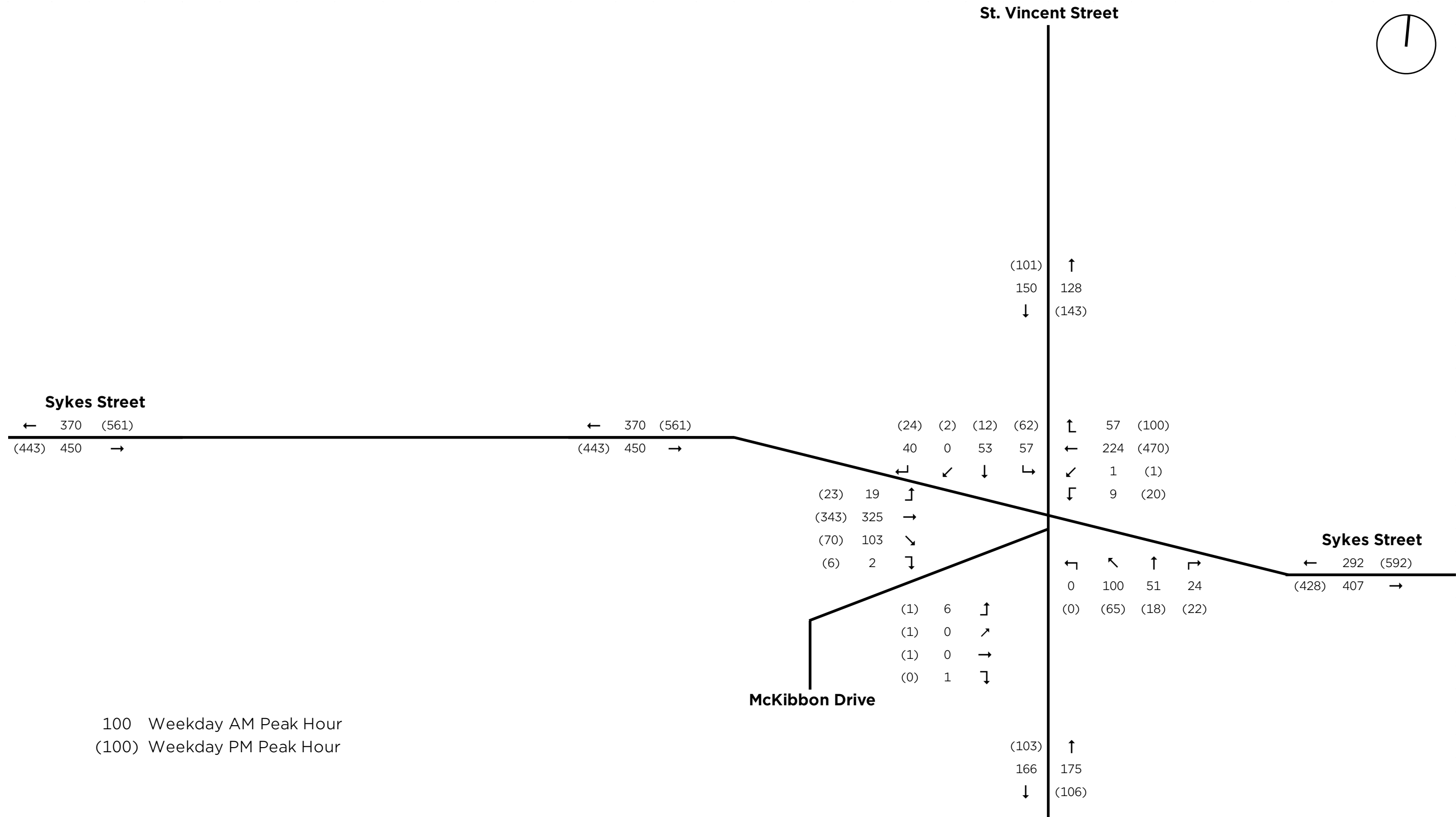
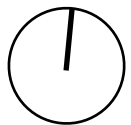
Looking north along St. Vincent Street towards proposed St. Vincent Street access location



Looking west from St. Vincent Street at proposed St. Vincent Street access location

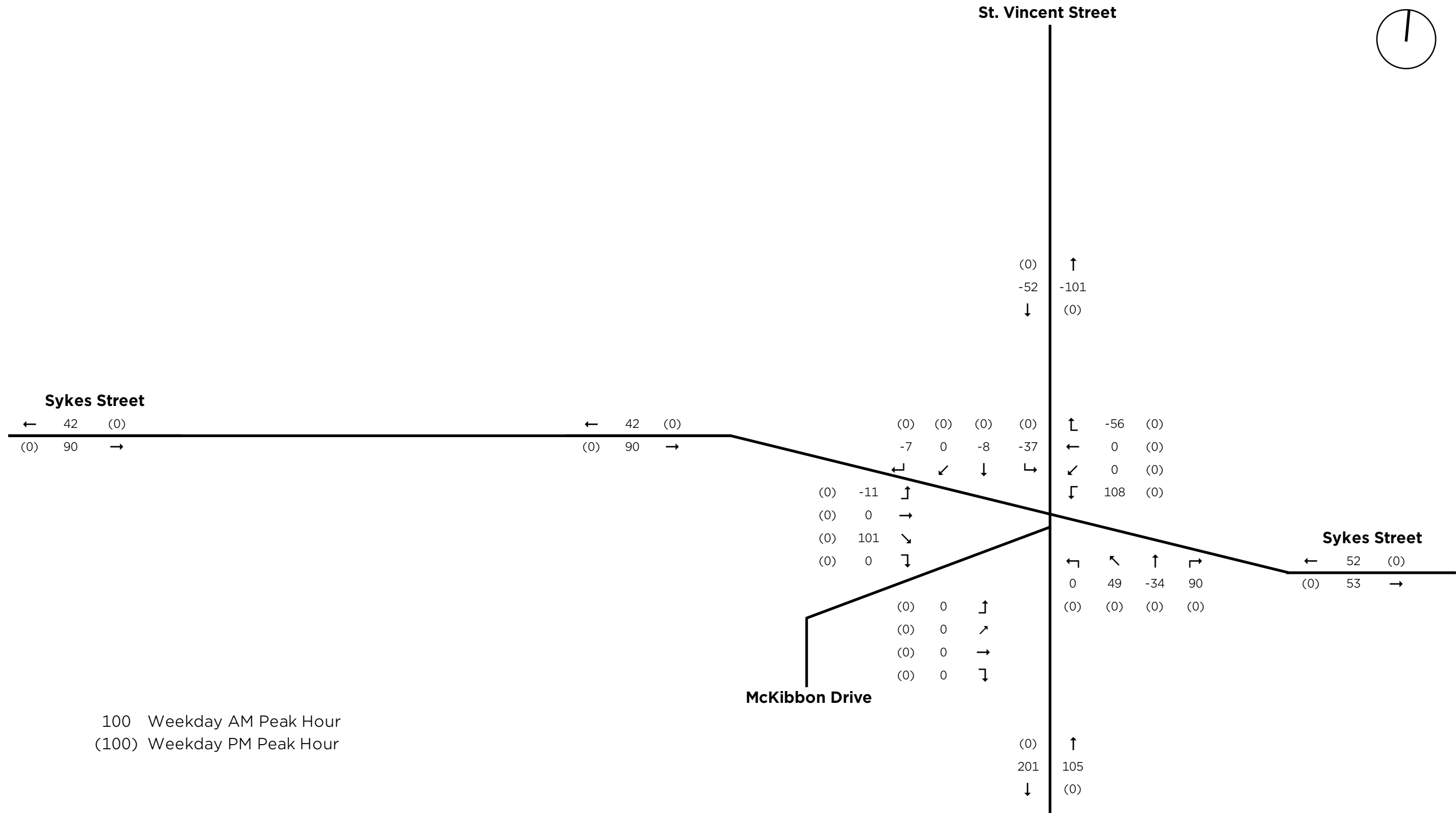
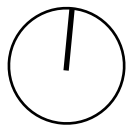
337 SYKES STREET
Figure 2B: Area Road Network





337 SYKES STREET
Figure 3: Existing Volumes

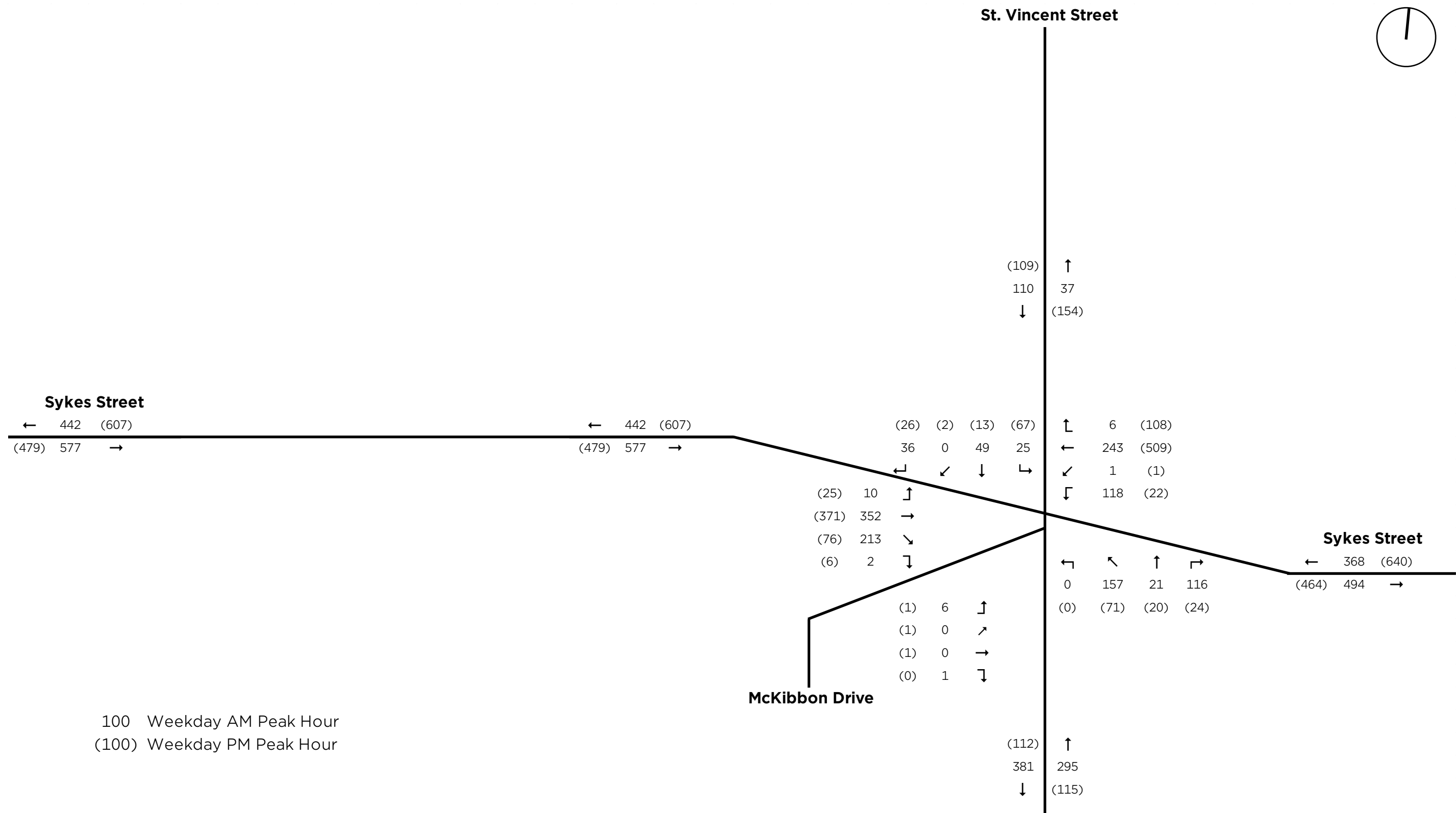
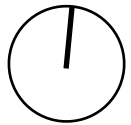




337 SYKES STREET

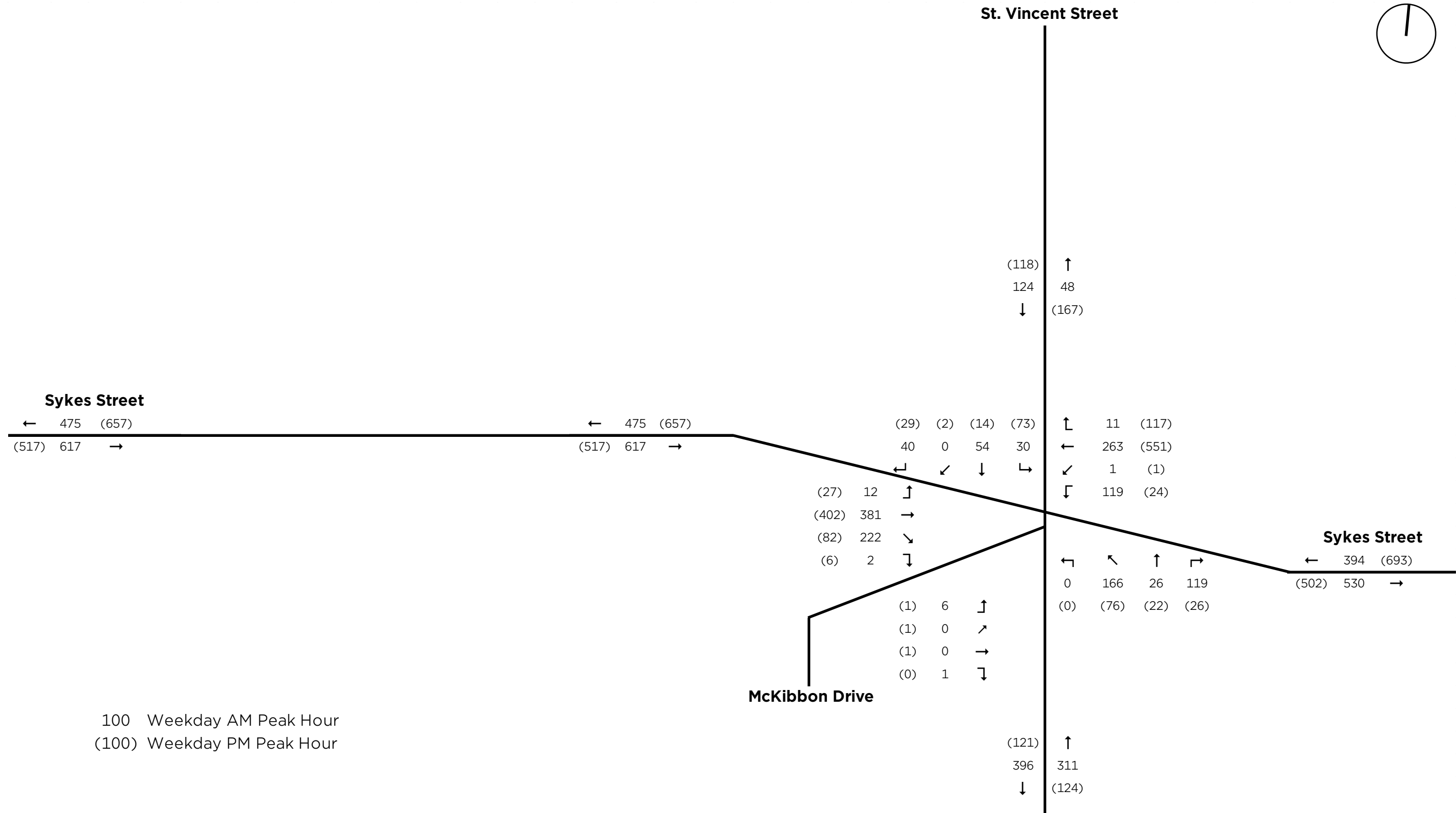
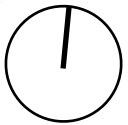
Figure 4: Background Development Traffic Volumes – Georgian Bay School (Net Trips)





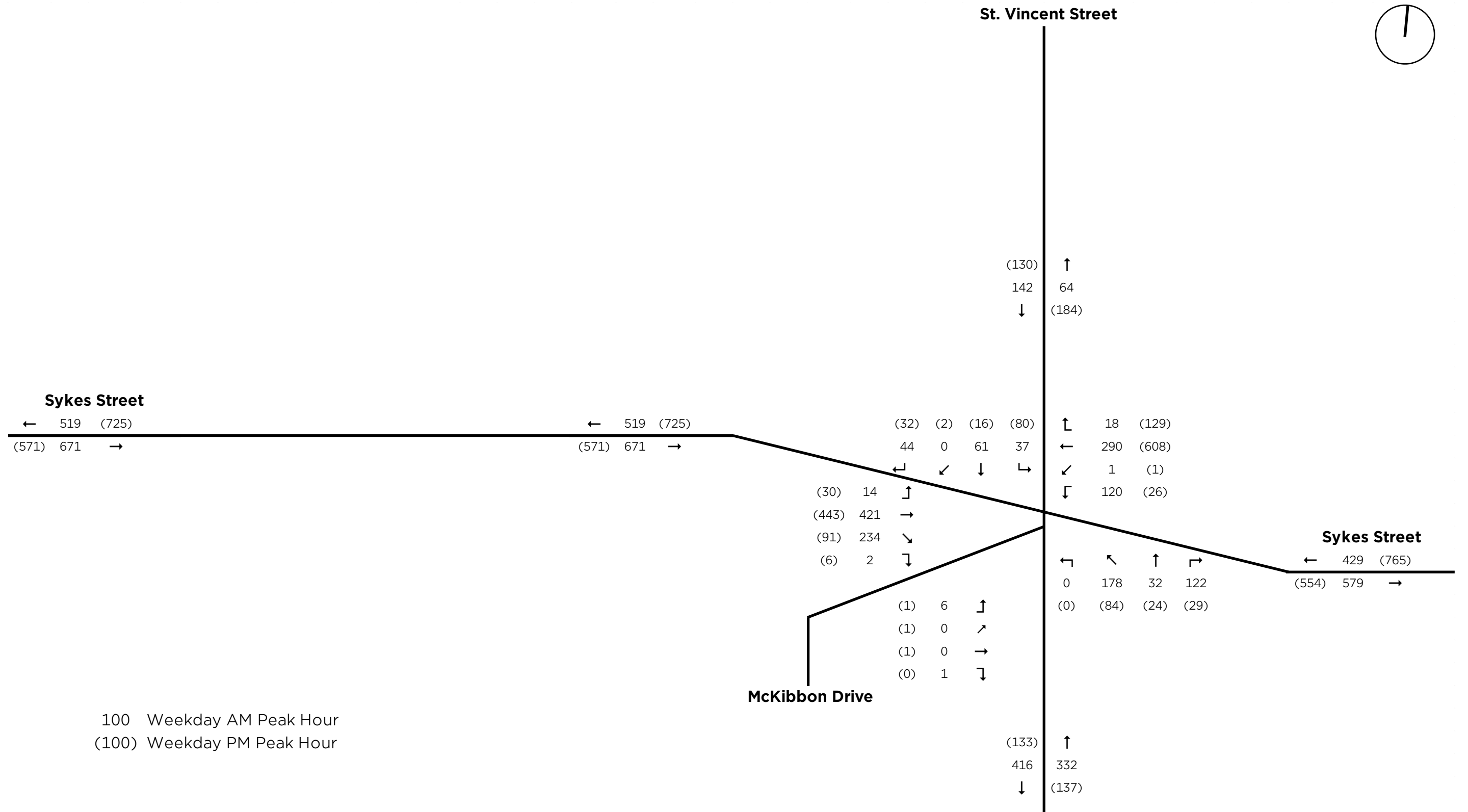
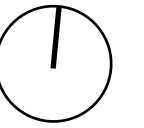
337 SYKES STREET
Figure 5: 2022 Background Traffic Volumes





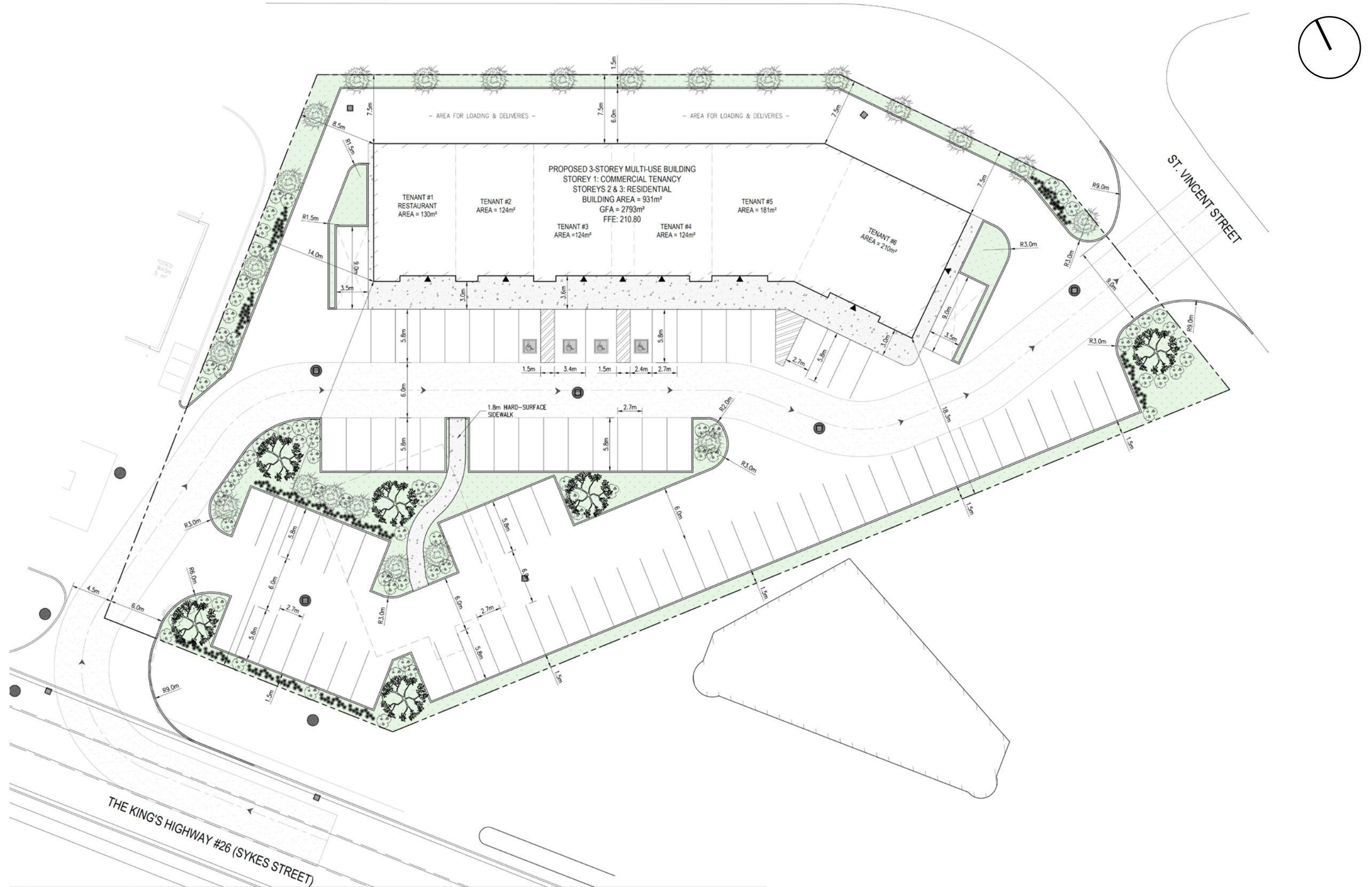
337 SYKES STREET
Figure 6: 2027 Background Traffic Volumes





337 SYKES STREET
Figure 7: 2032 Background Traffic Volumes

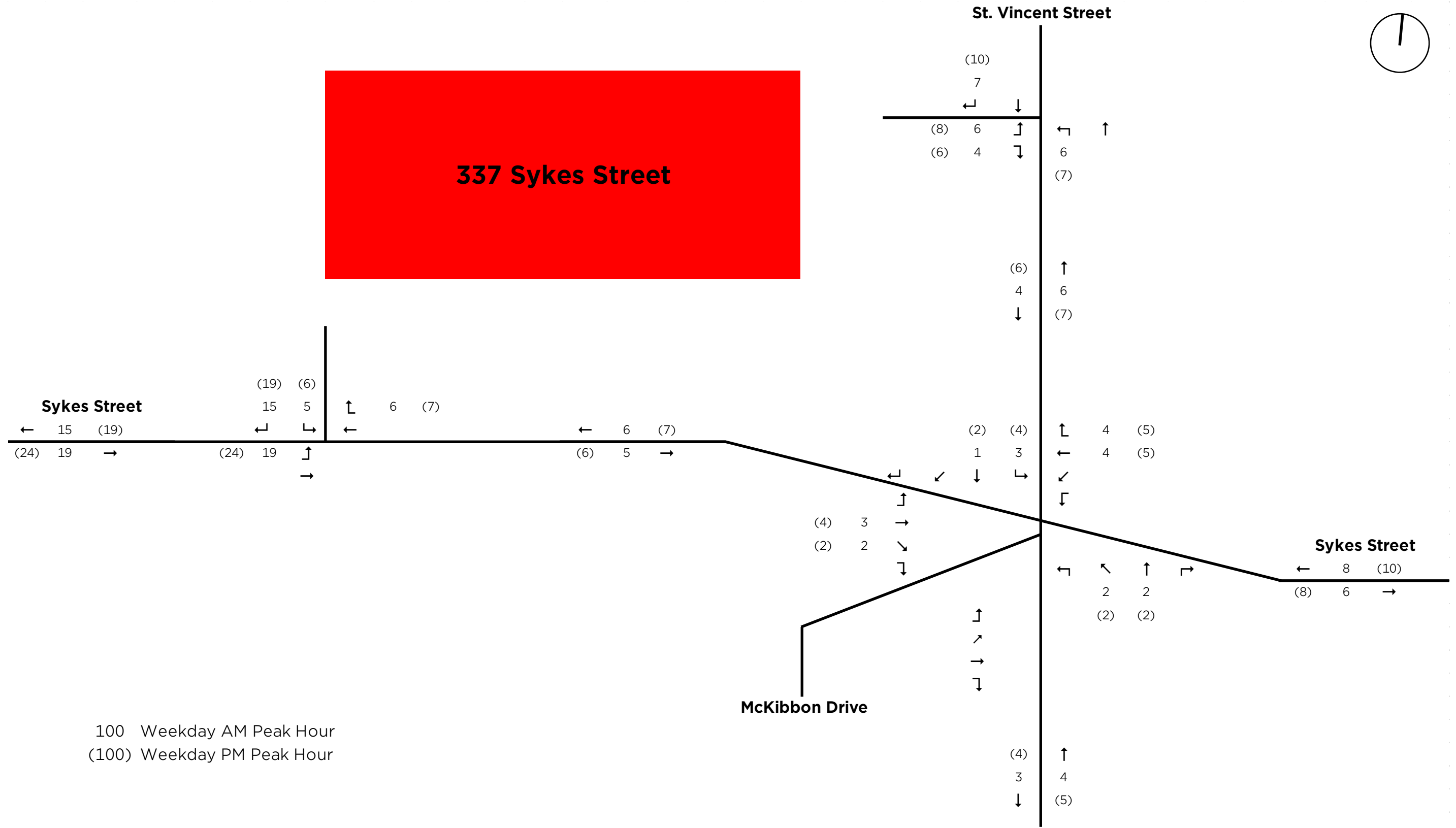
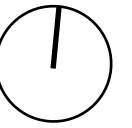


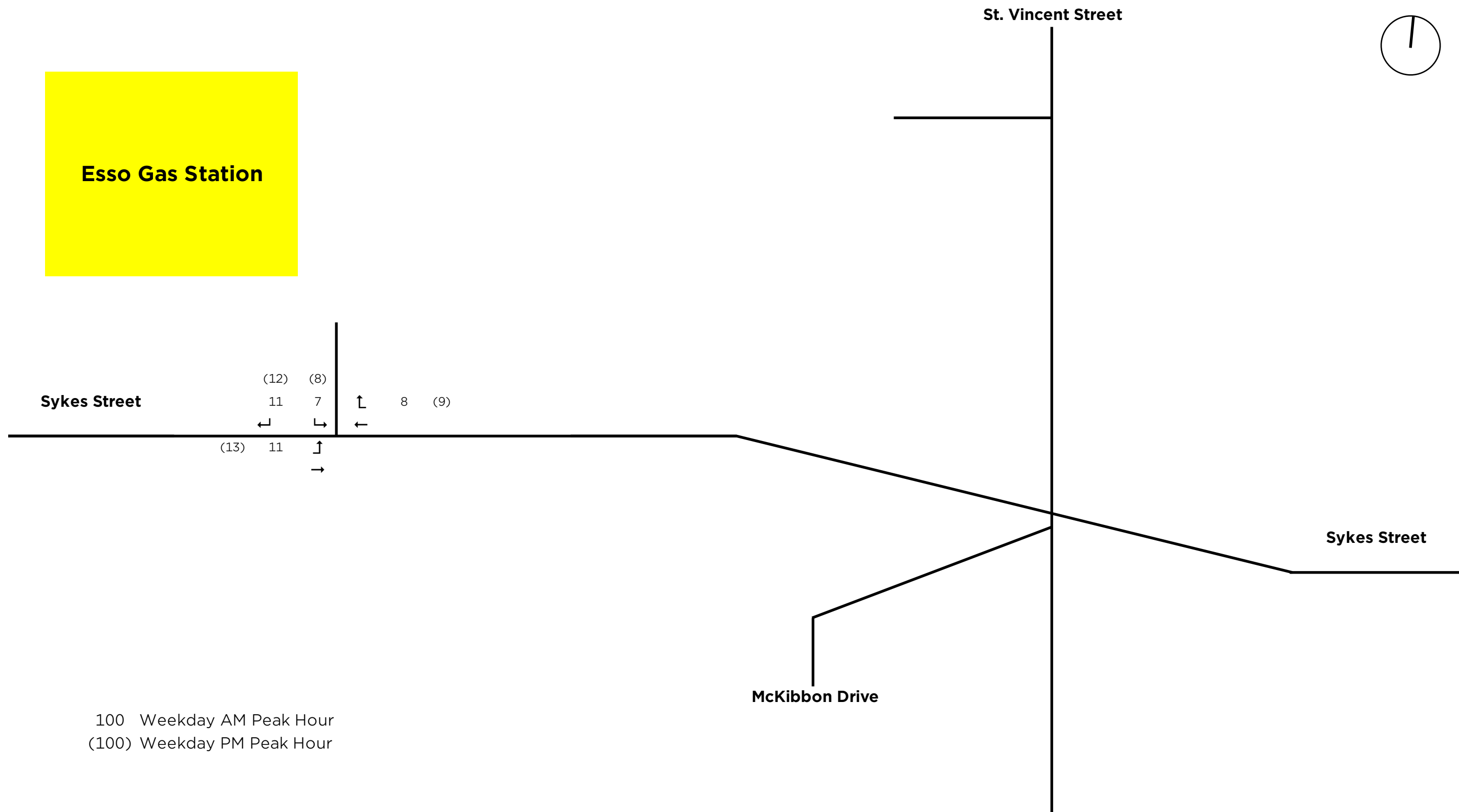
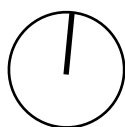


337 SYKES STREET

Figure 8: Site Plan





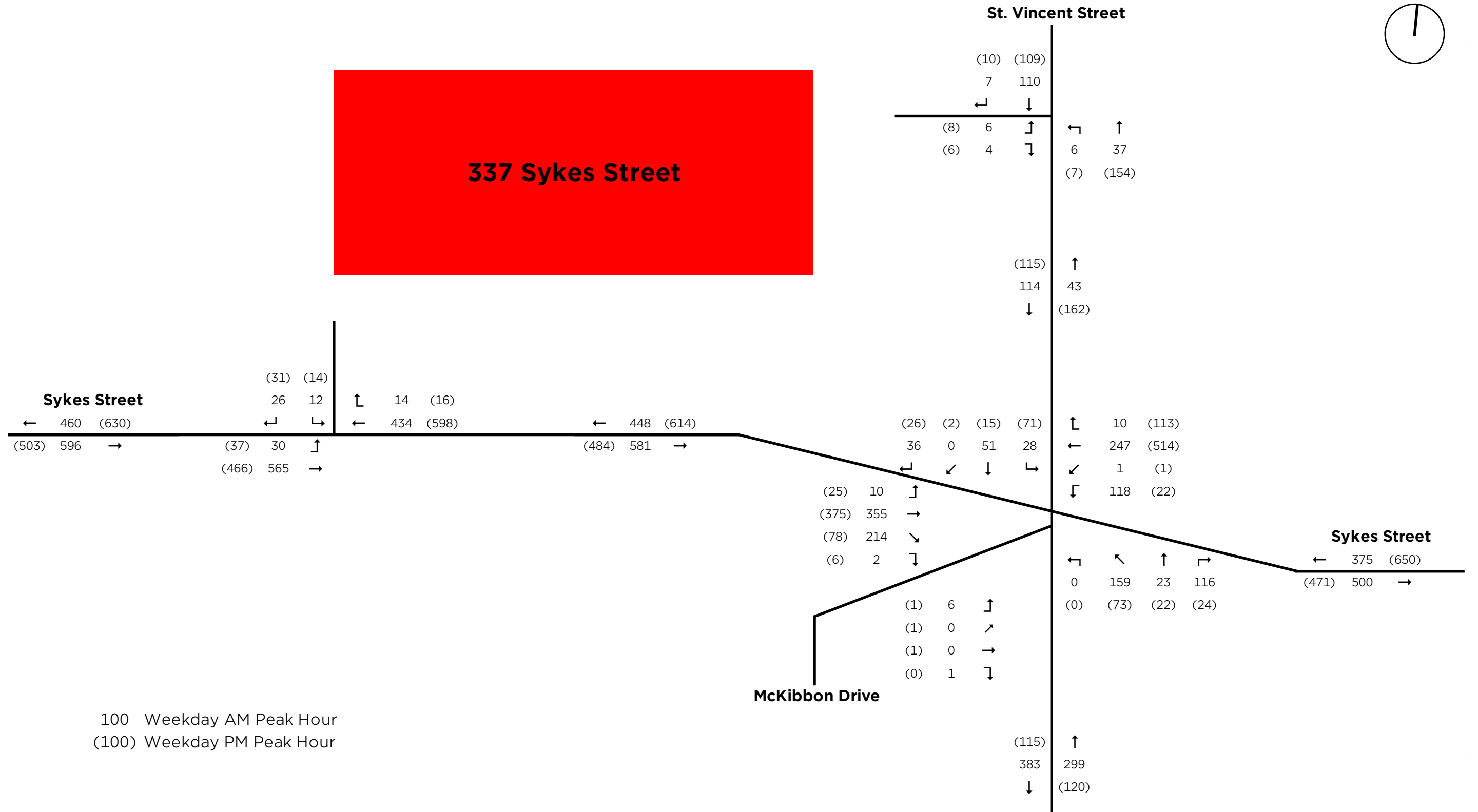
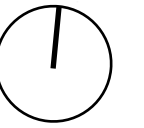


100 Weekday AM Peak Hour
(100) Weekday PM Peak Hour

337 SYKES STREET

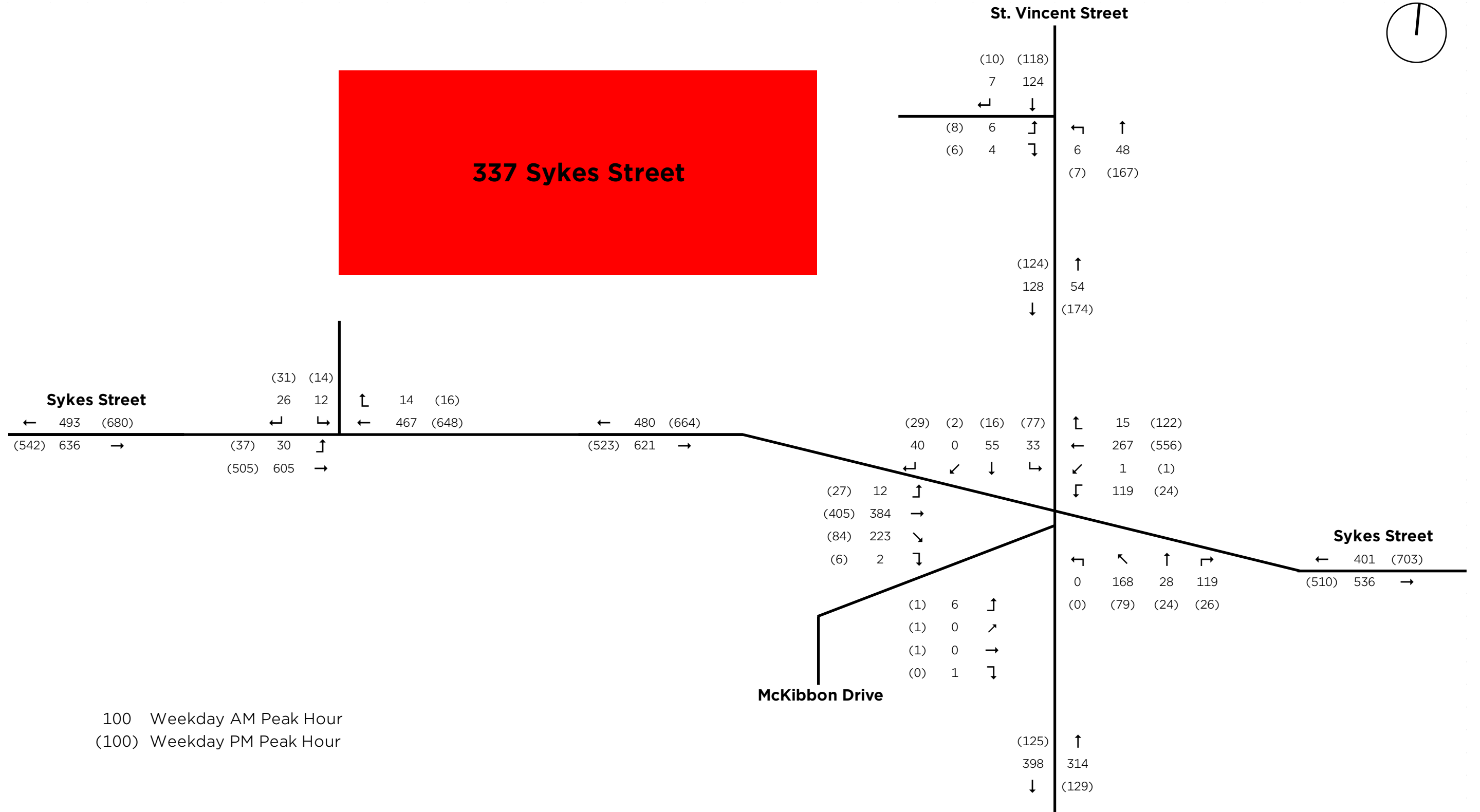
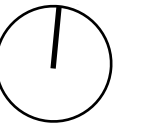
Figure 10: Esso Gas Station Traffic Volumes





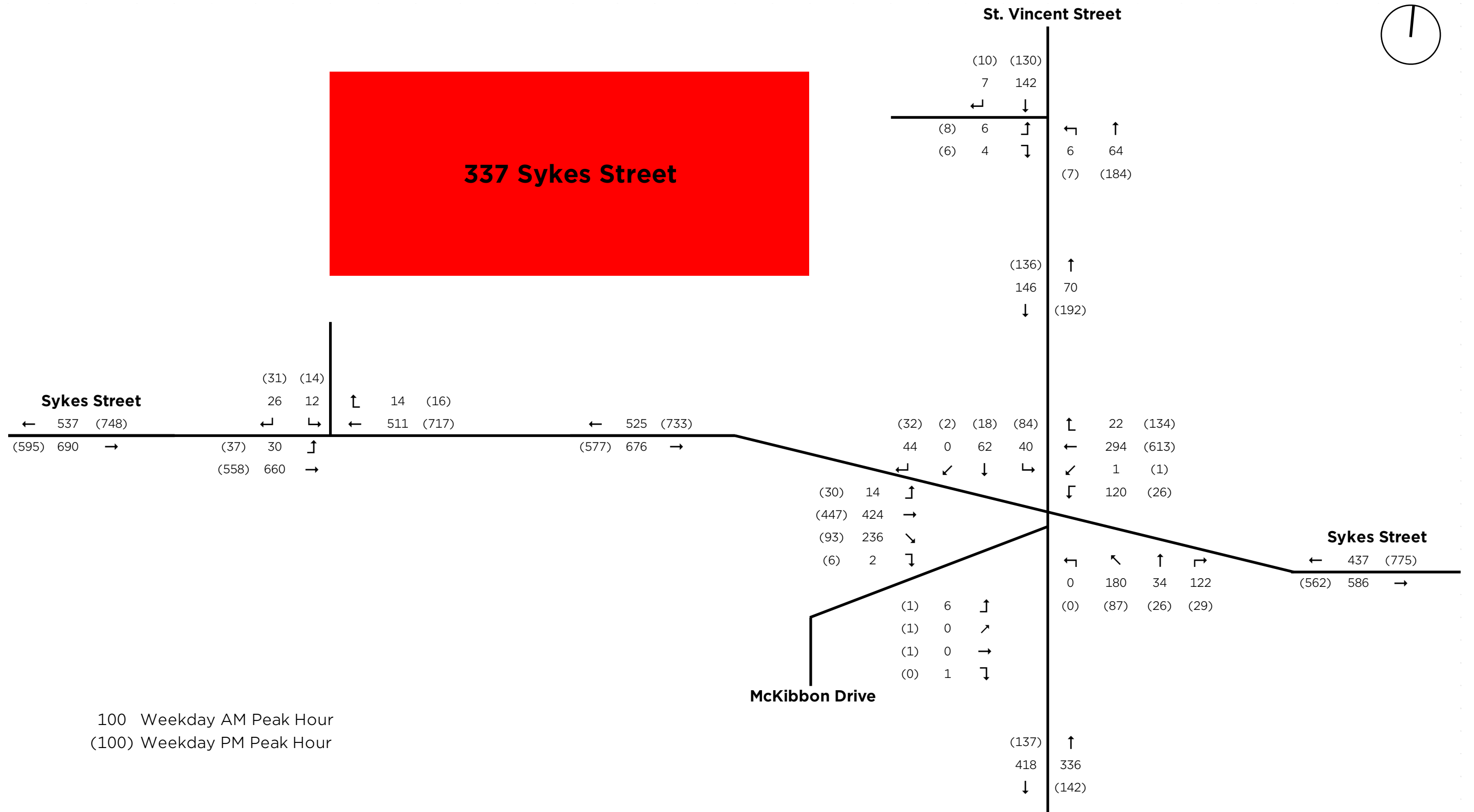
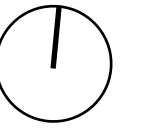
337 SYKES STREET
Figure 11: 2022 Total Traffic Volumes





337 SYKES STREET
Figure 12: 2027 Total Traffic Volumes





337 SYKES STREET
Figure 13: 2032 Total Traffic Volumes



Appendix A: Traffic Counts

St. Vincent Street & Sykes Street - TMC

Wed Dec 5, 2018

AM Peak (8:15AM - 9:15AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 597860, Location: 44.596507, -80.58429



Provided by: Paradigm Transportation Solutions Limited
22 King Street South, Suite 300,
Waterloo, ON, N2J 1N8, CA

Leg Direction	St. Vincent Street Southbound							Sykes Street Westbound							St. Vincent Street Northbound						
Time	R	BR	T	L	U	App	Ped*	R	T	BL	L	U	App	Ped*	R	T	L	HL	U	App	Ped*
2018-12-05 8:15AM	9	0	5	12	0	26	0	12	58	0	0	0	70	0	1	5	13	0	0	19	1
8:30AM	7	0	23	18	0	48	0	18	44	0	3	0	65	28	4	23	24	0	0	51	5
8:45AM	16	0	21	17	0	54	0	17	55	0	2	0	74	6	14	18	40	0	0	72	3
9:00AM	7	0	3	9	0	19	0	9	63	1	4	0	77	4	5	4	21	0	0	30	3
Total	39	0	52	56	0	147	0	56	220	1	9	0	286	38	24	50	98	0	0	172	12
% Approach	26.5%	0%	35.4%	38.1%	0%	-	-	19.6%	76.9%	0.3%	3.1%	0%	-	-	14.0%	29.1%	57.0%	0%	0%	-	-
% Total	3.7%	0%	4.9%	5.3%	0%	14.0%	-	5.3%	20.9%	0.1%	0.9%	0%	27.2%	-	2.3%	4.7%	9.3%	0%	0%	16.3%	-
PHF	0.609	-	0.565	0.778	-	0.681	-	0.778	0.873	0.250	0.563	-	0.929	-	0.429	0.543	0.613	-	-	0.597	-
Lights	37	0	46	52	0	135	-	51	203	1	9	0	264	-	24	43	92	0	0	159	-
% Lights	94.9%	0%	88.5%	92.9%	0%	91.8%	-	91.1%	92.3%	100%	100%	0%	92.3%	-	100%	86.0%	93.9%	0%	0%	92.4%	-
Articulated Trucks	0	0	0	1	0	1	-	0	7	0	0	0	7	-	0	0	0	0	0	0	-
% Articulated Trucks	0%	0%	0%	1.8%	0%	0.7%	-	0%	3.2%	0%	0%	0%	2.4%	-	0%	0%	0%	0%	0%	0%	-
Buses and Single-Unit Trucks	2	0	6	3	0	11	-	5	10	0	0	0	15	-	0	7	6	0	0	13	-
% Buses and Single-Unit Trucks	5.1%	0%	11.5%	5.4%	0%	7.5%	-	8.9%	4.5%	0%	0%	0%	5.2%	-	0%	14.0%	6.1%	0%	0%	7.6%	-
Bicycles on Road	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-
% Bicycles on Road	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	-
Pedestrians	-	-	-	-	-	-	0	-	-	-	-	-	-	38	-	-	-	-	-	-	12
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	100%
Bicycles on Crosswalk	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	0%

*Pedestrians and Bicycles on Crosswalk. BL: Bear left, BR: Bear right, HL: Hard left, HR: Hard right, L: Left, R: Right, T: Thru, U: U-Turn

St. Vincent Street & Sykes Street - TMC

Wed Dec 5, 2018

AM Peak (8:15AM - 9:15AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 597860, Location: 44.596507, -80.58429



Provided by: Paradigm Transportation Solutions Limited
22 King Street South, Suite 300,
Waterloo, ON, N2J 1N8, CA

Leg Direction	McKibbin Drive Northeastbound								Sykes Street Eastbound								
Time	HR	BR	BL	HL	U	App	Ped*		HR	R	T	L	U	App	Ped*		Int
2018-12-05 8:15AM	0	0	0	1	0	1	1		0	28	80	4	0	112	0		228
8:30AM	0	0	0	4	0	4	3		1	25	84	3	0	113	0		281
8:45AM	1	0	0	1	0	2	2		0	28	84	5	0	117	0		319
9:00AM	0	0	0	0	0	0	4		1	20	71	7	0	99	0		225
Total	1	0	0	6	0	7	10		2	101	319	19	0	441	0		1053
% Approach	14.3%	0%	0%	85.7%	0%	-	-		0.5%	22.9%	72.3%	4.3%	0%	-	-		-
% Total	0.1%	0%	0%	0.6%	0%	0.7%	-		0.2%	9.6%	30.3%	1.8%	0%	41.9%	-		-
PHF	0.250	-	-	0.375	-	0.438	-		0.500	0.902	0.949	0.679	-	0.942	-		0.825
Lights	1	0	0	6	0	7	-		2	96	300	19	0	417	-		982
% Lights	100%	0%	0%	100%	0%	100%	-		100%	95.0%	94.0%	100%	0%	94.6%	-		93.3%
Articulated Trucks	0	0	0	0	0	0	-		0	0	5	0	0	5	-		13
% Articulated Trucks	0%	0%	0%	0%	0%	0%	-		0%	0%	1.6%	0%	0%	1.1%	-		1.2%
Buses and Single-Unit Trucks	0	0	0	0	0	0	-		0	5	14	0	0	19	-		58
% Buses and Single-Unit Trucks	0%	0%	0%	0%	0%	0%	-		0%	5.0%	4.4%	0%	0%	4.3%	-		5.5%
Bicycles on Road	0	0	0	0	0	0	-		0	0	0	0	0	0	-		0
% Bicycles on Road	0%	0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	0%	-		0%
Pedestrians	-	-	-	-	-	-	10		-	-	-	-	-	-	0		
% Pedestrians	-	-	-	-	-	-	100%		-	-	-	-	-	-	-		-
Bicycles on Crosswalk	-	-	-	-	-	-	0		-	-	-	-	-	-	0		
% Bicycles on Crosswalk	-	-	-	-	-	-	0%		-	-	-	-	-	-	-		-

* Pedestrians and Bicycles on Crosswalk. BL: Bear left, BR: Bear right, HL: Hard left, HR: Hard right, L: Left, R: Right, T: Thru, U: U-Turn

St. Vincent Street & Sykes Street - TMC

Wed Dec 5, 2018

AM Peak (8:15AM - 9:15AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 597860, Location: 44.596507, -80.58429



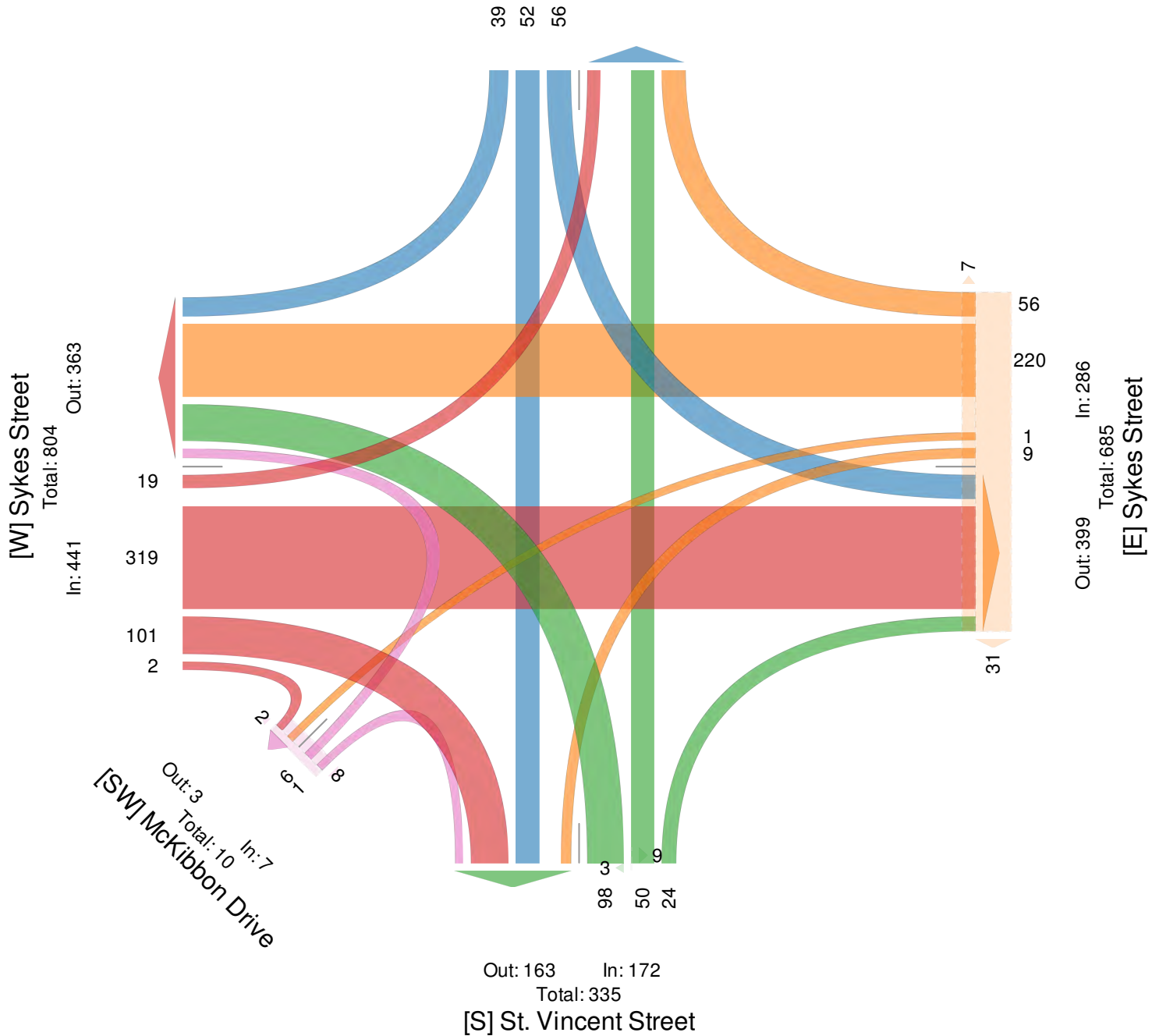
Provided by: Paradigm Transportation
Solutions Limited
22 King Street South, Suite 300,
Waterloo, ON, N2J 1N8, CA

[N] St. Vincent Street

Total: 272

In: 147 Out: 125

39 52 56



St. Vincent Street & Sykes Street - TMC

Wed Dec 5, 2018

PM Peak (4:15PM - 5:15PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 597860, Location: 44.596507, -80.58429



Provided by: Paradigm Transportation
Solutions Limited
22 King Street South, Suite 300,
Waterloo, ON, N2J 1N8, CA

Leg Direction	St. Vincent Street Southbound							Sykes Street Westbound							St. Vincent Street Northbound						
Time	R	BR	T	L	U	App	Ped*	R	T	BL	L	U	App	Ped*	R	T	L	HL	U	App	Ped*
2018-12-05 4:15PM	6	0	4	18	0	28	0	20	105	0	2	0	127	0	4	6	7	0	0	17	0
4:30PM	5	0	2	10	0	17	0	27	121	0	6	0	154	0	6	3	14	0	0	23	0
4:45PM	11	0	4	16	0	31	0	22	126	1	9	0	158	0	8	4	25	0	0	37	0
5:00PM	2	2	2	17	0	23	0	29	109	0	3	0	141	0	4	5	18	0	0	27	1
Total	24	2	12	61	0	99	0	98	461	1	20	0	580	0	22	18	64	0	0	104	1
% Approach	24.2%	2.0%	12.1%	61.6%	0%	-	-	16.9%	79.5%	0.2%	3.4%	0%	-	-	21.2%	17.3%	61.5%	0%	0%	-	-
% Total	2.0%	0.2%	1.0%	5.0%	0%	8.1%	-	8.0%	37.8%	0.1%	1.6%	0%	47.5%	-	1.8%	1.5%	5.2%	0%	0%	8.5%	-
PHF	0.545	0.250	0.750	0.847	-	0.798	-	0.845	0.915	0.250	0.556	-	0.918	-	0.688	0.750	0.640	-	-	0.703	-
Lights	24	2	12	61	0	99	-	97	441	1	20	0	559	-	21	18	61	0	0	100	-
% Lights	100%	100%	100%	100%	0%	100%	-	99.0%	95.7%	100%	100%	0%	96.4%	-	95.5%	100%	95.3%	0%	0%	96.2%	-
Articulated Trucks	0	0	0	0	0	0	-	0	1	0	0	0	1	-	0	0	0	0	0	0	-
% Articulated Trucks	0%	0%	0%	0%	0%	0%	-	0%	0.2%	0%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	0%	-
Buses and Single-Unit Trucks	0	0	0	0	0	0	-	1	19	0	0	0	20	-	1	0	3	0	0	4	-
% Buses and Single-Unit Trucks	0%	0%	0%	0%	0%	0%	-	1.0%	4.1%	0%	0%	0%	3.4%	-	4.5%	0%	4.7%	0%	0%	3.8%	-
Bicycles on Road	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-
% Bicycles on Road	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	-
Pedestrians	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	1
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%
Bicycles on Crosswalk	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%

*Pedestrians and Bicycles on Crosswalk. BL: Bear left, BR: Bear right, HL: Hard left, HR: Hard right, L: Left, R: Right, T: Thru, U: U-Turn

St. Vincent Street & Sykes Street - TMC

Wed Dec 5, 2018

PM Peak (4:15PM - 5:15PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 597860, Location: 44.596507, -80.58429



Provided by: Paradigm Transportation Solutions Limited
22 King Street South, Suite 300,
Waterloo, ON, N2J 1N8, CA

Leg Direction	McKibbin Drive Northeastbound								Sykes Street Eastbound								
Time	HR	BR	BL	HL	U	App	Ped*		HR	R	T	L	U	App	Ped*		Int
2018-12-05 4:15PM	0	1	0	0	0	1	0		0	23	83	7	0	113	0		286
4:30PM	0	0	0	1	0	1	0		2	11	81	10	0	104	0		299
4:45PM	0	0	0	0	1	1	0		1	17	75	2	0	95	0		322
5:00PM	0	0	0	0	0	0	2		3	18	97	4	0	122	0		313
Total	0	1	0	1	1	3	2		6	69	336	23	0	434	0		1220
% Approach	0%	33.3%	0%	33.3%	33.3%	-	-		1.4%	15.9%	77.4%	5.3%	0%	-	-		-
% Total	0%	0.1%	0%	0.1%	0.1%	0.2%	-		0.5%	5.7%	27.5%	1.9%	0%	35.6%	-		-
PHF	-	0.250	-	0.250	-	0.500	-		0.417	0.750	0.866	0.575	-	0.887	-		0.949
Lights	0	1	0	1	0	2	-		5	64	321	23	0	413	-		1173
% Lights	0%	100%	0%	100%	0%	66.7%	-		83.3%	92.8%	95.5%	100%	0%	95.2%	-		96.1%
Articulated Trucks	0	0	0	0	0	0	-		0	0	4	0	0	4	-		5
% Articulated Trucks	0%	0%	0%	0%	0%	0%	-		0%	0%	1.2%	0%	0%	0.9%	-		0.4%
Buses and Single-Unit Trucks	0	0	0	0	0	0	-		0	5	11	0	0	16	-		40
% Buses and Single-Unit Trucks	0%	0%	0%	0%	0%	0%	-		0%	7.2%	3.3%	0%	0%	3.7%	-		3.3%
Bicycles on Road	0	0	0	0	1	1	-		1	0	0	0	0	1	-		2
% Bicycles on Road	0%	0%	0%	0%	100%	33.3%	-		16.7%	0%	0%	0%	0%	0.2%	-		0.2%
Pedestrians	-	-	-	-	-	-	2		-	-	-	-	-	-	0		-
% Pedestrians	-	-	-	-	-	-	100%		-	-	-	-	-	-	-		-
Bicycles on Crosswalk	-	-	-	-	-	-	0		-	-	-	-	-	-	0		-
% Bicycles on Crosswalk	-	-	-	-	-	-	0%		-	-	-	-	-	-	-		-

* Pedestrians and Bicycles on Crosswalk. BL: Bear left, BR: Bear right, HL: Hard left, HR: Hard right, L: Left, R: Right, T: Thru, U: U-Turn

St. Vincent Street & Sykes Street - TMC

Wed Dec 5, 2018

PM Peak (4:15PM - 5:15PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 597860, Location: 44.596507, -80.58429



Provided by: Paradigm Transportation Solutions Limited

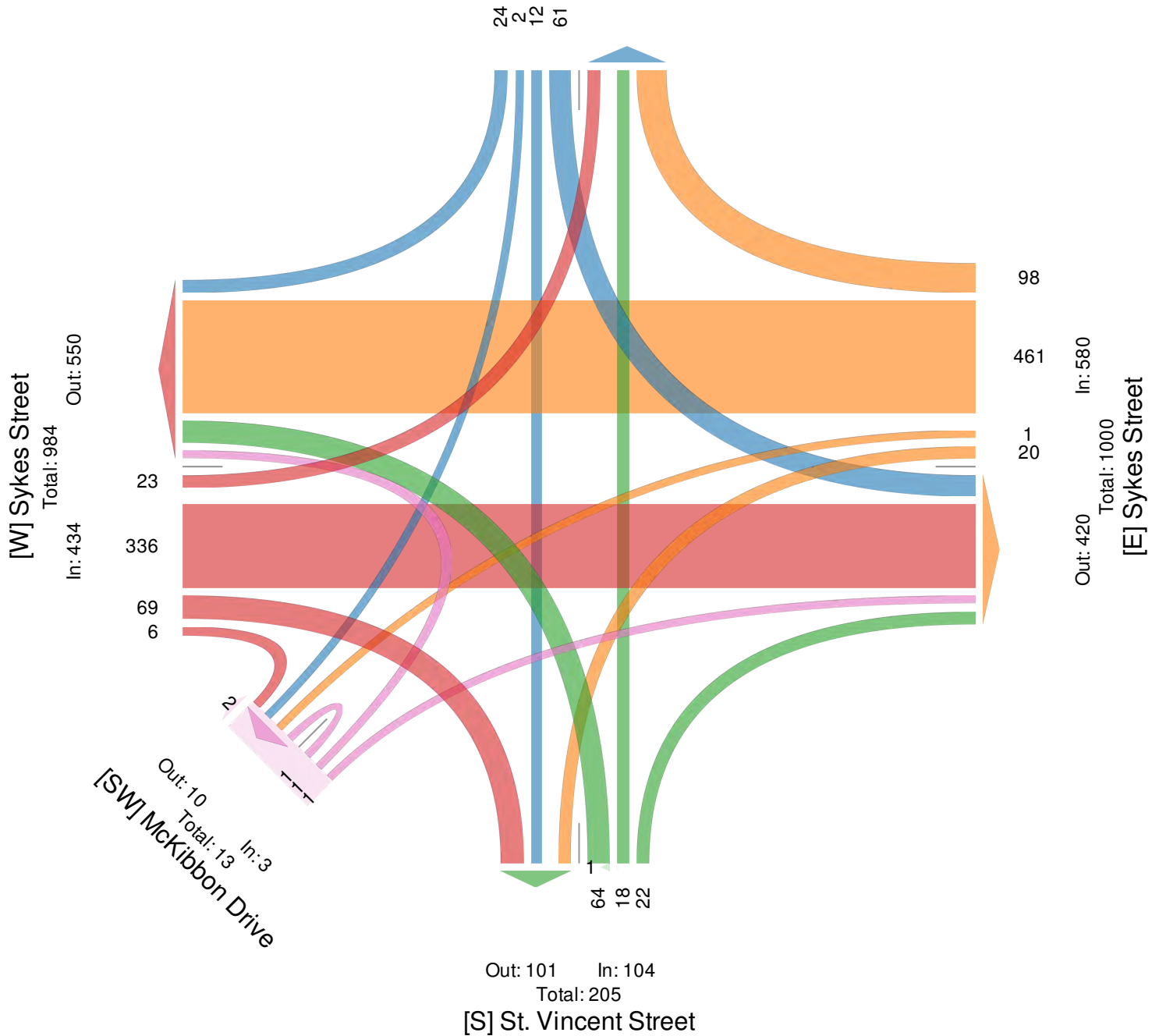
22 King Street South, Suite 300,
Waterloo, ON, N2J 1N8, CA

[N] St. Vincent Street

Total: 238

In: 99 Out: 139

24
2
12
61



Appendix B: Existing Operations

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - AM
337 Sykes Road

Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations		W			W	W		W	W	W	W	
Traffic Volume (vph)	6	0	1	100	51	24	57	53	40	19	325	103
Future Volume (vph)	6	0	1	100	51	24	57	53	40	19	325	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Flpb, ped/bikes		0.98			1.00	0.90		1.00		1.00	0.98	
Flpb, ped/bikes		1.00			1.00	1.00		0.98		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.96	
Flt Protected		0.96			0.97	1.00		0.98		0.95	1.00	
Satd. Flow (prot)		1741			1823	1445		1740		1789	1777	
Flt Permitted		1.00			0.48	1.00		0.81		0.40	1.00	
Satd. Flow (perm)		1818			907	1445		1428		763	1777	
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)	7	0	1	109	55	26	62	58	43	21	353	112
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	164	6	0	163	0	21	467	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA	pm+pt	NA		
Protected Phases	7				4			3	2	6		
Permitted Phases	7	7		4		4	3		6			
Actuated Green, G (s)		0.9			23.0	23.0		16.6		33.6	31.1	
Effective Green, g (s)		0.9			23.0	23.0		16.6		33.6	31.1	
Actuated g/C Ratio		0.01			0.22	0.22		0.16		0.32	0.30	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		15			201	320		228		272	533	
v/s Ratio Prot									c0.00	c0.26		
v/s Ratio Perm		c0.00			c0.18	0.00		c0.11		0.02		
v/c Ratio		0.53			0.82	0.02		0.71		0.08	0.88	
Uniform Delay, d1		51.1			38.3	31.5		41.3		24.3	34.4	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		31.9			21.9	0.0		10.2		0.1	14.9	
Delay (s)		83.0			60.1	31.5		51.4		24.5	49.3	
Level of Service		F			E	C		D		C	D	
Approach Delay (s)		83.0			56.2			51.4			48.3	
Approach LOS		F			E			D			D	
Intersection Summary												
HCM 2000 Control Delay		46.1			HCM 2000 Level of Service			D				
HCM 2000 Volume to Capacity ratio		0.80										
Actuated Cycle Length (s)		103.6			Sum of lost time (s)			30.9				
Intersection Capacity Utilization		70.8%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	9	1	224	57
Future Volume (vph)	2	9	1	224	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.97	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1787	1826	
Flt Permitted			0.22	1.00	
Satd. Flow (perm)			408	1826	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	10	1	243	62
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	11	305	0
Confl. Peds. (#/hr)	10	10			
Turn Type	pm+pt	pm+pt	NA		
Protected Phases	5	5	1		
Permitted Phases	1	1			
Actuated Green, G (s)			30.8	29.7	
Effective Green, g (s)			30.8	29.7	
Actuated g/C Ratio			0.30	0.29	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			135	523	
v/s Ratio Prot			0.00	0.17	
v/s Ratio Perm			0.02		
v/c Ratio			0.08	0.58	
Uniform Delay, d1			27.1	31.6	
Progression Factor			1.00	1.00	
Incremental Delay, d2			0.3	1.7	
Delay (s)			27.4	33.3	
Level of Service			C	C	
Approach Delay (s)				33.1	
Approach LOS				C	
Intersection Summary					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET
Lane Configurations		W				W	W		W	W	W	W
Traffic Volume (vph)	1	1	1	1	65	18	22	62	12	24	23	343
Future Volume (vph)	1	1	1	1	65	18	22	62	12	24	23	343
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0				7.3	7.3		7.3		3.0	7.3
Lane Util. Factor		1.00				1.00	1.00		1.00		1.00	1.00
Frpb, ped/bikes		0.97				1.00	1.00		1.00		1.00	1.00
Flpb, ped/bikes		1.00				1.00	1.00		1.00		1.00	1.00
Frt		0.93				1.00	0.85		0.97		1.00	0.97
Flt Protected		0.98				0.96	1.00		0.97		0.95	1.00
Satd. Flow (prot)		1669				1813	1601		1765		1789	1823
Flt Permitted		1.00				0.69	1.00		0.75		0.17	1.00
Satd. Flow (perm)		1711				1307	1601		1374		317	1823
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)	1	1	1	1	71	20	24	67	13	26	25	373
RTOR Reduction (vph)	0	0	0	0	0	0	21	0	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	0	91	3	0	106	0	25	456
Confl. Peds. (#/hr)			1	2								
Turn Type	Perm	Prot			Perm	NA	Perm	Perm	NA	pm+pt	NA	
Protected Phases		7				4			3		2	6
Permitted Phases	7	7			4		4	3			6	
Actuated Green, G (s)		0.8				9.1	9.1		9.6		35.6	33.4
Effective Green, g (s)		0.8				9.1	9.1		9.6		35.6	33.4
Actuated g/C Ratio		0.01				0.11	0.11		0.11		0.41	0.39
Clearance Time (s)		6.0				7.3	7.3		7.3		3.0	7.3
Vehicle Extension (s)		3.0				3.0	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)		15				138	169		153		168	708
v/s Ratio Prot											c0.00	0.25
v/s Ratio Perm		c0.00				c0.07	0.00		c0.08		0.06	
v/c Ratio		0.27				0.66	0.02		0.69		0.15	0.64
Uniform Delay, d1		42.3				37.0	34.4		36.8		17.5	21.5
Progression Factor		1.00				1.00	1.00		1.00		1.00	1.00
Incremental Delay, d2		9.3				10.8	0.0		12.7		0.4	2.0
Delay (s)		51.6				47.8	34.5		49.5		17.9	23.5
Level of Service		D				D	C		D		B	C
Approach Delay (s)		51.6				45.0			49.5			23.2
Approach LOS		D				D			D			C
Intersection Summary												
HCM 2000 Control Delay		32.8				HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio		0.77										
Actuated Cycle Length (s)		86.0				Sum of lost time (s)			30.9			
Intersection Capacity Utilization		64.3%				ICU Level of Service			C			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	70	6	20	1	470	100
Future Volume (vph)	70	6	20	1	470	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Frpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1834	
Flt Permitted				0.34	1.00	
Satd. Flow (perm)				644	1834	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	7	22	1	511	109
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	23	620	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type			pm+pt	pm+pt	NA	
Protected Phases			5	5	1	
Permitted Phases			1	1		
Actuated Green, G (s)				35.6	33.4	
Effective Green, g (s)				35.6	33.4	
Actuated g/C Ratio				0.41	0.39	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				295	712	
v/s Ratio Prot				0.00	c0.34	
v/s Ratio Perm				0.03		
v/c Ratio				0.08	0.87	
Uniform Delay, d1				15.6	24.3	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	11.3	
Delay (s)				15.7	35.6	
Level of Service				B	D	
Approach Delay (s)					34.9	
Approach LOS					C	
Intersection Summary						

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - AM (w/ improvements)
337 Sykes Road

Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations		W			W	W		W		W	W	
Traffic Volume (vph)	6	0	1	100	51	24	57	53	40	19	325	103
Future Volume (vph)	6	0	1	100	51	24	57	53	40	19	325	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Flpb, ped/bikes		0.99			1.00	0.94		1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.96	
Flt Protected		0.96			0.97	1.00		0.98		0.95	1.00	
Satd. Flow (prot)		1754			1823	1500		1759		1789	1789	
Flt Permitted		1.00			0.75	1.00		0.81		0.56	1.00	
Satd. Flow (perm)		1831			1418	1500		1443		1062	1789	
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)	7	0	1	109	55	26	62	58	43	21	353	112
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	164	6	0	163	0	21	467	0
Confl. Peds. (#/hr)			10			38		38				12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.6			12.6	12.6		12.6		20.6	19.8	
Effective Green, g (s)		0.6			12.6	12.6		12.6		20.6	19.8	
Actuated g/C Ratio		0.01			0.22	0.22		0.22		0.36	0.34	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		19			311	329		316		391	617	
v/s Ratio Prot										c0.00	c0.26	
v/s Ratio Perm		c0.00			c0.12	0.00		0.11		0.02		
v/c Ratio		0.42			0.53	0.02		0.52		0.05	0.76	
Uniform Delay, d1		28.2			19.8	17.5		19.7		11.9	16.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		14.4			1.6	0.0		1.4		0.1	5.3	
Delay (s)		42.6			21.4	17.6		21.1		12.0	22.0	
Level of Service		D			C	B		C		B	C	
Approach Delay (s)		42.6			20.9			21.1			21.5	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			19.8								B	
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			57.4			Sum of lost time (s)			23.6			
Intersection Capacity Utilization			70.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - AM (w/ improvements)
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	9	1	224	57
Future Volume (vph)	2	9	1	224	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.97	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1785	1826	
Flt Permitted			0.35	1.00	
Satd. Flow (perm)			654	1826	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	10	1	243	62
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	11	305	0
Confl. Peds. (#/hr)	10	10			
Turn Type		pm+pt	pm+pt	NA	
Protected Phases		5	5	1	
Permitted Phases		1	1		
Actuated Green, G (s)			20.6	19.8	
Effective Green, g (s)			20.6	19.8	
Actuated g/C Ratio			0.36	0.34	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			250	629	
v/s Ratio Prot			0.00	0.17	
v/s Ratio Perm			0.02		
v/c Ratio			0.04	0.48	
Uniform Delay, d1			12.2	14.8	
Progression Factor			1.00	1.00	
Incremental Delay, d2			0.1	0.6	
Delay (s)			12.2	15.4	
Level of Service			B	B	
Approach Delay (s)				15.3	
Approach LOS				B	
Intersection Summary					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - PM (w/ improvements)
337 Sykes Road

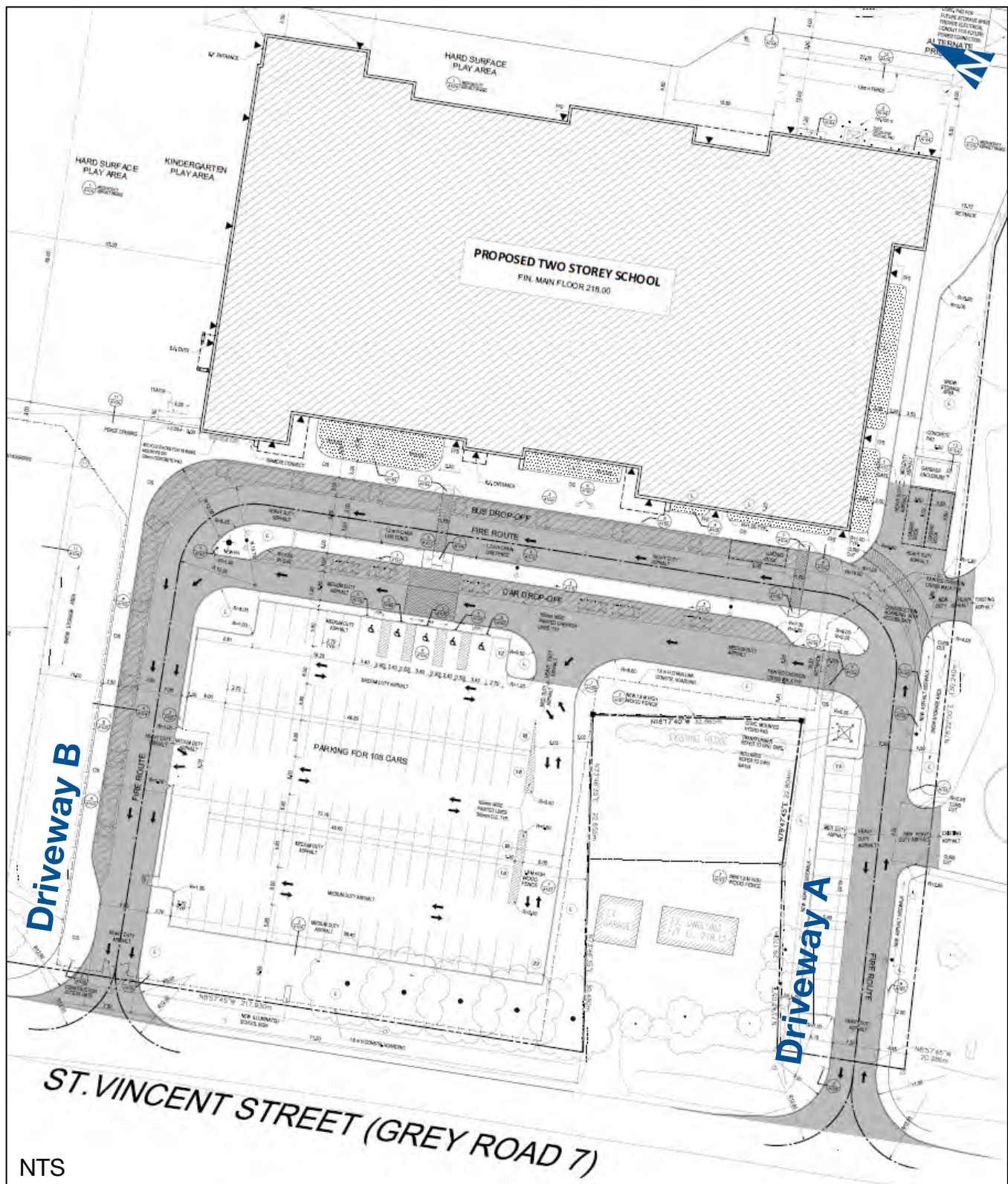
Movement	EBL2	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET
Lane Configurations		W				W	W		W	W	W	W
Traffic Volume (vph)	1	1	1	1	65	18	22	62	12	24	23	343
Future Volume (vph)	1	1	1	1	65	18	22	62	12	24	23	343
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0				7.3	7.3		7.3		3.0	7.3
Lane Util. Factor		1.00				1.00	1.00		1.00		1.00	1.00
Frpb, ped/bikes		0.98				1.00	1.00		1.00		1.00	1.00
Flpb, ped/bikes		1.00				1.00	1.00		1.00		1.00	1.00
Frt		0.93				1.00	0.85		0.97		1.00	0.97
Flt Protected		0.98				0.96	1.00		0.97		0.95	1.00
Satd. Flow (prot)		1677				1813	1601		1765		1789	1824
Flt Permitted		1.00				0.70	1.00		0.75		0.28	1.00
Satd. Flow (perm)		1719				1325	1601		1374		528	1824
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)	1	1	1	1	71	20	24	67	13	26	25	373
RTOR Reduction (vph)	0	0	0	0	0	0	21	0	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	0	91	3	0	106	0	25	456
Confl. Peds. (#/hr)			1	2								
Turn Type	Perm	Prot			Perm	NA	Perm	Perm	NA	pm+pt	NA	
Protected Phases		7				4			4		2	6
Permitted Phases	7	7			4		4	4			6	
Actuated Green, G (s)		0.7				8.1	8.1		8.1		30.2	29.3
Effective Green, g (s)		0.7				8.1	8.1		8.1		30.2	29.3
Actuated g/C Ratio		0.01				0.13	0.13		0.13		0.48	0.47
Clearance Time (s)		6.0				7.3	7.3		7.3		3.0	7.3
Vehicle Extension (s)		3.0				3.0	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)		19				171	207		177		272	853
v/s Ratio Prot											c0.00	0.25
v/s Ratio Perm		c0.00				0.07	0.00		c0.08		0.04	
v/c Ratio		0.21				0.53	0.02		0.60		0.09	0.53
Uniform Delay, d1		30.7				25.5	23.8		25.7		9.4	11.8
Progression Factor		1.00				1.00	1.00		1.00		1.00	1.00
Incremental Delay, d2		5.5				3.2	0.0		5.4		0.1	0.6
Delay (s)		36.1				28.6	23.8		31.1		9.5	12.5
Level of Service		D				C	C		C		A	B
Approach Delay (s)		36.1				27.6			31.1			12.3
Approach LOS		D				C			C			B
Intersection Summary												
HCM 2000 Control Delay		17.0				HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		62.6				Sum of lost time (s)			23.6			
Intersection Capacity Utilization		64.3%				ICU Level of Service			C			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Existing - PM (w/ improvements)
337 Sykes Road

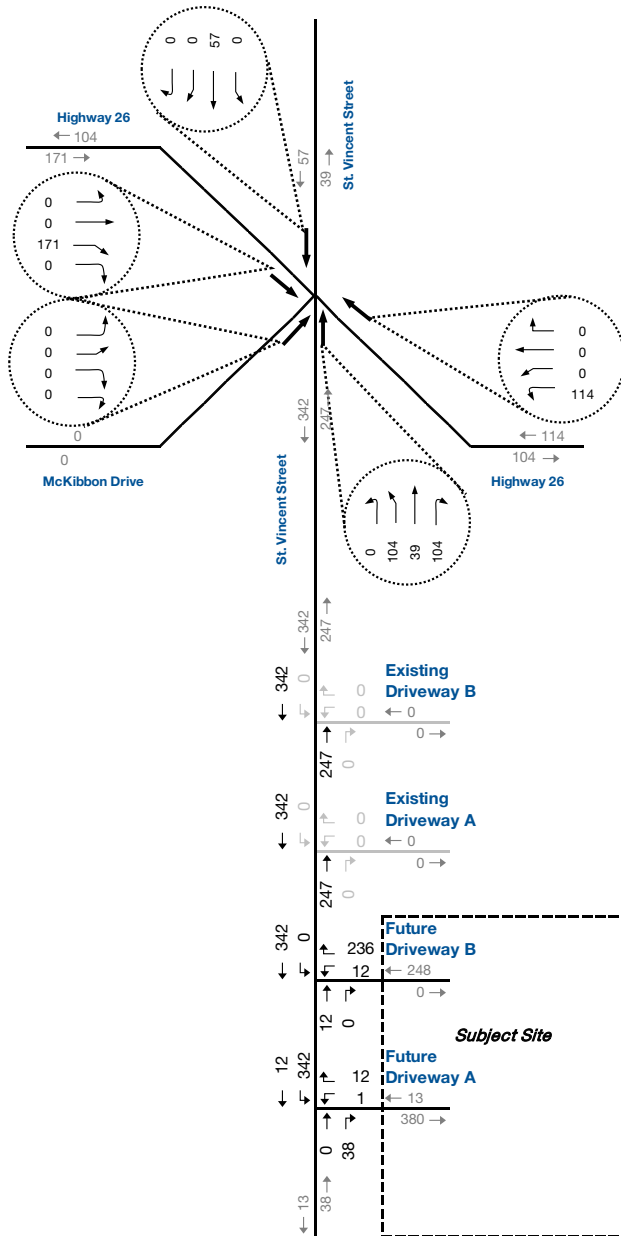
Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	W
Traffic Volume (vph)	70	6	20	1	470	100
Future Volume (vph)	70	6	20	1	470	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Frpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1787	1834	
Flt Permitted				0.43	1.00	
Satd. Flow (perm)				812	1834	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	7	22	1	511	109
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	23	620	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type			pm+pt	pm+pt	NA	
Protected Phases			5	5	1	
Permitted Phases			1	1		
Actuated Green, G (s)				30.2	29.3	
Effective Green, g (s)				30.2	29.3	
Actuated g/C Ratio				0.48	0.47	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				405	858	
v/s Ratio Prot				0.00	c0.34	
v/s Ratio Perm				0.03		
v/c Ratio				0.06	0.72	
Uniform Delay, d1				8.6	13.4	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	3.0	
Delay (s)				8.7	16.4	
Level of Service				A	B	
Approach Delay (s)					16.1	
Approach LOS					B	
Intersection Summary						

Appendix C: Background Development

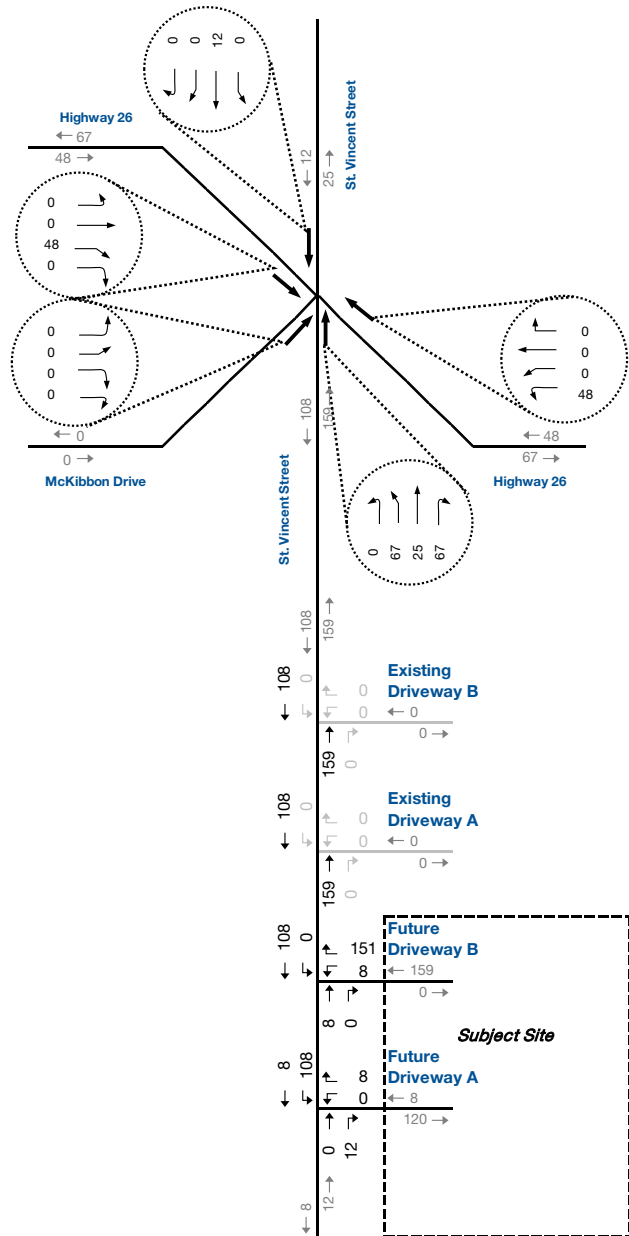




AM Peak Hour



PM Peak Hour



NTS



Site Generated Traffic Forecasts

Georgian Bay Community School TIS
180295

Figure 3.2

4.4 Future Total Traffic Forecasts

As the new Georgian Bay Community School is being designed as an amalgamation of three existing schools, the trips currently generated by both active schools within and near the study area need to be accounted for in the future total traffic forecasts. Once the new school is opened and the existing schools closed, traffic will reroute to the new school. As the trip generation estimates contained in **Section 3.2** reflect a standalone school building, the existing trips to and from the nearby schools should be removed to prevent double counting.

The calculation of trips to and from St. Vincent Euphrasia Elementary School immediately adjacent to the new school, with approximately 360 students, has been determined based on the traffic volumes observed at the school's two existing driveways. As illustrated in **Figure 2.4** the school appears to generate 243 trips in the AM peak hour and 127 trips in the PM peak hour.

The calculation of trips to and from the existing Georgian Bay Community School approximately 500 metres north of Sykes Street South on St. Vincent Street have been determined based on the school's existing population and trip generation rates contained in the ITE Trip Generation Manual. The student population at the school was confirmed by school administration in March 2019. The existing school accommodates approximately 600 students between Grades 4 and 12, comprising 126 Grade 4 and 5 students, 178 Grade 6 to 8 students, and 300 Grade 9 to 12 students. **Table 4.5** summarizes the trip generation estimates for the existing Georgian Bay Community School and indicates the school generates approximately 372 trips in the AM peak hour, and 159 trips in the PM peak hour.

TABLE 4.5: EXISTING GEORGIAN BAY SCHOOL TRIP GENERATION

ITE Land Use Code	Number of	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 520 (Elementary School)	126	0.65	44	38	82	0.34	19	24	43
LUC 522 (Middle School)	178	0.70	69	56	125	0.35	29	33	62
LUC 530 (High School)	300	0.55	112	53	165	0.33	17	37	54
Total Trip Generation			225	147	372		65	94	159

The distribution of these existing traffic volumes within the study area has been derived based on a combination of the trip distribution summarized in **Table 3.3**, a review of the catchment areas, and the most logical routing based on the roadway network near each school.

Table 4.6 summarizes the net trip generation of the new school, and indicates the new school is expected to generate 26 new trips in the AM peak hour and one new trip in the PM peak hour when compared to the other two school in/near the study area.



TABLE 4.6: NET TRIP GENERATION

Trip Generator	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Georgian Bay Community School (Proposed)	380	261	641	120	167	287
St. Vincent Euphrasia Elementary School (Existing)	133	110	243	60	67	127
Georgian Bay Community School (Existing)	225	147	372	65	94	159
Net Trip Generation (Proposed Minus Existing)	22	4	26	-5	6	1

The future total traffic forecasts have been derived through the addition of the site generated traffic (**Figure 3.2**) to the background traffic forecast for each respective horizon year, and the removal (subtraction) of the trips currently accessing both schools. **Appendix H** illustrates the traffic volumes removed from the study area road network for the two schools.

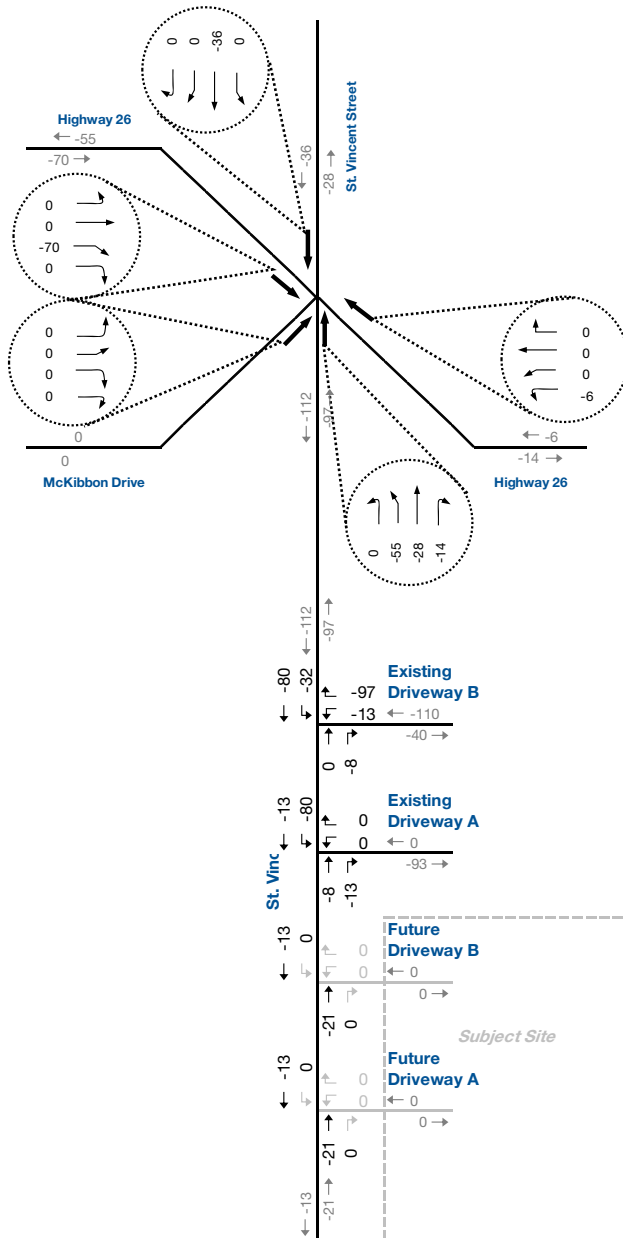
The future total traffic forecasts are illustrated in the following figures:

- ▶ **Figure 4.4:** 2020 Future Total Forecasts;
- ▶ **Figure 4.5:** 2025 Future Total Forecasts; and
- ▶ **Figure 4.6:** 2030 Future Total Forecasts.

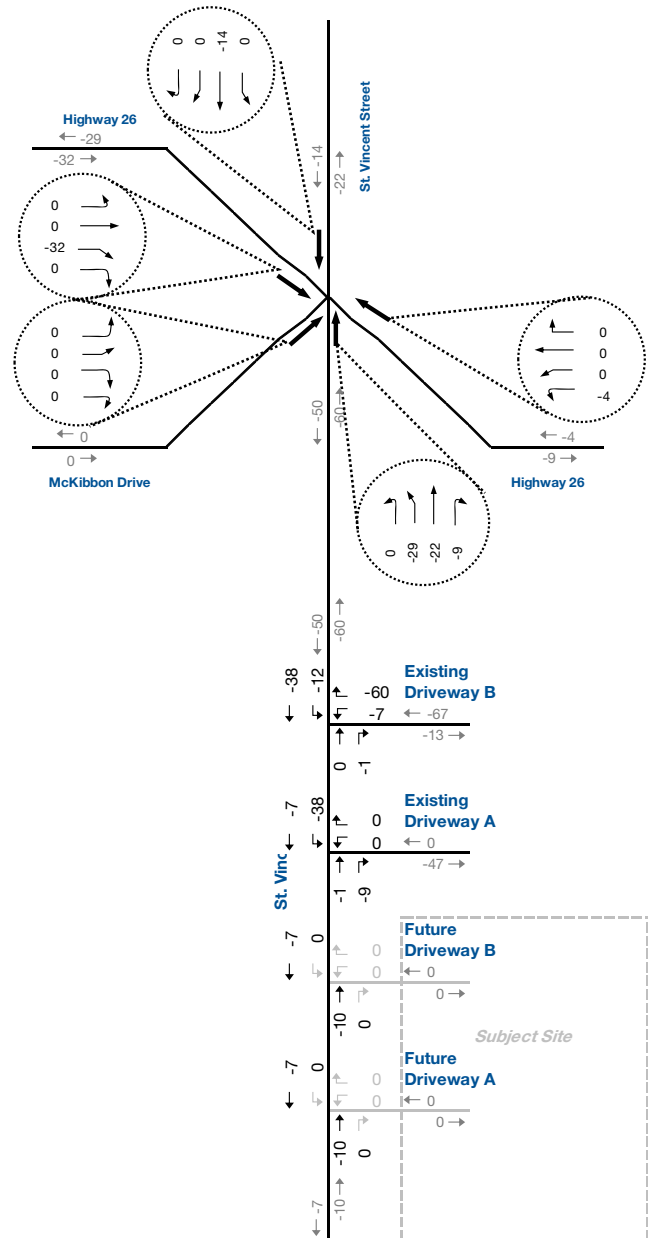




AM Peak Hour



PM Peak Hour



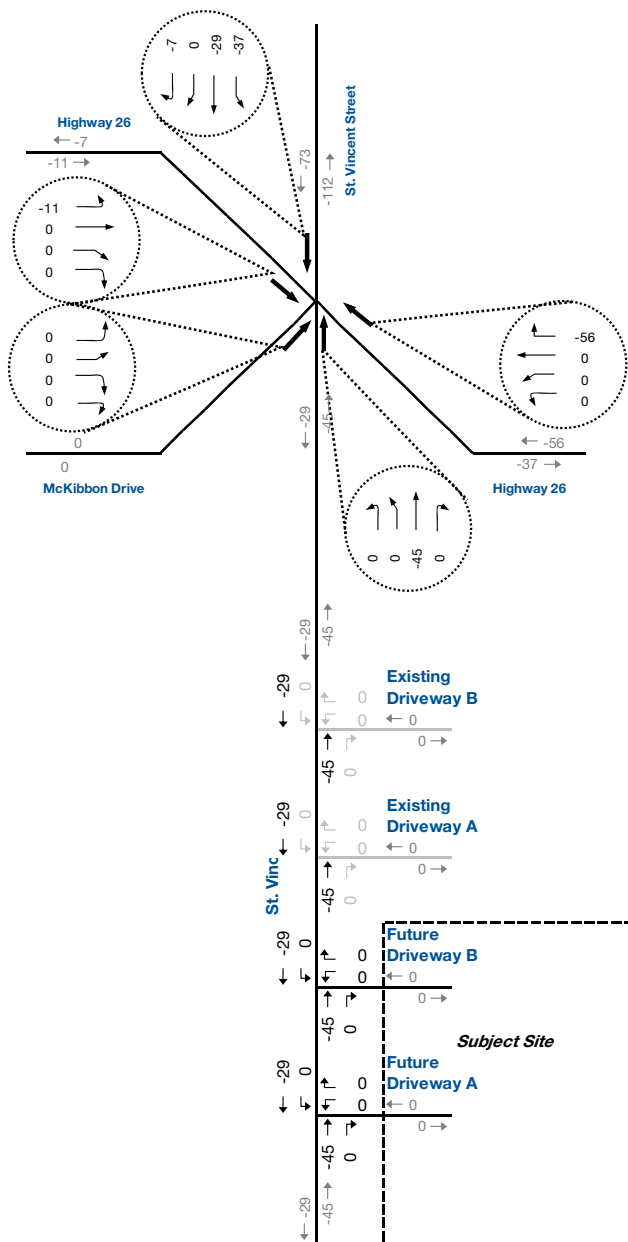
NTS



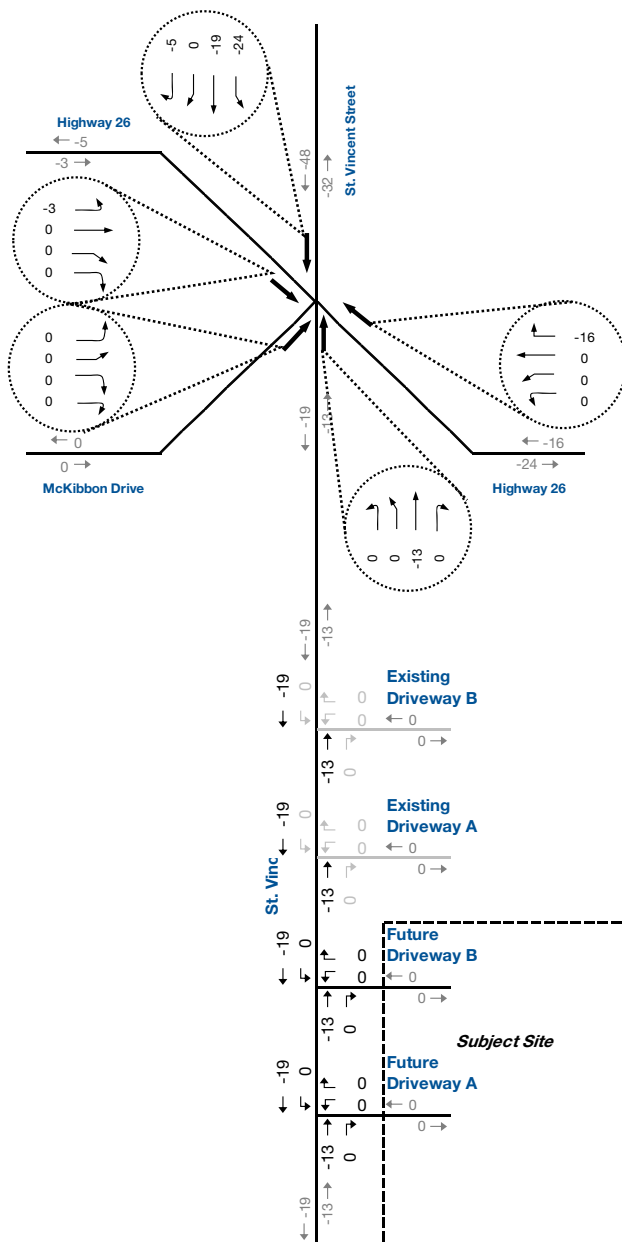
Existing St. Vincent-Euphrasia Elementary School Trips



AM Peak Hour



PM Peak Hour



NTS



Existing Georgian Bay Community School Trips

Appendix D: Future Background Operations

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2022 - AM
337 Sykes Road

												
Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations												
Traffic Volume (vph)	6	0	1	157	21	116	25	49	36	10	352	213
Future Volume (vph)	6	0	1	157	21	116	25	49	36	10	352	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.92		1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.94	
Flt Protected		0.96			0.96	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1749			1804	1478		1762		1789	1730	
Flt Permitted		1.00			0.74	1.00		0.88		0.59	1.00	
Satd. Flow (perm)		1825			1390	1478		1559		1116	1730	
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)	7	0	1	171	23	126	27	53	39	11	383	232
RTOR Reduction (vph)	0	0	0	0	0	100	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	194	26	0	119	0	11	617	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.8			15.5	15.5		15.5		32.1	31.1	
Effective Green, g (s)		0.8			15.5	15.5		15.5		32.1	31.1	
Actuated g/C Ratio		0.01			0.20	0.20		0.20		0.42	0.41	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		19			282	299		316		477	704	
v/s Ratio Prot										0.00	c0.36	
v/s Ratio Perm		c0.00			c0.14	0.02		0.08		0.01		
v/c Ratio		0.42			0.69	0.09		0.38		0.02	0.88	
Uniform Delay, d1		37.6			28.2	24.7		26.3		12.9	20.9	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		14.4			6.8	0.1		0.8		0.0	11.8	
Delay (s)		51.9			35.0	24.8		27.0		12.9	32.7	
Level of Service		D			D	C		C		B	C	
Approach Delay (s)		51.9			31.0			27.0			32.4	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			26.6		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			76.4		Sum of lost time (s)					23.6		
Intersection Capacity Utilization			83.0%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2022 - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	118	1	243	6
Future Volume (vph)	2	118	1	243	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	1.00	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1789	1876	
Flt Permitted			0.19	1.00	
Satd. Flow (perm)			352	1876	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	128	1	264	7
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	129	271	0
Confl. Peds. (#/hr)	10	10			
Turn Type		pm+pt	pm+pt	NA	
Protected Phases		5	5	1	
Permitted Phases		1	1		
Actuated Green, G (s)			39.5	35.5	
Effective Green, g (s)			39.5	35.5	
Actuated g/C Ratio			0.52	0.46	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			283	871	
v/s Ratio Prot			c0.03	0.14	
v/s Ratio Perm			0.20		
v/c Ratio			0.46	0.31	
Uniform Delay, d1			12.5	12.8	
Progression Factor			1.00	1.00	
Incremental Delay, d2			1.2	0.2	
Delay (s)			13.7	13.0	
Level of Service			B	B	
Approach Delay (s)				13.2	
Approach LOS				B	
Intersection Summary					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2022 - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET
Lane Configurations		W			W	W		W			W	W
Traffic Volume (vph)	1	1	1	71	20	24	67	13	2	26	25	371
Future Volume (vph)	1	1	1	71	20	24	67	13	2	26	25	371
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Lane Util. Factor		1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00			1.00	1.00
Frt		0.95			1.00	0.85		0.97			1.00	0.97
Flt Protected		0.97			0.96	1.00		0.97			0.95	1.00
Satd. Flow (prot)		1724			1813	1601		1763			1789	1823
Flt Permitted		1.00			0.75	1.00		0.75			0.22	1.00
Satd. Flow (perm)		1782			1407	1601		1368			422	1823
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)	1	1	1	77	22	26	73	14	2	28	27	403
RTOR Reduction (vph)	0	0	0	0	0	23	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	99	3	0	117	0	0	27	493
Confl. Peds. (#/hr)			1									
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4			2	6
Permitted Phases	7	7		4		4	4				6	
Actuated Green, G (s)		0.7			8.5	8.5		8.5			31.8	29.7
Effective Green, g (s)		0.7			8.5	8.5		8.5			31.8	29.7
Actuated g/C Ratio		0.01			0.13	0.13		0.13			0.49	0.46
Clearance Time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		19			185	210		180			252	839
v/s Ratio Prot											c0.00	0.27
v/s Ratio Perm		c0.00			0.07	0.00		c0.09			0.05	
v/c Ratio		0.16			0.54	0.02		0.65			0.11	0.59
Uniform Delay, d1		31.6			26.2	24.4		26.6			9.9	12.9
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		3.9			3.0	0.0		8.1			0.2	1.1
Delay (s)		35.5			29.1	24.4		34.7			10.1	13.9
Level of Service		D			C	C		C			B	B
Approach Delay (s)		35.5			28.1			34.7				13.7
Approach LOS		D			C			C				B
Intersection Summary												
HCM 2000 Control Delay		19.6			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		64.5			Sum of lost time (s)			23.6				
Intersection Capacity Utilization		67.5%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2022 - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	76	6	22	1	509	108
Future Volume (vph)	76	6	22	1	509	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1834	
Flt Permitted				0.39	1.00	
Satd. Flow (perm)				734	1834	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	7	24	1	553	117
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	25	670	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type		custom		pm+pt	NA	
Protected Phases				5	1	
Permitted Phases			5	1		
Actuated Green, G (s)				31.6	29.6	
Effective Green, g (s)				31.6	29.6	
Actuated g/C Ratio				0.49	0.46	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				392	841	
v/s Ratio Prot				0.00	c0.37	
v/s Ratio Perm				0.03		
v/c Ratio				0.06	0.80	
Uniform Delay, d1				8.8	14.9	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	5.3	
Delay (s)				8.8	20.2	
Level of Service				A	C	
Approach Delay (s)					19.8	
Approach LOS					B	
Intersection Summary						

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2027 - AM
337 Sykes Road

Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations												
Traffic Volume (vph)	6	0	1	166	26	119	30	54	40	12	381	222
Future Volume (vph)	6	0	1	166	26	119	30	54	40	12	381	222
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Flpb, ped/bikes		0.99			1.00	0.92		1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.94	
Flt Protected		0.96			0.96	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1749			1805	1477		1762		1789	1734	
Flt Permitted		1.00			0.72	1.00		0.86		0.58	1.00	
Satd. Flow (perm)		1825			1356	1477		1532		1089	1734	
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)	7	0	1	180	28	129	33	59	43	13	414	241
RTOR Reduction (vph)	0	0	0	0	0	102	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	208	27	0	135	0	13	657	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	7				4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.8			16.2	16.2		16.2		32.1	31.1	
Effective Green, g (s)		0.8			16.2	16.2		16.2		32.1	31.1	
Actuated g/C Ratio		0.01			0.21	0.21		0.21		0.42	0.40	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		18			285	310		322		463	700	
v/s Ratio Prot										0.00	c0.38	
v/s Ratio Perm		c0.00			c0.15	0.02		0.09		0.01		
v/c Ratio		0.44			0.73	0.09		0.42		0.03	0.94	
Uniform Delay, d1		37.9			28.4	24.5		26.3		13.2	22.0	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		16.5			9.0	0.1		0.9		0.0	20.2	
Delay (s)		54.4			37.4	24.6		27.2		13.2	42.2	
Level of Service		D			D	C		C		B	D	
Approach Delay (s)		54.4			32.5			27.2			41.6	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			31.1		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			77.0		Sum of lost time (s)					23.6		
Intersection Capacity Utilization			85.3%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2027 - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	119	1	263	11
Future Volume (vph)	2	119	1	263	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.99	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1789	1872	
Flt Permitted			0.15	1.00	
Satd. Flow (perm)			276	1872	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	129	1	286	12
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	130	298	0
Confl. Peds. (#/hr)	10	10			
Turn Type		pm+pt	pm+pt	NA	
Protected Phases		5	5	1	
Permitted Phases		1	1		
Actuated Green, G (s)			39.4	35.4	
Effective Green, g (s)			39.4	35.4	
Actuated g/C Ratio			0.51	0.46	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			245	860	
v/s Ratio Prot			c0.04	0.16	
v/s Ratio Perm			0.23		
v/c Ratio			0.53	0.35	
Uniform Delay, d1			13.7	13.4	
Progression Factor			1.00	1.00	
Incremental Delay, d2			2.2	0.2	
Delay (s)			15.9	13.6	
Level of Service			B	B	
Approach Delay (s)				14.3	
Approach LOS				B	
Intersection Summary					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2027 - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET
Lane Configurations		W			W	W		W			W	W
Traffic Volume (vph)	1	1	1	76	22	26	73	14	2	29	27	402
Future Volume (vph)	1	1	1	76	22	26	73	14	2	29	27	402
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Lane Util. Factor		1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00			1.00	1.00
Frt		0.95			1.00	0.85		0.96			1.00	0.97
Flt Protected		0.97			0.96	1.00		0.97			0.95	1.00
Satd. Flow (prot)		1724			1813	1601		1762			1789	1824
Flt Permitted		1.00			0.75	1.00		0.75			0.20	1.00
Satd. Flow (perm)		1781			1405	1601		1361			375	1824
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)	1	1	1	83	24	28	79	15	2	32	29	437
RTOR Reduction (vph)	0	0	0	0	0	24	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	107	4	0	128	0	0	29	533
Confl. Peds. (#/hr)		1										
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	7				4			4		2	6	
Permitted Phases	7	7		4		4	4				6	
Actuated Green, G (s)		0.8			12.3	12.3		12.3			41.1	38.9
Effective Green, g (s)		0.8			12.3	12.3		12.3			41.1	38.9
Actuated g/C Ratio		0.01			0.16	0.16		0.16			0.53	0.50
Clearance Time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		18			222	253		215			238	912
v/s Ratio Prot											c0.00	0.29
v/s Ratio Perm		c0.00			0.08	0.00		c0.09			0.06	
v/c Ratio		0.17			0.48	0.02		0.60			0.12	0.58
Uniform Delay, d1		38.2			29.8	27.6		30.4			11.2	13.7
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		4.3			1.6	0.0		4.4			0.2	1.0
Delay (s)		42.5			31.5	27.7		34.8			11.4	14.7
Level of Service		D			C	C		C			B	B
Approach Delay (s)		42.5			30.7			34.8				14.5
Approach LOS		D			C			C				B
Intersection Summary												
HCM 2000 Control Delay		20.4			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.71										
Actuated Cycle Length (s)		77.8			Sum of lost time (s)			23.6				
Intersection Capacity Utilization		70.8%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2027 - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	82	6	24	1	551	117
Future Volume (vph)	82	6	24	1	551	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1834	
Flt Permitted				0.36	1.00	
Satd. Flow (perm)				672	1834	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	7	26	1	599	127
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	27	726	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type		custom		pm+pt	NA	
Protected Phases				5	1	
Permitted Phases			5	1		
Actuated Green, G (s)				41.1	38.9	
Effective Green, g (s)				41.1	38.9	
Actuated g/C Ratio				0.53	0.50	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				386	917	
v/s Ratio Prot				0.00	c0.40	
v/s Ratio Perm				0.03		
v/c Ratio				0.07	0.79	
Uniform Delay, d1				9.3	16.1	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	4.7	
Delay (s)				9.4	20.8	
Level of Service				A	C	
Approach Delay (s)					20.4	
Approach LOS					C	
Intersection Summary						

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2032 - AM
337 Sykes Road

												
Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations												
Traffic Volume (vph)	6	0	1	178	32	122	37	61	44	14	421	234
Future Volume (vph)	6	0	1	178	32	122	37	61	44	14	421	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.91		1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.95	
Flt Protected		0.96			0.96	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1744			1807	1458		1759		1789	1732	
Flt Permitted		1.00			0.66	1.00		0.76		0.56	1.00	
Satd. Flow (perm)		1821			1237	1458		1347		1053	1732	
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)	7	0	1	193	35	133	40	66	48	15	458	254
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	228	29	0	154	0	15	714	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.9			20.1	20.1		20.1		41.3	40.2	
Effective Green, g (s)		0.9			20.1	20.1		20.1		41.3	40.2	
Actuated g/C Ratio		0.01			0.22	0.22		0.22		0.45	0.43	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		17			268	316		292		477	751	
v/s Ratio Prot										0.00	c0.41	
v/s Ratio Perm		c0.00			c0.18	0.02		0.11		0.01		
v/c Ratio		0.47			0.85	0.09		0.53		0.03	0.95	
Uniform Delay, d1		45.7			34.9	29.0		32.1		14.4	25.3	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		19.2			21.9	0.1		1.7		0.0	21.6	
Delay (s)		64.8			56.8	29.1		33.8		14.4	46.9	
Level of Service		E			E	C		C		B	D	
Approach Delay (s)		64.8			46.6			33.8			46.2	
Approach LOS		E			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			36.8		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			92.7		Sum of lost time (s)					23.6		
Intersection Capacity Utilization			88.5%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2032 - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	120	1	290	18
Future Volume (vph)	2	120	1	290	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.99	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1789	1867	
Flt Permitted			0.12	1.00	
Satd. Flow (perm)			223	1867	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	130	1	315	20
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	131	335	0
Confl. Peds. (#/hr)	10	10			
Turn Type		pm+pt	pm+pt	NA	
Protected Phases		5	5	1	
Permitted Phases		1	1		
Actuated Green, G (s)			51.1	47.0	
Effective Green, g (s)			51.1	47.0	
Actuated g/C Ratio			0.55	0.51	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			256	946	
v/s Ratio Prot			c0.04	0.18	
v/s Ratio Perm			0.24		
v/c Ratio			0.51	0.35	
Uniform Delay, d1			16.1	13.7	
Progression Factor			1.00	1.00	
Incremental Delay, d2			1.7	0.2	
Delay (s)			17.8	14.0	
Level of Service			B	B	
Approach Delay (s)				15.0	
Approach LOS				B	
Intersection Summary					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2032 - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET
Lane Configurations		W			W	W		W			W	W
Traffic Volume (vph)	1	1	1	84	24	29	80	16	2	32	30	443
Future Volume (vph)	1	1	1	84	24	29	80	16	2	32	30	443
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Lane Util. Factor		1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00			1.00	1.00
Frt		0.95			1.00	0.85		0.96			1.00	0.97
Flt Protected		0.97			0.96	1.00		0.97			0.95	1.00
Satd. Flow (prot)		1723			1813	1601		1762			1789	1824
Flt Permitted		1.00			0.73	1.00		0.74			0.14	1.00
Satd. Flow (perm)		1781			1369	1601		1352			259	1824
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)	1	1	1	91	26	32	87	17	2	35	33	482
RTOR Reduction (vph)	0	0	0	0	0	27	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	117	5	0	141	0	0	33	588
Confl. Peds. (#/hr)		1										
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA			pm+pt	NA
Protected Phases	7				4			4			2	6
Permitted Phases	7	7		4		4	4				6	
Actuated Green, G (s)		0.8			13.1	13.1		13.1			41.7	39.5
Effective Green, g (s)		0.8			13.1	13.1		13.1			41.7	39.5
Actuated g/C Ratio		0.01			0.17	0.17		0.17			0.53	0.50
Clearance Time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		17			226	264		223			178	909
v/s Ratio Prot											c0.01	0.32
v/s Ratio Perm		c0.00			0.09	0.00		c0.10			0.09	
v/c Ratio		0.18			0.52	0.02		0.63			0.19	0.65
Uniform Delay, d1		38.9			30.2	27.7		30.8			13.0	14.7
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		4.9			2.0	0.0		5.7			0.5	1.6
Delay (s)		43.8			32.2	27.7		36.5			13.5	16.3
Level of Service		D			C	C		D			B	B
Approach Delay (s)		43.8			31.2			36.5				16.1
Approach LOS		D			C			D				B
Intersection Summary												
HCM 2000 Control Delay		24.1			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.78										
Actuated Cycle Length (s)		79.2			Sum of lost time (s)			23.6				
Intersection Capacity Utilization		75.2%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Background 2032 - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	91	6	26	1	608	129
Future Volume (vph)	91	6	26	1	608	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1834	
Flt Permitted				0.31	1.00	
Satd. Flow (perm)				581	1834	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	7	28	1	661	140
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	29	801	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type			custom	pm+pt	NA	
Protected Phases				5	1	
Permitted Phases			5	1		
Actuated Green, G (s)				41.7	39.5	
Effective Green, g (s)				41.7	39.5	
Actuated g/C Ratio				0.53	0.50	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				339	914	
v/s Ratio Prot				0.00	c0.44	
v/s Ratio Perm				0.04		
v/c Ratio				0.09	0.88	
Uniform Delay, d1				10.0	17.7	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	9.5	
Delay (s)				10.1	27.1	
Level of Service				B	C	
Approach Delay (s)					26.5	
Approach LOS					C	
Intersection Summary						

Appendix E: Future Total Operations

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2022 - AM
337 Sykes Road

												
Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations												
Traffic Volume (vph)	6	0	1	159	23	116	28	51	36	10	355	214
Future Volume (vph)	6	0	1	159	23	116	28	51	36	10	355	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.92		1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.94	
Flt Protected		0.96			0.96	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1749			1805	1478		1763		1789	1730	
Flt Permitted		1.00			0.74	1.00		0.86		0.59	1.00	
Satd. Flow (perm)		1825			1385	1478		1542		1108	1730	
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)	7	0	1	173	25	126	30	55	39	11	386	233
RTOR Reduction (vph)	0	0	0	0	0	100	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	198	26	0	124	0	11	621	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.8			15.6	15.6		15.6		32.1	31.1	
Effective Green, g (s)		0.8			15.6	15.6		15.6		32.1	31.1	
Actuated g/C Ratio		0.01			0.20	0.20		0.20		0.42	0.41	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		19			282	301		314		473	703	
v/s Ratio Prot										0.00	c0.36	
v/s Ratio Perm		c0.00			c0.14	0.02		0.08		0.01		
v/c Ratio		0.42			0.70	0.09		0.39		0.02	0.88	
Uniform Delay, d1		37.6			28.3	24.7		26.4		13.0	21.0	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		14.4			7.7	0.1		0.8		0.0	12.6	
Delay (s)		52.0			36.0	24.8		27.2		13.0	33.6	
Level of Service		D			D	C		C		B	C	
Approach Delay (s)		52.0			31.6			27.2			33.3	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			27.1		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			76.5		Sum of lost time (s)					23.6		
Intersection Capacity Utilization			83.2%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2022 - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	118	1	247	10
Future Volume (vph)	2	118	1	247	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.99	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1789	1872	
Flt Permitted			0.18	1.00	
Satd. Flow (perm)			344	1872	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	128	1	268	11
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	129	279	0
Confl. Peds. (#/hr)	10	10			
Turn Type	pm+pt	pm+pt		NA	
Protected Phases	5	5		1	
Permitted Phases	1	1			
Actuated Green, G (s)			39.5	35.5	
Effective Green, g (s)			39.5	35.5	
Actuated g/C Ratio			0.52	0.46	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			279	868	
v/s Ratio Prot			c0.03	0.15	
v/s Ratio Perm			0.21		
v/c Ratio			0.46	0.32	
Uniform Delay, d1			12.6	12.9	
Progression Factor			1.00	1.00	
Incremental Delay, d2			1.2	0.2	
Delay (s)			13.8	13.1	
Level of Service			B	B	
Approach Delay (s)				13.4	
Approach LOS				B	
Intersection Summary					

HCM Unsignalized Intersection Capacity Analysis
2: Sykes Street S & West Access

Total 2022 - AM
337 Sykes Road

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	31	565	435	13	12	26
Future Volume (Veh/h)	31	565	435	13	12	26
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)	34	614	473	14	13	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (m)			246			
pX, platoon unblocked	0.94				0.94	0.94
vC, conflicting volume	487				1162	480
vC1, stage 1 conf vol					480	
vC2, stage 2 conf vol					682	
vCu, unblocked vol	425				1141	418
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				97	95
cM capacity (veh/h)	1069				416	599
Direction, Lane #	SE 1	SE 2	NW 1	SW 1		
Volume Total	34	614	487	41		
Volume Left	34	0	0	13		
Volume Right	0	0	14	28		
cSH	1069	1700	1700	525		
Volume to Capacity	0.03	0.36	0.29	0.08		
Queue Length 95th (m)	0.7	0.0	0.0	1.9		
Control Delay (s)	8.5	0.0	0.0	12.4		
Lane LOS	A			B		
Approach Delay (s)	0.4		0.0	12.4		
Approach LOS				B		
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			39.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: St. Vincent St & East Access

Total 2022 - AM
337 Sykes Road

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	4	6	37	110	7
Future Volume (Veh/h)	6	4	6	37	110	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	4	7	40	120	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				202		
pX, platoon unblocked						
vC, conflicting volume	178	124	128			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	178	124	128			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	808	927	1458			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	11	47	128			
Volume Left	7	7	0			
Volume Right	4	0	8			
cSH	847	1458	1700			
Volume to Capacity	0.01	0.00	0.08			
Queue Length 95th (m)	0.3	0.1	0.0			
Control Delay (s)	9.3	1.1	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.3	1.1	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay				0.8		
Intersection Capacity Utilization	17.0%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2022 - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET
Lane Configurations		W			W	W		W			W	W
Traffic Volume (vph)	1	1	1	73	22	24	71	15	2	26	25	375
Future Volume (vph)	1	1	1	73	22	24	71	15	2	26	25	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Lane Util. Factor		1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00			1.00	1.00
Frt		0.95			1.00	0.85		0.97			1.00	0.97
Flt Protected		0.97			0.96	1.00		0.97			0.95	1.00
Satd. Flow (prot)		1724			1814	1601		1766			1789	1823
Flt Permitted		1.00			0.77	1.00		0.75			0.21	1.00
Satd. Flow (perm)		1782			1450	1601		1365			400	1823
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)	1	1	1	79	24	26	77	16	2	28	27	408
RTOR Reduction (vph)	0	0	0	0	0	23	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	103	3	0	123	0	0	27	500
Confl. Peds. (#/hr)			1									
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA			pm+pt	NA
Protected Phases		7			4			4			2	6
Permitted Phases	7	7		4		4	4				6	
Actuated Green, G (s)		0.7			8.7	8.7		8.7			31.7	29.6
Effective Green, g (s)		0.7			8.7	8.7		8.7			31.7	29.6
Actuated g/C Ratio		0.01			0.13	0.13		0.13			0.49	0.46
Clearance Time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		19			194	215		183			241	834
v/s Ratio Prot											c0.00	0.27
v/s Ratio Perm		c0.00			0.07	0.00		c0.09			0.05	
v/c Ratio		0.16			0.53	0.02		0.67			0.11	0.60
Uniform Delay, d1		31.7			26.1	24.3		26.6			10.1	13.1
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		3.9			2.8	0.0		9.3			0.2	1.2
Delay (s)		35.6			28.9	24.3		36.0			10.3	14.3
Level of Service		D			C	C		D			B	B
Approach Delay (s)		35.6			28.0			36.0				14.1
Approach LOS		D			C			D				B
Intersection Summary												
HCM 2000 Control Delay		20.3			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.74										
Actuated Cycle Length (s)		64.7			Sum of lost time (s)			23.6				
Intersection Capacity Utilization		68.3%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2022 - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	78	6	22	1	514	113
Future Volume (vph)	78	6	22	1	514	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1832	
Flt Permitted				0.38	1.00	
Satd. Flow (perm)				714	1832	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	85	7	24	1	559	123
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	25	682	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type			custom	pm+pt	NA	
Protected Phases				5	1	
Permitted Phases			5	1		
Actuated Green, G (s)				31.7	29.6	
Effective Green, g (s)				31.7	29.6	
Actuated g/C Ratio				0.49	0.46	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				384	838	
v/s Ratio Prot				0.00	c0.37	
v/s Ratio Perm				0.03		
v/c Ratio				0.07	0.81	
Uniform Delay, d1				8.8	15.2	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	6.1	
Delay (s)				8.9	21.3	
Level of Service				A	C	
Approach Delay (s)					20.8	
Approach LOS					C	
Intersection Summary						

HCM Unsignalized Intersection Capacity Analysis
2: Sykes Street S & West Access

Total 2022 - PM
337 Sykes Road

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	37	466	598	16	14	32
Future Volume (Veh/h)	37	466	598	16	14	32
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)	40	507	650	17	15	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLT	TL			
Median storage (veh)		2	2			
Upstream signal (m)			246			
pX, platoon unblocked	0.71				0.71	0.71
vC, conflicting volume	667				1246	658
vC1, stage 1 conf vol					658	
vC2, stage 2 conf vol					587	
vCu, unblocked vol	330				1143	318
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	95				96	93
cM capacity (veh/h)	875				392	514
Direction, Lane #	SE 1	SE 2	NW 1	SW 1		
Volume Total	40	507	667	50		
Volume Left	40	0	0	15		
Volume Right	0	0	17	35		
cSH	875	1700	1700	470		
Volume to Capacity	0.05	0.30	0.39	0.11		
Queue Length 95th (m)	1.1	0.0	0.0	2.7		
Control Delay (s)	9.3	0.0	0.0	13.6		
Lane LOS	A			B		
Approach Delay (s)	0.7		0.0	13.6		
Approach LOS				B		
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			42.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: St. Vincent St & East Access

Total 2022 - PM
337 Sykes Road

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	6	7	154	109	10
Future Volume (Veh/h)	8	6	7	154	109	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	7	8	167	118	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)				185		
pX, platoon unblocked						
vC, conflicting volume	306	124	129			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	306	124	129			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	682	927	1457			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	16	175	129			
Volume Left	9	8	0			
Volume Right	7	0	11			
cSH	771	1457	1700			
Volume to Capacity	0.02	0.01	0.08			
Queue Length 95th (m)	0.5	0.1	0.0			
Control Delay (s)	9.8	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.8	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			23.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2027 - AM
337 Sykes Road

												
Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations												
Traffic Volume (vph)	6	0	1	168	28	119	33	55	40	12	384	223
Future Volume (vph)	6	0	1	168	28	119	33	55	40	12	384	223
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.92		1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.94	
Flt Protected		0.96			0.96	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1749			1806	1476		1762		1789	1734	
Flt Permitted		1.00			0.71	1.00		0.84		0.57	1.00	
Satd. Flow (perm)		1825			1344	1476		1504		1081	1734	
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)	7	0	1	183	30	129	36	60	43	13	417	242
RTOR Reduction (vph)	0	0	0	0	0	101	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	213	28	0	139	0	13	661	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.8			16.7	16.7		16.7		32.1	31.1	
Effective Green, g (s)		0.8			16.7	16.7		16.7		32.1	31.1	
Actuated g/C Ratio		0.01			0.22	0.22		0.22		0.41	0.40	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		18			289	318		324		456	695	
v/s Ratio Prot										0.00	c0.38	
v/s Ratio Perm		c0.00			c0.16	0.02		0.09		0.01		
v/c Ratio		0.44			0.74	0.09		0.43		0.03	0.95	
Uniform Delay, d1		38.1			28.4	24.3		26.3		13.4	22.5	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		16.5			9.4	0.1		0.9		0.0	22.8	
Delay (s)		54.6			37.8	24.4		27.2		13.4	45.2	
Level of Service		D			D	C		C		B	D	
Approach Delay (s)		54.6			32.7			27.2			44.6	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			32.5		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			77.5		Sum of lost time (s)					23.6		
Intersection Capacity Utilization			85.6%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2027 - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	119	1	267	15
Future Volume (vph)	2	119	1	267	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.99	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1789	1869	
Flt Permitted			0.14	1.00	
Satd. Flow (perm)			262	1869	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	129	1	290	16
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	130	306	0
Confl. Peds. (#/hr)	10	10			
Turn Type		pm+pt	pm+pt	NA	
Protected Phases		5	5	1	
Permitted Phases		1	1		
Actuated Green, G (s)			39.4	35.4	
Effective Green, g (s)			39.4	35.4	
Actuated g/C Ratio			0.51	0.46	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			237	853	
v/s Ratio Prot			c0.04	0.16	
v/s Ratio Perm			0.24		
v/c Ratio			0.55	0.36	
Uniform Delay, d1			14.1	13.7	
Progression Factor			1.00	1.00	
Incremental Delay, d2			2.6	0.3	
Delay (s)			16.7	13.9	
Level of Service			B	B	
Approach Delay (s)				14.7	
Approach LOS				B	
Intersection Summary					

HCM Unsignalized Intersection Capacity Analysis
2: Sykes Street S & West Access

Total 2027 - AM
337 Sykes Road

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	31	605	467	13	12	26
Future Volume (Veh/h)	31	605	467	13	12	26
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)	34	658	508	14	13	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage (veh)		2	2			
Upstream signal (m)			246			
pX, platoon unblocked	0.93				0.93	0.93
vC, conflicting volume	522				1241	515
vC1, stage 1 conf vol					515	
vC2, stage 2 conf vol					726	
vCu, unblocked vol	444				1220	436
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				97	95
cM capacity (veh/h)	1034				393	574
Direction, Lane #	SE 1	SE 2	NW 1	SW 1		
Volume Total	34	658	522	41		
Volume Left	34	0	0	13		
Volume Right	0	0	14	28		
cSH	1034	1700	1700	501		
Volume to Capacity	0.03	0.39	0.31	0.08		
Queue Length 95th (m)	0.8	0.0	0.0	2.0		
Control Delay (s)	8.6	0.0	0.0	12.8		
Lane LOS	A			B		
Approach Delay (s)	0.4		0.0	12.8		
Approach LOS				B		
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			41.8%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: St. Vincent St & East Access

Total 2027 - AM
337 Sykes Road

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	4	6	48	124	7
Future Volume (Veh/h)	6	4	6	48	124	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	4	7	52	135	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				202		
pX, platoon unblocked						
vC, conflicting volume	205	139	143			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	205	139	143			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	780	909	1440			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	11	59	143			
Volume Left	7	7	0			
Volume Right	4	0	8			
cSH	822	1440	1700			
Volume to Capacity	0.01	0.00	0.08			
Queue Length 95th (m)	0.3	0.1	0.0			
Control Delay (s)	9.4	0.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.4	0.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			17.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2027 - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET
Lane Configurations		W			W	W		W			W	W
Traffic Volume (vph)	1	1	1	79	24	26	77	16	2	29	27	405
Future Volume (vph)	1	1	1	79	24	26	77	16	2	29	27	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Lane Util. Factor		1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00			1.00	1.00
Frt		0.95			1.00	0.85		0.97			1.00	0.97
Flt Protected		0.97			0.96	1.00		0.97			0.95	1.00
Satd. Flow (prot)		1723			1814	1601		1765			1789	1823
Flt Permitted		1.00			0.74	1.00		0.75			0.19	1.00
Satd. Flow (perm)		1781			1389	1601		1356			359	1823
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)	1	1	1	86	26	28	84	17	2	32	29	440
RTOR Reduction (vph)	0	0	0	0	0	23	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	112	5	0	135	0	0	29	538
Confl. Peds. (#/hr)			1									
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA			pm+pt	NA
Protected Phases		7			4			4			2	6
Permitted Phases	7	7		4		4	4				6	
Actuated Green, G (s)		0.8			12.7	12.7		12.7			41.7	39.5
Effective Green, g (s)		0.8			12.7	12.7		12.7			41.7	39.5
Actuated g/C Ratio		0.01			0.16	0.16		0.16			0.53	0.50
Clearance Time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		18			223	258		218			229	913
v/s Ratio Prot											c0.00	0.30
v/s Ratio Perm		c0.00			0.08	0.00		c0.10			0.06	
v/c Ratio		0.17			0.50	0.02		0.62			0.13	0.59
Uniform Delay, d1		38.7			30.2	27.8		30.8			11.5	13.9
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		4.3			1.8	0.0		5.2			0.3	1.0
Delay (s)		43.0			31.9	27.8		36.0			11.8	14.9
Level of Service		D			C	C		D			B	B
Approach Delay (s)		43.0			31.1			36.0				14.7
Approach LOS		D			C			D				B
Intersection Summary												
HCM 2000 Control Delay		21.0			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		78.8			Sum of lost time (s)			23.6				
Intersection Capacity Utilization		71.7%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2027 - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	84	6	24	1	556	122
Future Volume (vph)	84	6	24	1	556	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1832	
Flt Permitted				0.35	1.00	
Satd. Flow (perm)				664	1832	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	7	26	1	604	133
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	27	737	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type			custom	pm+pt	NA	
Protected Phases				5	1	
Permitted Phases			5	1		
Actuated Green, G (s)				41.7	39.5	
Effective Green, g (s)				41.7	39.5	
Actuated g/C Ratio				0.53	0.50	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				382	918	
v/s Ratio Prot				0.00	c0.40	
v/s Ratio Perm				0.04		
v/c Ratio				0.07	0.80	
Uniform Delay, d1				9.5	16.4	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	5.1	
Delay (s)				9.5	21.5	
Level of Service				A	C	
Approach Delay (s)					21.1	
Approach LOS					C	
Intersection Summary						

HCM Unsignalized Intersection Capacity Analysis
2: Sykes Street S & West Access

Total 2027 - PM
337 Sykes Road

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	37	505	648	16	14	32
Future Volume (Veh/h)	37	505	648	16	14	32
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)	40	549	704	17	15	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLT	TL			
Median storage (veh)		2	2			
Upstream signal (m)			246			
pX, platoon unblocked	0.69				0.69	0.69
vC, conflicting volume	721				1342	712
vC1, stage 1 conf vol					712	
vC2, stage 2 conf vol					629	
vCu, unblocked vol	366				1269	354
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	95				96	93
cM capacity (veh/h)	819				363	474
Direction, Lane #	SE 1	SE 2	NW 1	SW 1		
Volume Total	40	549	721	50		
Volume Left	40	0	0	15		
Volume Right	0	0	17	35		
cSH	819	1700	1700	434		
Volume to Capacity	0.05	0.32	0.42	0.12		
Queue Length 95th (m)	1.2	0.0	0.0	2.9		
Control Delay (s)	9.6	0.0	0.0	14.4		
Lane LOS	A			B		
Approach Delay (s)	0.7		0.0	14.4		
Approach LOS				B		
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			45.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: St. Vincent St & East Access

Total 2027 - PM
337 Sykes Road

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	6	7	167	118	10
Future Volume (Veh/h)	8	6	7	167	118	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	7	8	182	128	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)				185		
pX, platoon unblocked						
vC, conflicting volume	332	134	139			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	332	134	139			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	660	916	1445			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	16	190	139			
Volume Left	9	8	0			
Volume Right	7	0	11			
cSH	752	1445	1700			
Volume to Capacity	0.02	0.01	0.08			
Queue Length 95th (m)	0.5	0.1	0.0			
Control Delay (s)	9.9	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.9	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			24.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2032 - AM
337 Sykes Road

												
Movement	EBL2	EBL	EBR2	NBL	NBT	NBR	SBL	SBT	SBR2	SEL	SET	SER
Lane Configurations												
Traffic Volume (vph)	6	0	1	180	34	122	40	62	44	14	424	236
Future Volume (vph)	6	0	1	180	34	122	40	62	44	14	424	236
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.91		1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00		0.99		1.00	1.00	
Frt		0.98			1.00	0.85		0.96		1.00	0.95	
Flt Protected		0.96			0.96	1.00		0.99		0.95	1.00	
Satd. Flow (prot)		1744			1807	1458		1759		1789	1731	
Flt Permitted		1.00			0.65	1.00		0.73		0.55	1.00	
Satd. Flow (perm)		1821			1229	1458		1306		1044	1731	
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)	7	0	1	196	37	133	43	67	48	15	461	257
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	0	0	0	0
Lane Group Flow (vph)	0	8	0	0	233	29	0	158	0	15	720	0
Confl. Peds. (#/hr)			10			38	38					12
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		7			4			4		2	6	
Permitted Phases	7	7		4		4	4			6		
Actuated Green, G (s)		0.9			20.6	20.6		20.6		41.4	40.3	
Effective Green, g (s)		0.9			20.6	20.6		20.6		41.4	40.3	
Actuated g/C Ratio		0.01			0.22	0.22		0.22		0.44	0.43	
Clearance Time (s)		6.0			7.3	7.3		7.3		3.0	7.3	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		17			271	322		288		472	748	
v/s Ratio Prot										0.00	c0.42	
v/s Ratio Perm		c0.00			c0.19	0.02		0.12		0.01		
v/c Ratio		0.47			0.86	0.09		0.55		0.03	0.96	
Uniform Delay, d1		45.9			34.9	28.9		32.2		14.5	25.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		19.2			22.7	0.1		2.1		0.0	23.9	
Delay (s)		65.1			57.7	29.0		34.3		14.5	49.6	
Level of Service		E			E	C		C		B	D	
Approach Delay (s)		65.1			47.2			34.3			48.9	
Approach LOS		E			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			38.2		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			93.2		Sum of lost time (s)					23.6		
Intersection Capacity Utilization			88.8%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2032 - AM
337 Sykes Road

Movement	SER2	NWL2	NWL	NWT	NWR
Lane Configurations			W	W	
Traffic Volume (vph)	2	120	1	294	22
Future Volume (vph)	2	120	1	294	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)			3.0	7.3	
Lane Util. Factor			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Flpb, ped/bikes			1.00	1.00	
Frt			1.00	0.99	
Flt Protected			0.95	1.00	
Satd. Flow (prot)			1789	1864	
Flt Permitted			0.11	1.00	
Satd. Flow (perm)			210	1864	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	130	1	320	24
RTOR Reduction (vph)	0	0	0	0	0
Lane Group Flow (vph)	0	0	131	344	0
Confl. Peds. (#/hr)	10	10			
Turn Type		pm+pt	pm+pt	NA	
Protected Phases		5	5	1	
Permitted Phases		1	1		
Actuated Green, G (s)			51.1	47.0	
Effective Green, g (s)			51.1	47.0	
Actuated g/C Ratio			0.55	0.50	
Clearance Time (s)			3.0	7.3	
Vehicle Extension (s)			3.0	3.0	
Lane Grp Cap (vph)			247	940	
v/s Ratio Prot			c0.04	0.18	
v/s Ratio Perm			0.25		
v/c Ratio			0.53	0.37	
Uniform Delay, d1			16.5	14.0	
Progression Factor			1.00	1.00	
Incremental Delay, d2			2.2	0.2	
Delay (s)			18.7	14.3	
Level of Service			B	B	
Approach Delay (s)				15.5	
Approach LOS				B	
Intersection Summary					

HCM Unsignalized Intersection Capacity Analysis
2: Sykes Street S & West Access

Total 2032 - AM
337 Sykes Road

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	31	660	511	13	12	26
Future Volume (Veh/h)	31	660	511	13	12	26
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)	34	717	555	14	13	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage (veh)	2		2			
Upstream signal (m)			246			
pX, platoon unblocked	0.91				0.91	0.91
vC, conflicting volume	569				1347	562
vC1, stage 1 conf vol					562	
vC2, stage 2 conf vol					785	
vCu, unblocked vol	477				1332	469
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				96	95
cM capacity (veh/h)	988				365	541
Direction, Lane #	SE 1	SE 2	NW 1	SW 1		
Volume Total	34	717	569	41		
Volume Left	34	0	0	13		
Volume Right	0	0	14	28		
cSH	988	1700	1700	469		
Volume to Capacity	0.03	0.42	0.33	0.09		
Queue Length 95th (m)	0.8	0.0	0.0	2.2		
Control Delay (s)	8.8	0.0	0.0	13.4		
Lane LOS	A			B		
Approach Delay (s)	0.4		0.0	13.4		
Approach LOS				B		
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			44.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: St. Vincent St & East Access

Total 2032 - AM
337 Sykes Road

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	4	6	64	142	7
Future Volume (Veh/h)	6	4	6	64	142	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	4	7	70	154	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				202		
pX, platoon unblocked						
vC, conflicting volume	242	158	162			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242	158	162			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	743	887	1417			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	11	77	162			
Volume Left	7	7	0			
Volume Right	4	0	8			
cSH	789	1417	1700			
Volume to Capacity	0.01	0.00	0.10			
Queue Length 95th (m)	0.3	0.1	0.0			
Control Delay (s)	9.6	0.7	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.6	0.7	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay				0.6		
Intersection Capacity Utilization	18.3%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2032 - PM
337 Sykes Road

Movement	EBL2	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SBR2	SEL	SET
Lane Configurations		W			W	W		W			W	W
Traffic Volume (vph)	1	1	1	87	26	29	84	18	2	32	30	447
Future Volume (vph)	1	1	1	87	26	29	84	18	2	32	30	447
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Lane Util. Factor		1.00			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00			1.00	1.00
Frt		0.95			1.00	0.85		0.97			1.00	0.97
Flt Protected		0.97			0.96	1.00		0.97			0.95	1.00
Satd. Flow (prot)		1723			1813	1601		1766			1789	1823
Flt Permitted		1.00			0.72	1.00		0.74			0.13	1.00
Satd. Flow (perm)		1781			1355	1601		1349			236	1823
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)	1	1	1	95	28	32	91	20	2	35	33	486
RTOR Reduction (vph)	0	0	0	0	0	27	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	123	5	0	148	0	0	33	594
Confl. Peds. (#/hr)			1									
Turn Type	Perm	Prot		Perm	NA	Perm	Perm	NA			pm+pt	NA
Protected Phases		7			4			4			2	6
Permitted Phases	7	7		4		4	4				6	
Actuated Green, G (s)		0.8			13.6	13.6		13.6			41.7	39.5
Effective Green, g (s)		0.8			13.6	13.6		13.6			41.7	39.5
Actuated g/C Ratio		0.01			0.17	0.17		0.17			0.52	0.50
Clearance Time (s)		6.0			7.3	7.3		7.3			3.0	7.3
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		17			231	273		230			166	903
v/s Ratio Prot											c0.01	0.33
v/s Ratio Perm		c0.00			0.09	0.00		c0.11			0.10	
v/c Ratio		0.18			0.53	0.02		0.64			0.20	0.66
Uniform Delay, d1		39.1			30.1	27.5		30.8			13.6	15.0
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		4.9			2.4	0.0		6.0			0.6	1.7
Delay (s)		44.0			32.5	27.5		36.8			14.2	16.8
Level of Service		D			C	C		D			B	B
Approach Delay (s)		44.0			31.5			36.8				16.6
Approach LOS		D			C			D				B
Intersection Summary												
HCM 2000 Control Delay		25.4			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.80										
Actuated Cycle Length (s)		79.7			Sum of lost time (s)			23.6				
Intersection Capacity Utilization		76.1%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: St. Vincent St & Sykes Street S & McKibbin Drive

Total 2032 - PM
337 Sykes Road

Movement	SER	SER2	NWL2	NWL	NWT	NWR
Lane Configurations				W	W	
Traffic Volume (vph)	93	6	26	1	613	134
Future Volume (vph)	93	6	26	1	613	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	7.3	
Lane Util. Factor				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Flpb, ped/bikes				1.00	1.00	
Frt				1.00	0.97	
Flt Protected				0.95	1.00	
Satd. Flow (prot)				1788	1833	
Flt Permitted				0.30	1.00	
Satd. Flow (perm)				566	1833	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	101	7	28	1	666	146
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	29	812	0
Confl. Peds. (#/hr)	1	2	2	1		
Turn Type			custom	pm+pt	NA	
Protected Phases				5	1	
Permitted Phases			5	1		
Actuated Green, G (s)				41.7	39.5	
Effective Green, g (s)				41.7	39.5	
Actuated g/C Ratio				0.52	0.50	
Clearance Time (s)				3.0	7.3	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				329	908	
v/s Ratio Prot				0.00	c0.44	
v/s Ratio Perm				0.04		
v/c Ratio				0.09	0.89	
Uniform Delay, d1				10.2	18.2	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	11.2	
Delay (s)				10.3	29.4	
Level of Service				B	C	
Approach Delay (s)					28.7	
Approach LOS					C	
Intersection Summary						

HCM Unsignalized Intersection Capacity Analysis
2: Sykes Street S & West Access

Total 2032 - PM
337 Sykes Road

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	37	558	717	16	14	32
Future Volume (Veh/h)	37	558	717	16	14	32
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)	40	607	779	17	15	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLT	TL			
Median storage (veh)		2	2			
Upstream signal (m)			246			
pX, platoon unblocked	0.61				0.61	0.61
vC, conflicting volume	796				1474	788
vC1, stage 1 conf vol					788	
vC2, stage 2 conf vol					687	
vCu, unblocked vol	350				1458	337
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	95				95	92
cM capacity (veh/h)	740				324	432
Direction, Lane #	SE 1	SE 2	NW 1	SW 1		
Volume Total	40	607	796	50		
Volume Left	40	0	0	15		
Volume Right	0	0	17	35		
cSH	740	1700	1700	393		
Volume to Capacity	0.05	0.36	0.47	0.13		
Queue Length 95th (m)	1.3	0.0	0.0	3.3		
Control Delay (s)	10.1	0.0	0.0	15.5		
Lane LOS	B			C		
Approach Delay (s)	0.6		0.0	15.5		
Approach LOS				C		
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			48.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
3: St. Vincent St & East Access

Total 2032 - PM
337 Sykes Road

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	6	7	167	118	10
Future Volume (Veh/h)	8	6	7	167	118	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	7	8	182	128	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)				185		
pX, platoon unblocked						
vC, conflicting volume	332	134	139			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	332	134	139			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	660	916	1445			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	16	190	139			
Volume Left	9	8	0			
Volume Right	7	0	11			
cSH	752	1445	1700			
Volume to Capacity	0.02	0.01	0.08			
Queue Length 95th (m)	0.5	0.1	0.0			
Control Delay (s)	9.9	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.9	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			24.5%		ICU Level of Service	A
Analysis Period (min)			15			