

Transportation Impact Study

PROPOSED BROCKTON APARTMENTS

117 Forest Avenue and 175 Catharine Street South
HAMILTON, ONTARIO

October, 2022
Project No: NT-16-103

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October 3, 2022

Attention: David Horwood

Representative Holdings Inc.
c/o David Horwood
242 Main Street East,
Hamilton, ON L8N 1H5

**Re: Transportation Impact Study
Proposed Brockton Apartments – Residential Development
117 Forest Avenue and 175 Catharine Street South
Our Project No. NT-16-103**

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Impact Study for the above noted site in support of a Zoning By-law Amendment application for a proposed Brockton Apartments residential development.

The subject lands are located at the municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton. The subject site consists of two vacant lots and one 10-storey apartment building. The proposed development will involve the redevelopment of the two vacant lots, which consists of a 14-storey high-rise building with a total of 216 residential dwelling units. The proposed development also provides a total of 160 vehicle parking spaces and 113 bicycle parking spaces.

The transportation impact study concludes that the proposed development can adequately be accommodated by the existing transportation network, existing Hamilton Transit service, as well as the recommended Transportation Demand Management measures and incentives recommended in this report.

We trust the enclosed sufficiently addresses your needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Nextrans Consulting Engineers

A Division of NextEng Consulting Group Inc.

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Report Submission Record

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Final Report	October 3, 2022	For Final Submission

EXECUTIVE SUMMARY

Nexttrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by Representative Holdings Inc. (the 'Client') to undertake a Transportation Impact Study in support of a Zoning By-law Amendment for a proposed residential development (Brockton Apartments). The subject lands are located at the municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton.

This Transportation Impact Study is prepared in accordance with the submitted terms of reference and the City of Hamilton Traffic Impact Study Guidelines and Transportation Demand Management Guidelines.

Proposed Development

The subject site consists of two vacant lots and one 10-storey apartment building. The proposed development will involve the redevelopment of the two vacant lots, which consists of a 14-storey high-rise building with a total of 216 residential dwelling units.

Proposed Development Access

Currently, the subject site has a full moves access onto Forest Avenue that provides access to the surface parking lot, which a second access (underground parking access) onto Catharine Street South.

With the redevelopment of the two vacant lots, a full moves access will be provided onto Forest Avenue at the easterly limit of the site to service the proposed development. The existing underground parking access onto Catharine Street South will remain to service the existing 10-storey apartment building and the proposed development.

The analysis indicates that the proposed development access onto Forest Avenue and existing underground parking access onto Catharine Street South are expected to operate at acceptable levels of service with negligible delay or queue. The recommended lane configurations for the proposed development access onto Forest Avenue include:

- One inbound lane (3.0 m)
- One outbound lane (3.0 m)
- One shared westbound through/left on Forest Avenue (same as the existing conditions)

It should be noted that the access onto Catharine Street South existing lane configurations will be remained the same. In addition, a proposed drop-off/pick-up area is provided on the north side of Forest Avenue, just to the east of Catharine Street South.

Transportation Capacity Assessment

The proposed development is expected to generate:

- 87 total two-way trips (49 inbound and 38 outbound) during the weekday morning peak hour and 88 total two-way trips (43 inbound and 45 outbound) during the afternoon peak hour;
- 50 total two-way auto trips (17 inbound and 33 outbound) during the weekday morning peak hour and 56 total two-way auto trips (32 inbound and 24 outbound) during the afternoon peak hour; and
- 37 total two-way non-auto trips (32 inbound and 5 outbound) during the weekday morning peak hour and 32 total two-way non-auto trips (11 inbound and 21 outbound) during the afternoon peak hour

Auto Mode Assessment

The intersection capacity analysis indicates that the existing unsignalized intersections are currently operating at acceptable levels of service. However, some of the critical movements at the signalized intersections are currently operating near or at capacity with higher delay during the peak periods.

Walking

The area is currently well served by a complete network of sidewalks. The sidewalks are generally available on both sides of the streets and reasonably maintained on the public streets. It is Nexttrans' opinion that no improvements are required to the sidewalk network under the existing conditions.

As part of the proposed development, pedestrian connections will be provided internally within the proposed development. Direct entrances will be provided onto Forest Avenue and Catharine Street South to facilitate the proposed development pedestrians.

The existing sidewalks along Forest Avenue and Catharine Street South along the frontage of the proposed development will be maintained and enhanced, with sufficient lighting to help with security and user experience.

Cycling

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated bicycle lanes on Cannon Street, Hunter Street, Markland Street and Arkledun Avenue. There are also signed routes/sharrows on part of Arkledun Avenue, Stinson Street and Ferguson Avenue. Bicycle trails are also available in the east-west direction south of Charlton Street E and south of James Mountain Road.

Under Appendix B of the City of Hamilton Cycling Master Plan Update and Review, on-street bicycle lanes are identified on Charlton Avenue E between James Street s to Ferguson and John Street S between Charlton and St Joseph's Drive. It is Nexttrans' understanding that the City is currently reviewing the design and it has not been finalized at this time. It is Nexttrans' opinion that this cycling project is important for both Charlton Street E and John Street S in order to complete the cycling network in the area.

The proposed development will provide a total of 113 bicycle parking spaces, with 5 short-term and 108 long-term bicycle parking spaces. This provision will support TDM and help reduce the numbers of single-occupant-vehicle trips to and from the proposed development. This provision will also help achieve the City's sustainability objectives and utilization of the existing and planned active transportation infrastructure.

Transit Mode Assessment

The proposed development is expected to generate 37 total two-way non-auto trips (32 inbound and 5 outbound) during the weekday morning peak hour and 32 total two-way non-auto trips (11 inbound and 21 outbound) during the afternoon peak hour. It is anticipated that the majority of these trips will be transit related trips.

As indicated in Section 2.4, the area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station and transit terminal. The proposed development is also located within a few minutes walk to bus stops for HSR Bus Routes 22, 23, 24, 25, 26, 27.

It is Nexttrans' understanding that the Province has cancelled the proposed Light Rail Transit (LRT) and replace it with a Future Rapid Transit Corridor. Although the LRT could accommodate higher ridership, however, the Future Rapid Transit Corridor still will be a significant improvement from the existing conditions.

It is Nexttrans' opinion that the proposed development is located in the heart of Downtown Hamilton and has the best location for use of public transit. It is Nexttrans' opinion that the proposed development transit trips can be accommodated by the existing and future transit services without any additional improvements. The proposed land uses also support future transit ridership and help reduce the numbers of single-occupant-vehicles to and from the proposed development.

Transportation Demand Management Measures and Incentives

The Report identifies and recommends appropriate Transportation Demand Management measures and incentives to support active transportation and transit, to meet the objectives and requirements in the City's *TDM for Development Report (June, 2015)*.

Vehicle Parking Assessment

Nextrans provided a comprehensive parking justification Study Addendum dated December, 2017 and the original Parking Justification Study dated December, 2016. It is Nextrans' understanding that the City has accepted the recommended parking rates for the proposed development, which is a reduction from the current/applicable Zoning By-law No. 6593 Vehicle Parking Requirements.

Therefore, the proposed development only needs to provide a total of 160 vehicle parking spaces, inclusive of resident and visitor parking space requirements. The proposed development meets this requirement and has reflected in the appropriate site plan.

Bicycle Parking Assessment

It is Nextrans' understanding that the proposed development is required to provide 5 short-term parking spaces and 0.5 bicycle parking spaces/unit as per the current Zoning By-law requirements. On this basis, the proposed development will provide a total of 113 bicycle parking spaces (216 units x 0.5 spaces/unit plus 5 short-term spaces). This meets the applicable Zoning By-law requirements.

Site Loading Assessment

It is Nextrans' understanding that the proposed development will have curb side solid waste pick-up on Forest Avenue, similar to the existing apartment building that currently has solid waste curb side pick-up on Young Street.

The vehicle turning movements will be provided at the site plan stage when more detailed site plan design is provided. It is anticipated that there is no potential issues with the passenger vehicles entering and exiting the existing underground parking as it is similar to the existing conditions. Similarly, no issues are expected for the surface parking lot.

Study Recommendations

Based on the Study assessment and findings, the following recommendations are provided:

- The proposed development implements the Transportation Demand Management (TDM) measures and incentives identified in Section 9 of this report to support active transportation and public transit, to meet the objectives and requirements by the City of Hamilton's TDM for Development (June, 2015);
- The proposed development reduces the vehicle parking supply based on recommendations of this Study in order to reduce the numbers of single-occupant-vehicle trips to and from the proposed developments;
- The proposed development provides direct pedestrian and cycling connections to Forest Avenue; and
- No physical improvements are required at the boundary roadway intersections to accommodate the future background traffic and the proposed development site generated traffic

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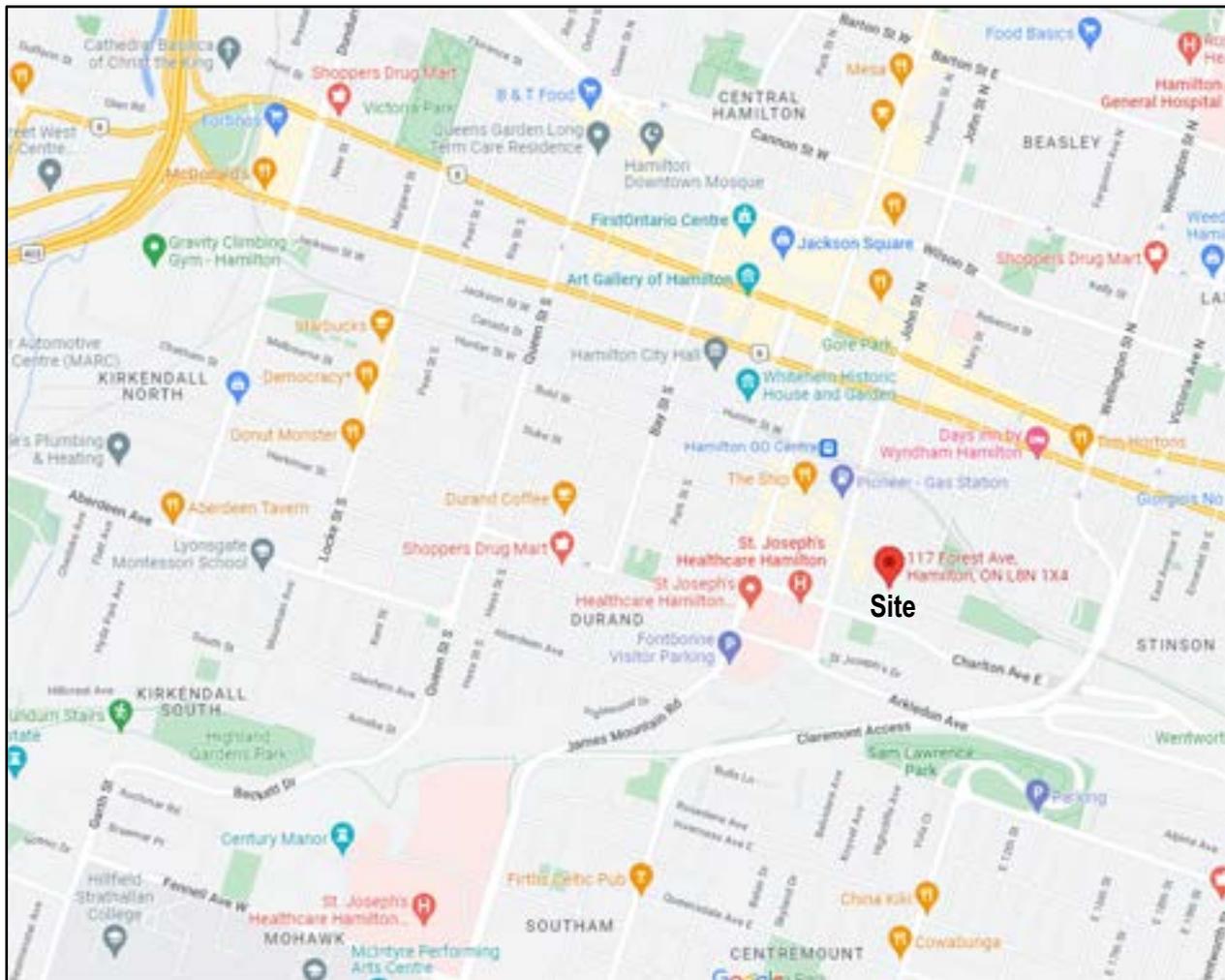
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1.0 INTRODUCTION

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by S Representative Holdings Inc. (the 'Client') to undertake a Transportation Impact Study in support of a Zoning By-law Amendment for a proposed residential development (Brockton Apartments). The subject lands are located at the municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton. The location of the proposed development is illustrated in **Figure 1**.

This Transportation Impact Study is prepared in accordance with the submitted terms of reference (**Appendix A**) and the City of Hamilton Traffic Impact Study Guidelines and Transportation Demand Management Guidelines.

Figure 1 – Proposed Development Location



Source: Google Map

The subject site consists of two vacant lots and one 10-storey apartment building. The proposed development will involve the redevelopment of the two vacant lots, which consists of a 14-storey high-rise building with a total of 216 residential dwelling units.

The proposed development also provides a total of 160 vehicle parking spaces and 113 bicycle parking spaces.

Figure 2 illustrates the conceptual site plan.

Figure 2 – Conceptual Site Plan



2.0 EXISTING TRANSPORTATION CONDITIONS

2.1. Existing Road Network

The existing road network, lane configuration and existing traffic control for the study area are shown in **Figure 3**. The description of the existing road network in the study area is summarized in **Table 1** below.

Table 1 – Summary of the Existing Road Network

Road Name	Jurisdiction	Number of Lanes	Sidewalk/Bike Lane	Speed
John Street S	City of Hamilton	4	Sidewalk on both sides of the street with no bike facilities	50 km/h
Catharine St S (one-way SB)	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	40 km/h
Forest Avenue (one-way WB)	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	30 km/h
Young Street	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	40 km/h
Walnut Street S	City of Hamilton	2 (on-street parking)	Sidewalk on both sides of the street with no bike facilities	30 km/h

Figure 3 – Existing Lane Configuration and Traffic Control



Source: Google Map

2.3. Existing Active Transportation Assessment

Figure 4 illustrates the cycling network in the study area.

Walking

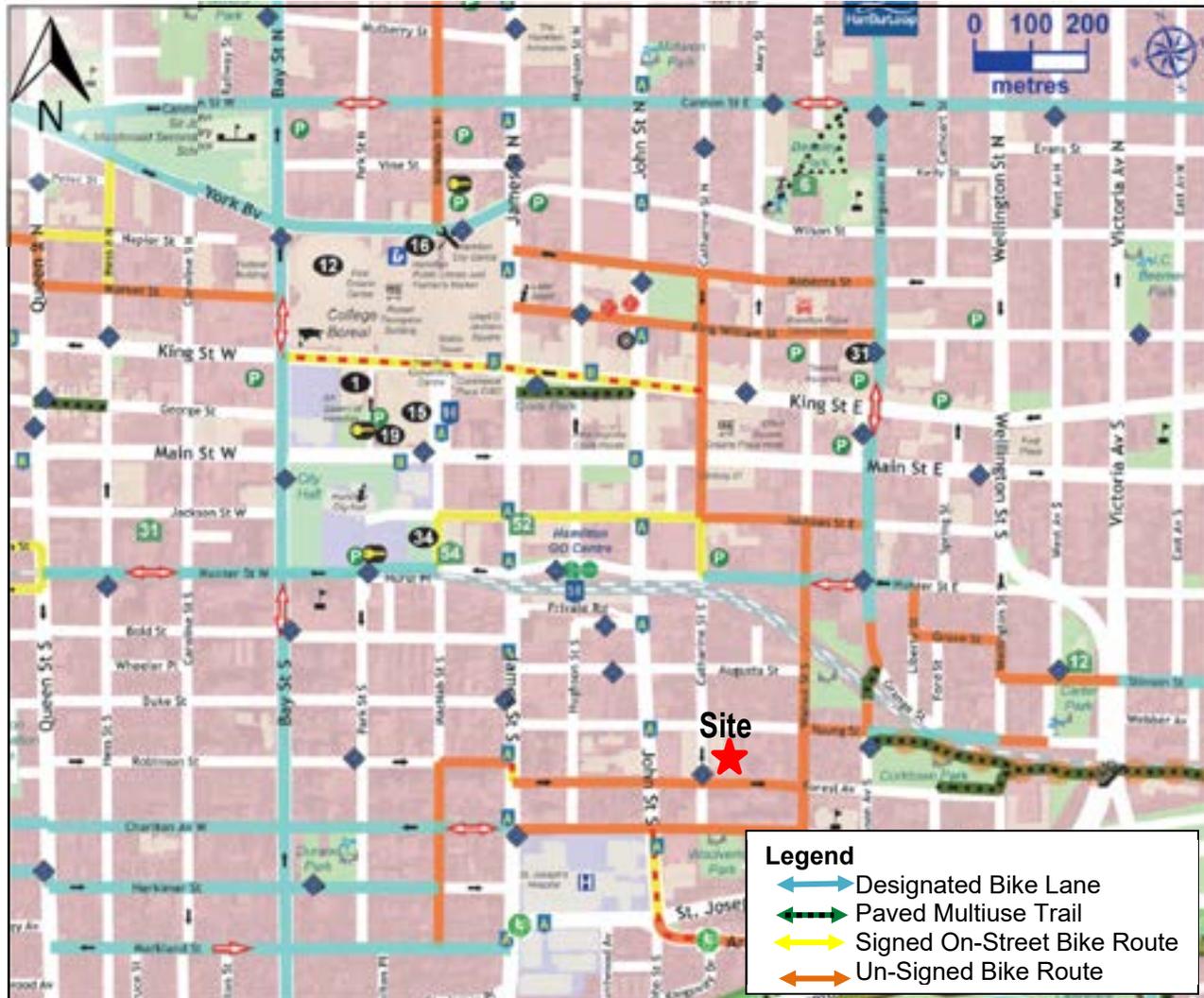
The area is currently well served by a complete network of sidewalks. The sidewalks are generally available on both sides of the streets and reasonably maintained on the public streets. It is Nextrans’ opinion that no improvements are required to the sidewalk network under the existing conditions on the public streets given some potential physical constraints. However, under the future total conditions, Nextrans will review and provide recommendations for sidewalk improvements, if appropriate.

Cycling

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated bicycle lanes on Cannon Street, Hunter Street, Markland Street and Arkledun Avenue. There are also signed routes/sharrows on part of Arkledun Avenue, Stinson Street and Ferguson Avenue. Bicycle trails are also available in the east-west direction south of Charlton Street E and south of James Mountain Road.

However, there are still gaps in the cycling network. It is Nextrans’ opinion that a better and more connected bicycle network should be implemented as part of future City’s capital projects in order to increase cycling trips and reduce the number of single-occupant-vehicle trips to and from the area. Nextrans will review the current City’s proposal for bicycle lanes on Charlton Avenue E and John Street S in the area.

Figure 4 – Existing Bicycle Network in the Study Area



Source: Hamilton Cycling Map

2.4. Existing Transit Assessment

Figure 5 illustrates the existing HSR Transit Bus Routes in the study area. The area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station and transit terminal. The proposed development is also located within a few minutes walk to bus stops for HSR Bus Routes 22, 23, 24, 25, 26, 27.

It is Nextrans' understanding that the Province has cancelled the proposed Light Rail Transit (LRT) and replace it with a Future Rapid Transit Corridor. Although the LRT could accommodate higher ridership, however, the Future Rapid Transit Corridor still will be a significant improvement from the existing conditions.

It is Nextrans' opinion that the proposed development is located in the heart and best location of public transit in the City of Hamilton. The proposed land uses also support future transit ridership and help reduce the numbers of single-occupant-vehicles to and from the proposed development.

Figure 5 – HSR Transit System Map for the Area



Source: HSR Transit System Map

2.5. Existing Traffic Volumes

Existing traffic volumes at the study area intersections were undertaken by Spectrum on Tuesday June 7, 2022 and during the morning (7:00 a.m. to 10:00 a.m.) and afternoon (4:00 p.m. to 7:00 p.m.) peak periods for the following intersections:

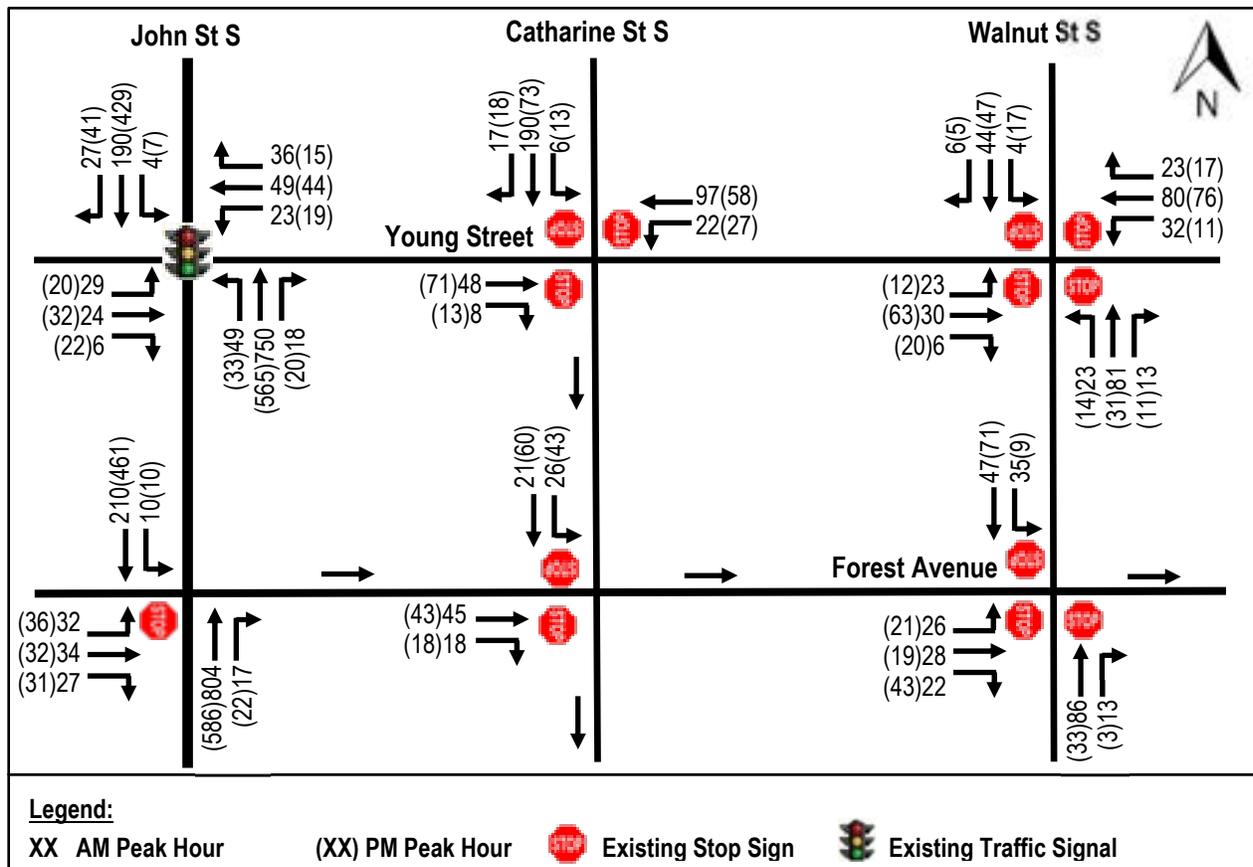
- Forest Avenue at Catharine Street South – Tuesday June 7, 2022
- Forest Avenue at Walnut Street South – Tuesday June 7, 2022
- Forest Avenue at John Street South – Tuesday June 7, 2022
- John Street South at Young Street – Tuesday June 7, 2022
- Young Street at Catharine Street – Tuesday June 7, 2022
- Young Street at Walnut Street South – Tuesday June 7, 2022

It should be noted that the traffic turning movement counts were undertaken while the Province was fully opened with no restrictions. All businesses and schools were opened at the time. Nextrans' review also indicates that there were no major road constructions in the area that may potentially impact the traffic turning movement counts.

It is Nextrans' opinion that traffic is mostly returning to normal. This is the new normal and some employees will permanently be working from home. This provision may not change in the future, and even if it does, it will take a few years to get back to the pre-pandemic situation.

The Turning movement counts are summarized in **Appendix B**. The existing volumes are illustrated in **Figure 6**.

Figure 6 – Existing Traffic Volumes



2.6. Existing Traffic Assessment

The existing volumes in **Figure 6** were analyzed using Synchro Version 11 software. The methodology of the software follows the procedures described and outlined in the Highway Capacity Manual, HCM 2000, published by the Transportation Research Board. It should be noted that the printouts for unsignalized intersections are based on HCM outputs and the results for signalized intersections are based on Synchro so that queues and more detailed information are provided. The detailed results are provided in **Appendix C** and summarized in **Table 2**.

It should be noted that Nextrans has requested the signal timing plans for the John Street South/Young Street intersection in early June, 2022. However, Nextrans has not received the data in time for the preparation of this Study as of August 2, 2022. For the purposes of this assessment, Nextrans has utilized the existing traffic signal timing plan for the John Street South/Charlton Avenue E intersection. All input parameters should be consistent between the two intersections give that that the John Street South/Young Street is only located about 200 m to the north. It is Nextrans' opinion that this provision is reasonable.

Table 2 – Existing Levels of Service

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Available Storage Length (m)
		LOS (v/c)	Delay (s)	95 th Queue (m)	LOS (v/c)	Delay (s)	95 th Queue (m)	
John Street S/ Young Street (signalized)	Overall	A (0.46)	8		A (0.35)	6		
	EB – L	D (0.26)	40	14	D (0.14)	27	10	~15
	EB – TR	C (0.13)	30	12	C (0.24)	27	17	~100
	WB – LTR	C (0.46)	33	31	C (0.35)	34	25	~90
	NB – LTR	A (0.36)	4	35	A (0.27)	3	22	~100
	SB – LTR	A (0.09)	3	8	A (0.19)	3	15	~100

John Street S/ Forest Avenue (unsignalized)	EB – LTR	C (0.33)	23	11	C (0.36)	25	13	~100
	NB – TR	A (0.34)	0	0	A (0.24)	0	0	~100
	SB – TL	A (0.02)	2	0	A (0.01)	1	0	~100
Young Street/ Catharine Street S (signalized)	EB – TR	A (0.08)	8	-	A (0.11)	8	-	~90
	WB – TL	A (0.17)	9	-	A (0.12)	8	-	~175
	SB – LTR	A (0.29)	9	-	A (0.14)	8	-	~100
Forest Avenue/ Catharine Street S (unsignalized)	EB – TR	A (0.10)	7	-	A (0.08)	7	-	~90
	SB – LTR	A (0.08)	8	-	A (0.14)	8	-	~100
Young Street/ Walnut Street S (signalized)	EB – LTR	A (0.08)	8	-	A (0.12)	8	-	~175
	WB – LTR	A (0.18)	8	-	A (0.13)	8	-	~100
	NB – LTR	A (0.16)	8	-	A (0.07)	8	-	~100
	SB – LTR	A (0.07)	8	-	A (0.09)	8	-	~65
Forest Avenue/ Walnut Street S (unsignalized)	EB – LTR	A (0.11)	8	-	A (0.10)	7	-	~175
	NB – TR	A (0.13)	8	-	A (0.05)	7	-	~100
	SB – TL	A (0.12)	8	-	A (0.10)	8	-	~100

The analysis indicates that under the existing conditions, all signalized and unsignalized intersections are currently operating at acceptable levels of service during the morning and afternoon peak periods.

3.0 TRANSPORTATION AND LAND USE PLANNING CONTEXT

3.1. Existing Area Context

Based on Nextrans comprehensive review of the study area, it is evident that there is a wide range of different types of land uses and housing types currently exist in the area such as residential (including rental), retail/commercial, St. Joseph’s Health Care Hamilton and medical offices on John Street S, James Street S and Charlton Avenue E.

3.2. Future Rapid Transit Corridor

It is Nextrans’ understanding that the Province has cancelled the proposed Light Rail Transit (LRT) and replace it with a Future Rapid Transit Corridor. Although the LRT could accommodate higher ridership, however, the Future Rapid Transit Corridor still will be a significant improvement from the existing conditions.

With the excellent existing transit service along with the Future Rapid Transit Corridor in the Downtown Core, the proposed development represents good transportation planning since it utilizes the existing transportation network, existing and future transit network, as well as the existing active transportation network in the area. The traffic pattern and generation are also consistent with the existing neighbourhood.

3.3. Cycling Master Plan

Under Appendix B of the City of Hamilton Cycling Master Plan Update and Review, on-street bicycle lanes are identified on Charlton Avenue E between James Street s to Ferguson and John Street S between Charlton and St Joseph’s Drive. It is Nextrans’ understanding that the City is currently reviewing the design and it has not been finalized at this time.

It is Nextrans’ opinion that this cycling project is important for both Charlton Street E and John Street S in order to complete the cycling network in the area.

4.0 FUTURE BACKGROUND CONDITIONS

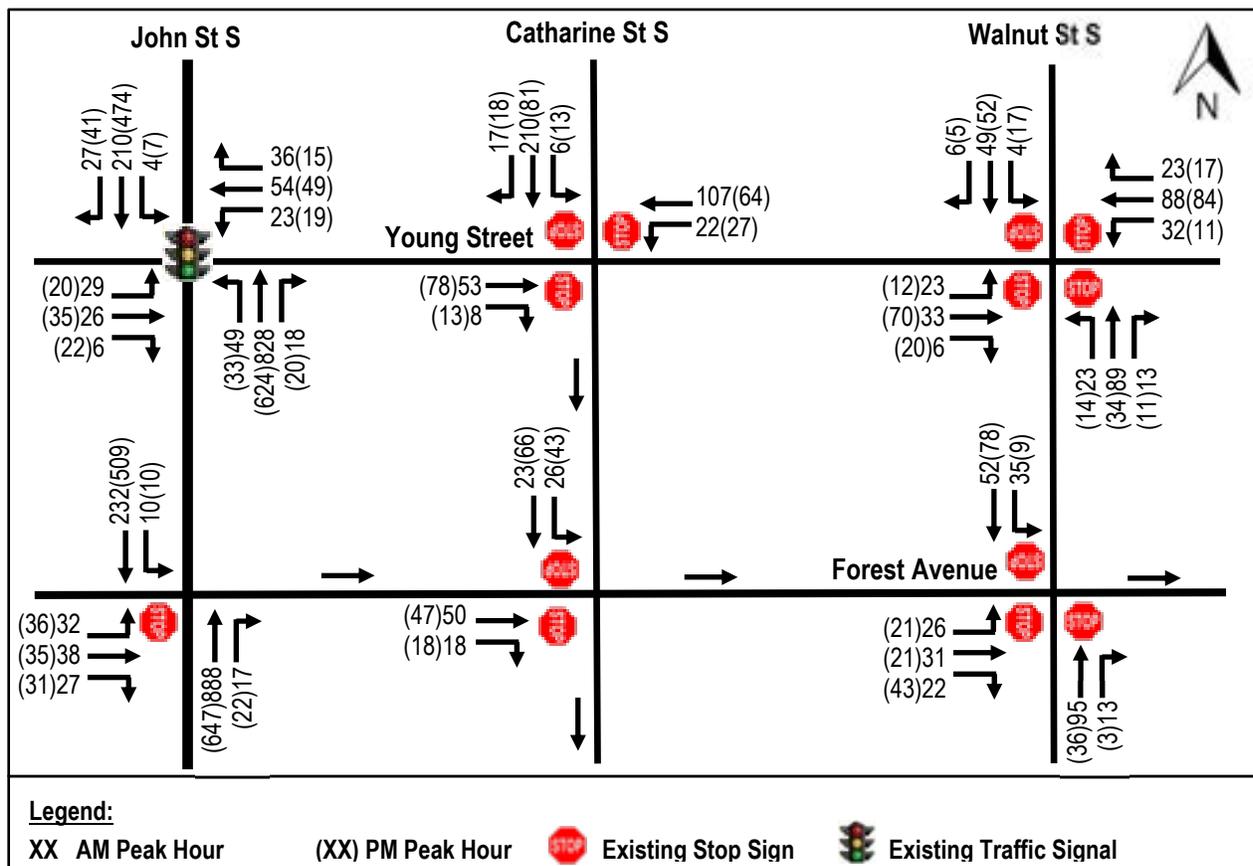
4.1. Analysis Horizon

For the purposes of this assessment, a five-year horizon (2022 to 2027) has been carried out for the study analysis. This is consistent with the City’s Traffic Impact Study Guidelines and industry best practices.

4.2. Future Background Corridor Growth

Based on Nextrans' consultation with the City staff through the submitted study terms of reference, staff indicated that a 2% background traffic growth per annum for the boundary road network in the study area. This is consistent with the City's Traffic Impact Study Guidelines. **Figure 7** illustrates the future background corridor growth.

Figure 7 – 2027 Future Background Corridor Growth



4.3. Background Development Applications

In the preparation of the original study and the study update, Nextrans has reviewed the available background development applications in the area based on the information provided on the City of Hamilton Development Application Portal.

The review indicates that the majority of the background developments are either conversions from rental units to condominium units or small-scale development that does not generate significant auto trips. It is Nextrans' opinion that these proposed background developments will be captured as part of the 2% growth per annum. **Table 3** summarizes the background development applications in the area.

For 225 John Street S, the residential trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE). The site trip generation for 225 Forest Avenue is summarized in **Table 4**.

Table 3 – Future Background Developments in Close Proximity to Study Area

Location	Development Details	Proposed Units
225 John Street S	Proposed mixed-use development consisting of a 27-storey and a 14-storey	415 dwelling units and 354 dwelling units, 900 m ² of ground related retail
119 John Street S	Mixed-use development	723 residential units and 1,587 m ² of ground related retail
155 Charlton Ave E	Condominium Conversion	Convert 34 of 38 existing rental units to condominium units
46 Arkledun Ave	Condominium Conversion	Convert 72 rental residential units to condominium units
147 Yonge St	3-storey Townhouse Dwellings	7 units
154 Catharine St S	Condominium	14 units
86 Augusta St	Condominium	6 units

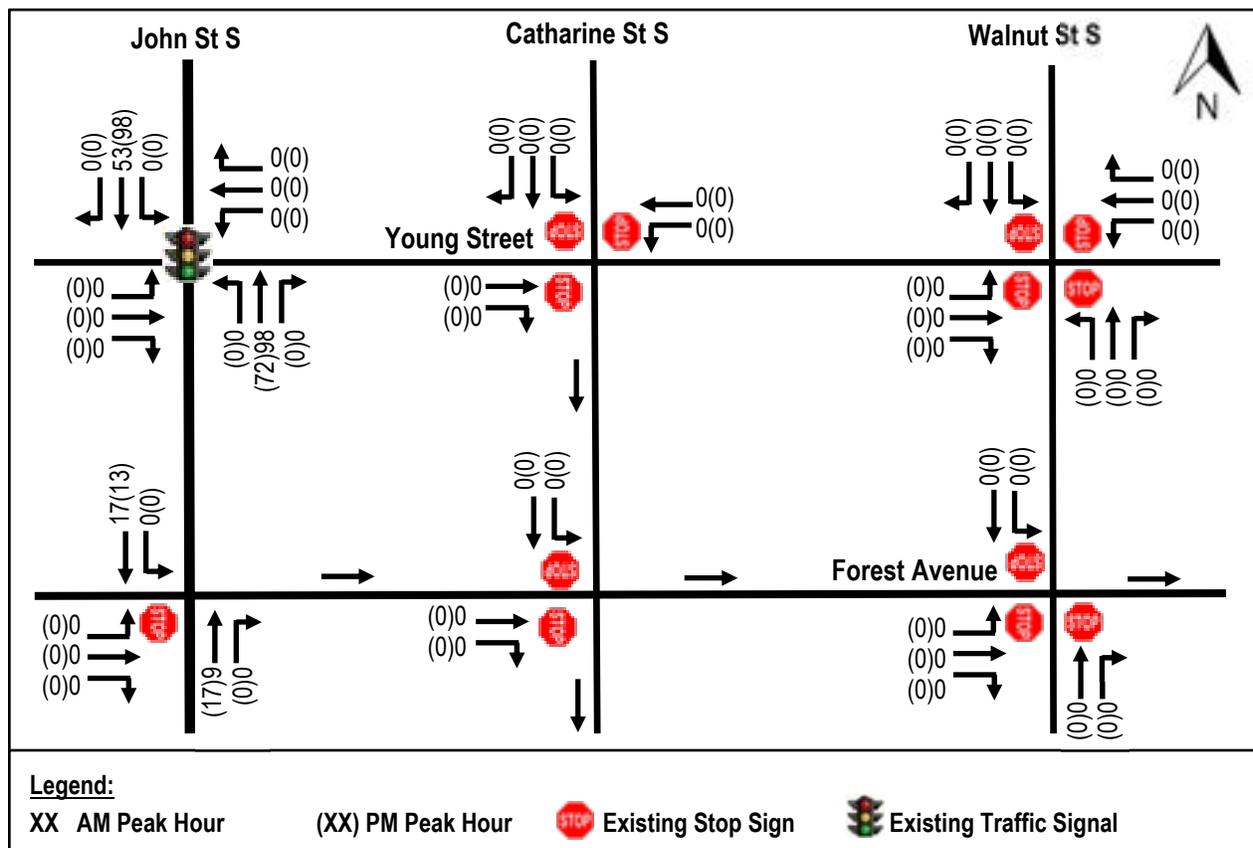
Table 4 summarizes the background site trip generation.

Table 4 – Background Site Traffic Trip Generation

ITE Land Use	Magnitude (units)	Parameters		Morning Peak Hour			Afternoon Peak Hour		
				In	Out	Total	In	Out	Total
Multifamily Housing (High-Rise) LUC 222 Close to Rail Transit	769	Vehicle Trips	Trip Rates (use average as no equations were given)	0.08	0.15	0.23	0.15	0.11	0.26
			New Auto Trips	62	115	177	115	85	200
		Walk + Bike + Transit	Trip Rates (use average as no equations were given)	0.15	0.02	0.17	0.05	0.1	0.15
			New Non-Auto Trips	115	16	131	38	77	115
Total New Trips				177	131	308	153	162	315

The background development located at 225 John Street S is expected to generate 177 two-way auto trips (62 inbound and 115 outbound) and 200 two-way auto trips (115 inbound and 85 outbound) during the morning and afternoon peak hours, respectively. Figure 8 illustrates the site traffic volumes for background developments noted above.

Figure 8 – Background Development Site Traffic



4.4. Future Background Traffic Assessment

The estimated future background traffic volumes are illustrated in **Figure 9**, and were analyzed using Synchro 10 software. The detailed calculations are provided in **Appendix D** and summarized in **Table 5**.

Figure 9 – 2027 Future Background Traffic Volumes

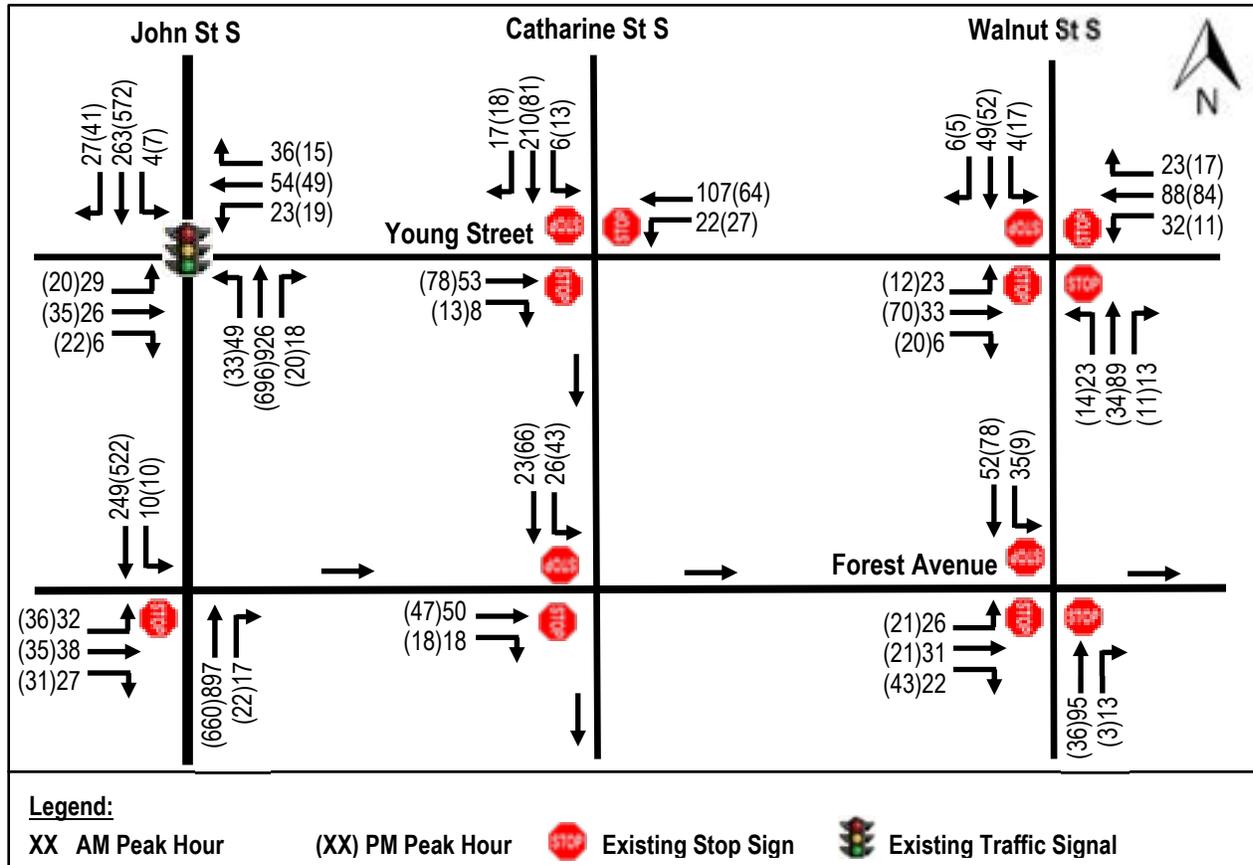


Table 5 – 2027 Future Background Levels of Service

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Available Storage Length (m)
		LOS (v/c)	Delay (s)	95 th Queue (m)	LOS (v/c)	Delay (s)	95 th Queue (m)	
John Street S/ Young Street (signalized)	Overall	A (0.47)	8		A (0.37)	6		
	EB – L	D (0.25)	39	13	D (0.14)	37	10	~15
	EB – TR	C (0.14)	30	13	C (0.25)	27	17	~100
	WB – LTR	C (0.47)	33	31	C (0.37)	35	26	~90
	NB – LTR	A (0.46)	5	48	A (0.33)	3	28	~100
SB – LTR	A (0.13)	3	11	A (0.25)	3	21	~100	
John Street S/ Forest Avenue (unsignalized)	EB – LTR	D (0.42)	30	16	D (0.44)	31	17	~100
	NB – TR	A (0.37)	0	0	A (0.27)	0	0	~100
	SB – TL	A (0.02)	1	0	A (0.01)	1	0	~100
Young Street/ Catharine Street S (signalized)	EB – TR	A (0.09)	8	-	A (0.12)	8	-	~90
	WB – TL	A (0.19)	9	-	A (0.13)	8	-	~175
	SB – LTR	A (0.32)	10	-	A (0.15)	8	-	~100
Forest Avenue/ Catharine Street S (unsignalized)	EB – TR	A (0.10)	7	-	A (0.09)	7	-	~90
	SB – LTR	A (0.08)	8	-	A (0.15)	8	-	~100
Young Street/ Walnut Street S (signalized)	EB – LTR	A (0.09)	8	-	A (0.13)	8	-	~175
	WB – LTR	A (0.19)	9	-	A (0.14)	8	-	~100
	NB – LTR	A (0.17)	9	-	A (0.08)	8	-	~100
	SB – LTR	A (0.08)	8	-	A (0.10)	8	-	~65

Forest Avenue/ Walnut Street S (unsignalized)	EB – LTR NB – TR SB – TL	A (0.11) A (0.15) A (0.12)	8 8 8	- - -	A (0.10) A (0.05) A (0.11)	7 7 8	- - -	~175 ~100 ~100
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The analysis indicates that under the 2027 future background conditions, all signalized and unsignalized intersections are expected to operate at acceptable levels of service during the morning and afternoon peak periods.

5.0 PROPOSED DEVELOPMENT ASSESSMENT

5.1. Proposed Development

The proposed development will involve the redevelopment of the two vacant lots, which consists of a 14-storey high-rise building with a total of 216 residential dwelling units.

The 2016 Transportation Tomorrow Survey (TTS) and the *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE) information was reviewed to estimate the modal split, trip distribution and trip generation for the proposed development.

5.2. Modes of Travel Assessment in the Area

Table 6 summarizes the travel mode split information based on the review of the 2016 Transportation Tomorrow Survey data for Traffic Zones 5159 and 5168. Detailed information is included in **Appendix E**.

Table 6 – Modes of Travel based on 2016 TTS

Land use	Time Period	Auto Driver	Auto Passenger	Local Transit	GO Transit	Cycle	Walk
Residential	AM Peak Period (6:00 AM – 9:00 AM)	35%	2%	40%	1%	4%	18%
	PM Peak Period (3:00 PM – 6:00 PM)	51%	8%	30%	1%	2%	8%

Based on the information above, the predominant modes of travel for the residents in the area under the existing conditions are non-auto modes of transportation such as walking, cycling, public transit and carpooling. The high walking percentage is expected given the close proximity of the area to the Hamilton GO Centre/HSR Terminal and Downtown area. It is expected that for non-residential mode, the driving percentage is higher than other modes.

5.3. Site Trip Generation

The trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE). It should be noted that the proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the Hamilton GO Train Station (Rail Transit) and HSR transit terminal, and similar distance to the Future Rapid Transit Corridor along King Street. For the purposes of this assessment, the ITE Land Use Codes (LUC) 222 “Multifamily Housing High-Rise Close to Rail Transit” average rates have been utilized for the proposed development.

It also should be noted that no modal split is applied to the average trip rates. **Table 5** summarizes the site trip generations based on the methodologies outlined above.

Table 7 – Site Traffic Trip Generation

ITE Land Use	Magnitude (units)	Parameters		Morning Peak Hour			Afternoon Peak Hour		
				In	Out	Total	In	Out	Total
Multifamily Housing (High-Rise) LUC 222 Close to Rail Transit	216	Vehicle Trips	Trip Rates (use average as no equations were given)	0.08	0.15	0.23	0.15	0.11	0.26
			New Auto Trips	17	33	50	32	24	56
		Walk + Bike + Transit	Trip Rates (use average as no equations were given)	0.15	0.02	0.17	0.05	0.1	0.15
			New Non-Auto Trips	32	5	37	11	21	32
Total New Trips				49	38	87	43	45	88

The proposed development is expected to generate:

- 87 total two-way trips (49 inbound and 38 outbound) during the weekday morning peak hour and 88 total two-way trips (43 inbound and 45 outbound) during the afternoon peak hour;
- 50 total two-way auto trips (17 inbound and 33 outbound) during the weekday morning peak hour and 56 total two-way auto trips (32 inbound and 24 outbound) during the afternoon peak hour; and
- 37 total two-way non-auto trips (32 inbound and 5 outbound) during the weekday morning peak hour and 32 total two-way non-auto trips (11 inbound and 21 outbound) during the afternoon peak hour

5.4. Site Trip Distribution and Assignment

The 2016 Transportation Tomorrow Survey (TTS) data was reviewed for Traffic Zones 5159 and 5168 in order to estimate the general trip distribution for the proposed development. **Table 8** summarizes the auto trip distribution based on the 2016 TTS traffic zone data.

Table 8 – Site Trip Distribution Based on TTS Data

Land Use	Hamilton	Halt Region	Toronto	Flamborough	Niagara Region	Waterloo	Total
Residential	65%	13%	0%	13%	2%	7%	100%
Non-residential	52%	9%	5%	18%	10%	6%	100%

Table 9 summarizes the auto trip assignment based on the general trip distribution noted above, existing transportation network and turning restrictions in the area for the proposed development. **Figure 10** illustrates the site traffic volumes.

Table 9 – Site Trip Assignment

Direction To/From	Street Name	Residential
North	John Street South	37%
South	John Street South/Arkledun Avenue	15%
East	Charlton Ave E/Main St E via Wentworth St S and Victoria Ave S	28%
West	Charlton Ave W/Main St E via John St S and James St S	20%
Total		100%

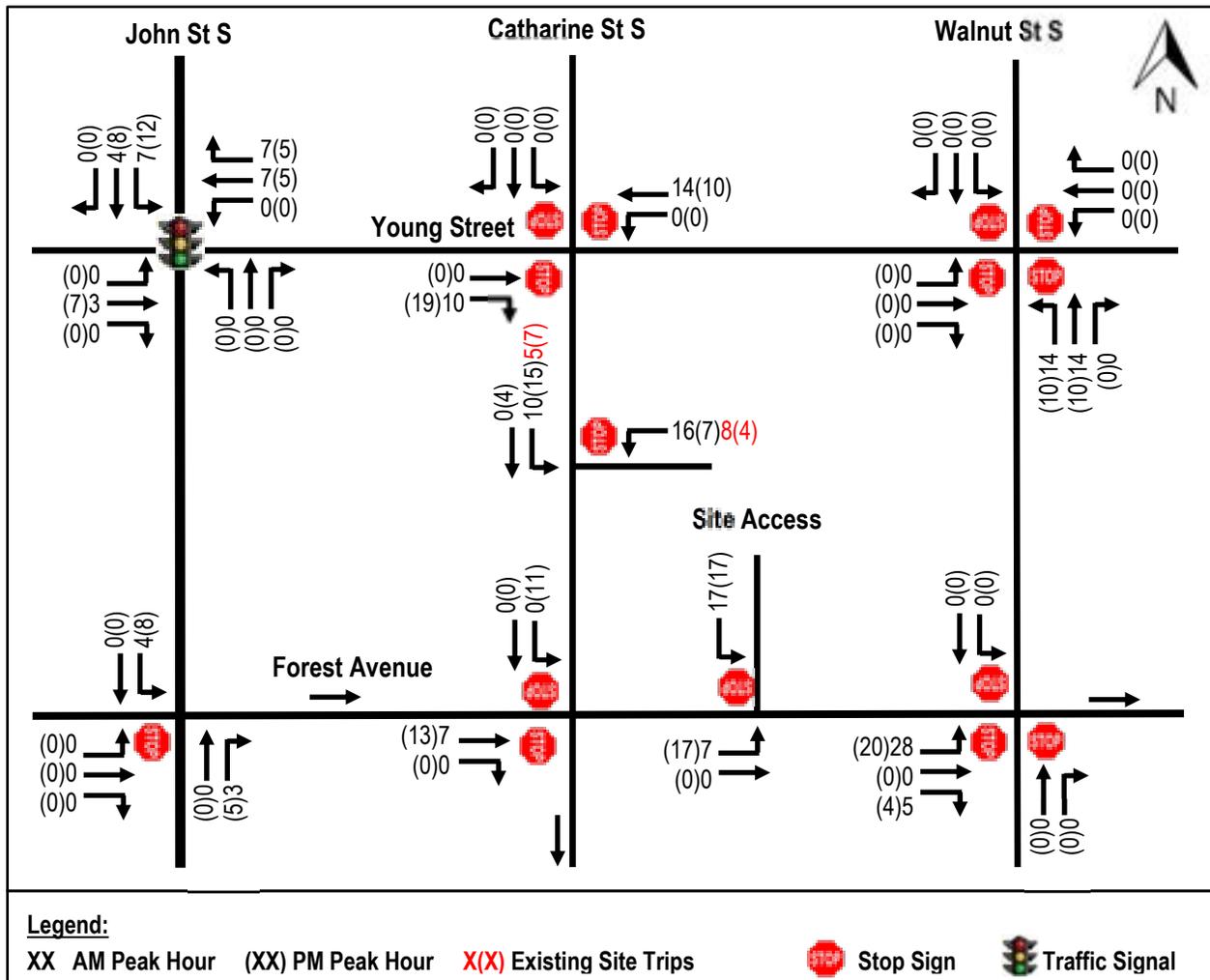
It should be noted that the trip assignment is also based on logical routes, one-way operation, turning restrictions as well as the general trip distribution noted above. Figure 10 illustrates the proposed development site generated traffic based on the methodologies indicated above.

As indicated, Currently, the subject site has a full moves access onto Forest Avenue that provides access to the surface parking lot, which a second access (underground parking access) onto Catharine Street South.

With the redevelopment of the two vacant lots, a full moves access will be provided onto Forest Avenue at the easterly limit of the site to service the proposed development. The existing underground parking access onto Catharine Street South will remain to service the existing 10-storey apartment building and the proposed development.

Given that the existing number of units for the site is 94, this is approximately half of the proposed future units. For purposes of this assessment and to be conservative, it is assumed that the existing apartments will generate about half of the future development. The existing apartment trips are also included in **Figure 10** below.

Figure 10 – Site Traffic Volumes



6.0 FUTURE TOTAL CONDITIONS

6.1. Future Total Traffic Assessment for Auto Mode

The estimated future total traffic volumes (future background traffic volumes plus site generated traffic volumes) are illustrated in **Figure 11**, and were analyzed using Synchro 11 software. The detailed calculations are provided in **Appendix F** and summarized in **Table 10**.

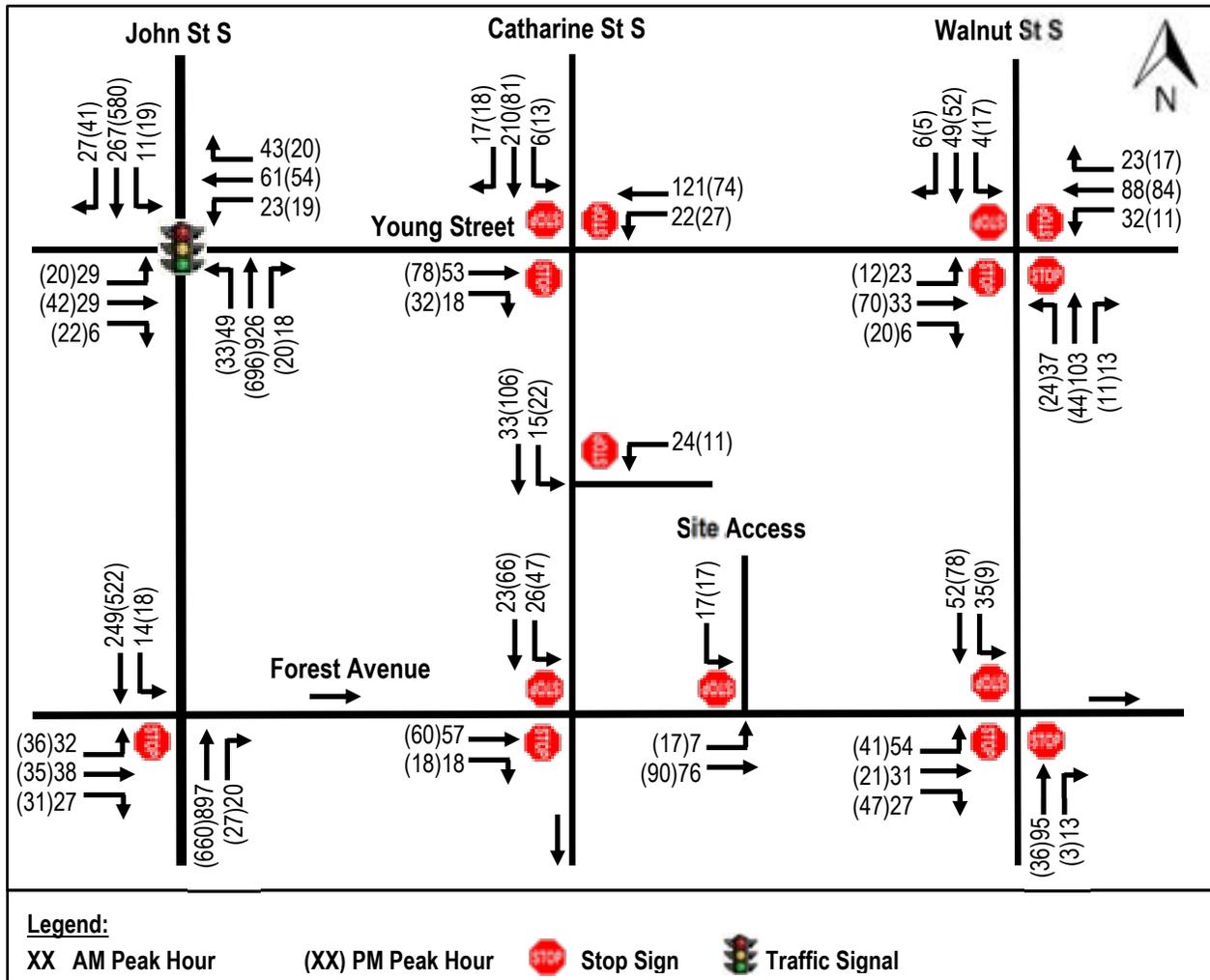
The analysis indicates that under the 2027 future total conditions, all signalized and unsignalized intersections are expected to operate at acceptable levels of service during the morning and afternoon peak periods.

The analysis indicates that the proposed development access onto Forest Avenue and existing underground parking access onto Catharine Street South are expected to operate at acceptable levels of service with negligible delay or queue. The recommended lane configurations for the proposed development access onto Forest Avenue include:

- One inbound lane (3.0 m)
- One outbound lane (3.0 m)
- One shared westbound through/left on Forest Avenue (same as the existing conditions)

It should be noted that the access onto Catharine Street South existing lane configurations will be remained the same. In addition, a proposed drop-off/pick-up area is provided on the north side of Forest Avenue, just to the east of Catharine Street South.

Figure 11 – 2027 Future Total Traffic Volumes



6.2. Future Total Traffic Assessment for Transit Mode

The proposed development is expected to generate 37 total two-way non-auto trips (32 inbound and 5 outbound) during the weekday morning peak hour and 32 total two-way non-auto trips (11 inbound and 21 outbound) during the afternoon peak hour. It is anticipated that the majority of these trips will be transit related trips.

As indicated in Section 2.4, the area is currently well serviced by the existing transit network. The proposed development has excellent access to the public transit and only located approximately 400 m (or less than 6-minute walk) to the

Hamilton GO Train Station and transit terminal. The proposed development is also located within a few minutes walk to bus stops for HSR Bus Routes 22, 23, 24, 25, 26, 27.

It is Nextrans' understanding that the Province has cancelled the proposed Light Rail Transit (LRT) and replace it with a Future Rapid Transit Corridor. Although the LRT could accommodate higher ridership, however, the Future Rapid Transit Corridor still will be a significant improvement from the existing conditions.

It is Nextrans' opinion that the proposed development is located in the heart of Downtown Hamilton and has the best location for use of public transit. It is Nextrans' opinion that the proposed development transit trips can be accommodated by the existing and future transit services without any additional improvements. The proposed land uses also support future transit ridership and help reduce the numbers of single-occupant-vehicles to and from the proposed development.

Table 10 – 2027 Future Total Levels of Service

Intersection	Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Available Storage Length (m)
		LOS (v/c)	Delay (s)	95 th Queue (m)	LOS (v/c)	Delay (s)	95 th Queue (m)	
John Street S/ Young Street (signalized)	Overall	A (0.51)	8		A (0.40)	7		
	EB – L	D (0.26)	39	13	D (0.15)	37	10	~15
	EB – TR	C (0.14)	30	13	C (0.28)	28	19	~100
	WB – LTR	C (0.51)	34	35	C (0.40)	35	28	~90
	NB – LTR	A (0.46)	5	50	A (0.33)	3	29	~100
	SB – LTR	A (0.14)	3	12	A (0.26)	3	23	~100
John Street S/ Forest Avenue (unsignalized)	EB – LTR	D (0.42)	30	16	D (0.45)	33	17	~100
	NB – TR	A (0.37)	0	0	A (0.27)	0	0	~100
	SB – TL	A (0.02)	2	1	A (0.02)	1	1	~100
Young Street/ Catharine Street S (signalized)	EB – TR	A (0.10)	8	-	A (0.14)	8	-	~90
	WB – TL	A (0.21)	9	-	A (0.14)	8	-	~175
	SB – LTR	A (0.32)	10	-	A (0.15)	8	-	~100
Forest Avenue/ Catharine Street S (unsignalized)	EB – TR	A (0.11)	8	-	A (0.10)	8	-	~90
	SB – LTR	A (0.08)	8	-	A (0.15)	8	-	~100
Young Street/ Walnut Street S (signalized)	EB – LTR	A (0.09)	8	-	A (0.13)	8	-	~175
	WB – LTR	A (0.20)	9	-	A (0.15)	8	-	~100
	NB – LTR	A (0.21)	9	-	A (0.11)	8	-	~100
	SB – LTR	A (0.08)	8	-	A (0.10)	8	-	~65
Forest Avenue/ Walnut Street S (unsignalized)	EB – LTR	A (0.16)	8	-	A (0.14)	8	-	~175
	NB – TR	A (0.15)	8	-	A (0.05)	7	-	~100
	SB – TL	A (0.13)	8	-	A (0.11)	8	-	~100
Forest Avenue/ Site Access (unsignalized)	EB – TL	A (0.01)	1	0	A (0.02)	10	0	~50
	SB – R	A (0.02)	9	1	A (0.02)	1	0	~15
Catharine Street South/ Site Access (unsignalized)	SB – TL	A (0.03)	9	1	A (0.01)	1	0	~60
	WB – R	A (0.01)	2	0	A (0.02)	10	1	~15

6.3. Future Active Transportation Mode Assessment

Walking

The area is currently well served by a complete network of sidewalks. The sidewalks are generally available on both sides of the streets and reasonably maintained on the public streets. It is Nextrans' opinion that no improvements are required to the sidewalk network under the existing conditions.

As part of the proposed development, pedestrian connections will be provided internally within the proposed development. Direct entrances will be provided onto Forest Avenue and Catharine Street South to facilitate the proposed development pedestrians.

The existing sidewalks along Forest Avenue and Catharine Street South along the frontage of the proposed development will be maintained and enhanced, with sufficient lighting to help with security and user experience.

Cycling

Under the existing conditions, there are some bicycle facilities available in the area such as the dedicated bicycle lanes on Cannon Street, Hunter Street, Markland Street and Arkledun Avenue. There are also signed routes/sharrows on part of Arkledun Avenue, Stinson Street and Ferguson Avenue. Bicycle trails are also available in the east-west direction south of Charlton Street E and south of James Mountain Road.

Under Appendix B of the City of Hamilton Cycling Master Plan Update and Review, on-street bicycle lanes are identified on Charlton Avenue E between James Street s to Ferguson and John Street S between Charlton and St Joseph's Drive. It is Nextrans' understanding that the City is currently reviewing the design and it has not been finalized at this time. It is Nextrans' opinion that this cycling project is important for both Charlton Street E and John Street S in order to complete the cycling network in the area.

The proposed development will provide a total of 113 bicycle parking spaces, with 5 short-term and 108 long-term bicycle parking spaces. This provision will support TDM and help reduce the numbers of single-occupant-vehicle trips to and from the proposed development. This provision will also help achieve the City's sustainability objectives and utilization of the existing and planned active transportation infrastructure.

7.0 SITE PLAN REVIEW

7.1. Proposed Development Access Location

Currently, the subject site has a full moves access onto Forest Avenue that provides access to the surface parking lot, which a second access (underground parking access) onto Catharine Street South.

With the redevelopment of the two vacant lots, a full moves access will be provided onto Forest Avenue at the easterly limit of the site to service the proposed development. The existing underground parking access onto Catharine Street South will remain to service the existing 10-storey apartment building and the proposed development.

The analysis indicates that the proposed development access onto Forest Avenue and existing underground parking access onto Catharine Street South are expected to operate at acceptable levels of service with negligible delay or queue. The recommended lane configurations for the proposed development access onto Forest Avenue include:

- One inbound lane (3.0 m)
- One outbound lane (3.0 m)
- One shared westbound through/left on Forest Avenue (same as the existing conditions)

It should be noted that the access onto Catharine Street South existing lane configurations will be remained the same. In addition, a proposed drop-off/pick-up area is provided on the north side of Forest Avenue, just to the east of Catharine Street South.

7.2. Solid Waste Pick-up

It is Nextrans' understanding that the proposed development will have curb side solid waste pick-up on Forest Avenue, similar to the existing apartment building that currently has solid waste curb side pick-up on Young Street.

7.3. Vehicle Turning Movements

The vehicle turning movements will be provided at the site plan stage when more detailed site plan design is provided. It is anticipated that there is no potential issues with the passenger vehicles entering and exiting the existing underground parking as it is similar to the existing conditions. Similarly, no issues are expected for the surface parking lot.

8.0 PARKING ASSESSMENT

8.1. Vehicle Parking

Nextrans provided a comprehensive parking justification Study Addendum dated December, 2017 and the original Parking Justification Study dated December, 2016 (**Appendix G**). It is Nextrans' understanding that the City has accepted the recommended parking rates for the proposed development. **Table 11** below summarizes the vehicle parking requirements for the proposed development based on the recommended rates.

Table 11 – Vehicle Parking Requirement Based on Recommended Rates

Land Use	Magnitude	Required Rates	Total Requirement
Residential Existing	92 units	0.39 spaces/unit	36 spaces
Residential Proposed	216 units	0.39 spaces/unit	84 spaces
Visitor	308 units	0.13 spaces/unit	40 spaces
Total Parking Requirements			160 spaces

Therefore, the proposed development only needs to provide a total of 160 vehicle parking spaces, inclusive of resident and visitor parking space requirements. The proposed development meets this requirement and has reflected in the appropriate site plan.

8.2. Bicycle Parking

It is Nextrans' understanding that the proposed development is required to provide 5 short-term parking spaces and 0.5 bicycle parking spaces/unit as per the current Zoning By-law requirements. On this basis, the proposed development will provide a total of 113 bicycle parking spaces (216 units x 0.5 spaces/unit plus 5 short-term spaces). This meets the applicable Zoning By-law requirements.

9.0 TRANSPORTATION DEMAND MANAGEMENT (TDM) OPTIONS

9.1. Planning and Design

a. Increase Density and Compact Site Design

As indicated, the proposed development will involve the redevelopment of the two vacant lots, which consists of a 14-storey high-rise building with a total of 216 residential dwelling units.

This is a very compact development that utilized the existing lands that are currently vacant. It is Nextrans' opinion that the current development proposal provides a better and suitable land use mix for these lands and maximize the transportation planning potential for walking, cycling and existing and future public transit initiatives.

b. Site Design Elements

It is Nextrans' understanding that the proposed development concept is designed to maximize the available developable space that includes the following design elements:

- Direct main entrances are provided onto Forest Avenue to facilitate pedestrians;
- Minimizes surface parking spaces and interference with pedestrians and cyclists;
- Provides a total of 113 secured bicycle racks on site with 5 short-term surface bicycle parking spaces for visitors; and
- Provides only a total of 160 vehicle parking spaces, inclusive of resident and visitor spaces.

It is Nextrans' opinion that the proposed design elements are sufficient to accommodate the active modes of transportation for the proposed development.

9.2. Walking and Cycling

a. Sidewalks and pathways

It is Nextrans' understanding that pedestrian walkways are provided along the side of the building, internal to the site and inside the buildings, to facilitate pedestrian circulation.

b. Bicycle Parking (Long and Short-Term)

It is Nextrans' understanding that the proposed development will include 113 secured, long-term and short-term bike storage within the site for the residents.

c. End of Trip Facilities (Lockers, Showers)

It is Nextrans' opinion that this requirement is more appropriate for large employment buildings. As the proposed development only include small ground-related retail and commercial spaces, as such, this requirement is not applicable for the proposed development.

9.3. Transit

a. Direct Connections to Transit

The proposed development is committed to provide direct pedestrian connections and place the main entrance to the adjacent public roads. These connections provide direct access to existing transit stop at the John Street S/Young Street intersection.

b. Weather Protected Waiting Areas

Given that the proposed development is not directly fronting onto existing bus routes and bus stops, it is Nextrans recommendation that HSR should review and provide transit shelters where appropriate.

9.4. Parking

Nextrans provided a comprehensive parking justification Study Addendum dated December, 2017 and the original Parking Justification Study dated December, 2016. It is Nextrans' understanding that the City has accepted the recommended parking rates for the proposed development, which is a reduction from the current/applicable Zoning By-law No. 6593 Vehicle Parking Requirements.

Therefore, the proposed development only needs to provide a total of 160 vehicle parking spaces, inclusive of resident and visitor parking space requirements. The proposed development meets this requirement and has reflected in the appropriate site plan.

a. Opportunities for Reduced Parking Requirements

As noted above, the proposed development will reduce the numbers of vehicle parking spaces to support TDM and minimize the numbers of single-occupant-vehicle trips to and from the proposed developments.

b. Unbundle Parking

It is Nextrans' understanding that a portion of the parking provided will be available on demand basis. As such, it is Nextrans' opinion that this requirement is met.

c. Paid Parking

This provision is not applicable for this type of residential development. However, with the rental component, parking rental will be separate from the unit rental.

d. Carpool Parking

It is Nextrans' opinion that this requirement is only applicable to non-residential development such as large employment buildings. As such, it is not applicable for the proposed development with residential dwelling units.

e. Shared Parking

This provision is only applicable to mixed-use development and is not required for residential development.

9.5. Carshare/Bikeshare

Carshare Potential

It is suggested that the proposed development designates one or two parking spaces for carshare, if required or economically feasible. It should be noted that the carshare company will evaluate and determine if the proposed building is feasible for carshare operation.

Bikeshare Potential

Since the proposed development will provide 113 secured bicycle parking spaces including 5 short-term bicycle parking spaces, it is Nextrans' opinion that bikeshare provision is not required for the proposed development.

a. On-Site Carshare Vehicle(s) and Parking Spot(s)

It is suggested that the proposed development designates at least one parking space for future carshare service for the residents living in the buildings.

b. On-Site Bikeshare

It is Nextrans' opinion that this requirement is not required for the proposed development as per the reasons noted above.

9.6. Wayfinding and Travel Planning

a. Wayfinding Signage

This provision is not required for the proposed development given its location and small-scale development. The proposed development is visible to visitors and residents.

b. Travel Planning Tools and Support for Development of a School Travel Plan

Based on Nextrans' review of the area, the proposed development is located approximately:

- 200 m to Queen Victoria Elementary School;
- 2.6 km to Cathedral High School;
- 1.9 km to Sir John A Macdonald Secondary School; and
- 1.3 km to Ryerson Middle School

This information indicates that elementary school students can easily walk to Queen Victoria Elementary School located at 166 Forest Avenue. High School students can either walk, bicycle or take public transit to Cathedral High School or Sir John A Macdonald Secondary School.

It is Nextrans' opinion that it maybe beneficial to have travel planning tools to support development school travel plan, however, given the location the proposed development relative to the surrounding schools, a school travel plan is not necessary. As such, we do not recommend a school travel plan for the proposed development.

9.7. Education/Promotion and Incentives

a. TDM Branding

It is Nextrans' opinion that a TDM branding is not required for the proposed development given the nature of the proposed land uses, which are mostly residential dwelling units. It is Nextrans' opinion that TDM branding would not be effective for this type of land use.

b. Membership in TMAs/Smart Commute

It is Nextrans' understanding that TMAs and Smart Commute are currently concentrate their efforts in helping employment base programs and incentives. These programs and incentives are not currently expanded to include residential developments. As such, it is Nextrans' opinion that this requirement is only applicable to non-residential development. As such, it is not applicable for this proposed mixed-use (residential and small retail) development.

c. Opportunities for Transit Passes, Carshare Memberships, or Bikeshare Memberships

Bikeshare Membership

As indicated, the proposed development provides a total of 113 bicycle parking spaces including 5 short-term visitor bicycle parking spaces at convenient locations. As such, it is Nextrans' opinion that bikeshare membership is not required for the proposed development.

Carshare Membership

The Study suggests that the proposed development designates at least two parking spaces for carshare. It is also recommended that the proposed development contact carshare company in the future to provide carshare service for the residents living in the buildings. Once carshare is established in the buildings, carshare membership information can be made available at the building management office in the future, if appropriate.

Transit Passes

Given that the proposed development is located close to transit terminal and GO Train Station, it is Nextrans' opinion that transit incentives are not required. Residents who will be living in this area understand the convenient of the area and will make their conscious decisions.

9.8. Project Trip Reductions for TDM Measures

Table 12 summarizes the travel mode split information based on the review of the 2016 Transportation Tomorrow Survey data for Traffic Zones 5159 and 5168.

Table 12 – Modes of Travel based on 2016 TTS

Land use	Time Period	Auto Driver	Auto Passenger	Local Transit	GO Transit	Cycle	Walk
Residential	AM Peak Period (6:00 AM – 9:00 AM)	35%	2%	40%	1%	4%	18%
	PM Peak Period (3:00 PM – 6:00 PM)	51%	8%	30%	1%	2%	8%

Based on the information above, the predominant modes of travel for the residents in the area under the existing conditions are non-auto modes of transportation such as walking, cycling, public transit and carpooling. The high walking percentage is expected given the close proximity of the area to the Hamilton GO Centre/HSR Terminal and Downtown area. It is expected that for non-residential mode, the driving percentage is higher than other modes.

9.9. Site Plan that Incorporates TDM Measures/Strategies

It is Nextrans' understanding that the proposed development concept is designed to maximize the available developable space that includes the following design elements:

- Direct main entrances are provided onto Forest Avenue to facilitate pedestrians;
- Minimizes surface parking spaces and interference with pedestrians and cyclists;
- Provides a total of 113 secured bicycle racks on site with 5 short-term surface bicycle parking spaces for visitors; and
- Provides only a total of 160 vehicle parking spaces, inclusive of resident and visitor spaces.

It is Nextrans' opinion that the proposed design elements are sufficient to accommodate the active modes of transportation for the proposed development.

9.10. Proposed Monitoring and Evaluation of TDM Measures

It is suggested that the Owner or building management, where appropriate, should monitor the short-term and long-term bike parking usage in order to make provision for future expansion if necessary; and

9.11. Conclusions / Recommendations for TDM Measures

Based on the review of the context of the proposed development in relation to the TDM requirements by the City of Hamilton findings of this report, a number of TDM measures and incentives are recommended for the proposed development. **Table 13** summarizes the recommended TDM measures and incentives.

Table 13 – Recommended TDM Measures for the Proposed Development

Category	TDM Initiative Suggested by Nextrans	Recommended Actions	Responsibility
Cycling	<ul style="list-style-type: none"> Visible, well-lit, short-term bicycle parking for visitors (above minimum provisions or recommendations) Secure, indoor bicycle parking storage spaces for tenants/residents Ensure development connects to bicycle network 	<ul style="list-style-type: none"> The proposed development to provide a total of 113 bicycle parking spaces for all buildings Provide secured long-term parking spaces underground; Provide at least 5 short-term bicycle parking spaces for visitors 	Applicant
Walking	<ul style="list-style-type: none"> Safe, attractive and direct walkways for pedestrians linking building entrances with public sidewalks and with key destinations such as schools Enhanced pedestrian amenities on-site (benches, landscaping, lighting) 	<ul style="list-style-type: none"> Provide direct shared pedestrian and cycling connections onto Forest Avenue 	Applicant
Transit	<ul style="list-style-type: none"> Enhance walking routes between main building entrance(s) and transit stops/stations Bicycle parking located at or near transit stops Implement transit priority measures (queue jump lanes, traffic signal priority, bus only lanes) 	<ul style="list-style-type: none"> Not required 	Applicant/ City of Hamilton
Parking	<ul style="list-style-type: none"> Reduced minimum parking requirements based on proximity to transit Shared parking with nearby developments or on-street spaces Unbundle parking costs from unit costs 	<ul style="list-style-type: none"> Only provide 160 vehicle parking spaces, as per the recommendations of this Study 	Applicant
Information Brochure/ Letter	<ul style="list-style-type: none"> Provide an information brochure/letter for each residential unit that include HSR Transit System schedules, GO Transit schedules, cycling maps and community maps. 	<ul style="list-style-type: none"> Provide a brochure (or a letter) to new residents that include all website links to HSR Transit System schedules, GO Transit schedules, community maps and cycling maps. Provide hard copies of the HSR system map and schedule for Bus Routes 22, 23, 24, 25, 26 and 27, GO Transit schedule, cycling maps and community maps at the sale office and building management office, or close to the building entrances 	Applicant
Pre-loaded PRESTO Card	<ul style="list-style-type: none"> Provide transit incentives such as transit passes 	<ul style="list-style-type: none"> Not required 	Applicant
Monitoring	<ul style="list-style-type: none"> Monitoring and evaluation of TDM measures 	<ul style="list-style-type: none"> Monitor the short-term and long-term bike parking usage in order to make provision for future expansion if necessary 	Applicant

10.0 CONCLUSIONS / RECOMMENDATIONS

10.1. Study Conclusions

The findings and conclusions of the analysis are as follows:

- The proposed development is expected to generate:
 - 87 total two-way trips (49 inbound and 38 outbound) during the weekday morning peak hour and 88 total two-way trips (43 inbound and 45 outbound) during the afternoon peak hour;
 - 50 total two-way auto trips (17 inbound and 33 outbound) during the weekday morning peak hour and 56 total two-way auto trips (32 inbound and 24 outbound) during the afternoon peak hour; and

- 37 total two-way non-auto trips (32 inbound and 5 outbound) during the weekday morning peak hour and 32 total two-way non-auto trips (11 inbound and 21 outbound) during the afternoon peak hour
- The intersection capacity analysis indicates that the existing, future background and future total conditions, all signalized and unsignalized intersections are expected to operate at acceptable levels of service. No improvements are required to accommodate the background development and the proposed development site generated traffic.
- The analysis indicates that the proposed development access onto Forest Avenue and existing underground parking access onto Catharine Street South are expected to operate at acceptable levels of service with negligible delay or queue.
- Based on the transit assessment, the site is currently located within short walking distance to HSR Transit System and Hamilton GO Station. It is Nextrans' opinion that the the proposed development is well-served by the HSR Transit System and the potential transit ridership generated by the proposed development can be accommodated without any additional improvements.
- Nextrans provided a comprehensive parking justification Study Addendum dated December, 2017 and the original Parking Justification Study dated December, 2016. It is Nextrans' understanding that the City has accepted the recommended parking rates for the proposed development. Therefore, the proposed development only needs to provide a total of 160 vehicle parking spaces, inclusive of resident and visitor parking space requirements. The proposed development meets this requirement and has reflected in the appropriate site plan.
- It is Nextrans' understanding that the proposed development is required to provide 5 short-term parking spaces and 0.5 bicycle parking spaces/unit as per the current Zoning By-law requirements. On this basis, the proposed development will provide a total of 113 bicycle parking spaces (216 units x 0.5 spaces/unit plus 5 short-term spaces). This meets the applicable Zoning By-law requirements.
- It is Nextrans' understanding that the proposed development proposes three loading spaces with the following dimensions: 4.0 m Width x 13.0 m Length x 6.1 m Vertical Clearance. One loading space will be accessed via Charlton Avenue and to service Building, with the two of the loading spaces will be accessed via St. Joseph's Drive to service Buildings B and C. These three loading spaces will be utilized for garbage loading, delivery vehicles and moving vehicles. AutoTURN software was used (TAC-1999 HSU) to generate vehicular turning templates to confirm and demonstrate the accessibility for service vehicles such as garbage truck and fire truck.

10.2. Study Recommendations

Based on the Study assessment and findings, the following recommendations are provided:

- The proposed development implements the Transportation Demand Management (TDM) measures and incentives identified in Section 9 of this report to support active transportation and public transit, to meet the objectives and requirements by the City of Hamilton's TDM for Development (June, 2015);
- The proposed development reduces the vehicle parking supply based on recommendations of this Study in order to reduce the numbers of single-occupant-vehicle trips to and from the proposed developments;
- The proposed development provides direct pedestrian and cycling connections to Forest Avenue; and
- No physical improvements are required at the boundary roadway intersections to accommodate the future background traffic and the proposed development site generated traffic

Appendix A

Terms of Reference

From: Transportation Planning <Transportation.Planning@hamilton.ca>
Sent: June 13, 2022 11:44 AM
To: Sam Nguyen <sam@nextrans.ca>
Cc: Scott Beedie <sbeedie@urbansolutions.info>
Subject: RE: Terms of Reference - 117 Forest Avenue Proposed Residential Development

Hi Sam,

Thank you for your submission. It has been noted that under Application DA-22-014 this site has been reviewed with a much lower residential unit density compared to what is being proposed in your TIS submission (previously approximately 80 units vs. the 216 units proposed). Without setting precedent, Transportation Planning does not require a TIS to be submitted for the increase in density to the site provided that the number of residential units does not significantly exceed the 216 units now proposed.

It shall be noted that following the formal submission of the Application, Transportation Planning will request funds to be provided for the purpose of implementing Traffic Calming measures within the surrounding neighbourhood due to the increase in residential density (please note a traffic calming study is not required). Please let me know if you have any questions or concerns. Thank you,

Matthew Radaelli
Project Manager, Transportation Planning – Development Approvals
On Behalf of Transportation Planning

COVID-19 UPDATE: Flexibility and patience is asked of ourselves, clients, contractors and customers working with the City of Hamilton. Most staff are working remotely with limited access to voicemail, so please send emails. All in-person meetings that are required will be become conference calls or another form of virtual meetings. The City is making adjustments to ensure staff are connected to office tools and project files while we protect ourselves and our communities during this time. Please note that while we are trying to maintain time frames for comments on applications and dealing with responding information, we may not always achieve these goals.

From: Sam Nguyen <sam@nextrans.ca>
Sent: June 3, 2022 12:09 PM
To: Transportation Planning <Transportation.Planning@hamilton.ca>
Cc: Scott Beedie <sbeedie@urbansolutions.info>
Subject: Terms of Reference - 117 Forest Avenue Proposed Residential Development

Good afternoon,

We have been retained to undertake a TIS to support a proposed residential development located at 117 Forest Avenue, in the City of Hamilton. The following is a proposed scope of the TIS that takes into consideration the City Traffic Impact Study Guidelines:

1. Study Area intersection:
 - a. John Street S/Young St (signalized)

- b. John Street S/Forest Avenue (unsignalized)
 - c. Young Street/Catharine Street S (unsignalized)
 - d. Forest Avenue/Catharine Street S (unsignalized)
 - e. Young Street/Walnut Street S (unsignalized)
 - f. Forest Avenue/Walnut Street S (unsignalized)
 - g. Site accesses
1. Horizon Year
 - a. Project completion by 2025-2026
 - b. Analysis horizon year 2027 (five years from 2022)
 1. Background Developments and Growth Rate
 - a. Background corridor through traffic growth – 2% as per City typical requirements
 - b. Please let us know if any proposed background developments in the area
 - c. Please send us any available TIS for the background developments in the area
 1. Trip Generation
 - a. ITE Trip Generation Manual 11th Edition or trip generation at the existing driveways, where appropriate.
 - b. Multimodal trip generation using 2016 TTS modal split data
 1. Trip Distribution
 - a. Extract 2016 TTS data based on the surrounding traffic zones where appropriate
 1. Future Total Assessment
 - a. The following tasks will be conducted for the future total conditions:
 - Future Total Traffic Assessment for Auto Mode (using existing signal timing and optimize as necessary)
 - Future non-auto mode assessment
 - Proposed development access assessment
 - Vehicular and Bicycle Parking Assessment
 - Internal Site Circulation and loading assessment (if necessary)
 1. Transit, Active Transportation and TDM
 - a. Conduct a review of the existing and proposed future transit network in the area. Based on these findings, appropriate recommendations will be provided to ensure adequate walking distances to/from the proposed development to transit stations/stops.
 - b. Review the existing and proposed future active transportation network in the area. Based on these findings, Nextrans will identify missing gaps and additional interconnections and connections from the proposed development to adjacent land uses, the City facilities, as well as to transit stations/stops.
 - c. A Transportation Demand Management (TDM) assessment will be undertaken to identify specific measures and programs to reduce single-occupant-vehicle trips to/from the proposed development. These TDM measures and programs may include but not limited to, Carpooling, Auto Share, Bike racks, Parking management strategies, etc. The TDM report will be completed and included as part of this Study for submission purposes submitted in accordance with the City requirements.
 1. Parking Justification Study if necessary

Thanks,

Sam (Trang) Nguyen
Transportation Analyst

o: 905-503-2563 ext. 207
e: sam@nextrans.ca

w: www.nextrans.ca

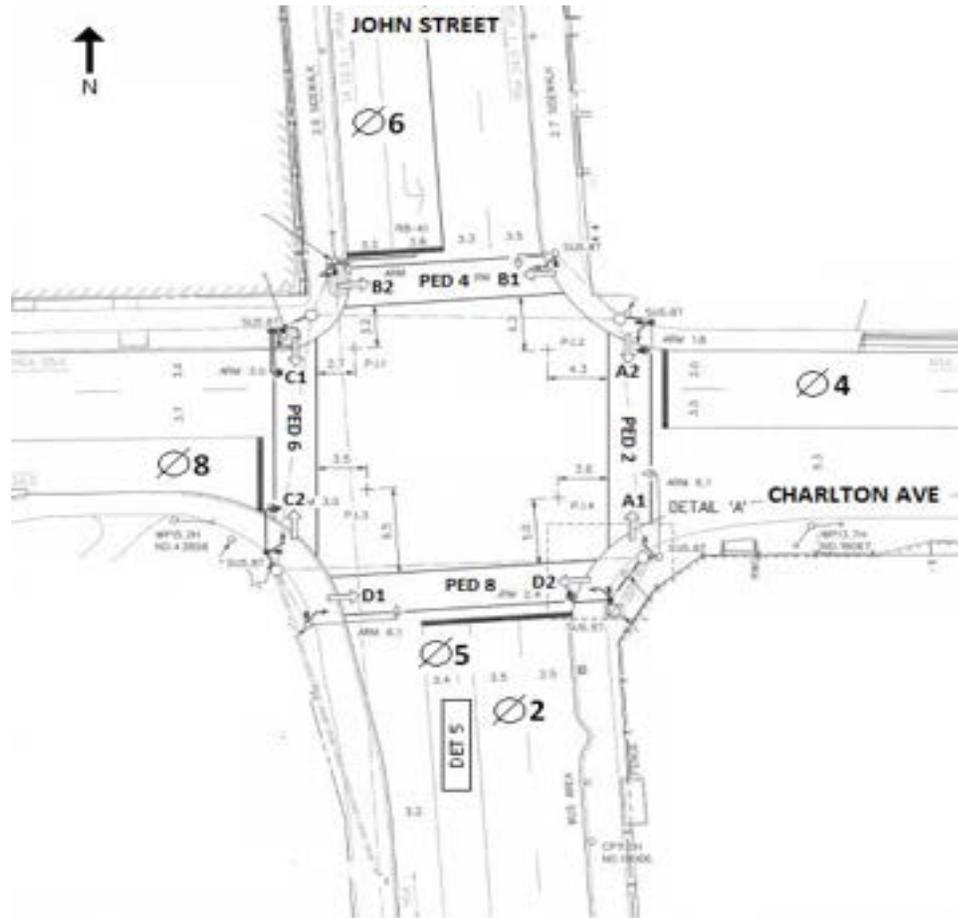
NexTrans Consulting Engineers
A Division of NextEng Consulting Group Inc.
520 Industrial Parkway South, Suite 201
Aurora ON L4G 6W8

Appendix B

Existing Traffic Data and Signal Timing Plans

City of Hamilton - Traffic Traffic Signal Controller Timing Data

Intersection: **Charlton & John**
Controller Type: **3000E** Page **1** of **14**
Programmed By: **JC** Installed By: _____
Date: **March 6/17** Date: _____



- φ1:
- φ2: John - NB, East Xwalk
- φ3:
- φ4: Charlton - WB, North Xwalk
- φ5: John - NBLT
- φ6: John - SB, West Xwalk
- φ7:
- φ8: Charlton - EB, South Xwalk

Flash Operation: Red: John
Red: Charlton

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
START-UP	Phases				X				X									
	Interval	0	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)															
	Flash	10	(0-255 seconds start-up flash time)															
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)															
	Sequence	3	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph)															

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		X		X												
	Ring 2					X	X		X								
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		X			X	X										
	CO PH 2				X				X								
	CO PH 3																
	CO PH 4																

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.)

USE 1 TO ALL 4 TIMING PLANS

		(X = ENABLE)															
		TP1 PHASE RECALLS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
NO SKIP																	

		(X = ENABLE)															
		TP2 PHASE RECALLS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
NO SKIP																	

CONTROLLER DATA

		(X = ENABLE)															
		TP3 PHASE RECALLS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK					X											
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

		(X = ENABLE)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X		X		X		X								
	CNA 2																
	CNA 3																
	CNA 4																
	WRM		X		X		X		X								
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		10		10	5	10		10								
	Passage					2											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.4		2.4	0.0	2.4		2.4								
	Walk		12		8		12		8								
	Ped Clr		10		11		10		11								
	Max 1		40		20	10	40		20								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																

CONTROLLER DATA

		TP2															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		10		10	5	10		10								
	Passage					2											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.4		2.4	0.0	2.4		2.4								
	Walk		12		8		12		8								
	Ped Clr		10		11		10		11								
	Max 1		50		30	20	50		30								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

		TP3															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		10		10	5	10		10								
	Passage					2											
	Yellow		3.3		3.3	3.0	3.3		3.3								
	Red		2.4		2.4	0.0	2.4		2.4								
	Walk		12		8		12		8								
	Ped Clr		10		11		10		11								
	Max 1		50		20	15	50		20								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.
--------------------	----------	---

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL ENTRY ASSIGNMENTS	1																
	2						X										
	3																
	4								X								
	5			X													
	6			X													
	7																
	8					X											

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET ASSIGNMENTS	1																
	2																
	3																
	4																
	5						X										
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET MODES	Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DETECTOR TIMES (MM-3-1-4-4)

	DET	1	2	3	4	5	6	7	8
DET TIMES	Delay	0	0	0	0	0	0	0	0
	Str/Stp								

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	1	0=TOD, 1=CL, 2=INT
Split Source:	0	0=TOD, 1=CL, 2=INT
Offset Source:	0	0=TOD, 1=CL, 2=INT

Free Source:	0	0=TOD, 1=CL, 2=INT
Flash Source:	0	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	255	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	N	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	N	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	N	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	Y	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	0	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

SPLIT TO TIME PLAN	CYCLE	1	2	3	4	5	6
	SPLIT 1	1	2	3			
	SPLIT 2		2				
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED
WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

CYCLE & OFFSETS	Cycle #	1/1	2/1	2/2	3/1	4/1	
	Length	70	90		90		
	Offset 1	36	28		64		
	Offset 2						
	Offset 3						
	Offset 4						
	Offset 5						
	Max Dwell	32	32		32		

COORD PHASES (MM-3-2-5)

COORD PHASES	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	1-1		X					X										
	2-1		X					X										
	2-2		X					X										
	3-1		X					X										

PHASE ALLOCATION (MM-3-2-6)

ENTRY IN: **Secs** % or Secs: Not a controller entry--for reference only. Controller entry is under

PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE ALLO-CATION	C1 S1		44		26	10	34		26							
	C1 S2															
	C1 S3															
	C1 S4															
	C2 S1		55		35	20	35		35							
	C2 S2															
	C2 S3															
	C2 S4															
	C3 S1		58		32	15	43		32							
	C3 S2															
	C3 S3															
	C3 S4															
	C4 S1															
	C4 S2															
	C4 S3															
	C4 S4															

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeking Mode: **0**

Mode

- 0 Add only, cycle times 20% slow only to get in sync
- 1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step
- 2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	Y	Y/N: See note	Invert Free In:	N	Y/N: See note
Central Override:	N	Y/N: See note	Split Matrix:	N	Y/N: See note
No PCL Offset Adjust:	N	Y/N: See note	4 Splits/Cycle:	Y	Y/N: See note
			No Early Coord Ped:	N	Y/N: See note

Yeil Percent	1	0-10%: See note
EGB%	0	0-100%: See note
RGB%	0	0-100%: See note
# Cycles to out of step:	0	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	0	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute
--------------	----------	---

Charts below only For City Zero offsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	0	Cycle 2:	0	Cycle 3:	0
Cycle 4:	0	Cycle 5:	0	Cycle 6:	0

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	Y	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	0	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	OFF
	00	00		1	1	1		
2	00	00					11(FRE)	OFF
	00	00		1	1	1		
	06	00		2	1	1		
	10	00		1	1	1		
	14	30		3	1	1		
	18	30		1	1	1		

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each circuit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVERRIDES	Circuit	65	66	67	68	69	70	71	72
	Function	LL1	LL2	LL3	LL4	LL5	LL6	LL7	LL8
	State								
	Circuit	73	74	75	76	77	78	79	80
	Function	CN1	CN2	CN3	CN4	WRM	MIN	DIM	CVS
	State	ON				ON			
CIRCUIT OVERRIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	125	126	127	128
	Function	PH2	DP2	DP3	3CD	EVL	EML	ASC	DCP
	State					ON	ON		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	2	11	1

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	0	0 = Time dependent, 1 = C/O/S Event
-------	----------	-------------------------------------

Time Clock Reset:	HH: 00	MM: 00	TOD clock reset to by TBC input
Interrupter:	N Y/N; Y = Interrupter pulses provided		
Pulses:	0 0-6 = Number of interrupter pulses		

TIME DEPENDENT CYCLE REFERENCES

	HH	MM
CYC 1:	00	00
CYC 4:	00	00

	HH	MM
CYC 2:	00	00
CYC 5:	00	00

	HH	MM
CYC 3:	00	00
CYC 6:	00	00

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference. When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	1	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	4	0-255
	Master Identification	11	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	9600	1200, 2400, 4800, 9600, 14400, 19200
	Parity	0	0 = None, 1 = Odd, 2=Even
	Data bits	1	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	1200	1200, 2400, 4800, 9600, 14400, 19200
	Parity	0	0 = None, 1 = Odd, 2=Even
	Data bits	1	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &
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PHONE NUMBERS (MM-3-5-3)

PHONE NUM- BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

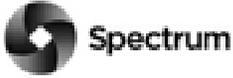
LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	60	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	60	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)



Turning Movement Count (4 . FOREST AVE & CATHARINE ST)

Start Time	N Approach CATHARINE ST						E Approach FOREST AVE						S Approach CATHARINE ST						W Approach FOREST AVE						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	4	4	0	5	8	0	0	0	0	4	0	0	0	0	2	0	4	4	0	0	1	8	16		
07:15:00	0	11	1	0	13	12	0	0	0	0	9	0	0	0	0	3	0	4	8	0	0	0	12	24		
07:30:00	0	9	1	0	9	10	0	0	0	0	1	0	0	0	0	4	0	4	10	0	0	2	14	24		
07:45:00	0	3	4	0	5	7	0	0	0	0	5	0	0	0	0	9	0	4	12	0	0	3	16	23	87	
08:00:00	0	7	4	0	12	11	0	0	0	0	9	0	0	0	0	5	0	1	12	0	0	1	13	24	95	
08:15:00	0	4	4	0	18	8	0	0	0	0	13	0	0	0	0	4	0	3	16	0	0	2	19	27	98	
08:30:00	0	3	7	0	5	10	0	0	0	0	6	0	0	0	0	5	0	7	5	0	0	1	12	22	96	
08:45:00	0	7	9	0	12	16	0	0	0	0	6	0	0	0	0	5	0	2	8	0	0	5	10	26	99	
09:00:00	0	7	6	0	4	13	0	0	0	0	2	0	0	0	0	4	0	6	16	0	0	2	22	35	110	
09:15:00	0	6	2	0	7	8	0	0	0	0	6	0	0	0	0	8	0	2	8	0	0	5	10	18	101	
09:30:00	0	8	5	0	11	13	0	0	0	0	4	0	0	0	0	2	0	3	9	0	0	0	12	25	104	
09:45:00	0	2	3	0	11	5	0	0	0	0	6	0	0	0	0	11	0	5	12	0	0	2	17	22	100	
BREAK																										
16:00:00	0	23	4	0	22	27	0	0	0	0	15	0	1	0	0	0	9	1	7	10	0	0	2	17	45	
16:15:00	0	13	4	0	14	17	0	0	0	0	15	0	0	1	0	0	6	1	5	10	0	0	4	15	33	
16:30:00	0	10	5	0	16	15	0	0	0	0	11	0	0	0	0	6	0	6	10	0	0	2	16	31		
16:45:00	0	18	12	0	14	30	0	0	0	0	13	0	0	0	0	3	0	3	11	0	0	6	14	44	153	
17:00:00	0	13	11	0	16	24	0	0	0	0	9	0	0	0	0	3	0	6	12	0	0	6	18	42	150	
17:15:00	0	9	12	0	18	21	0	0	2	0	11	2	0	0	0	5	0	7	9	0	0	5	16	39	156	
17:30:00	0	20	8	0	9	28	0	0	0	0	11	0	0	0	0	4	0	2	11	0	0	4	13	41	166	
17:45:00	0	14	8	0	12	22	0	0	0	0	6	0	1	0	0	5	1	4	15	0	0	6	19	42	164	
18:00:00	0	10	7	0	11	17	0	0	0	0	4	0	0	0	0	4	0	2	9	0	0	5	11	28	150	
18:15:00	0	7	15	0	16	22	0	0	0	0	15	0	0	0	0	7	0	6	9	0	0	6	15	37	148	
18:30:00	0	15	10	0	8	25	0	0	0	0	8	0	0	0	0	8	0	3	8	0	0	7	11	36	143	
18:45:00	0	11	6	0	16	17	0	0	0	0	12	0	0	2	0	4	2	4	11	0	0	2	15	34	135	
Grand Total	0	234	152	0	284	386	0	0	2	0	201	2	2	3	0	0	126	5	100	245	0	0	79	345	738	-
Approach%	0%	60.6%	39.4%	0%	-	-	0%	0%	100%	0%	-	-	40%	60%	0%	0%	-	29%	71%	0%	0%	-	-	-	-	
Totals %	0%	31.7%	20.6%	0%	52.3%	0%	0%	0.3%	0%	0.3%	0%	0.3%	0.3%	0.4%	0%	0%	0.7%	13.6%	33.2%	0%	0%	46.7%	-	-	-	
Heavy	0	2	2	0	-	-	0	0	0	0	-	-	0	0	0	0	-	0	9	0	0	-	-	-	-	
Heavy %	0%	0.9%	1.3%	0%	-	-	0%	0%	0%	0%	-	-	0%	0%	0%	0%	-	0%	3.7%	0%	0%	-	-	-	-	
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Peak Hour: 08:15 AM - 09:15 AM Weather: Light Rain (18.14 °C)

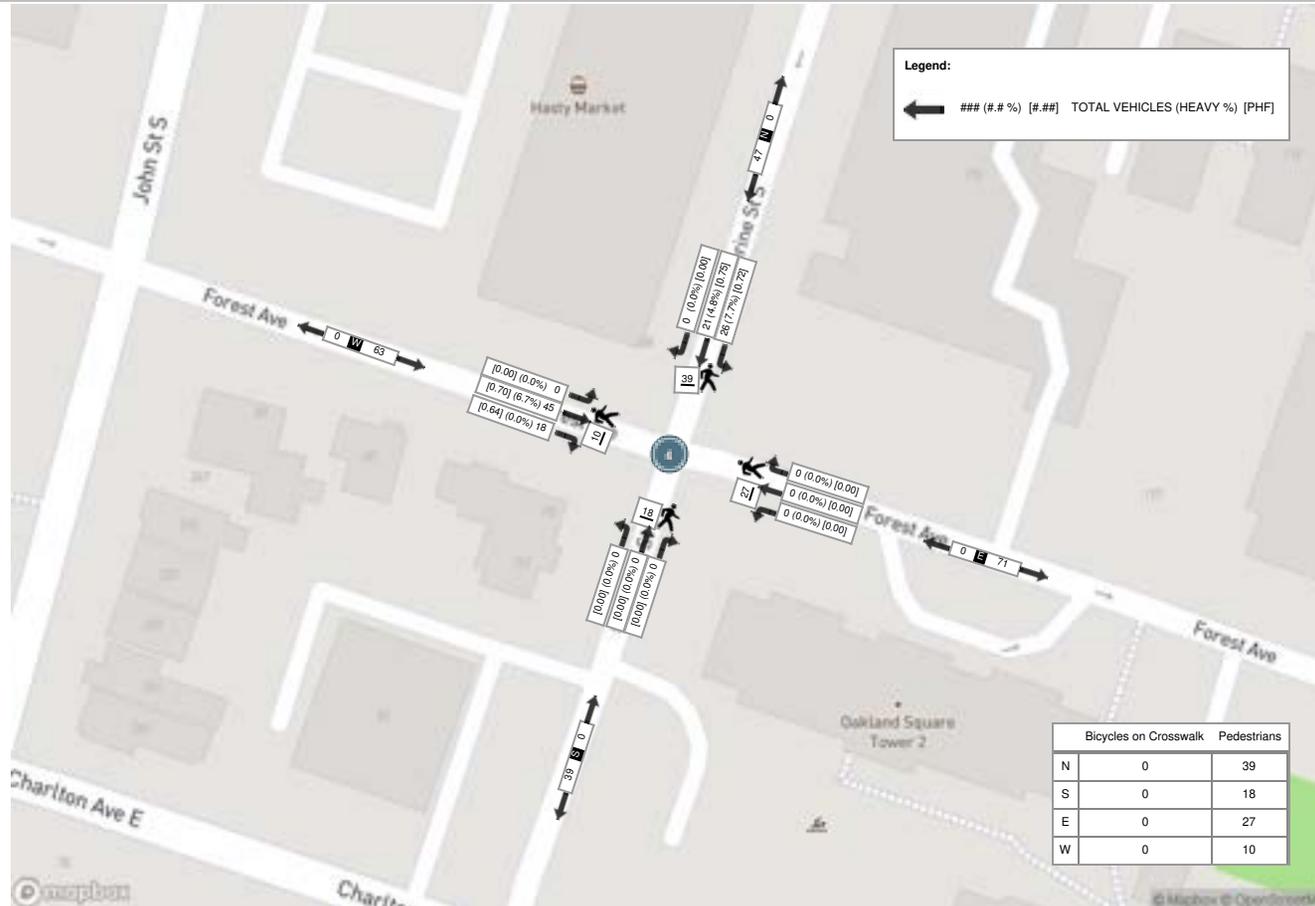
Start Time	N Approach CATHARINE ST						E Approach FOREST AVE						S Approach CATHARINE ST						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:15:00	0	4	4	0	18	8	0	0	0	0	13	0	0	0	0	4	0	3	16	0	0	2	19	27	
08:30:00	0	3	7	0	5	10	0	0	0	0	6	0	0	0	0	5	0	7	5	0	0	1	12	22	
08:45:00	0	7	9	0	12	16	0	0	0	0	6	0	0	0	0	5	0	2	8	0	0	5	10	26	
09:00:00	0	7	6	0	4	13	0	0	0	0	2	0	0	0	0	4	0	6	16	0	0	2	22	35	
Grand Total	0	21	26	0	39	47	0	0	0	0	27	0	0	0	0	18	0	18	45	0	0	10	63	110	
Approach%	0%	44.7%	55.3%	0%	-	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	28.6%	71.4%	0%	0%	-	-	-	-	
Totals %	0%	19.1%	23.6%	0%	42.7%	42.7%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	16.4%	40.9%	0%	0%	57.3%	-	-	-	
PHF	0	0.75	0.72	0	0.73	0.73	0	0	0	0	0	0	0	0	0	0	0.64	0.7	0	0	0.72	-	-	-	
Heavy	0	1	2	0	3	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	-	-	-	
Heavy %	0%	4.8%	7.7%	0%	6.4%	6.4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6.7%	0%	0%	4.8%	-	-	-	
Lights	0	20	24	0	44	44	0	0	0	0	0	0	0	0	0	0	18	42	0	0	60	-	-	-	
Lights %	0%	95.2%	92.3%	0%	93.6%	93.6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	93.3%	0%	0%	95.2%	-	-	-	
Single-Unit Trucks	0	1	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	-	-	
Single-Unit Trucks %	0%	4.8%	3.8%	0%	4.3%	4.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.2%	0%	0%	1.6%	-	-	-	
Buses	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	-	-	-	
Buses %	0%	0%	3.8%	0%	2.1%	2.1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4.4%	0%	0%	3.2%	-	-	-	
Bicycles on Road	0	0	0	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%	0%	0%	0%	-	-	-	
Pedestrians	-	-	-	-	39	-	-	-	-	27	-	-	-	-	18	-	-	-	-	-	10	-	-	-	
Pedestrians%	-	-	-	-	41.5%	-	-	-	-	28.7%	-	-	-	-	19.1%	-	-	-	-	-	10.6%	-	-	-	
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	



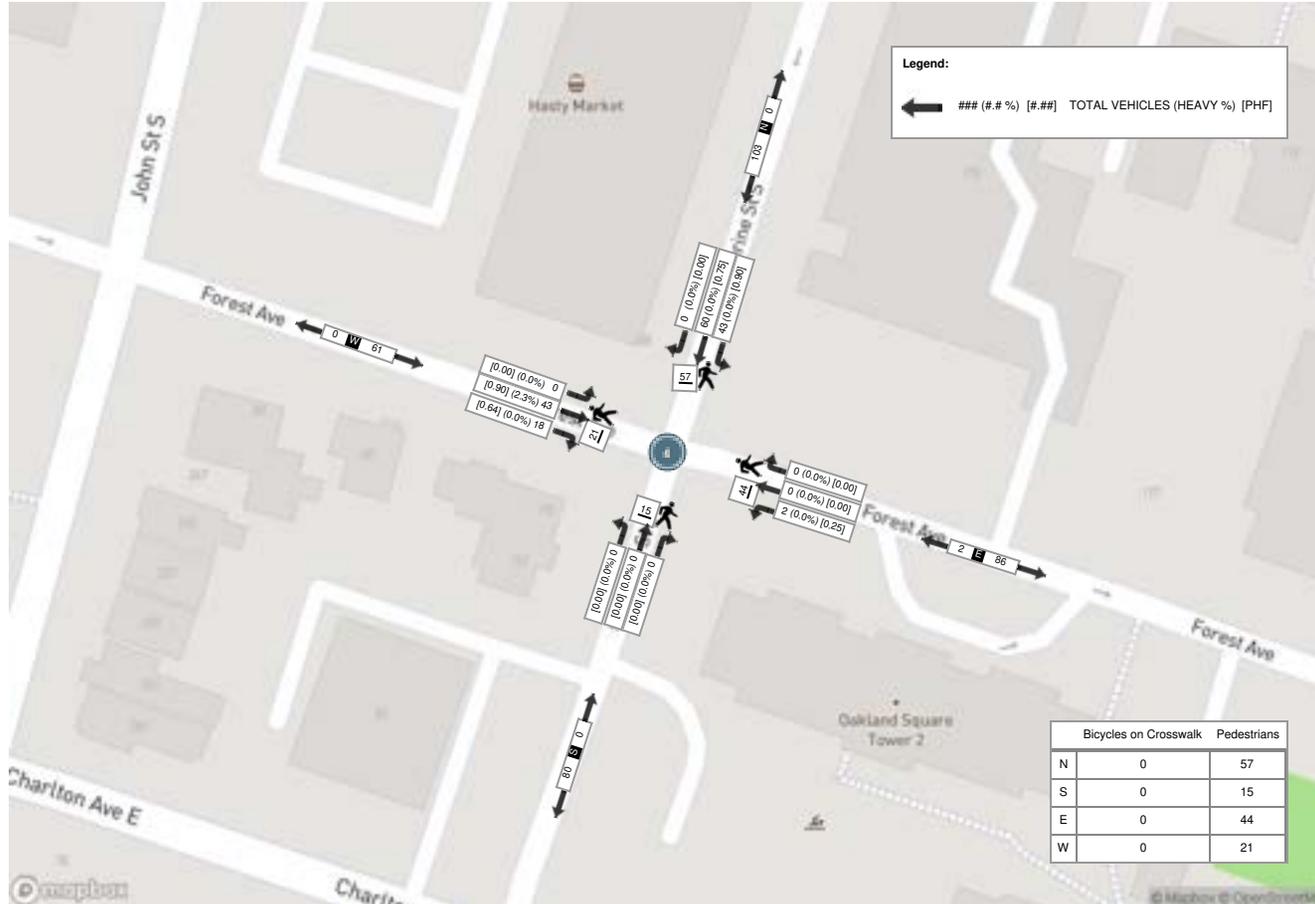
Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)

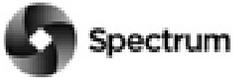
Start Time	N Approach CATHARINE ST						E Approach FOREST AVE						S Approach CATHARINE ST						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:45:00	0	18	12	0	14	30	0	0	0	0	13	0	0	0	0	3	0	3	11	0	0	6	14	44	
17:00:00	0	13	11	0	16	24	0	0	0	0	9	0	0	0	0	3	0	6	12	0	0	6	18	42	
17:15:00	0	9	12	0	18	21	0	0	2	0	11	2	0	0	0	5	0	7	9	0	0	5	16	39	
17:30:00	0	20	8	0	9	28	0	0	0	0	11	0	0	0	0	4	0	2	11	0	0	4	13	41	
Grand Total	0	60	43	0	57	103	0	0	2	0	44	2	0	0	0	15	0	18	43	0	0	21	61	166	
Approach%	0%	58.3%	41.7%	0%	-	-	0%	0%	100%	0%	-	0%	0%	0%	0%	-	29.5%	70.5%	0%	0%	-	-	-	-	
Totals %	0%	36.1%	25.9%	0%	62%	62%	0%	0%	1.2%	0%	1.2%	0%	0%	0%	0%	0%	10.8%	25.9%	0%	0%	36.7%	36.7%	-	-	
PHF	0	0.75	0.9	0	0.86	0.86	0	0	0.25	0	0.25	0	0	0	0	0	0.64	0.9	0	0	0.85	0.85	-	-	
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	-	
Heavy %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	0%	0%	1.6%	-	-	
Lights	0	60	43	0	103	103	0	0	0	0	0	0	0	0	0	0	0	18	42	0	0	60	-	-	
Lights %	0%	100%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	97.7%	0%	0%	98.4%	-	-	
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	-	-	
Single-Unit Trucks %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	0%	0%	1.6%	-	-	
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	
Buses %	0%	0%	0%	0%	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	2	0	2	0	0	0	0	0	0	0	0	0	0	0	-	-	
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	
Pedestrians	-	-	-	-	57	-	-	-	-	44	-	-	-	-	15	-	-	-	-	-	21	-	-	-	
Pedestrians%	-	-	-	-	41.6%	-	-	-	-	32.1%	-	-	-	-	10.9%	-	-	-	-	-	15.3%	-	-	-	
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	

Peak Hour: 08:15 AM - 09:15 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)





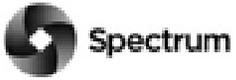
Turning Movement Count (6 . FOREST AVE & WALNUT ST S)

Start Time	N Approach WALNUT ST S						E Approach FOREST AVE						S Approach WALNUT ST S						W Approach FOREST AVE						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	5	0	0	0	5	0	0	0	0	3	0	0	8	0	0	0	8	7	1	8	0	0	16	29	
07:15:00	0	7	0	0	2	7	0	0	0	0	0	0	2	9	0	0	2	11	3	3	3	0	1	9	27	
07:30:00	0	6	0	0	3	6	0	0	0	0	0	0	1	13	0	0	4	14	4	3	5	0	0	12	32	
07:45:00	0	11	0	0	3	11	0	0	0	0	1	0	4	25	0	0	9	29	3	7	8	0	0	18	58	146
08:00:00	0	12	9	0	2	21	0	0	0	0	6	0	1	20	0	0	16	21	8	5	3	0	8	16	58	175
08:15:00	0	12	18	0	9	30	1	0	0	0	20	1	5	24	0	0	42	29	5	10	7	0	6	22	82	230
08:30:00	0	12	8	0	5	20	0	0	0	0	26	0	3	17	0	0	31	20	6	6	8	0	7	20	60	258
08:45:00	0	6	3	0	4	9	0	0	0	0	6	0	1	24	0	0	6	25	1	7	4	0	3	12	46	246
09:00:00	0	7	5	0	2	12	0	0	0	0	0	0	2	18	0	0	5	20	3	7	10	0	0	20	52	240
09:15:00	0	4	1	0	4	5	0	0	0	0	0	0	1	17	0	0	3	18	4	5	8	0	2	17	40	198
09:30:00	0	3	0	0	3	3	0	0	0	0	2	0	0	14	0	0	1	14	4	3	7	0	1	14	31	169
09:45:00	0	7	0	0	2	7	0	0	0	0	0	0	2	10	0	0	1	12	5	3	6	0	1	14	33	156
BREAK																										
16:00:00	0	19	5	0	8	24	0	0	0	0	3	0	1	7	0	0	7	8	15	4	3	0	3	22	54	
16:15:00	0	16	2	0	8	18	0	0	0	0	6	0	0	11	0	0	13	11	9	7	7	0	10	23	52	
16:30:00	0	18	2	1	1	21	0	0	1	0	1	1	1	6	0	0	6	7	14	4	4	0	2	22	51	
16:45:00	0	18	0	0	8	18	0	0	0	0	5	0	1	9	0	0	9	10	5	4	7	0	3	16	44	201
17:00:00	0	16	2	0	4	18	0	0	0	0	5	0	0	7	0	1	5	8	7	7	6	0	5	20	46	193
17:15:00	0	11	1	0	8	12	0	2	0	0	10	2	3	10	0	1	5	14	5	6	7	0	7	18	46	187
17:30:00	0	9	2	0	4	11	0	0	1	0	0	1	3	8	0	0	4	11	10	4	3	0	2	17	40	176
17:45:00	0	13	4	0	8	17	0	0	0	0	6	0	2	6	0	0	8	8	3	11	7	0	5	21	46	178
18:00:00	1	5	2	0	9	8	1	0	0	0	3	1	2	9	0	0	16	11	6	5	6	0	5	17	37	169
18:15:00	0	8	1	0	7	9	0	0	0	0	0	0	1	3	0	0	5	4	8	5	5	0	6	18	31	154
18:30:00	0	6	2	0	3	8	0	0	0	0	0	0	0	6	0	0	6	6	4	5	12	0	3	21	35	149
18:45:00	0	6	4	0	5	10	0	2	0	0	3	2	2	10	0	0	7	12	4	5	5	0	6	14	38	141
Grand Total	1	237	71	1	112	310	2	4	2	0	106	8	38	291	0	2	211	331	143	127	149	0	86	419	1068	-
Approach%	0.3%	76.5%	22.9%	0.3%	-	-	25%	50%	25%	0%	-	-	11.5%	87.9%	0%	0.6%	-	-	34.1%	30.3%	35.6%	0%	-	-	-	-
Totals %	0.1%	22.2%	6.6%	0.1%	29%	29%	0.2%	0.4%	0.2%	0%	0.7%	0.7%	3.6%	27.2%	0%	0.2%	31%	31%	13.4%	11.9%	14%	0%	39.2%	39.2%	-	-
Heavy	0	6	3	0	-	-	0	0	0	0	-	-	1	6	0	0	-	-	3	5	2	0	-	-	-	-
Heavy %	0%	2.5%	4.2%	0%	-	-	0%	0%	0%	0%	-	-	2.6%	2.1%	0%	0%	-	-	2.1%	3.9%	1.3%	0%	-	-	-	-
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach WALNUT ST S						E Approach FOREST AVE						S Approach WALNUT ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	0	11	0	0	3	11	0	0	0	0	1	0	4	25	0	0	9	29	3	7	8	0	0	18	58
08:00:00	0	12	9	0	2	21	0	0	0	0	6	0	1	20	0	0	16	21	8	5	3	0	8	16	58
08:15:00	0	12	18	0	9	30	1	0	0	0	20	1	5	24	0	0	42	29	5	10	7	0	6	22	82
08:30:00	0	12	8	0	5	20	0	0	0	0	26	0	3	17	0	0	31	20	6	6	8	0	7	20	60
Grand Total	0	47	35	0	19	82	1	0	0	0	53	1	13	86	0	0	98	99	22	28	26	0	21	76	258
Approach%	0%	57.3%	42.7%	0%	-	-	100%	0%	0%	0%	-	-	13.1%	86.9%	0%	0%	-	-	28.9%	36.8%	34.2%	0%	-	-	-
Totals %	0%	18.2%	13.6%	0%	31.8%	0.4%	0.4%	0%	0%	0%	0.4%	0.4%	5%	33.3%	0%	0%	38.4%	8.5%	10.9%	10.1%	0%	0%	29.5%	-	-
PHF	0	0.98	0.49	0	0.68	0.25	0.25	0	0	0	0.25	0.25	0.65	0.86	0	0	0.85	0.85	0.69	0.7	0.81	0	0	0.86	-
Heavy	0	2	1	0	3	0	0	0	0	0	0	0	1	4	0	0	5	5	1	1	1	0	0	3	-
Heavy %	0%	4.3%	2.9%	0%	3.7%	0%	0%	0%	0%	0%	0%	0%	7.7%	4.7%	0%	0%	5.1%	5.1%	4.5%	3.6%	3.8%	0%	0%	3.9%	-
Lights	0	44	34	0	78	1	0	0	0	0	1	1	11	82	0	0	93	93	21	26	25	0	0	72	-
Lights %	0%	93.6%	97.1%	0%	95.1%	100%	0%	0%	0%	0%	100%	100%	84.6%	95.3%	0%	0%	93.9%	93.9%	95.5%	92.9%	96.2%	0%	0%	94.7%	-
Single-Unit Trucks	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Single-Unit Trucks %	0%	0%	2.9%	0%	1.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
Buses	0	2	0	0	2	0	0	0	0	0	0	0	1	4	0	0	5	5	1	1	1	0	0	3	-
Buses %	0%	4.3%	0%	0%	2.4%	0%	0%	0%	0%	0%	0%	0%	7.7%	4.7%	0%	0%	5.1%	5.1%	4.5%	3.6%	3.8%	0%	0%	3.9%	-
Bicycles on Road	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	1	-
Bicycles on Road %	0%	2.1%	0%	0%	1.2%	0%	0%	0%	0%	0%	0%	0%	7.7%	0%	0%	0%	1%	1%	0%	3.6%	0%	0%	0%	1.3%	-
Pedestrians	-	-	-	-	19	-	-	-	-	53	-	-	-	-	-	-	98	-	-	-	-	-	21	-	-
Pedestrians%	-	-	-	-	9.9%	-	-	-	-	27.7%	-	-	-	-	-	51.3%	-	-	-	-	-	-	11%	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	-	0%	-	-



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)

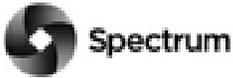
Start Time	N Approach WALNUT ST S						E Approach FOREST AVE						S Approach WALNUT ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:00:00	0	19	5	0	8	24	0	0	0	0	3	0	1	7	0	0	7	8	15	4	3	0	3	22	54
16:15:00	0	16	2	0	8	18	0	0	0	0	6	0	0	11	0	0	13	11	9	7	7	0	10	23	52
16:30:00	0	18	2	1	1	21	0	0	1	0	1	1	1	6	0	0	6	7	14	4	4	0	2	22	51
16:45:00	0	18	0	0	8	18	0	0	0	0	5	0	1	9	0	0	9	10	5	4	7	0	3	16	44
Grand Total	0	71	9	1	25	81	0	0	1	0	15	1	3	33	0	0	35	36	43	19	21	0	18	83	201
Approach%	0%	87.7%	11.1%	1.2%	-	-	0%	0%	100%	0%	-	-	8.3%	91.7%	0%	0%	-	-	51.8%	22.9%	25.3%	0%	-	-	-
Totals %	0%	35.3%	4.5%	0.5%	40.3%	0%	0%	0.5%	0%	0.5%	0.5%	0.5%	1.5%	16.4%	0%	0%	17.9%	17.9%	21.4%	9.5%	10.4%	0%	41.3%	41.3%	-
PHF	0	0.93	0.45	0.25	0.84	0.84	0	0	0.25	0	0.25	0.25	0.75	0.75	0	0	0.82	0.82	0.72	0.68	0.75	0	0.9	0.9	-
Heavy	0	1	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2	-
Heavy %	0%	1.4%	11.1%	0%	2.5%	2.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	5.3%	0%	0%	2.4%	2.4%	-
Lights	0	70	8	1	79	79	0	0	0	0	0	0	2	33	0	0	35	35	42	17	21	0	80	80	-
Lights %	0%	98.6%	88.9%	100%	97.5%	97.5%	0%	0%	0%	0%	0%	0%	66.7%	100%	0%	0%	97.2%	97.2%	97.7%	89.5%	100%	0%	96.4%	96.4%	-
Single-Unit Trucks	0	1	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	-
Single-Unit Trucks %	0%	1.4%	11.1%	0%	2.5%	2.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5.3%	0%	0%	1.2%	1.2%	-
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	-
Buses %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.3%	0%	0%	0%	1.2%	1.2%	-
Bicycles on Road	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1	0	1	0	0	1	1	-
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%	33.3%	0%	0%	0%	2.8%	2.8%	0%	5.3%	0%	0%	1.2%	1.2%	-
Pedestrians	-	-	-	-	24	-	-	-	-	-	15	-	-	-	-	-	35	-	-	-	-	-	18	-	-
Pedestrians %	-	-	-	-	25.8%	-	-	-	-	-	16.1%	-	-	-	-	-	37.6%	-	-	-	-	-	19.4%	-	-
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk %	-	-	-	-	1.1%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)





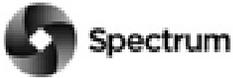
Turning Movement Count (2 . JOHN ST S & FOREST AVE)

Start Time	N Approach JOHN ST S						E Approach FOREST AVE						S Approach JOHN ST S						W Approach FOREST AVE						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	0	42	1	0	4	43	0	0	0	0	3	0	6	129	0	0	7	135	6	1	2	0	1	9	187	
07:15:00	0	35	3	0	4	38	0	0	0	0	8	0	8	154	0	0	2	162	4	3	2	0	5	9	209	
07:30:00	0	52	2	0	5	54	0	0	0	0	2	0	5	152	0	0	6	157	1	6	6	0	8	13	224	
07:45:00	0	51	2	0	3	53	0	0	0	0	6	0	7	212	0	0	6	219	5	8	4	0	5	17	289	909
08:00:00	0	55	0	0	5	55	0	0	0	0	2	0	6	202	0	0	2	208	5	7	13	0	1	25	288	1010
08:15:00	0	57	5	0	9	62	0	0	0	0	5	0	3	211	0	0	7	214	8	11	8	0	8	27	303	1104
08:30:00	0	47	3	0	2	50	0	0	0	0	6	0	1	179	0	0	2	180	9	8	7	0	4	24	254	1134
08:45:00	0	56	3	0	3	59	0	0	0	0	2	0	4	184	0	0	7	188	9	4	7	0	2	20	267	1112
09:00:00	0	65	4	0	4	69	0	0	0	0	4	0	8	153	0	0	6	161	12	9	14	0	6	35	265	1089
09:15:00	0	48	2	0	4	50	0	0	0	0	7	0	5	137	0	0	2	142	6	3	13	0	1	22	214	1000
09:30:00	1	57	4	0	3	62	0	0	0	0	7	0	2	112	0	0	5	114	8	6	14	0	3	28	204	950
09:45:00	0	56	4	0	5	60	0	0	0	0	3	0	4	104	0	0	5	108	12	10	12	0	0	34	202	885
BREAK																										
16:00:00	0	94	3	0	12	97	0	0	0	0	8	0	6	144	0	0	9	150	8	7	10	0	14	25	272	
16:15:00	0	100	4	0	10	104	0	0	0	0	12	0	2	155	0	0	5	157	6	11	8	0	7	25	286	
16:30:00	0	126	2	0	8	128	0	0	0	0	12	0	8	143	0	0	7	151	13	4	13	0	6	30	309	
16:45:00	0	107	2	0	9	109	0	0	0	0	12	0	4	147	0	0	4	151	6	8	10	0	3	24	284	1151
17:00:00	0	128	2	0	8	130	0	0	0	0	4	0	8	141	0	0	2	149	6	9	5	0	5	20	299	1178
17:15:00	0	95	3	0	1	98	0	0	0	0	5	0	7	134	0	0	3	141	6	4	7	0	9	17	256	1148
17:30:00	0	109	4	0	2	113	0	0	0	0	5	0	4	164	0	0	2	168	6	5	7	0	3	18	299	1138
17:45:00	0	79	5	0	4	84	0	0	0	0	4	0	7	176	0	0	1	183	4	8	3	0	7	15	282	1136
18:00:00	0	71	0	0	16	71	0	0	0	0	6	0	8	163	0	0	2	171	9	3	11	0	6	23	265	1102
18:15:00	0	64	4	0	7	68	0	0	0	0	9	0	3	149	0	0	4	152	3	7	5	0	5	15	235	1081
18:30:00	1	77	3	0	5	81	0	0	0	0	4	0	7	125	0	0	9	132	6	2	4	0	7	12	225	1007
18:45:00	0	72	4	0	4	76	0	0	0	0	6	0	6	119	0	0	4	125	6	5	6	0	5	17	218	943
Grand Total	2	1743	69	0	137	1814	0	0	0	0	142	0	129	3689	0	0	109	3818	164	149	191	0	121	504	6136	-
Approach%	0.1%	96.1%	3.8%	0%	-	-	0%	0%	0%	0%	-	-	3.4%	96.6%	0%	0%	-	-	32.5%	29.6%	37.9%	0%	-	-	-	
Totals %	0%	28.4%	1.1%	0%	29.6%	-	0%	0%	0%	0%	0%	0%	2.1%	60.1%	0%	0%	62.2%	-	2.7%	2.4%	60.1%	0%	8.2%	-	-	
Heavy	0	33	2	0	-	-	0	0	0	0	-	-	4	288	0	0	-	-	4	3	0	0	-	-	-	
Heavy %	0%	1.9%	2.9%	0%	-	-	0%	0%	0%	0%	-	-	3.1%	7.8%	0%	0%	-	-	2.4%	2%	0%	0%	-	-	-	
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

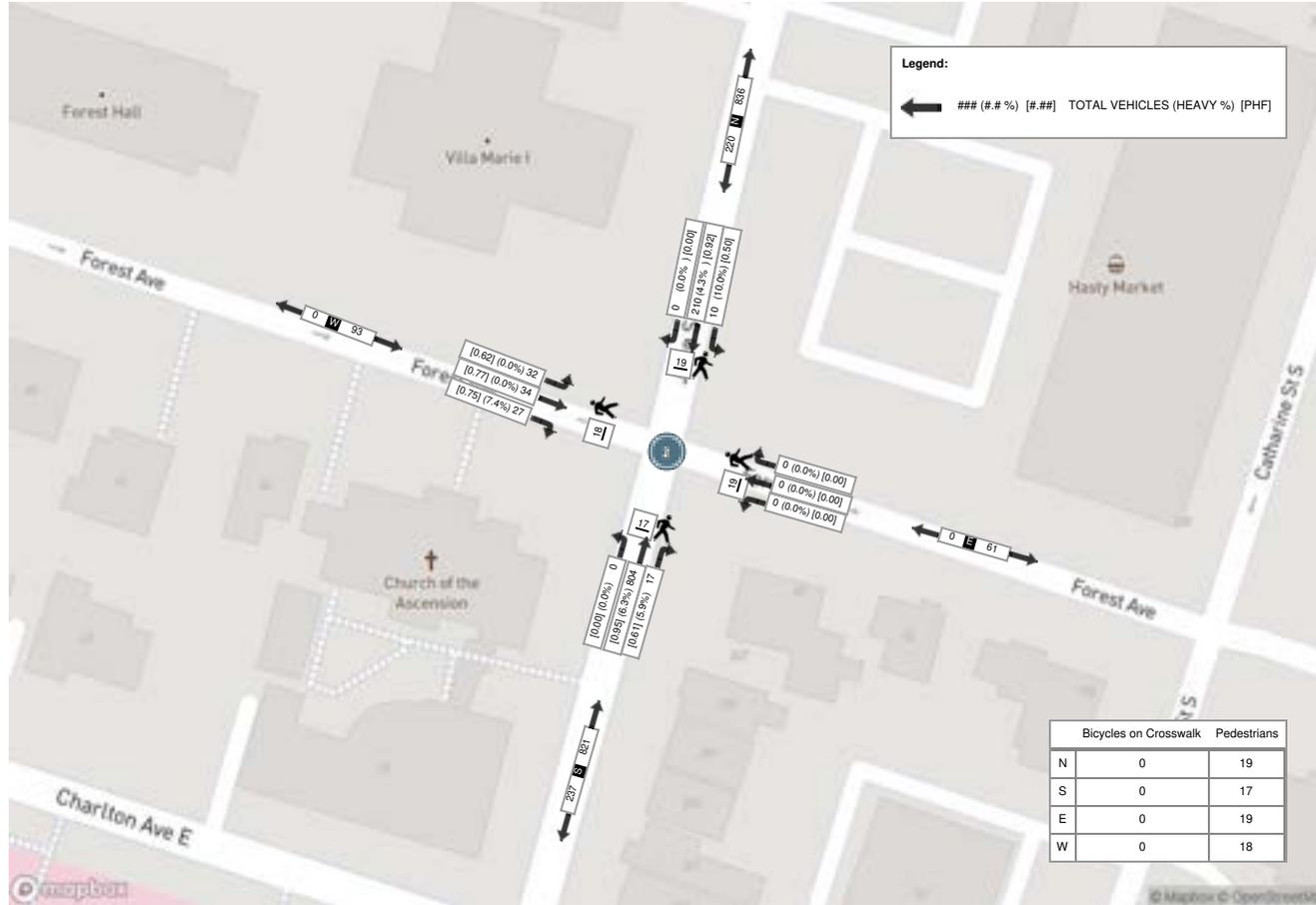
Start Time	N Approach JOHN ST S						E Approach FOREST AVE						S Approach JOHN ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	0	51	2	0	3	53	0	0	0	0	6	0	7	212	0	0	6	219	5	8	4	0	5	17	289
08:00:00	0	55	0	0	5	55	0	0	0	0	2	0	6	202	0	0	2	208	5	7	13	0	1	25	288
08:15:00	0	57	5	0	9	62	0	0	0	0	5	0	3	211	0	0	7	214	8	11	8	0	8	27	303
08:30:00	0	47	3	0	2	50	0	0	0	0	6	0	1	179	0	0	2	180	9	8	7	0	4	24	254
Grand Total	0	210	10	0	19	220	0	0	0	0	19	0	17	804	0	0	17	821	27	34	32	0	18	93	1134
Approach%	0%	95.5%	4.5%	0%	-	-	0%	0%	0%	0%	-	-	2.1%	97.9%	0%	0%	-	-	29%	36.6%	34.4%	0%	-	-	-
Totals %	0%	18.5%	0.9%	0%	19.4%	19.4%	0%	0%	0%	0%	0%	0%	1.5%	70.9%	0%	0%	72.4%	72.4%	2.4%	3%	2.8%	0%	8.2%	8.2%	-
PHF	0	0.92	0.5	0	0.89	0.89	0	0	0	0	0	0	0.61	0.95	0	0	0.94	0.94	0.75	0.77	0.62	0	0.86	0.86	-
Heavy	0	9	1	0	10	10	0	0	0	0	0	0	1	51	0	0	52	52	2	0	0	0	2	2	-
Heavy %	0%	4.3%	10%	0%	4.5%	4.5%	0%	0%	0%	0%	0%	0%	5.9%	6.3%	0%	0%	6.3%	6.3%	7.4%	0%	0%	0%	2.2%	2.2%	-
Lights	0	201	9	0	210	210	0	0	0	0	0	0	16	753	0	0	769	769	25	33	32	0	90	90	-
Lights %	0%	95.7%	90%	0%	95.5%	95.5%	0%	0%	0%	0%	0%	0%	94.1%	93.7%	0%	0%	93.7%	93.7%	92.6%	97.1%	100%	0%	96.8%	96.8%	-
Single-Unit Trucks	0	6	0	0	6	6	0	0	0	0	0	0	0	7	0	0	7	7	2	0	0	0	2	2	-
Single-Unit Trucks %	0%	2.9%	0%	0%	2.7%	2.7%	0%	0%	0%	0%	0%	0%	0%	0.9%	0%	0%	0.9%	0.9%	7.4%	0%	0%	0%	2.2%	2.2%	-
Buses	0	2	1	0	3	3	0	0	0	0	0	0	1	44	0	0	45	45	0	0	0	0	0	0	-
Buses %	0%	1%	10%	0%	1.4%	1.4%	0%	0%	0%	0%	0%	0%	5.9%	5.5%	0%	0%	5.5%	5.5%	0%	0%	0%	0%	0%	0%	-
Articulated Trucks	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Articulated Trucks %	0%	0.5%	0%	0%	0.5%	0.5%	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	0	1	0	0	1	1	-
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.9%	0%	0%	1.1%	1.1%	-
Pedestrians	-	-	-	-	19	19	-	-	-	-	19	-	-	-	-	17	17	-	-	-	-	-	18	18	-
Pedestrians %	-	-	-	-	26%	26%	-	-	-	-	26%	-	-	-	-	23.3%	23.3%	-	-	-	-	-	24.7%	24.7%	-
Bicycles on Crosswalk	-	-	-	-	0	0	-	-	-	-	0	-	-	-	-	0	0	-	-	-	-	-	0	0	-
Bicycles on Crosswalk %	-	-	-	-	0%	0%	-	-	-	-	0%	-	-	-	-	0%	0%	-	-	-	-	-	0%	0%	-



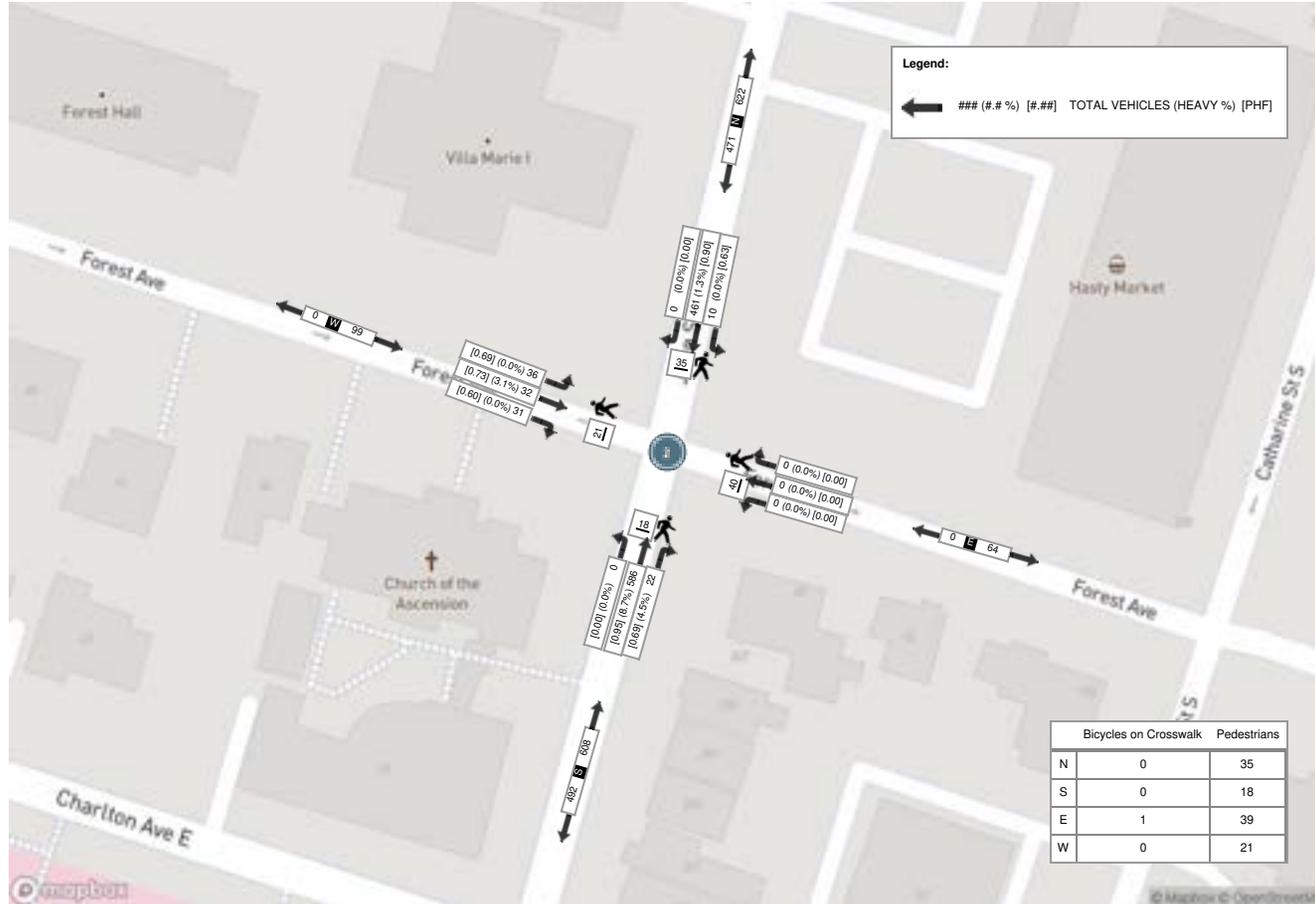
Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach JOHN ST S						E Approach FOREST AVE						S Approach JOHN ST S						W Approach FOREST AVE						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:15:00	0	100	4	0	10	104	0	0	0	0	12	0	2	155	0	0	5	157	6	11	8	0	7	25	286
16:30:00	0	126	2	0	8	128	0	0	0	0	12	0	8	143	0	0	7	151	13	4	13	0	6	30	309
16:45:00	0	107	2	0	9	109	0	0	0	0	12	0	4	147	0	0	4	151	6	8	10	0	3	24	284
17:00:00	0	128	2	0	8	130	0	0	0	0	4	0	8	141	0	0	2	149	6	9	5	0	5	20	299
Grand Total	0	461	10	0	35	471	0	0	0	0	40	0	22	586	0	0	18	608	31	32	36	0	21	99	1178
Approach%	0%	97.9%	2.1%	0%	-	-	0%	0%	0%	0%	-	-	3.6%	96.4%	0%	0%	-	-	31.3%	32.3%	36.4%	0%	-	-	-
Totals %	0%	39.1%	0.8%	0%	40%	40%	0%	0%	0%	0%	0%	0%	1.9%	49.7%	0%	0%	0%	51.6%	2.6%	2.7%	3.1%	0%	8.4%	-	-
PHF	0	0.9	0.63	0	0.91	0.91	0	0	0	0	0	0	0.69	0.95	0	0	0	0.97	0.6	0.73	0.69	0	0.83	-	-
Heavy	0	6	0	0	6	6	0	0	0	0	0	0	1	51	0	0	0	52	0	1	0	0	1	-	-
Heavy %	0%	1.3%	0%	0%	1.3%	1.3%	0%	0%	0%	0%	0%	0%	4.5%	8.7%	0%	0%	0%	8.6%	0%	3.1%	0%	0%	1%	-	-
Lights	0	455	10	0	465	465	0	0	0	0	0	0	21	534	0	0	0	555	31	31	36	0	98	-	-
Lights %	0%	98.7%	100%	0%	98.7%	98.7%	0%	0%	0%	0%	0%	0%	95.5%	91.1%	0%	0%	0%	91.3%	100%	96.9%	100%	0%	99%	-	-
Single-Unit Trucks	0	3	0	0	3	3	0	0	0	0	0	0	1	3	0	0	0	4	0	0	0	0	0	-	-
Single-Unit Trucks %	0%	0.7%	0%	0%	0.6%	0.6%	0%	0%	0%	0%	0%	0%	4.5%	0.5%	0%	0%	0%	0.7%	0%	0%	0%	0%	0%	-	-
Buses	0	3	0	0	3	3	0	0	0	0	0	0	0	47	0	0	0	47	0	1	0	0	1	-	-
Buses %	0%	0.7%	0%	0%	0.6%	0.6%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	7.7%	0%	3.1%	0%	0%	1%	-	-
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	-	-
Articulated Trucks %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2%	0%	0%	0%	0.2%	0%	0%	0%	0%	0%	-	-
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	-	-
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2%	0%	0%	0%	0.2%	0%	0%	0%	0%	0%	-	-
Pedestrians	-	-	-	-	35	-	-	-	-	-	39	-	-	-	-	-	18	-	-	-	-	-	21	-	-
Pedestrians %	-	-	-	-	30.7%	-	-	-	-	-	34.2%	-	-	-	-	-	15.8%	-	-	-	-	-	18.4%	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk %	-	-	-	-	0%	-	-	-	-	-	0.9%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (1 . JOHN ST S & YOUNG ST)

Start Time	N Approach JOHN ST S						E Approach YOUNG ST						S Approach JOHN ST S						W Approach YOUNG ST						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	4	35	0	0	1	39	5	6	3	0	1	14	1	133	2	0	5	136	4	3	2	0	6	9	198	
07:15:00	7	33	1	0	3	41	7	9	5	0	4	21	1	153	3	0	5	157	0	5	3	0	12	8	227	
07:30:00	6	49	0	0	1	55	3	13	10	0	4	26	1	158	4	0	2	163	1	6	5	0	7	12	256	
07:45:00	7	48	0	0	2	55	6	14	5	0	3	25	5	197	5	0	2	207	1	6	8	0	13	15	302	983
08:00:00	6	49	1	0	2	56	11	8	5	0	5	24	3	184	21	0	4	208	0	5	4	0	2	9	297	1082
08:15:00	7	55	3	0	1	65	6	16	6	0	8	28	7	200	13	0	4	220	1	7	8	0	6	16	329	1184
08:30:00	7	38	0	0	3	45	13	11	7	0	3	31	3	169	10	0	10	182	4	6	9	0	6	19	277	1205
08:45:00	8	47	3	0	3	58	3	15	10	0	3	28	4	162	21	0	5	187	2	8	6	0	4	16	289	1192
09:00:00	9	61	1	0	4	71	5	11	3	0	4	19	3	148	13	0	10	164	1	5	8	0	6	14	268	1163
09:15:00	8	43	2	0	4	53	3	19	5	0	6	27	3	129	10	0	6	142	2	7	9	0	4	18	240	1074
09:30:00	11	53	0	0	0	64	3	14	5	0	2	22	1	121	8	0	7	130	3	1	3	0	8	7	223	1020
09:45:00	8	47	0	0	9	55	2	20	6	0	8	28	3	106	7	0	4	116	4	8	4	0	2	16	215	946
BREAK																										
16:00:00	12	95	4	0	9	111	3	9	6	0	9	18	3	147	0	0	21	150	3	14	3	0	16	20	299	
16:15:00	11	96	1	0	3	108	1	13	4	0	14	18	6	151	8	0	5	165	4	5	4	0	7	13	304	
16:30:00	10	116	1	0	1	127	7	11	5	0	10	23	5	142	4	0	10	151	7	7	6	0	10	20	321	
16:45:00	11	98	4	0	8	113	2	15	5	0	9	22	4	132	16	0	18	152	6	9	7	0	17	22	309	1233
17:00:00	9	119	1	0	5	129	5	5	5	0	5	15	5	140	5	0	19	150	5	11	3	0	12	19	313	1247
17:15:00	11	95	5	0	6	111	4	5	6	0	13	15	5	130	6	0	13	141	3	9	6	0	12	18	285	1228
17:30:00	16	101	3	0	2	120	8	11	2	0	8	21	5	156	3	0	12	164	2	6	4	0	12	12	317	1224
17:45:00	15	79	2	0	8	96	3	12	4	0	10	19	4	166	4	0	13	174	1	3	5	0	11	9	298	1213
18:00:00	8	65	2	0	11	75	6	13	3	0	6	22	2	158	7	0	15	167	0	8	7	0	6	15	279	1179
18:15:00	8	66	3	0	15	77	4	18	0	0	18	22	4	151	3	0	12	158	3	6	3	0	14	12	269	1163
18:30:00	5	70	3	0	10	78	5	13	9	0	8	27	3	122	3	0	9	128	4	7	5	0	6	16	249	1095
18:45:00	5	66	0	0	6	71	8	11	3	0	10	22	2	116	3	0	17	121	3	4	4	0	7	11	225	1022
Grand Total	209	1624	40	0	117	1873	123	292	122	0	171	537	83	3571	179	0	228	3833	64	156	126	0	206	346	6589	-
Approach%	11.2%	86.7%	2.1%	0%	-	-	22.9%	54.4%	22.7%	0%	-	-	2.2%	93.2%	4.7%	0%	-	-	18.5%	45.1%	36.4%	0%	-	-	-	
Totals %	3.2%	24.6%	0.6%	0%	28.4%	1.9%	4.4%	1.9%	0%	0%	8.1%	1.3%	54.2%	2.7%	0%	58.2%	1%	2.4%	1.9%	0%	5.3%	-	-	-		
Heavy	3	34	1	0	-	1	5	4	0	-	-	0	286	3	0	-	-	0	1	4	0	-	-	-		
Heavy %	1.4%	2.1%	2.5%	0%	-	0.8%	1.7%	3.3%	0%	-	-	0%	8%	1.7%	0%	-	-	0%	0.6%	3.2%	0%	-	-	-		
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach JOHN ST S						E Approach YOUNG ST						S Approach JOHN ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	7	48	0	0	2	55	6	14	5	0	3	25	5	197	5	0	2	207	1	6	8	0	13	15	302
08:00:00	6	49	1	0	2	56	11	8	5	0	5	24	3	184	21	0	4	208	0	5	4	0	2	9	297
08:15:00	7	55	3	0	1	65	6	16	6	0	8	28	7	200	13	0	4	220	1	7	8	0	6	16	329
08:30:00	7	38	0	0	3	45	13	11	7	0	3	31	3	169	10	0	10	182	4	6	9	0	6	19	277
Grand Total	27	190	4	0	8	221	36	49	23	0	19	108	18	750	49	0	20	817	6	24	29	0	27	59	1205
Approach%	12.2%	86%	1.8%	0%	-	-	33.3%	45.4%	21.3%	0%	-	-	2.2%	91.8%	6%	0%	-	10.2%	40.7%	49.2%	0%	-	-	-	
Totals %	2.2%	15.8%	0.3%	0%	18.3%	18.3%	3%	4.1%	1.9%	0%	9%	9%	1.5%	62.2%	4.1%	0%	67.8%	0.5%	2%	2.4%	0%	4.9%	4.9%	-	
PHF	0.96	0.86	0.33	0	0.85	0.85	0.69	0.77	0.82	0	0.87	0.87	0.64	0.94	0.58	0	0.93	0.38	0.86	0.81	0	0.78	0.78	-	
Heavy	1	9	0	0	10	10	1	2	1	0	4	4	0	50	1	0	51	0	0	2	0	2	2	-	
Heavy %	3.7%	4.7%	0%	0%	4.5%	4.5%	2.8%	4.1%	4.3%	0%	3.7%	3.7%	0%	6.7%	2%	0%	6.2%	0%	0%	6.9%	0%	3.4%	3.4%	-	
Lights	26	181	4	0	211	211	35	46	22	0	103	103	18	700	48	0	766	6	23	27	0	56	56	-	
Lights %	96.3%	95.3%	100%	0%	95.5%	95.5%	97.2%	93.9%	95.7%	0%	95.4%	95.4%	100%	93.3%	98%	0%	93.8%	100%	95.8%	93.1%	0%	94.9%	94.9%	-	
Single-Unit Trucks	1	6	0	0	7	7	1	1	0	0	2	2	0	6	1	0	7	0	0	1	0	1	1	-	
Single-Unit Trucks %	3.7%	3.2%	0%	0%	3.2%	3.2%	2.8%	2%	0%	0%	1.9%	1.9%	0%	0.8%	2%	0%	0.9%	0%	0%	3.4%	0%	1.7%	1.7%	-	
Buses	0	2	0	0	2	2	0	1	1	0	2	2	0	44	0	0	44	0	0	1	0	1	1	-	
Buses %	0%	1.1%	0%	0%	0.9%	0.9%	0%	2%	4.3%	0%	1.9%	1.9%	0%	5.9%	0%	0%	5.4%	0%	0%	3.4%	0%	1.7%	1.7%	-	
Articulated Trucks	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	
Articulated Trucks %	0%	0.5%	0%	0%	0.5%	0.5%	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	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	1	-	
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0.9%	0.9%	0%	0%	0%	0%	0%	0%	4.2%	0%	0%	1.7%	1.7%	-	
Pedestrians	-	-	-	-	8	8	-	-	-	-	19	19	-	-	-	-	20	-	-	-	-	26	26	-	
Pedestrians%	-	-	-	-	10.8%	10.8%	-	-	-	-	25.7%	25.7%	-	-	-	-	27%	-	-	-	-	35.1%	35.1%	-	
Bicycles on Crosswalk	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	-	-	-	-	1	1	-	
Bicycles on Crosswalk%	-	-	-	-	0%	0%	-	-	-	-	0%	0%	-	-	-	-	0%	-	-	-	-	1.4%	1.4%	-	



Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach JOHN ST S						E Approach YOUNG ST						S Approach JOHN ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:15:00	11	96	1	0	3	108	1	13	4	0	14	18	6	151	8	0	5	165	4	5	4	0	7	13	304
16:30:00	10	116	1	0	1	127	7	11	5	0	10	23	5	142	4	0	10	151	7	7	6	0	10	20	321
16:45:00	11	98	4	0	8	113	2	15	5	0	9	22	4	132	16	0	18	152	6	9	7	0	17	22	309
17:00:00	9	119	1	0	5	129	5	5	5	0	5	15	5	140	5	0	19	150	5	11	3	0	12	19	313
Grand Total	41	429	7	0	17	477	15	44	19	0	38	78	20	565	33	0	52	618	22	32	20	0	46	74	1247
Approach%	8.6%	89.9%	1.5%	0%	-	-	19.2%	56.4%	24.4%	0%	-	-	3.2%	91.4%	5.3%	0%	-	-	29.7%	43.2%	27%	0%	-	-	-
Totals %	3.3%	34.4%	0.6%	0%	38.3%	1.2%	3.5%	1.5%	0%	6.3%	1.6%	45.3%	2.6%	0%	49.6%	1.8%	2.6%	1.6%	0%	5.9%	-	-	-	-	
PHF	0.93	0.9	0.44	0	0.92	0.54	0.73	0.95	0	0.85	0.83	0.94	0.52	0	0.94	0.79	0.73	0.71	0	0.84	-	-	-	-	
Heavy	0	6	0	0	6	0	0	1	0	1	0	52	0	0	52	0	0	0	0	0	0	0	0	-	
Heavy %	0%	1.4%	0%	0%	1.3%	0%	0%	5.3%	0%	1.3%	0%	9.2%	0%	0%	8.4%	0%	0%	0%	0%	0%	0%	0%	0%	-	
Lights	41	423	7	0	471	15	43	17	0	75	20	512	33	0	565	22	29	20	0	71	-	-	-	-	
Lights %	100%	98.6%	100%	0%	98.7%	100%	97.7%	89.5%	0%	96.2%	100%	90.6%	100%	0%	91.4%	100%	90.6%	100%	0%	95.9%	-	-	-	-	
Single-Unit Trucks	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	-	
Single-Unit Trucks %	0%	0.7%	0%	0%	0.6%	0%	0%	0%	0%	0%	0%	0.5%	0%	0%	0.5%	0%	0%	0%	0%	0%	0%	0%	0%	-	
Buses	0	3	0	0	3	0	0	1	0	1	0	48	0	0	48	0	0	0	0	0	0	0	0	-	
Buses %	0%	0.7%	0%	0%	0.6%	0%	0%	5.3%	0%	1.3%	0%	8.5%	0%	0%	7.8%	0%	0%	0%	0%	0%	0%	0%	0%	-	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	-	
Articulated Trucks %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2%	0%	0%	0.2%	0%	0%	0%	0%	0%	0%	0%	0%	-	
Bicycles on Road	0	0	0	0	0	0	1	1	0	2	0	1	0	0	1	0	3	0	0	3	0	0	3	-	
Bicycles on Road %	0%	0%	0%	0%	0%	0%	2.3%	5.3%	0%	2.6%	0%	0.2%	0%	0%	0.2%	0%	9.4%	0%	0%	4.1%	-	-	-	-	
Pedestrians	-	-	-	-	16	-	-	-	-	37	-	-	-	-	52	-	-	-	-	45	-	-	-	-	
Pedestrians %	-	-	-	-	10.5%	-	-	-	-	24.2%	-	-	-	-	34%	-	-	-	-	29.4%	-	-	-	-	
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-	-	-	1	-	-	-	-	
Bicycles on Crosswalk %	-	-	-	-	0.7%	-	-	-	-	0.7%	-	-	-	-	0%	-	-	-	-	0.7%	-	-	-	-	

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:15 PM - 05:15 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (3 . YOUNG ST & CATHARINE ST)

Start Time	N Approach CATHARINE ST						E Approach YOUNG ST						S Approach CATHARINE ST						W Approach YOUNG ST						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	6	3	1	0	2	10	0	10	3	0	2	13	0	0	0	0	3	0	1	2	0	0	3	3	26	
07:15:00	2	6	0	0	3	8	0	20	3	1	5	24	0	0	0	0	5	0	2	6	0	0	4	8	40	
07:30:00	1	9	3	0	1	13	0	28	1	0	3	29	0	0	0	0	2	0	1	7	0	0	1	8	50	
07:45:00	3	1	3	0	1	7	0	21	5	0	1	26	0	0	0	0	1	0	1	11	0	0	2	12	45	161
08:00:00	5	6	0	0	5	11	0	22	5	1	3	28	0	0	0	0	1	0	2	12	0	0	3	14	53	188
08:15:00	4	2	2	0	2	8	0	27	5	0	4	32	0	0	0	0	4	0	3	14	0	0	5	17	57	205
08:30:00	5	6	3	0	3	14	0	23	4	0	5	27	0	0	0	0	3	0	1	9	0	0	3	10	51	206
08:45:00	3	5	1	0	4	9	0	25	8	0	1	33	0	0	0	0	4	0	2	13	0	0	8	15	57	218
09:00:00	3	9	1	0	5	13	0	17	4	0	4	21	0	0	0	0	6	0	0	11	0	0	0	11	45	210
09:15:00	3	4	1	0	2	8	0	28	5	0	4	33	0	0	0	0	1	0	1	9	0	0	0	10	51	204
09:30:00	5	3	2	0	1	10	0	18	9	0	1	27	0	0	0	0	3	0	0	1	0	0	0	1	38	191
09:45:00	7	2	0	0	6	9	0	25	4	0	1	29	0	0	0	0	1	0	2	11	0	0	2	13	51	185
BREAK																										
16:00:00	4	21	8	0	2	33	0	14	4	0	4	18	0	0	0	0	11	0	3	22	0	0	7	25	76	
16:15:00	3	13	3	0	6	19	0	19	2	0	4	21	0	1	0	0	3	1	4	15	0	0	6	19	60	
16:30:00	4	9	3	0	6	16	0	21	3	0	4	24	0	0	0	0	9	0	3	15	0	0	8	18	58	
16:45:00	5	15	2	0	19	22	0	14	11	0	13	25	0	0	0	0	12	0	3	21	0	0	12	24	71	265
17:00:00	4	23	6	0	9	33	0	13	4	0	5	17	0	0	0	0	10	0	2	15	0	0	10	17	67	256
17:15:00	7	13	3	0	4	23	0	13	8	0	5	21	0	0	0	0	7	0	3	21	0	0	9	24	68	264
17:30:00	2	22	2	0	3	26	0	18	4	0	7	22	0	0	0	0	4	0	5	14	0	0	7	19	67	273
17:45:00	3	16	2	0	15	21	0	15	4	0	0	19	0	0	0	0	9	0	1	11	0	0	3	12	52	254
18:00:00	3	10	4	0	17	17	0	21	6	0	7	27	0	0	0	0	6	0	2	10	0	0	5	12	56	243
18:15:00	5	10	2	0	14	17	0	18	7	0	7	25	0	0	0	0	6	0	6	12	0	0	10	18	60	235
18:30:00	0	17	2	0	7	19	0	25	8	0	4	33	0	0	0	0	7	0	6	8	0	0	9	14	66	234
18:45:00	3	12	3	0	4	18	0	17	6	0	4	23	0	0	2	0	6	2	2	6	0	0	5	8	51	233
Grand Total	90	237	57	0	141	384	0	472	123	2	98	597	0	1	2	0	124	3	56	276	0	0	122	332	1316	-
Approach%	23.4%	61.7%	14.8%	0%	-	-	0%	79.1%	20.6%	0.3%	-	-	0%	33.3%	66.7%	0%	-	-	16.9%	83.1%	0%	0%	-	-	-	-
Totals %	6.8%	18%	4.3%	0%	29.2%	0%	35.9%	9.3%	0.2%	45.4%	0%	0.1%	0.2%	0%	0.2%	0%	0.2%	4.3%	21%	0%	0%	25.2%	-	-	-	-
Heavy	0	3	3	0	-	0	8	2	0	-	0	0	0	0	-	0	0	0	3	0	0	-	-	-	-	-
Heavy %	0%	1.3%	5.3%	0%	-	0%	1.7%	1.6%	0%	-	0%	0%	0%	0%	-	0%	0%	0%	1.1%	0%	0%	-	-	-	-	-
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 08:00 AM - 09:00 AM Weather: Light Rain (18.14 °C)

Start Time	N Approach CATHARINE ST						E Approach YOUNG ST						S Approach CATHARINE ST						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:00:00	5	6	0	0	5	11	0	22	5	1	3	28	0	0	0	0	1	0	2	12	0	0	3	14	53
08:15:00	4	2	2	0	2	8	0	27	5	0	4	32	0	0	0	0	4	0	3	14	0	0	5	17	57
08:30:00	5	6	3	0	3	14	0	23	4	0	5	27	0	0	0	0	3	0	1	9	0	0	3	10	51
08:45:00	3	5	1	0	4	9	0	25	8	0	1	33	0	0	0	0	4	0	2	13	0	0	8	15	57
Grand Total	17	19	6	0	14	42	0	97	22	1	13	120	0	0	0	0	12	0	8	48	0	0	19	56	218
Approach%	40.5%	45.2%	14.3%	0%	-	-	0%	80.8%	18.3%	0.8%	-	-	0%	0%	0%	0%	-	14.3%	85.7%	0%	0%	-	-	-	
Totals %	7.8%	8.7%	2.8%	0%	19.3%	19.3%	0%	44.5%	10.1%	0.5%	55%	55%	0%	0%	0%	0%	0%	3.7%	22%	0%	0%	25.7%	25.7%	-	
PHF	0.85	0.79	0.5	0	0.75	0.75	0	0.9	0.69	0.25	0.91	0.91	0	0	0	0	0	0.67	0.86	0	0	0.82	0.82	-	
Heavy	0	1	1	0	2	2	0	3	2	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	-
Heavy %	0%	5.3%	16.7%	0%	4.8%	4.8%	0%	3.1%	9.1%	0%	4.2%	4.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
Lights	17	18	5	0	40	40	0	94	20	1	115	115	0	0	0	0	0	8	47	0	0	55	55	-	
Lights %	100%	94.7%	83.3%	0%	95.2%	95.2%	0%	96.9%	90.9%	100%	95.8%	95.8%	0%	0%	0%	0%	0%	100%	97.9%	0%	0%	98.2%	98.2%	-	
Single-Unit Trucks	0	0	1	0	1	1	0	2	2	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	-
Single-Unit Trucks %	0%	0%	16.7%	0%	2.4%	2.4%	0%	2.1%	9.1%	0%	3.3%	3.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
Buses	0	1	0	0	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
Buses %	0%	5.3%	0%	0%	2.4%	2.4%	0%	1%	0%	0%	0.8%	0.8%	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	1	0	0	1	1	-	
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.1%	0%	0%	1.8%	1.8%	-	
Pedestrians	-	-	-	-	14	14	-	-	-	13	13	13	-	-	-	-	12	-	-	-	-	19	19	-	
Pedestrians%	-	-	-	-	24.1%	24.1%	-	-	-	22.4%	22.4%	22.4%	-	-	-	-	20.7%	-	-	-	-	32.8%	32.8%	-	
Bicycles on Crosswalk	-	-	-	-	0	0	-	-	-	0	0	0	-	-	-	-	0	-	-	-	-	0	0	-	
Bicycles on Crosswalk%	-	-	-	-	0%	0%	-	-	-	0%	0%	0%	-	-	-	-	0%	-	-	-	-	0%	0%	-	



Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach CATHARINE ST						E Approach YOUNG ST						S Approach CATHARINE ST						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:45:00	5	15	2	0	19	22	0	14	11	0	13	25	0	0	0	0	12	0	3	21	0	0	12	24	71
17:00:00	4	23	6	0	9	33	0	13	4	0	5	17	0	0	0	0	10	0	2	15	0	0	10	17	67
17:15:00	7	13	3	0	4	23	0	13	8	0	5	21	0	0	0	0	7	0	3	21	0	0	9	24	68
17:30:00	2	22	2	0	3	26	0	18	4	0	7	22	0	0	0	0	4	0	5	14	0	0	7	19	67
Grand Total	18	73	13	0	35	104	0	58	27	0	30	85	0	0	0	0	33	0	13	71	0	0	38	84	273
Approach%	17.3%	70.2%	12.5%	0%		-	0%	68.2%	31.8%	0%		-	0%	0%	0%	0%		-	15.5%	84.5%	0%	0%		-	-
Totals %	6.6%	26.7%	4.8%	0%		38.1%	0%	21.2%	9.9%	0%		31.1%	0%	0%	0%	0%		0%	4.8%	26%	0%	0%		30.8%	-
PHF	0.64	0.79	0.54	0		0.79	0	0.81	0.61	0		0.85	0	0	0	0		0	0.65	0.85	0	0		0.88	-
Heavy	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	-
Heavy %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	1.4%	0%	0%		1.2%	-
Lights	17	73	13	0		103	0	53	27	0		80	0	0	0	0		0	13	67	0	0		80	-
Lights %	94.4%	100%	100%	0%		99%	0%	91.4%	100%	0%		94.1%	0%	0%	0%	0%		0%	100%	94.4%	0%	0%		95.2%	-
Single-Unit Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	-
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	1.4%	0%	0%		1.2%	-
Buses	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Buses %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Bicycles on Road	1	0	0	0		1	0	5	0	0		5	0	0	0	0		0	0	3	0	0		3	-
Bicycles on Road %	5.6%	0%	0%	0%		1%	0%	8.6%	0%	0%		5.9%	0%	0%	0%	0%		0%	0%	4.2%	0%	0%		3.6%	-
Pedestrians	-	-	-	-	35		-	-	-	-	29		-	-	-	-	33		-	-	-	-	38		-
Pedestrians%	-	-	-	-	25.7%		-	-	-	-	21.3%		-	-	-	-	24.3%		-	-	-	-	27.9%		-
Bicycles on Crosswalk	-	-	-	-	0		-	-	-	-	1		-	-	-	-	0		-	-	-	-	0		-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0.7%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 08:00 AM - 09:00 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Overcast Clouds (20.65 °C)





Turning Movement Count (5 . YOUNG ST & WALNUT ST S)

Start Time	N Approach WALNUT ST S						E Approach YOUNG ST					S Approach WALNUT ST S					W Approach YOUNG ST					Int. Total (15 min)	Int. Total (1 hr)				
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N			UTurn W:W	Peds W:	Approach Total	
07:00:00	0	3	0	0	1	3	0	8	3	0	3	11	1	10	5	0	2	16	0	5	1	0	0	6	36		
07:15:00	1	3	0	0	1	4	2	19	3	0	1	24	2	9	2	0	1	13	0	3	2	0	2	5	46		
07:30:00	2	3	0	0	4	5	2	23	3	0	0	28	2	17	0	0	1	19	1	9	0	0	3	10	62		
07:45:00	0	6	0	0	0	6	0	21	5	0	0	26	3	28	3	0	0	34	0	11	4	0	0	15	81	225	
08:00:00	1	11	3	0	0	15	6	22	9	0	3	37	1	17	5	0	2	23	1	9	5	0	6	15	90	279	
08:15:00	3	14	1	0	1	18	10	17	12	0	10	39	3	20	7	0	2	30	3	7	6	0	8	16	103	336	
08:30:00	2	13	0	0	1	15	7	20	6	0	6	33	6	16	8	0	2	30	2	3	8	0	4	13	91	365	
08:45:00	3	4	3	0	1	10	6	21	5	0	3	32	1	20	5	0	4	26	2	6	3	0	2	11	79	363	
09:00:00	1	4	0	0	4	5	1	17	4	0	0	22	5	20	2	0	5	27	1	9	4	0	3	14	68	341	
09:15:00	5	3	3	0	1	11	1	20	1	0	0	22	5	9	10	0	3	24	1	7	2	0	0	10	67	305	
09:30:00	2	2	2	0	0	6	0	19	0	0	0	19	1	11	7	0	0	19	1	2	0	0	2	3	47	261	
09:45:00	1	4	3	0	1	8	1	20	5	0	1	26	4	5	6	0	3	15	0	5	4	0	3	9	58	240	
BREAK																											
16:00:00	0	9	2	0	1	11	3	16	2	0	4	21	0	6	4	0	3	10	13	16	2	0	8	31	73		
16:15:00	1	13	6	0	4	20	5	19	4	0	2	28	3	8	4	0	4	15	1	18	2	0	3	21	84		
16:30:00	1	15	6	0	4	22	4	22	2	0	2	28	2	8	3	0	6	13	3	13	3	0	5	19	82		
16:45:00	3	10	3	0	6	16	5	19	3	0	6	27	6	9	3	0	8	18	3	16	5	0	12	24	85	324	
17:00:00	1	9	3	0	5	13	4	14	4	0	4	22	0	8	5	0	6	13	6	10	4	0	12	20	68	319	
17:15:00	1	6	4	0	3	11	2	15	3	0	11	20	1	14	2	0	3	17	4	19	3	0	4	26	74	309	
17:30:00	1	9	5	0	6	15	6	17	3	0	5	26	1	6	4	0	4	11	0	13	2	0	1	15	67	294	
17:45:00	1	10	6	0	15	17	2	12	4	0	2	18	1	8	4	0	4	13	2	9	1	0	4	12	60	269	
18:00:00	1	5	6	0	7	12	0	22	2	0	5	24	0	8	8	0	5	16	1	9	1	0	7	11	63	264	
18:15:00	3	7	1	0	4	11	1	18	1	0	3	20	1	5	2	0	5	8	1	7	2	0	6	10	49	239	
18:30:00	1	5	5	0	12	11	2	25	1	0	3	28	4	9	6	0	6	19	2	5	2	0	3	9	67	239	
18:45:00	1	7	3	0	0	11	2	13	3	0	1	18	0	8	6	0	3	14	2	6	1	0	6	9	52	231	
Grand Total	36	175	65	0	82	276	72	439	88	0	75	599	53	279	111	0	82	443	50	217	67	0	104	334	1652	-	
Approach%	13%	63.4%	23.6%	0%	-	-	12%	73.3%	14.7%	0%	-	-	12%	63%	25.1%	0%	-	15%	65%	20.1%	0%	-	-	-	-	-	
Totals %	2.2%	10.6%	3.9%	0%	-	16.7%	4.4%	26.6%	5.3%	0%	-	36.3%	3.2%	16.9%	6.7%	0%	-	26.8%	3%	13.1%	4.1%	0%	-	20.2%	-	-	
Heavy	1	5	0	0	-	-	0	11	3	0	-	-	1	7	0	0	-	-	1	3	2	0	-	-	-	-	
Heavy %	2.8%	2.9%	0%	0%	-	-	0%	2.5%	3.4%	0%	-	-	1.9%	2.5%	0%	0%	-	-	2%	1.4%	3%	0%	-	-	-	-	
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)

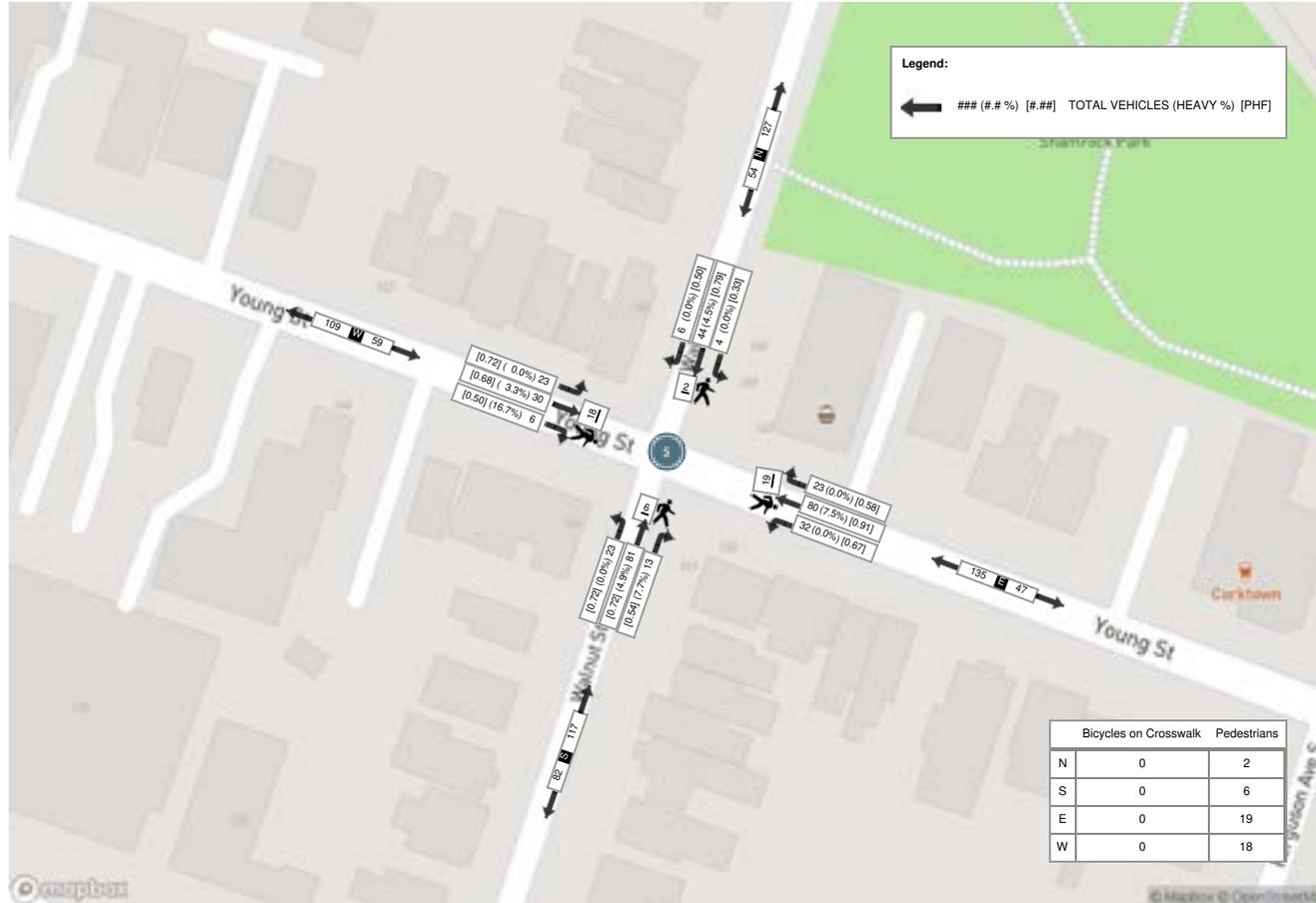
Start Time	N Approach WALNUT ST S						E Approach YOUNG ST						S Approach WALNUT ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
07:45:00	0	6	0	0	0	6	0	21	5	0	0	26	3	28	3	0	0	34	0	11	4	0	0	15	81
08:00:00	1	11	3	0	0	15	6	22	9	0	3	37	1	17	5	0	2	23	1	9	5	0	6	15	90
08:15:00	3	14	1	0	1	18	10	17	12	0	10	39	3	20	7	0	2	30	3	7	6	0	8	16	103
08:30:00	2	13	0	0	1	15	7	20	6	0	6	33	6	16	8	0	2	30	2	3	8	0	4	13	91
Grand Total	6	44	4	0	2	54	23	80	32	0	19	135	13	81	23	0	6	117	6	30	23	0	18	59	365
Approach%	11.1%	81.5%	7.4%	0%	-	-	17%	59.3%	23.7%	0%	-	-	11.1%	69.2%	19.7%	0%	-	-	10.2%	50.8%	39%	0%	-	-	-
Totals %	1.6%	12.1%	1.1%	0%	14.8%	6.3%	21.9%	8.8%	0%	37%	3.6%	22.2%	6.3%	0%	32.1%	1.6%	8.2%	6.3%	0%	16.2%	-	-	-	-	-
PHF	0.5	0.79	0.33	0	0.75	0.58	0.91	0.67	0	0.87	0.54	0.72	0.72	0	0.86	0.5	0.68	0.72	0	0.92	-	-	-	-	-
Heavy	0	2	0	0	2	0	6	0	0	6	1	4	0	0	5	1	1	0	0	2	-	-	-	-	-
Heavy %	0%	4.5%	0%	0%	3.7%	0%	7.5%	0%	0%	4.4%	7.7%	4.9%	0%	0%	4.3%	16.7%	3.3%	0%	0%	3.4%	-	-	-	-	-
Lights	6	41	4	0	51	23	73	32	0	128	12	77	23	0	112	5	28	23	0	56	-	-	-	-	-
Lights %	100%	93.2%	100%	0%	94.4%	100%	91.3%	100%	0%	94.8%	92.3%	95.1%	100%	0%	95.7%	83.3%	93.3%	100%	0%	94.9%	-	-	-	-	-
Single-Unit Trucks	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	1	0	0	0	1	-	-	-	-	-
Single-Unit Trucks %	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	3%	0%	0%	0%	0%	16.7%	0%	0%	0%	1.7%	-	-	-	-	-
Buses	0	2	0	0	2	0	2	0	0	2	1	4	0	0	5	0	1	0	0	1	-	-	-	-	-
Buses %	0%	4.5%	0%	0%	3.7%	0%	2.5%	0%	0%	1.5%	7.7%	4.9%	0%	0%	4.3%	0%	3.3%	0%	0%	1.7%	-	-	-	-	-
Bicycles on Road	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	-	-	-	-	-
Bicycles on Road %	0%	2.3%	0%	0%	1.9%	0%	1.3%	0%	0%	0.7%	0%	0%	0%	0%	0%	0%	3.3%	0%	0%	1.7%	-	-	-	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	19	-	-	-	-	6	-	-	-	-	18	-	-	-	-	-
Pedestrians%	-	-	-	-	4.4%	-	-	-	-	42.2%	-	-	-	-	13.3%	-	-	-	-	40%	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-



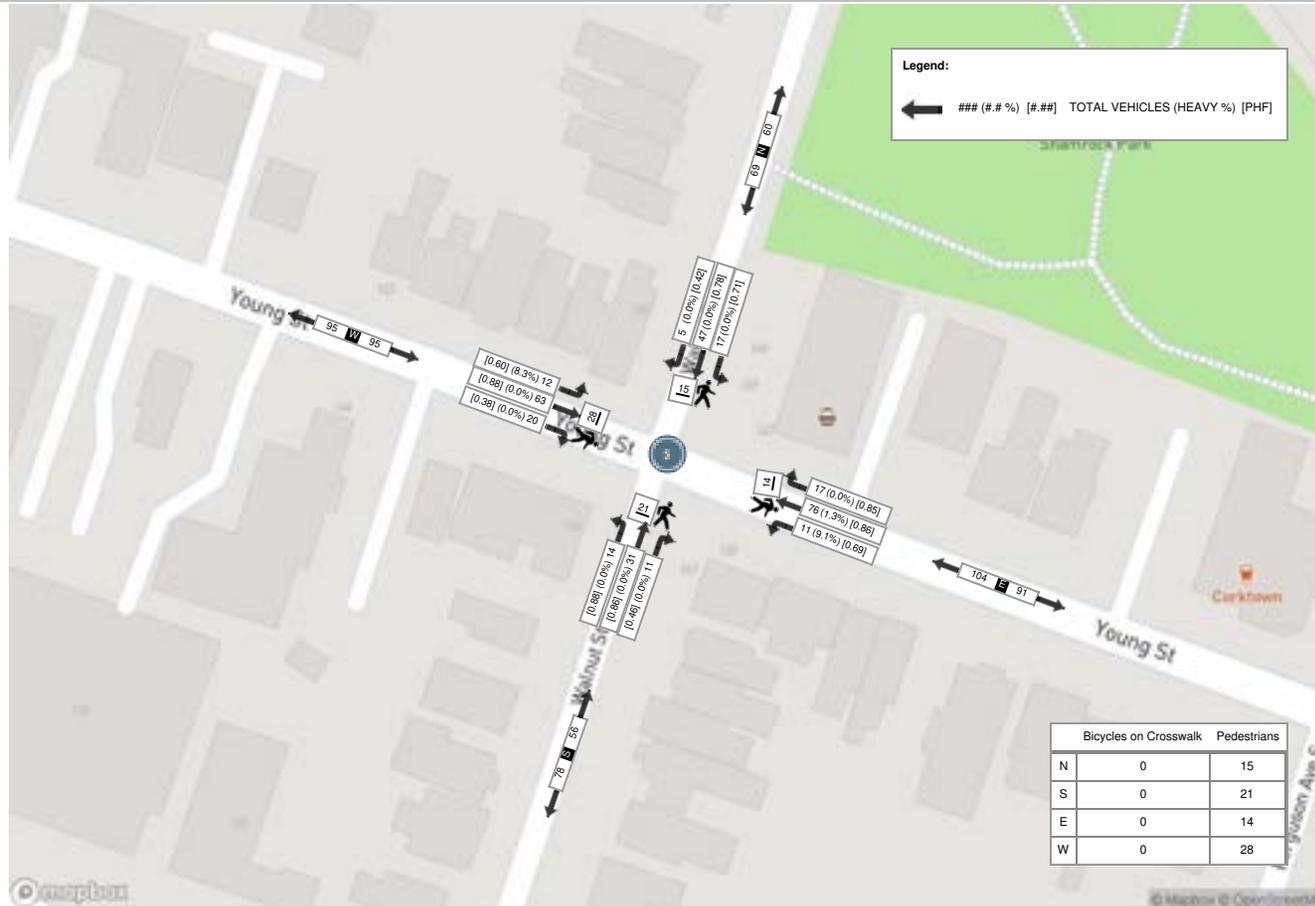
Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)

Start Time	N Approach WALNUT ST S						E Approach YOUNG ST						S Approach WALNUT ST S						W Approach YOUNG ST						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:00:00	0	9	2	0	1	11	3	16	2	0	4	21	0	6	4	0	3	10	13	16	2	0	8	31	73
16:15:00	1	13	6	0	4	20	5	19	4	0	2	28	3	8	4	0	4	15	1	18	2	0	3	21	84
16:30:00	1	15	6	0	4	22	4	22	2	0	2	28	2	8	3	0	6	13	3	13	3	0	5	19	82
16:45:00	3	10	3	0	6	16	5	19	3	0	6	27	6	9	3	0	8	18	3	16	5	0	12	24	85
Grand Total	5	47	17	0	15	69	17	76	11	0	14	104	11	31	14	0	21	56	20	63	12	0	28	95	324
Approach%	7.2%	68.1%	24.6%	0%	-	-	16.3%	73.1%	10.6%	0%	-	-	19.6%	55.4%	25%	0%	-	21.1%	66.3%	12.6%	0%	-	-	-	
Totals %	1.5%	14.5%	5.2%	0%	21.3%	5.2%	23.5%	3.4%	0%	32.1%	3.4%	9.6%	4.3%	0%	17.3%	6.2%	19.4%	3.7%	0%	29.3%	-	-	-	-	
PHF	0.42	0.78	0.71	0	0.78	0.85	0.86	0.69	0	0.93	0.46	0.86	0.88	0	0.78	0.38	0.88	0.6	0	0.77	-	-	-	-	
Heavy	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	1	0	1	-	-	
Heavy %	0%	0%	0%	0%	0%	0%	0%	1.3%	9.1%	0%	1.9%	0%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%	1.1%	-	-	
Lights	5	47	17	0	69	17	72	10	0	99	10	31	14	0	55	20	55	11	0	86	-	-	-	-	
Lights %	100%	100%	100%	0%	100%	100%	94.7%	90.9%	0%	95.2%	90.9%	100%	100%	0%	98.2%	100%	87.3%	91.7%	0%	90.5%	-	-	-	-	
Single-Unit Trucks	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	-	-	
Single-Unit Trucks %	0%	0%	0%	0%	0%	0%	0%	0%	9.1%	0%	1%	0%	0%	0%	0%	0%	0%	0%	8.3%	0%	1.1%	-	-	-	
Buses	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	-	-	
Buses %	0%	0%	0%	0%	0%	0%	0%	1.3%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	
Bicycles on Road	0	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	0	8	0	0	8	-	-	-	
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	3.9%	0%	0%	2.9%	9.1%	0%	0%	0%	1.8%	0%	12.7%	0%	0%	8.4%	-	-	-	
Pedestrians	-	-	-	-	15	-	-	-	-	14	-	-	-	-	21	-	-	-	-	-	28	-	-	-	
Pedestrians%	-	-	-	-	19.2%	-	-	-	-	17.9%	-	-	-	-	26.9%	-	-	-	-	-	35.9%	-	-	-	
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-	-	
Bicycles on Crosswalk%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (18.14 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (20.65 °C)



Appendix C

Existing Traffic Level of Service Calculations

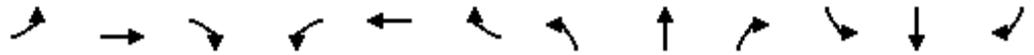
Lanes, Volumes, Timings
3: John Street South & Young Street

08-01-2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	24	6	23	49	36	49	750	18	4	190	27
Future Volume (vph)	29	24	6	23	49	36	49	750	18	4	190	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	1813	0	0	1699	0	0	3326	0	0	3312	0
Flt Permitted	0.512				0.931			0.918			0.945	
Satd. Flow (perm)	891	1813	0	0	1590	0	0	3055	0	0	3132	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			28			4			29	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	8		20	20		8	27		19	19		27
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	0%	0%	4%	4%	3%	2%	7%	0%	0%	5%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	32	0	0	117	0	0	878	0	0	237	0
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA										
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings
 3: John Street South & Young Street

08-01-2022

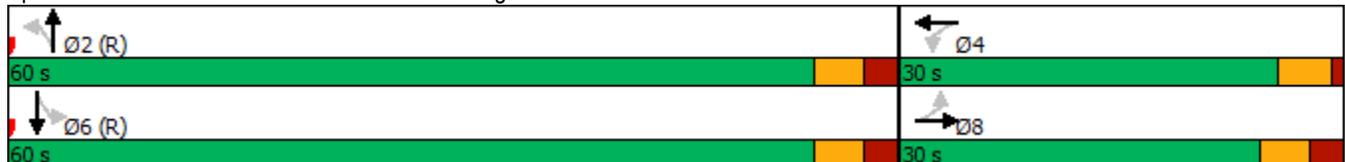


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	12.1	12.1			13.0			72.6			72.6	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.26	0.13			0.46			0.36			0.09	
Control Delay	40.2	30.1			32.5			3.8			2.5	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	40.2	30.1			32.5			3.8			2.5	
LOS	D	C			C			A			A	
Approach Delay		35.1			32.5			3.8			2.5	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	5.2	4.3			15.1			20.6			3.7	
Queue Length 95th (m)	13.5	12.1			30.6			35.3			7.9	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	250	513			487			2465			2532	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.12	0.06			0.24			0.36			0.09	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.46
 Intersection Signal Delay: 7.6
 Intersection Capacity Utilization 65.9%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis

6: John Street South & Forest Avenue

08-01-2022

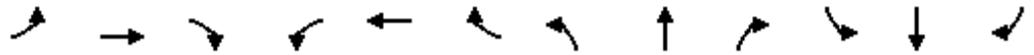


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔						↕			↕	
Traffic Volume (veh/h)	32	34	27	0	0	0	0	804	17	10	210	0
Future Volume (Veh/h)	32	34	27	0	0	0	0	804	17	10	210	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	34	36	29	0	0	0	0	855	18	11	223	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked												
vC, conflicting volume	710	1155	146	1080	1146	474	241			892		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	710	1155	146	1080	1146	474	241			892		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	89	81	97	100	100	100	100			98		
cM capacity (veh/h)	308	193	834	139	195	533	1318			708		
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	99	570	303	85	149							
Volume Left	34	0	0	11	0							
Volume Right	29	0	18	0	0							
cSH	298	1700	1700	708	1700							
Volume to Capacity	0.33	0.34	0.18	0.02	0.09							
Queue Length 95th (m)	11.3	0.0	0.0	0.4	0.0							
Control Delay (s)	23.0	0.0	0.0	1.5	0.0							
Lane LOS	C			A								
Approach Delay (s)	23.0	0.0		0.5								
Approach LOS	C											
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			42.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Catharine Street South & Young Street

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔						↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	48	8	22	97	0	0	0	0	6	190	17
Future Volume (vph)	0	48	8	22	97	0	0	0	0	6	190	17
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	53	9	24	107	0	0	0	0	7	209	19
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total (vph)	62	131	235									
Volume Left (vph)	0	24	7									
Volume Right (vph)	9	0	19									
Hadj (s)	-0.09	0.11	0.04									
Departure Headway (s)	4.5	4.6	4.4									
Degree Utilization, x	0.08	0.17	0.29									
Capacity (veh/h)	738	730	786									
Control Delay (s)	7.9	8.6	9.2									
Approach Delay (s)	7.9	8.6	9.2									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.8									
Level of Service			A									
Intersection Capacity Utilization			35.9%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	45	18	0	0	0	0	0	0	26	21	0
Future Volume (vph)	0	45	18	0	0	0	0	0	0	26	21	0
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	0	62	25	0	0	0	0	0	0	36	29	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	87	65										
Volume Left (vph)	0	36										
Volume Right (vph)	25	0										
Hadj (s)	-0.09	0.22										
Departure Headway (s)	4.0	4.3										
Degree Utilization, x	0.10	0.08										
Capacity (veh/h)	889	810										
Control Delay (s)	7.4	7.7										
Approach Delay (s)	7.4	7.7										
Approach LOS	A	A										
Intersection Summary												
Delay			7.5									
Level of Service			A									
Intersection Capacity Utilization			25.2%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	30	6	32	80	23	23	81	13	4	44	6
Future Volume (vph)	23	30	6	32	80	23	23	81	13	4	44	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	33	7	35	87	25	25	88	14	4	48	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	65	147	127	59								
Volume Left (vph)	25	35	25	4								
Volume Right (vph)	7	25	14	7								
Hadj (s)	0.07	0.03	0.05	0.01								
Departure Headway (s)	4.6	4.4	4.5	4.6								
Degree Utilization, x	0.08	0.18	0.16	0.07								
Capacity (veh/h)	745	767	756	737								
Control Delay (s)	8.0	8.4	8.4	7.9								
Approach Delay (s)	8.0	8.4	8.4	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.3									
Level of Service			A									
Intersection Capacity Utilization			28.2%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	26	28	22	0	0	0	0	86	13	35	47	0
Future Volume (vph)	26	28	22	0	0	0	0	86	13	35	47	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	30	33	26	0	0	0	0	100	15	41	55	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	89	115	96									
Volume Left (vph)	30	0	41									
Volume Right (vph)	26	15	0									
Hadj (s)	-0.03	0.01	0.15									
Departure Headway (s)	4.3	4.2	4.4									
Degree Utilization, x	0.11	0.13	0.12									
Capacity (veh/h)	791	824	801									
Control Delay (s)	7.9	7.9	8.0									
Approach Delay (s)	7.9	7.9	8.0									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.9									
Level of Service			A									
Intersection Capacity Utilization			32.2%	ICU Level of Service								A
Analysis Period (min)			15									

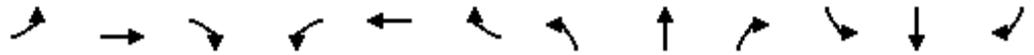
Lanes, Volumes, Timings
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	32	22	19	44	15	33	565	20	7	429	41
Future Volume (vph)	20	32	22	19	44	15	33	565	20	7	429	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	1704	0	0	1774	0	0	3318	0	0	3455	0
Flt Permitted	0.643				0.919			0.908			0.947	
Satd. Flow (perm)	1184	1704	0	0	1623	0	0	3015	0	0	3273	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			14			7			20	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	17		52	52		17	46		38	38		46
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	7%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	57	0	0	83	0	0	657	0	0	507	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings
 3: John Street South & Young Street

08-01-2022

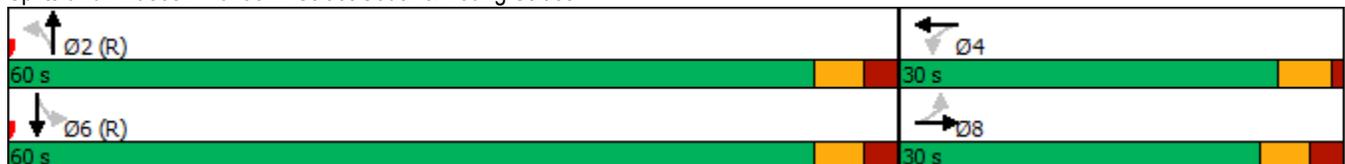


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.4	11.4			12.3			73.3			73.3	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.14	0.24			0.35			0.27			0.19	
Control Delay	37.1	26.5			33.9			3.0			2.6	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	37.1	26.5			33.9			3.0			2.6	
LOS	D	C			C			A			A	
Approach Delay		29.4			33.9			3.0			2.6	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.5	5.6			11.5			13.9			9.6	
Queue Length 95th (m)	10.4	16.6			25.0			21.6			15.4	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	332	495			487			2457			2669	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.06	0.12			0.17			0.27			0.19	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.35
 Intersection Signal Delay: 6.4
 Intersection Capacity Utilization 62.9%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis

6: John Street South & Forest Avenue

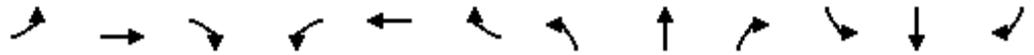
08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	32	31	0	0	0	0	586	22	10	461	0
Future Volume (Veh/h)	36	32	31	0	0	0	0	586	22	10	461	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	37	33	32	0	0	0	0	604	23	10	475	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked	0.99	0.99	0.99	0.99	0.99		0.99					
vC, conflicting volume	834	1159	272	958	1148	352	493			646		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	807	1136	238	932	1124	352	462			646		
tC, single (s)	7.5	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	83	96	100	100	100	100			99		
cM capacity (veh/h)	260	192	738	178	199	641	1080			949		
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	102	403	224	168	317							
Volume Left	37	0	0	10	0							
Volume Right	32	0	23	0	0							
cSH	285	1700	1700	949	1700							
Volume to Capacity	0.36	0.24	0.13	0.01	0.19							
Queue Length 95th (m)	12.5	0.0	0.0	0.3	0.0							
Control Delay (s)	24.5	0.0	0.0	0.6	0.0							
Lane LOS	C			A								
Approach Delay (s)	24.5	0.0		0.2								
Approach LOS	C											
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			39.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Catharine Street South & Young Street

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔						↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	71	13	27	58	0	0	0	0	13	73	18
Future Volume (vph)	0	71	13	27	58	0	0	0	0	13	73	18
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	81	15	31	66	0	0	0	0	15	83	20
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total (vph)	96	97	118									
Volume Left (vph)	0	31	15									
Volume Right (vph)	15	0	20									
Hadj (s)	-0.08	0.06	-0.08									
Departure Headway (s)	4.2	4.3	4.2									
Degree Utilization, x	0.11	0.12	0.14									
Capacity (veh/h)	829	804	806									
Control Delay (s)	7.7	7.9	7.9									
Approach Delay (s)	7.7	7.9	7.9									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.9									
Level of Service			A									
Intersection Capacity Utilization			32.5%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	43	18	0	0	0	0	0	0	43	60	0
Future Volume (vph)	0	43	18	0	0	0	0	0	0	43	60	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	0	50	21	0	0	0	0	0	0	50	70	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	71	120										
Volume Left (vph)	0	50										
Volume Right (vph)	21	0										
Hadj (s)	-0.15	0.08										
Departure Headway (s)	4.0	4.1										
Degree Utilization, x	0.08	0.14										
Capacity (veh/h)	868	847										
Control Delay (s)	7.4	7.8										
Approach Delay (s)	7.4	7.8										
Approach LOS	A	A										
Intersection Summary												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			27.0%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	12	63	20	11	76	17	14	31	11	17	47	5
Future Volume (vph)	12	63	20	11	76	17	14	31	11	17	47	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	68	22	12	82	18	15	33	12	18	51	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	103	112	60	74								
Volume Left (vph)	13	12	15	18								
Volume Right (vph)	22	18	12	5								
Hadj (s)	-0.09	-0.05	-0.07	0.01								
Departure Headway (s)	4.2	4.3	4.4	4.5								
Degree Utilization, x	0.12	0.13	0.07	0.09								
Capacity (veh/h)	814	801	771	757								
Control Delay (s)	7.8	7.9	7.7	7.9								
Approach Delay (s)	7.8	7.9	7.7	7.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.9									
Level of Service			A									
Intersection Capacity Utilization			27.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	19	43	0	0	0	0	33	3	9	71	0
Future Volume (vph)	21	19	43	0	0	0	0	33	3	9	71	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	23	21	48	0	0	0	0	37	3	10	79	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	92	40	89									
Volume Left (vph)	23	0	10									
Volume Right (vph)	48	3	0									
Hadj (s)	-0.23	-0.04	0.06									
Departure Headway (s)	4.0	4.1	4.2									
Degree Utilization, x	0.10	0.05	0.10									
Capacity (veh/h)	879	837	836									
Control Delay (s)	7.4	7.3	7.7									
Approach Delay (s)	7.4	7.3	7.7									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.5									
Level of Service			A									
Intersection Capacity Utilization			31.9%	ICU Level of Service								A
Analysis Period (min)			15									

Appendix D

Future Background Level of Service Calculations

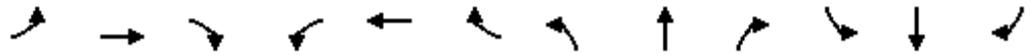
Lanes, Volumes, Timings
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	26	6	23	54	36	49	926	18	4	263	27
Future Volume (vph)	29	26	6	23	54	36	49	926	18	4	263	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	1817	0	0	1704	0	0	3328	0	0	3331	0
Flt Permitted	0.536				0.938			0.918			0.946	
Satd. Flow (perm)	933	1817	0	0	1606	0	0	3055	0	0	3154	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			27			4			22	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	8		20	20		8	27		19	19		27
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	0%	0%	4%	4%	3%	2%	7%	0%	0%	5%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	34	0	0	122	0	0	1068	0	0	316	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings
 3: John Street South & Young Street

08-01-2022

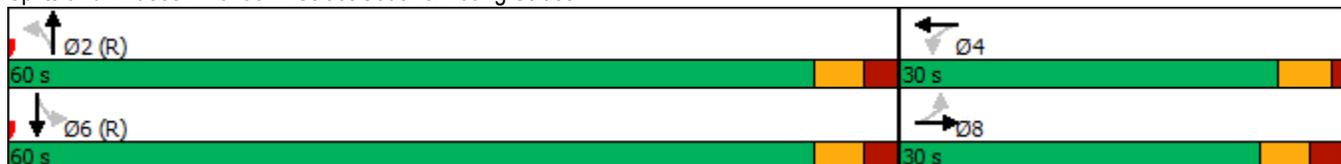


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	12.2	12.2			13.4			68.4			68.4	
Actuated g/C Ratio	0.14	0.14			0.15			0.76			0.76	
v/c Ratio	0.25	0.14			0.47			0.46			0.13	
Control Delay	39.2	30.2			32.9			4.9			3.0	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	39.2	30.2			32.9			4.9			3.0	
LOS	D	C			C			A			A	
Approach Delay		34.5			32.9			4.9			3.0	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	5.2	4.6			16.1			27.5			5.4	
Queue Length 95th (m)	13.3	12.7			31.7			47.6			10.9	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	262	515			491			2322			2402	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.12	0.07			0.25			0.46			0.13	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.47
 Intersection Signal Delay: 7.9
 Intersection Capacity Utilization 71.0%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis

6: John Street South & Forest Avenue

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔						↕			↕	
Traffic Volume (veh/h)	32	38	27	0	0	0	0	897	17	10	249	0
Future Volume (Veh/h)	32	38	27	0	0	0	0	897	17	10	249	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	34	40	29	0	0	0	0	954	18	11	265	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked												
vC, conflicting volume	801	1296	168	1202	1287	524	283			991		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	801	1296	168	1202	1287	524	283			991		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	87	75	96	100	100	100	100			98		
cM capacity (veh/h)	264	158	808	107	160	495	1272			647		
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	103	636	336	99	177							
Volume Left	34	0	0	11	0							
Volume Right	29	0	18	0	0							
cSH	247	1700	1700	647	1700							
Volume to Capacity	0.42	0.37	0.20	0.02	0.10							
Queue Length 95th (m)	15.5	0.0	0.0	0.4	0.0							
Control Delay (s)	29.6	0.0	0.0	1.4	0.0							
Lane LOS	D			A								
Approach Delay (s)	29.6	0.0		0.5								
Approach LOS	D											
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			44.9%			ICU Level of Service				A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Catharine Street South & Young Street

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↗						↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	53	8	22	107	0	0	0	0	6	210	17
Future Volume (vph)	0	53	8	22	107	0	0	0	0	6	210	17
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	58	9	24	118	0	0	0	0	7	231	19

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	67	142	257
Volume Left (vph)	0	24	7
Volume Right (vph)	9	0	19
Hadj (s)	-0.08	0.10	0.05
Departure Headway (s)	4.6	4.7	4.5
Degree Utilization, x	0.09	0.19	0.32
Capacity (veh/h)	722	719	777
Control Delay (s)	8.1	8.8	9.5
Approach Delay (s)	8.1	8.8	9.5
Approach LOS	A	A	A

Intersection Summary		
Delay		9.1
Level of Service		A
Intersection Capacity Utilization	37.3%	ICU Level of Service A
Analysis Period (min)		15

HCM Unsignalized Intersection Capacity Analysis
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	47	18	0	0	0	0	0	0	26	23	0
Future Volume (vph)	0	47	18	0	0	0	0	0	0	26	23	0
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	0	64	25	0	0	0	0	0	0	36	32	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	89	68										
Volume Left (vph)	0	36										
Volume Right (vph)	25	0										
Hadj (s)	-0.08	0.22										
Departure Headway (s)	4.0	4.3										
Degree Utilization, x	0.10	0.08										
Capacity (veh/h)	886	810										
Control Delay (s)	7.4	7.7										
Approach Delay (s)	7.4	7.7										
Approach LOS	A	A										
Intersection Summary												
Delay			7.5									
Level of Service			A									
Intersection Capacity Utilization			25.4%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	33	6	32	88	23	23	89	13	4	49	6
Future Volume (vph)	23	33	6	32	88	23	23	89	13	4	49	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	36	7	35	96	25	25	97	14	4	53	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	68	156	136	64								
Volume Left (vph)	25	35	25	4								
Volume Right (vph)	7	25	14	7								
Hadj (s)	0.07	0.03	0.05	0.02								
Departure Headway (s)	4.6	4.5	4.6	4.6								
Degree Utilization, x	0.09	0.19	0.17	0.08								
Capacity (veh/h)	735	757	748	727								
Control Delay (s)	8.1	8.6	8.5	8.0								
Approach Delay (s)	8.1	8.6	8.5	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.4									
Level of Service			A									
Intersection Capacity Utilization			29.0%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	26	31	22	0	0	0	0	95	13	35	52	0
Future Volume (vph)	26	31	22	0	0	0	0	95	13	35	52	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	30	36	26	0	0	0	0	110	15	41	60	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	92	125	101									
Volume Left (vph)	30	0	41									
Volume Right (vph)	26	15	0									
Hadj (s)	-0.03	0.02	0.14									
Departure Headway (s)	4.4	4.2	4.4									
Degree Utilization, x	0.11	0.15	0.12									
Capacity (veh/h)	782	820	798									
Control Delay (s)	7.9	8.0	8.0									
Approach Delay (s)	7.9	8.0	8.0									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			32.3%	ICU Level of Service								A
Analysis Period (min)			15									

Lanes, Volumes, Timings
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	35	22	19	49	15	33	696	20	7	572	41
Future Volume (vph)	20	35	22	19	49	15	33	696	20	7	572	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	1713	0	0	1780	0	0	3323	0	0	3472	0
Flt Permitted	0.620				0.923			0.904			0.948	
Satd. Flow (perm)	1142	1713	0	0	1635	0	0	3004	0	0	3294	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			13			5			15	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	17		52	52		17	46		38	38		46
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	7%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	60	0	0	88	0	0	796	0	0	660	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings
 3: John Street South & Young Street

08-01-2022

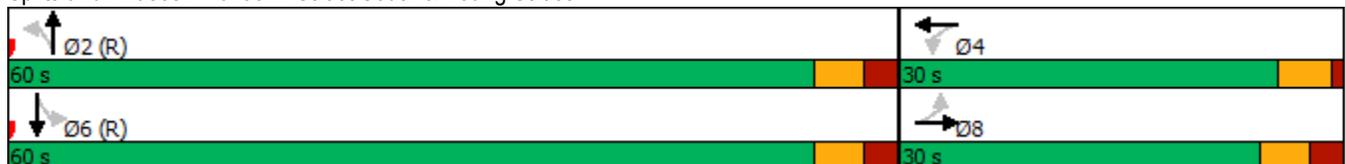


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.5	11.5			12.4			73.2			73.2	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.14	0.25			0.37			0.33			0.25	
Control Delay	37.1	27.1			34.6			3.3			2.9	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	37.1	27.1			34.6			3.3			2.9	
LOS	D	C			C			A			A	
Approach Delay		29.7			34.6			3.3			2.9	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.5	6.1			12.6			18.1			13.5	
Queue Length 95th (m)	10.3	17.4			26.3			28.2			21.3	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	321	498			490			2445			2682	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.07	0.12			0.18			0.33			0.25	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	90
Offset:	28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle:	55
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.37
Intersection Signal Delay:	6.2
Intersection LOS:	A
Intersection Capacity Utilization:	65.5%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis

6: John Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	35	31	0	0	0	0	660	22	10	522	0
Future Volume (Veh/h)	36	35	31	0	0	0	0	660	22	10	522	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	37	36	32	0	0	0	0	680	23	10	538	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)											99	
pX, platoon unblocked	0.98	0.98	0.98	0.98	0.98		0.98					
vC, conflicting volume	935	1298	304	1066	1286	390	556			722		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	895	1265	251	1029	1253	390	508			722		
tC, single (s)	7.5	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	77	96	100	100	100	100			99		
cM capacity (veh/h)	223	159	719	143	166	605	1031			889		
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	105	453	250	189	359							
Volume Left	37	0	0	10	0							
Volume Right	32	0	23	0	0							
cSH	241	1700	1700	889	1700							
Volume to Capacity	0.44	0.27	0.15	0.01	0.21							
Queue Length 95th (m)	16.6	0.0	0.0	0.3	0.0							
Control Delay (s)	31.1	0.0	0.0	0.6	0.0							
Lane LOS	D			A								
Approach Delay (s)	31.1	0.0		0.2								
Approach LOS	D											
Intersection Summary												
Average Delay			2.5									
Intersection Capacity Utilization			41.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Catharine Street South & Young Street

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔						↔		
Sign Control		Stop			Stop			Stop			Stop		
Traffic Volume (vph)	0	78	13	27	64	0	0	0	0	13	81	18	
Future Volume (vph)	0	78	13	27	64	0	0	0	0	13	81	18	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	0	89	15	31	73	0	0	0	0	15	92	20	
Direction, Lane #	EB 1	WB 1	SB 1										
Volume Total (vph)	104	104	127										
Volume Left (vph)	0	31	15										
Volume Right (vph)	15	0	20										
Hadj (s)	-0.07	0.06	-0.07										
Departure Headway (s)	4.2	4.4	4.3										
Degree Utilization, x	0.12	0.13	0.15										
Capacity (veh/h)	820	797	797										
Control Delay (s)	7.8	8.0	8.1										
Approach Delay (s)	7.8	8.0	8.1										
Approach LOS	A	A	A										
Intersection Summary													
Delay			8.0										
Level of Service			A										
Intersection Capacity Utilization			32.8%	ICU Level of Service									A
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	47	18	0	0	0	0	0	0	43	66	0
Future Volume (vph)	0	47	18	0	0	0	0	0	0	43	66	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	0	55	21	0	0	0	0	0	0	50	77	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	76	127										
Volume Left (vph)	0	50										
Volume Right (vph)	21	0										
Hadj (s)	-0.14	0.08										
Departure Headway (s)	4.0	4.1										
Degree Utilization, x	0.09	0.15										
Capacity (veh/h)	861	845										
Control Delay (s)	7.4	7.9										
Approach Delay (s)	7.4	7.9										
Approach LOS	A	A										
Intersection Summary												
Delay			7.7									
Level of Service			A									
Intersection Capacity Utilization			27.3%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	12	70	20	11	84	17	14	34	11	17	52	5
Future Volume (vph)	12	70	20	11	84	17	14	34	11	17	52	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	75	22	12	90	18	15	37	12	18	56	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	110	120	64	79								
Volume Left (vph)	13	12	15	18								
Volume Right (vph)	22	18	12	5								
Hadj (s)	-0.08	-0.04	-0.07	0.01								
Departure Headway (s)	4.3	4.3	4.4	4.5								
Degree Utilization, x	0.13	0.14	0.08	0.10								
Capacity (veh/h)	805	793	760	748								
Control Delay (s)	7.9	8.0	7.8	8.0								
Approach Delay (s)	7.9	8.0	7.8	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			27.7%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	21	43	0	0	0	0	36	3	9	78	0
Future Volume (vph)	21	21	43	0	0	0	0	36	3	9	78	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	23	23	48	0	0	0	0	40	3	10	87	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	94	43	97									
Volume Left (vph)	23	0	10									
Volume Right (vph)	48	3	0									
Hadj (s)	-0.22	-0.04	0.06									
Departure Headway (s)	4.0	4.2	4.2									
Degree Utilization, x	0.10	0.05	0.11									
Capacity (veh/h)	871	833	834									
Control Delay (s)	7.4	7.4	7.7									
Approach Delay (s)	7.4	7.4	7.7									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			32.1%	ICU Level of Service								A
Analysis Period (min)			15									

Appendix E
2016 TTS Data

Modes of Travel - AM Peak Periods (6:00 - 9:00)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
 Column: 2006 GTA zone of household - gta06_hhld

Filters:

Primary travel mode of trip - mode_prime In B C D G J M P T U W
 and
 Start time of trip - start_time In 600-900
 and
 2006 GTA zone of household - gta06_hhld In 5159 5168

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	154	453	607	39%
Cycle	61	0	61	4%
Auto driver	342	203	545	35%
GO rail only	0	23	23	1%
Auto passenger	26	7	33	2%
Walk	104	169	273	18%
Total	687	855	1542	100%

Modes of Travel - PM Peak Periods (3:00 - 6:00 PM)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime

Column: 2006 GTA zone of household - gta06_hhld

Filters:

Primary travel mode of trip - mode_prime In B
and

Start time of trip - start_time In 1500-1800
and

2006 GTA zone of household - gta06_hhld In 5159

C D G J M P T U W

5168

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	263	392	655	26%
Cycle	61	0	61	2%
Auto driver	1148	125	1273	51%
GO rail only	0	23	23	1%
Joint GO rail and local transit	0	70	70	3%
Auto passenger	137	7	144	6%
Taxi passenger	34	0	34	1%
Paid rideshare	34	0	34	1%
Walk	59	152	211	8%
Total	1736	769	2505	100%

Residential Auto Trip Distribution - External Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: Planning district of destination - pd_dest

Filters:

Primary travel mode of trip - mode_prime In D M P T U

and

Start time of trip - start_time In 600-900

and

2006 GTA zone of household - gta06_hhld In 5159 5168

Trip 2016

Table:

Traffic Zones	PD 2 of Toronto	Burlington	Flamborough	Hamilton	St. Catharines	Kitchener	Brant	Total
5159	0	71	70	175	13	17	23	369
5168	0	0	0	178	0	0	0	178
Total	0	71	70	353	13	17	23	547
Percentage	0.0%	13.0%	12.8%	64.5%	2.4%	3.1%	4.2%	100.0%

Residential Auto Trip Distribution - Internal Hamilton

Wed Apr 29 2020 12:42:36 GMT-0400 (Eastern Daylight Time) - Run Time: 2229ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: 2006 GTA zone of destination - gta06_dest

Filters:

Primary travel mode of trip - mode_prime In D
and

Start time of trip - start_time In 600-900
and

2006 GTA zone of origin - gta06_orig In 5159
and

Ward number of destination - ward_dest In 171-185

Trip 2016

Table:

	5069	5084	5089	5100	5140	5144	5151	5155	5172	5182	5186	5194	5195	5198	5203	5214	5223	5241	5246	5251	
5159	28	51	66	44	0	41	98	97	0	0	0	0	21	53	0	26	26	25	34	17	627
5168	0	0	0	0	72	14	0	0	43	53	80	39	0	0	20	0	0	0	0	0	321
	28	51	66	44	72	55	98	97	43	53	80	39	21	53	20	26	26	25	34	17	948
	3%	5%	7%	5%	8%	6%	10%	10%	5%	6%	8%	4%	2%	6%	2%	3%	3%	3%	4%	2%	

Hamilton	65%		
	East	43%	28%
	West	18%	12%
	North	18%	11%
	South	21%	14%
		100%	

Transit Trip Distribution - External Hamilton

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: Planning district of destination - pd_dest

Filters:

Primary travel mode of trip - mode_prime In B C G J W

and

Start time of trip - start_time In 600-900

and

2006 GTA zone of household - gta06_hhld In 5159 5168

Trip 2016

Table:

Traffic Zones	PD 1 of Toronto	Flamborough	Dundas	Hamilton	Total
5159	34	40	0	229	303
5168	23	0	143	462	628
Total	57	40	143	691	931
Percentage	6%	4%	15%	74%	100%

Transit Trip Distribution - Internal Hamilton

Wed Apr 29 2020 12:40:34 GMT-0400 (Eastern Daylight Time) - Run Time: 2725ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: 2006 GTA zone of destination - gta06_dest

Filters:

Primary travel mode of trip - mode_prime In B

C

G

J

W

and

Start time of trip - start_time In 600-900

and

2006 GTA zone of origin - gta06_orig In 5159

5168

and

Ward number of destination - ward_dest In 171-185

Trip 2016

Table:

	5121	5139	5140	5143	5159	5167	5172	5184	5190	5191	5193	5194	5195	5198	5199	5201	5214	
5159	0	0	0	26	79	24	15	98	0	0	0	59	19	0	31	0	40	391
5168	26	89	42	0	0	0	25	92	17	143	18	41	0	72	41	40	0	646
	26	89	42	26	79	24	40	190	17	143	18	100	19	72	72	40	40	1037
	3%	9%	4%	3%	8%	2%	4%	18%	2%	14%	2%	10%	2%	7%	7%	4%	4%	100%

Non-Residential Modes of Travel (AM Peak Period)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime

Column: 2006 GTA zone of destination - gta06_dest

Filters:

Primary travel mode of trip - mode_prime In B C D G J M P T U W
 and
 Start time of trip - start_time In 600-900
 and
 2006 GTA zone of destination - gta06_dest In 5159 5168
 and
 Trip purpose of destination - purp_dest In E M P R W

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	364	71	435	12%
Cycle	132	0	132	4%
Auto driver	1696	641	2337	65%
Auto passenger	377	105	482	13%
Walk	201	0	201	6%
Total	2770	817	3587	100%

Non-Residential Modes of Travel (PM Peak Period)

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime

Column: 2006 GTA zone of destination - gta06_dest

Filters:

Start time of trip - start_time In 1500-1800
 and
 Primary travel mode of trip - mode_prime In B C D G J M P T U W
 and
 2006 GTA zone of destination - gta06_dest In 5159 5168
 and
 Trip purpose of destination - purp_dest In E M P R W

Trip 2016

Table:

Modes of Transportation/Traffic Zones	5159	5168	Total	Percentage
Transit excluding GO rail	0	39	39	14%
Auto driver	161	22	183	64%
Auto passenger	13	0	13	5%
Walk	51	0	51	18%
Total	225	61	286	100%

Appendix F

Future Total Level of Service Calculations

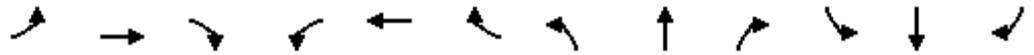
Lanes, Volumes, Timings
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	29	6	23	61	43	49	926	18	11	267	27
Future Volume (vph)	29	29	6	23	61	43	49	926	18	11	267	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1668	1822	0	0	1702	0	0	3328	0	0	3336	0
Flt Permitted	0.494				0.944			0.917			0.914	
Satd. Flow (perm)	860	1822	0	0	1613	0	0	3052	0	0	3054	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			29			4			21	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	8		20	20		8	27		19	19		27
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	0%	0%	4%	4%	3%	2%	7%	0%	0%	5%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	37	0	0	137	0	0	1068	0	0	328	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings
 3: John Street South & Young Street

08-01-2022

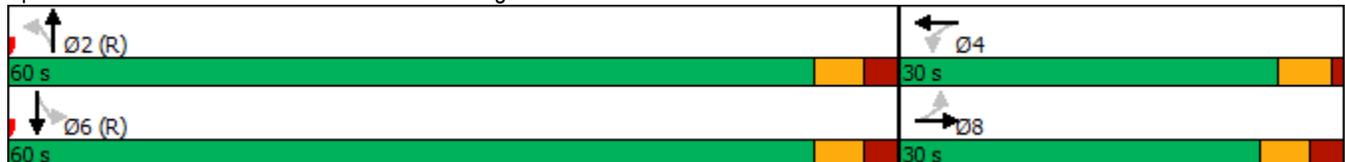


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	12.6	12.6			13.8			68.0			68.0	
Actuated g/C Ratio	0.14	0.14			0.15			0.76			0.76	
v/c Ratio	0.26	0.14			0.51			0.46			0.14	
Control Delay	39.2	30.1			33.8			5.1			3.2	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	39.2	30.1			33.8			5.1			3.2	
LOS	D	C			C			A			A	
Approach Delay		34.2			33.8			5.1			3.2	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	5.2	5.1			18.5			27.6			5.7	
Queue Length 95th (m)	13.2	13.2			34.7			50.3			12.1	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	241	516			495			2306			2312	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.13	0.07			0.28			0.46			0.14	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.51
 Intersection Signal Delay: 8.4 Intersection LOS: A
 Intersection Capacity Utilization 71.6% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis

6: John Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	38	27	0	0	0	0	897	20	14	249	0
Future Volume (Veh/h)	32	38	27	0	0	0	0	897	20	14	249	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	34	40	29	0	0	0	0	954	21	15	265	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)											99	
pX, platoon unblocked												
vC, conflicting volume	809	1307	168	1212	1296	526	283			994		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	809	1307	168	1212	1296	526	283			994		
tC, single (s)	7.5	6.5	7.0	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	87	74	96	100	100	100	100			98		
cM capacity (veh/h)	260	155	808	104	157	494	1272			645		
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	103	636	339	103	177							
Volume Left	34	0	0	15	0							
Volume Right	29	0	21	0	0							
cSH	242	1700	1700	645	1700							
Volume to Capacity	0.42	0.37	0.20	0.02	0.10							
Queue Length 95th (m)	15.9	0.0	0.0	0.6	0.0							
Control Delay (s)	30.4	0.0	0.0	1.8	0.0							
Lane LOS	D			A								
Approach Delay (s)	30.4	0.0		0.7								
Approach LOS	D											
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			45.0%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Catharine Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	53	18	22	121	0	0	0	0	6	210	17
Future Volume (vph)	0	53	18	22	121	0	0	0	0	6	210	17
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	58	20	24	133	0	0	0	0	7	231	19
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total (vph)	78	157	257									
Volume Left (vph)	0	24	7									
Volume Right (vph)	20	0	19									
Hadj (s)	-0.15	0.10	0.05									
Departure Headway (s)	4.6	4.7	4.5									
Degree Utilization, x	0.10	0.21	0.32									
Capacity (veh/h)	729	717	764									
Control Delay (s)	8.1	8.9	9.6									
Approach Delay (s)	8.1	8.9	9.6									
Approach LOS	A	A	A									
Intersection Summary												
Delay			9.2									
Level of Service			A									
Intersection Capacity Utilization			38.0%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	57	18	0	0	0	0	0	0	26	23	0
Future Volume (vph)	0	57	18	0	0	0	0	0	0	26	23	0
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	0	78	25	0	0	0	0	0	0	36	32	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	103	68										
Volume Left (vph)	0	36										
Volume Right (vph)	25	0										
Hadj (s)	-0.06	0.22										
Departure Headway (s)	4.0	4.3										
Degree Utilization, x	0.11	0.08										
Capacity (veh/h)	880	802										
Control Delay (s)	7.5	7.7										
Approach Delay (s)	7.5	7.7										
Approach LOS	A	A										
Intersection Summary												
Delay			7.6									
Level of Service			A									
Intersection Capacity Utilization			25.6%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	33	6	32	88	23	37	103	13	4	49	6
Future Volume (vph)	23	33	6	32	88	23	37	103	13	4	49	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	36	7	35	96	25	40	112	14	4	53	7
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	68	156	166	64								
Volume Left (vph)	25	35	40	4								
Volume Right (vph)	7	25	14	7								
Hadj (s)	0.07	0.03	0.07	0.02								
Departure Headway (s)	4.7	4.6	4.6	4.7								
Degree Utilization, x	0.09	0.20	0.21	0.08								
Capacity (veh/h)	708	741	746	719								
Control Delay (s)	8.2	8.7	8.8	8.1								
Approach Delay (s)	8.2	8.7	8.8	8.1								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.6									
Level of Service			A									
Intersection Capacity Utilization			30.9%	ICU Level of Service	A							
Analysis Period (min)			15									

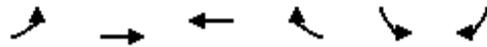
HCM Unsignalized Intersection Capacity Analysis
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	54	31	27	0	0	0	0	95	13	35	52	0
Future Volume (vph)	54	31	27	0	0	0	0	95	13	35	52	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	63	36	31	0	0	0	0	110	15	41	60	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	130	125	101									
Volume Left (vph)	63	0	41									
Volume Right (vph)	31	15	0									
Hadj (s)	0.03	0.02	0.14									
Departure Headway (s)	4.4	4.3	4.5									
Degree Utilization, x	0.16	0.15	0.13									
Capacity (veh/h)	773	797	765									
Control Delay (s)	8.3	8.1	8.1									
Approach Delay (s)	8.3	8.1	8.1									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.2									
Level of Service			A									
Intersection Capacity Utilization			33.4%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 17: Forest Avenue & Site Access

08-01-2022



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		4			4	
Traffic Volume (veh/h)	7	76	0	0	17	0
Future Volume (Veh/h)	7	76	0	0	17	0
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)	8	83	0	0	18	0
Pedestrians		20			20	
Lane Width (m)		3.5			3.5	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		2			2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20				119	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20				119	40
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	100
cM capacity (veh/h)	1583				863	1004
Direction, Lane #	EB 1	SB 1				
Volume Total	91	18				
Volume Left	8	18				
Volume Right	0	0				
cSH	1583	863				
Volume to Capacity	0.01	0.02				
Queue Length 95th (m)	0.1	0.5				
Control Delay (s)	0.7	9.3				
Lane LOS	A	A				
Approach Delay (s)	0.7	9.3				
Approach LOS		A				
Intersection Summary						
Average Delay		2.1				
Intersection Capacity Utilization		24.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
 19: Catharine Street South & Site Access

08-01-2022

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	24	0	0	0	15	33
Future Volume (Veh/h)	24	0	0	0	15	33
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)	26	0	0	0	16	36
Pedestrians	20		20		20	
Lane Width (m)	3.5		0.0		3.5	
Walking Speed (m/s)	1.2		1.2		1.2	
Percent Blockage	2		0		2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	108	40			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	108	40			20	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			99	
cM capacity (veh/h)	871	1004			1583	
Direction, Lane #	WB 1	SB 1				
Volume Total	26	52				
Volume Left	26	16				
Volume Right	0	0				
cSH	871	1583				
Volume to Capacity	0.03	0.01				
Queue Length 95th (m)	0.7	0.2				
Control Delay (s)	9.3	2.3				
Lane LOS	A	A				
Approach Delay (s)	9.3	2.3				
Approach LOS	A					
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization			24.1%	ICU Level of Service	A	
Analysis Period (min)			15			

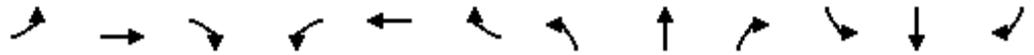
Lanes, Volumes, Timings
3: John Street South & Young Street

08-01-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	42	22	19	54	20	33	696	20	19	580	41
Future Volume (vph)	20	42	22	19	54	20	33	696	20	19	580	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	15.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Satd. Flow (prot)	1785	1732	0	0	1774	0	0	3323	0	0	3474	0
Flt Permitted	0.576				0.929			0.902			0.922	
Satd. Flow (perm)	1061	1732	0	0	1642	0	0	2999	0	0	3204	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			15			5			15	
Link Speed (k/h)		40			40			50			50	
Link Distance (m)		56.2			95.6			98.8			61.1	
Travel Time (s)		5.1			8.6			7.1			4.4	
Confl. Peds. (#/hr)	17		52	52		17	46		38	38		46
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	7%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	4
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	68	0	0	98	0	0	796	0	0	681	0
Enter Blocked Intersection	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	8	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.7	24.7		23.5	23.5		28.7	28.7		28.7	28.7	
Total Split (s)	30.0	30.0		30.0	30.0		60.0	60.0		60.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	24.3	24.3		25.5	25.5		54.3	54.3		54.3	54.3	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.4	2.4		1.0	1.0		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)	4.7	4.7			3.5			4.7			4.7	

Lanes, Volumes, Timings
 3: John Street South & Young Street

08-01-2022

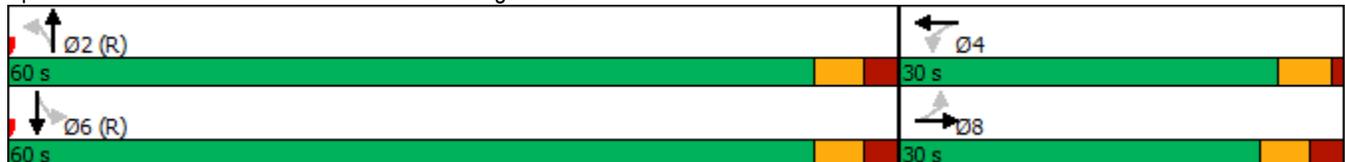


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	8.0	8.0		8.0	8.0		12.0	12.0		12.0	12.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		10.0	10.0		10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.7	11.7			12.6			73.0			73.0	
Actuated g/C Ratio	0.13	0.13			0.14			0.81			0.81	
v/c Ratio	0.15	0.28			0.40			0.33			0.26	
Control Delay	37.1	28.3			34.7			3.4			3.1	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	37.1	28.3			34.7			3.4			3.1	
LOS	D	C			C			A			A	
Approach Delay		30.4			34.7			3.4			3.1	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.5	7.5			14.0			18.1			14.1	
Queue Length 95th (m)	10.3	19.4			28.4			29.3			23.2	
Internal Link Dist (m)		32.2			71.6			74.8			37.1	
Turn Bay Length (m)	15.0											
Base Capacity (vph)	298	503			494			2434			2602	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.07	0.14			0.20			0.33			0.26	

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 28 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.40
 Intersection Signal Delay: 6.6
 Intersection Capacity Utilization 65.5%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 3: John Street South & Young Street



HCM Unsignalized Intersection Capacity Analysis

6: John Street South & Forest Avenue

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔						↕			↕	
Traffic Volume (veh/h)	36	35	31	0	0	0	0	660	27	18	522	0
Future Volume (Veh/h)	36	35	31	0	0	0	0	660	27	18	522	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	37	36	32	0	0	0	0	680	28	19	538	0
Pedestrians		18			19			17			19	
Lane Width (m)		3.5			0.0			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)											99	
pX, platoon unblocked	0.98	0.98	0.98	0.98	0.98		0.98					
vC, conflicting volume	953	1321	304	1087	1307	392	556			727		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	910	1285	247	1047	1271	392	504			727		
tC, single (s)	7.5	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	76	96	100	100	100	100			98		
cM capacity (veh/h)	215	153	723	136	160	603	1033			886		
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	105	453	255	198	359							
Volume Left	37	0	0	19	0							
Volume Right	32	0	28	0	0							
cSH	233	1700	1700	886	1700							
Volume to Capacity	0.45	0.27	0.15	0.02	0.21							
Queue Length 95th (m)	17.4	0.0	0.0	0.5	0.0							
Control Delay (s)	32.6	0.0	0.0	1.1	0.0							
Lane LOS	D			A								
Approach Delay (s)	32.6	0.0		0.4								
Approach LOS	D											
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			47.3%			ICU Level of Service				A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Catharine Street South & Young Street

08-01-2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔						↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	78	32	27	74	0	0	0	0	13	81	18
Future Volume (vph)	0	78	32	27	74	0	0	0	0	13	81	18
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	89	36	31	84	0	0	0	0	15	92	20
Direction, Lane #	EB 1	WB 1	SB 1									
Volume Total (vph)	125	115	127									
Volume Left (vph)	0	31	15									
Volume Right (vph)	36	0	20									
Hadj (s)	-0.16	0.05	-0.07									
Departure Headway (s)	4.2	4.4	4.4									
Degree Utilization, x	0.14	0.14	0.15									
Capacity (veh/h)	834	784	781									
Control Delay (s)	7.9	8.1	8.2									
Approach Delay (s)	7.9	8.1	8.2									
Approach LOS	A	A	A									
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			32.9%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 10: Catharine Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	60	18	0	0	0	0	0	0	47	66	0
Future Volume (vph)	0	60	18	0	0	0	0	0	0	47	66	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	0	70	21	0	0	0	0	0	0	55	77	0
Direction, Lane #	EB 1	SB 1										
Volume Total (vph)	91	132										
Volume Left (vph)	0	55										
Volume Right (vph)	21	0										
Hadj (s)	-0.11	0.08										
Departure Headway (s)	4.1	4.2										
Degree Utilization, x	0.10	0.15										
Capacity (veh/h)	852	835										
Control Delay (s)	7.6	7.9										
Approach Delay (s)	7.6	7.9										
Approach LOS	A	A										
Intersection Summary												
Delay			7.8									
Level of Service			A									
Intersection Capacity Utilization			27.7%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 13: Walnut Street South & Young Street

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	12	70	20	11	84	17	24	44	11	17	52	5
Future Volume (vph)	12	70	20	11	84	17	24	44	11	17	52	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	75	22	12	90	18	26	47	12	18	56	5
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	110	120	85	79								
Volume Left (vph)	13	12	26	18								
Volume Right (vph)	22	18	12	5								
Hadj (s)	-0.08	-0.04	-0.02	0.01								
Departure Headway (s)	4.3	4.4	4.5	4.5								
Degree Utilization, x	0.13	0.15	0.11	0.10								
Capacity (veh/h)	792	780	753	742								
Control Delay (s)	8.0	8.1	8.0	8.0								
Approach Delay (s)	8.0	8.1	8.0	8.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.1									
Level of Service			A									
Intersection Capacity Utilization			27.5%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 14: Walnut Street South & Forest Avenue

08-01-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	41	21	47	0	0	0	0	36	3	9	78	0
Future Volume (vph)	41	21	47	0	0	0	0	36	3	9	78	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	46	23	52	0	0	0	0	40	3	10	87	0
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total (vph)	121	43	97									
Volume Left (vph)	46	0	10									
Volume Right (vph)	52	3	0									
Hadj (s)	-0.15	-0.04	0.06									
Departure Headway (s)	4.1	4.2	4.3									
Degree Utilization, x	0.14	0.05	0.11									
Capacity (veh/h)	857	816	818									
Control Delay (s)	7.7	7.4	7.8									
Approach Delay (s)	7.7	7.4	7.8									
Approach LOS	A	A	A									
Intersection Summary												
Delay			7.7									
Level of Service			A									
Intersection Capacity Utilization			33.1%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

17: Catharine Street South & Site Access

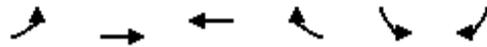
08-01-2022

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	11	0	0	0	22	106
Future Volume (Veh/h)	11	0	0	0	22	106
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)	12	0	0	0	24	115
Pedestrians	20		20		20	
Lane Width (m)	3.5		0.0		3.5	
Walking Speed (m/s)	1.2		1.2		1.2	
Percent Blockage	2		0		2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	203	40			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	203	40			20	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			98	
cM capacity (veh/h)	765	1004			1583	
Direction, Lane #	WB 1	SB 1				
Volume Total	12	139				
Volume Left	12	24				
Volume Right	0	0				
cSH	765	1583				
Volume to Capacity	0.02	0.02				
Queue Length 95th (m)	0.4	0.4				
Control Delay (s)	9.8	1.4				
Lane LOS	A	A				
Approach Delay (s)	9.8	1.4				
Approach LOS	A					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			28.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

19: Forest Avenue & Site Access

08-01-2022



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶			↷	
Traffic Volume (veh/h)	17	90	0	0	17	0
Future Volume (Veh/h)	17	90	0	0	17	0
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)	18	98	0	0	18	0
Pedestrians		20	20		20	
Lane Width (m)		3.5	0.0		3.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		2	0		2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20				174	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20				174	40
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	100
cM capacity (veh/h)	1583				798	1004
Direction, Lane #	EB 1	SB 1				
Volume Total	116	18				
Volume Left	18	18				
Volume Right	0	0				
cSH	1583	798				
Volume to Capacity	0.01	0.02				
Queue Length 95th (m)	0.3	0.6				
Control Delay (s)	1.2	9.6				
Lane LOS	A	A				
Approach Delay (s)	1.2	9.6				
Approach LOS		A				
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			27.2%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix G

Parking Justifications

December 20, 2017

David Horwood
Representative Holdings Inc.
242 Main Street East
Hamilton, Ontario, L8N 1H5

**Re: Parking Study and Analysis Addendum
117 Forest Avenue and 175 Catharine Street South
City of Hamilton
Our Project No. NT-16-103**

Nextrans Consulting Engineers (A Division of NextEng Consulting Group Inc.) was retained by Representative Holdings Inc. (The Client) to undertake a Parking Study and Analysis for a Zoning By-law Amendment application and site plan application. The subject sites are located at municipal addresses 117 Forest Avenue and 175 Catharine Street South, in the City of Hamilton.

Nextrans has prepared the original Parking Study and Analysis in December, 2016, in support of the proposed development application mentioned above. The City of Hamilton has provided comments dated February 3, 2017 and May 9, 2016 (**Appendix A**).

The purpose of this Addendum is to address the City's comments and provide additional information as requested by staff.

COMMENTS AND RESPONSES

1. Section 3.4 "Existing On-Street and Paid Parking" - of the parking study submitted by NexTrans illustrates the parking regulations and the potential numbers of parking spaces are in the area, however it fails to demonstrate the availability of unoccupied spaces through a study/count on a typical day. From staff observations' parking in this area is heavily utilized as shown on the Google aerial and street images. In addition, residents on Catherine Street between Young Street and Augusta Street, have recently petitioned to have "Permit Parking" on this section of Catherine Street and has been approved and installed as a result of competing demand for parking in this area. The closest paid parking lot to this development at Charlton Avenue East and John Street South is also at or near capacity given its location to the Hospital. The applicant should be made aware that on-street parking permits/time limit exemption permits are not available to multi-tenant buildings.

Response:

We concur with staff findings, which is consistent with our observation that the on-street parking in the area is busy at times. However, similar to any big cities in the GTA, on-street parking is intended for short-term parking needs and on a first-come-first-serve basis. Visitors and residents will need to adjust to the demand in the area. Lack of on-street visitor parking will encourage visitors and residents to take other modes of transportation to and from this area.

While on-street parking is an option for visitors or residents for this area, it is not the only option or requirement for the proposed development. The proposed development will provide and support other travel options such as walking, cycling and public transit. The proposed land use and site design will be conducive to other modes, unlike other low-rise development in other parts of the City.

Based on our involvement with other projects in the GTA, the tenants usually look for apartments that are close to their work, either within walking/cycling distance or accessible to transit routes. Costs of owning a car are expensive and may not be viable for some tenants. As such, unbundle or lack of parking spaces from the unit will help reduce rental costs and become more attractive to young professionals and small families.

2. Section 3.5 "Existing Non-Auto Model Share" – of the parking study discusses residents who choose to make non-auto trips based on "Transportation Tomorrow Surveys" however residents who choose to make non-auto trips may still own a vehicle. The study could have chosen to review the vehicle ownership in the area which would give a better understanding of the number of vehicles that will be utilizing a parking space.

Response:

We have analyzed the vehicle ownership data from the 2011 TTS as per the suggestion above. Based on our findings, about 39% of the households do not own a car and average of only 0.8 cars per household in the area. In addition, about 48% of household size in Ward 2 is one person.

Based on these results, it is our opinion that there are a significant number of residents in the area that are taking alternative modes of transportation other than driving single-occupant-vehicle.

3. Section 7.0 "Proposed Site Plan Review and Parking Requirement" – indicates a parking ratio of 1.6 spaces per townhouse and 0.96 spaces per multiple dwelling unit is required under Zoning By-law 6593, however it is unclear how these figures were derived. Under Zoning By-law 6593 "Street Townhouses" require one space per unit and "Multiple dwelling units" require 0.8 spaces per unit.

Response:

These comments have been addressed in the Addendum report contained herein.

4. Section 8.0 "Adjacent Sites Parking Utilization" – discusses the parking utilization within the adjacent sites however it does not provide information on occupancy rates for each building, number of residents who choose to park on-street, or vehicle ownership.

Response:

To address this comment, we have obtained the maximum occupancy rates for the adjacent buildings as of December, 2016. The analysis is summarized in Table 4 of the Addendum report. The results indicate that the conclusion of the previous report is still valid that the parking utilization rate is very low ($\pm 50\%$).

5. Section 9.0 "Proposed Parking Rates for the Development" – the headings "Parking Requirements" in table 4 should read "Parking Proposed". In page 9 of the parking report suggests that the parking rates were derived through (bullet 5) review of the available on-street and paid parking within walking distance, however parking studies/counts were not shown to have been conducted to determine the potential available number of unoccupied on-street parking spaces on a typical day, in addition parking along Catherine Street South between Young Street and Augusta Street is by "Permit Only" which is not available to multi-tenant buildings. Bullet 6 discusses non-auto trips however as previously discussed residents who make non-auto trips still own vehicles for those trips that cannot be made by transit or other modes of transportation.

Response:

Acknowledged and addressed in the Addendum report contained herein. Given that the area is located adjacent to health care/medical centres and St. Joseph's Hospital, it is difficult to identify whether all on-street parking spaces are utilized by visitors related to the existing residential uses or other uses in the area. As such, it is our opinion that a parking utilization study will be difficult and will not be useful for the purposes of this assessment.

This site current use is a parking lot as such the parking which is currently occurring on-site may also be displaced to surrounding lots or on-street worsening parking conditions.

Response:

It is our understanding that parking at this location is only used by on-site contractors of ET and is not available to the general public. As such, removing this lot will not worsen on-street parking conditions in the area.

It is our opinion that all the public streets in the area are already at their ultimate cross-section. There is no additional space to construct additional lanes to accommodate traffic. If residents and visitors to the area continue to drive here, congestion will become a greater problem for the area. As such, the City should encourage other modes of transportation instead of driving.

In addition, the area is within walking distance to existing transit routes on John Street S and to Hamilton GO Station, residents and visitors should be encouraged to use other modes of transportation such as walking, cycling and taking transit. This is the requirement of the Provincial Places to Grow policies and the City Urban Hamilton Official Plan to build more sustainable and healthy communities.

In view of the plan provided the applicant is showing a substandard driving aisle/manoeuvring space under the proposed 10 storey building, it is unclear how motorists will ingress and egress to and from those parking spaces with a substandard aisle.

Response:

It is our understanding that this comment has been addressed with the revised site plan. The new aisle is 6.0 m.

Opportunity for parking in the surrounding area is limited as such it is recommended that a warning clause be implemented in the purchase/sale agreements stating that a clause be included as part of the purchase of sale agreement (and/or lease agreement) warning purchasers the following:

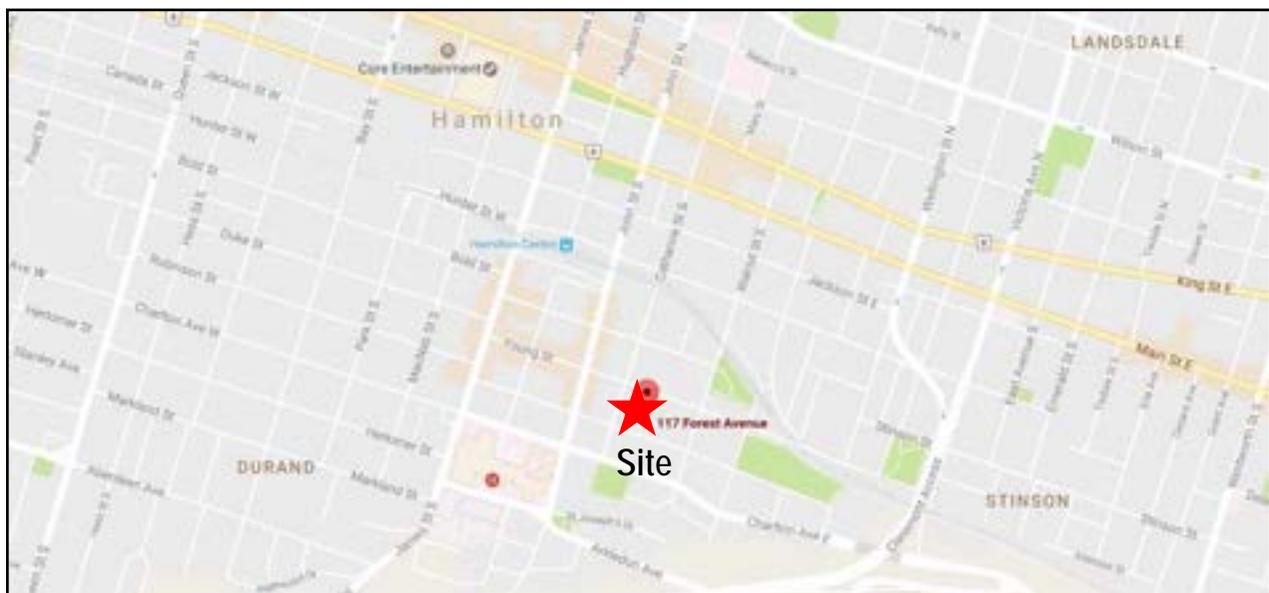
"It is the responsibility of the owner/tenant to ensure that the parking provided on site is sufficient for his/her needs. Parking in the surrounding neighbourhood is limited and highly restrictive and on-street parking permits/time limit exemption permits are not available to multi-tenant buildings".

Nexttrans suggested that this clause will be included in the purchase or rental agreement.

1.0 INTRODUCTION

Currently, 117 Forest Avenue is a vacant lot occupied by a gravel parking lot and 175 Catharine Street South is currently occupied by an 11-storey, 93 multiple dwelling units. Figure 1 illustrates the proposed site location.

Figure 1 - Proposed Site Location



Source: Google Map

2.0 LAND USE PLANNING CONTEXT

The proposed development is currently situated in the south of the City of Hamilton's Ward 2, also known as the Downtown area situated in the centre of the City, below the Niagara Escapement. Ward 2 is bounded by the Escarpment to the south, Hamilton Harbour to the north, Queen Street to the west, and Wellington and Wentworth streets to the east. Ward 2 is considered the City's downtown and contains City Hall, Jackson Square, Gore Park, First Ontario Centre, the Hamilton Farmer's Market, St. Joseph's Hospital, the Art Gallery of Hamilton, and Hamilton Place.

Current Urban Hamilton Official Plan Designation

The subject property is designated Neighbourhoods on Schedule E-1 to the Urban Hamilton Official Plan (UHOP). The Neighbourhoods designation embodies the concept of the complete community and is planned to encompass a full range of residential dwelling types and densities as well as complementary facilities and services to serve residents. It is the intent of the Neighbourhoods designation to allow for the continued evolution of neighbourhoods, including compatible residential intensification.

Within the Neighbourhoods designation, high density residential areas are located on the periphery of neighbourhoods in proximity to arterial roads. These areas are characterized by multiple dwellings, including block townhouses, with residential densities of 100 to 500 units per hectare. The proposed development will result in a residential density of approximately 374 dwelling units per hectare.

The subject property is situated in a desirable location for high density residential uses as described in the UHOP. The site is located within safe and convenient walking distance to a variety of community facilities/services such as Queen Victoria Elementary School, Woolverton Park, and public transit including both Hamilton Transit service and GO Transit service. The site is also in close proximity to the Downtown Urban Growth Centre.

In addition, the development will not be immediately adjacent to low-density residential uses, and will have access to collector and minor arterial roads via local roads abutting minimal low-density dwellings. On this basis, it is our opinion that the development proposal will support the goals and objectives of the Official Plan.

Current Zoning

The subject property is zoned "E-3/S-601" District (High Density Multiple Dwellings), Modified within the City of Hamilton's Zoning By-law No. 6593. The existing zoning permits a variety of residential, institutional, public, and commercial uses, including multiple dwellings. Townhouse dwellings are not permitted in the existing zoning. An application for Zoning By-law Amendment has been submitted to permit townhouse dwellings and to establish appropriate site-specific regulations with regards to parking, setbacks, and building envelopes for both the multiple dwellings and townhouse uses.

Planning Direction

To facilitate the proposal, an amendment to the Zoning By-law is required. The intent of the amendment would be to create site specific regulations that accommodate the proposal while implementing the goals and objectives of the Official Plan.

The site is surrounded by compatible multi-unit residential buildings and is located in close proximity to a variety of complementary facilities and services including HSR Transit routes. Accordingly, the underutilized portion of the subject property is in an optimal location for high density residential development, and it is our opinion that the development proposal will support the intent of the UHOP.

3.0 EXISTING CONDITIONS

3.1. Existing Transit Service

As the proposed site is located within the Downtown area, it is currently well-served by Hamilton Transit. Ten bus routes - including the A-Line Express, various Upper Hamilton lines, Sanatorium line, and College line - run along John Street,

only a block east of Catharine, and several convenient stops are located very close to the project site. These lines link to the Hamilton Centre a short distance to the north, offering connections to several other of the city's public transit systems, as well as to the GO Transit service running east toward Toronto.

The proposed development is located approximately 200 metres (less than 3 minute-walk) to the bus stops at John Street S and Young Street, and approximately 600 metres (about 8 minute-walk) to the Hamilton Centre GO Train/Bus Station and Hamilton Transit Station.

Figure 2 illustrates the HSR Transit system for the Downtown area.

Figure 2 – Hamilton Transit System in the Downtown Area



Source: HSR Transit System Map

3.2. Existing Active Transportation System

Based on our review, under the existing conditions, the area is well served by a network of complete sidewalks on both sides of the Street. Although, there are no dedicated bicycle lanes in the immediate area, there are a number of existing trails to the east and south of the proposed site.

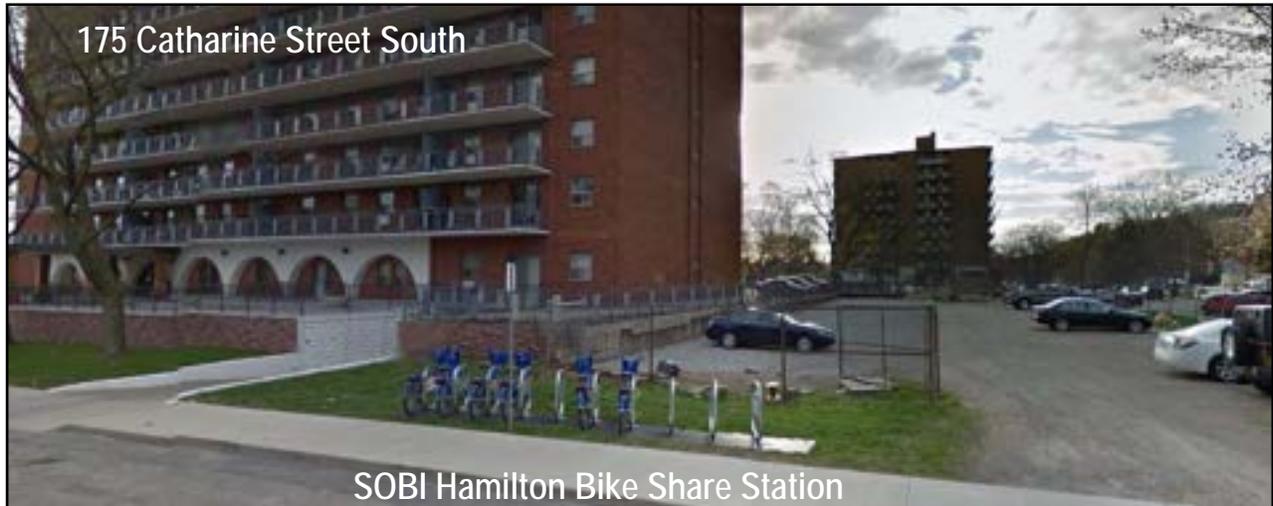
SOBI Hamilton

As indicated on the City of Hamilton's website, the City of Hamilton, in partnership with Social Bicycles, implemented a bike share program in 2014. Over 100 stations were installed between downtown Dundas and Gage Park. One of the stations is located in front of the 175 Catharine Street South with the capacity of 10 bicycles.

The program was funded by Metrolinx Quick Wins and will serve transit riders, commuter cyclists, recreational cyclists and visitors to the City of Hamilton. The intent of the Bike Share is to complement public transit and provides first and last mile connectivity for users.

Figure 3 illustrates the SoBi Hamilton Bike Share Station in front of 175 Catharine Street South.

Figure 3 – Bike Share Station in front of 175 Catharine Street S



Source: Google Streetview

3.3. Existing Amenities in the Area

The proposed development is located close to a number of institutions and amenities, including Queen Victoria Elementary School, St. Joseph's Hospital, the Hamilton Escarpment Rail trail, and the Augusta Street food and entertainment district. The many other amenities of Hamilton's downtown core may be accessed via a short trip on public transit or bicycle ride, instead of driving. **Figure 4** illustrates the available institutions and amenities in the immediate area within 300 m and 500 m walking distance (approximately 4 to 7 minute-walk).

Figure 4 – Available Amenities in the Area (approximately 300-500 m Walking Radius)



Source: Google Map

3.4. Existing On-Street and Paid Parking

As indicated in our previous assessment, there are some on-street parking spaces available in the area along Forest Avenue, Catharine Street S and Young Street with certain restrictions. In addition, there are two existing paid parking lots operated by Impark Parking. The closest paid parking to the proposed development (Charlton Avenue E and John Street S) has a capacity of approximately 100 parking spaces. However, both on-street parking and paid parking lots are well-utilized by residents and visitors. Given that the area is located adjacent to health care/medical centres and St. Joseph’s Hospital, it is difficult to identify whether all on-street parking spaces are utilized by visitors related to the existing residential uses or other uses in the area. As such, it is our opinion that a parking utilization study will be difficult and will not be useful for the purposes of this assessment.

We also concur with staff findings, which is consistent with our observation that on-street parking in the area is busy at times. However, similar to any big cities in the GTA, on-street parking is intended for short-term parking needs and is available on a first-come-first-serve basis. Visitors and residents will need to adjust to the demand in the area. Lack of on-street visitor parking will encourage visitors and residents to take other modes of transportation to and from this area. It is our opinion that while on-street parking is an option for visitors or residents, this is not the only option or requirement for the proposed development. The proposed development will provide and encourage other travel options such as walking, cycling and taking transit. The proposed land use and site design will be conducive to other modes, unlike low-rise development in other parts of the City.

Based on our involvement with other projects in the GTA, the tenants usually look for apartments that are close to their work, either within walking/cycling distance or assessible to transit routes. Costs of owning a car are expensive and not viable for some tenants. As such, unbundled or lack of parking spaces from the rental units will reduce rental costs and will be more attractive to young professionals and small families who do not need a car.

3.5. Existing Non-Auto Modal Share

Table 1 summarizes the non-auto (transit, walking/cycling and carpooling) modal split information based on the review of the 2011 Transportation Tomorrow Survey (TTS) data for the City of Hamilton Ward 2.

Table 1 – Non-Auto Modal Split based on 2011 TTS Data

Ward		Trips Made by Residents of the City of Hamilton (Ward 2)		Trips to the City of Hamilton (Ward 2)	
Ward 2	6-9 AM	49%		38%	
	24 Hours	46%		43%	
<i>Average</i>		<i>48%</i>		<i>41%</i>	

Based on the information outlined in Table 1, the average non-auto modal split is approximately 45% for both inbound and outbound.

As requested by the City, Nextrans also reviewed the vehicle ownership for Ward 2. **Table 2** summarizes the vehicle ownership based on the 2011 Transportation Tomorrow Survey data, while the detailed TTS table is included in **Appendix B**.

Table 2 – Vehicle Ownership for Ward 2 Based on 2011 TTS Data

Household Type			Household Size					Number of Available Vehicles					Household Averages	
House	Townhouse	Apartment	1	2	3	4	5+	0	1	2	3	4+	Drivers	Vehicles
27%	1%	71%	48%	30%	9%	6%	4%	39%	47%	12%	1%	0%	0.9	0.8

As indicated in Table 2 above, the majority of the dwelling type in the Downtown area is apartment (71%), almost half of household with a single person, 39% of households does not own a car, and average less than one vehicle per household.

These findings are consistent with our previous assessment findings that almost half of the residents will not own a car or drive in this area. It is our opinion that with the future Light Rail Transit, there will be more residents and employees using alternative modes of transportation instead of driving.

4.0 HAMILTON LIGHT RAIL TRANSIT

As part of Metrolinx's Moving Ontario Forward plan and the "Big Move", Metrolinx is investing up to \$1 billion and will cover 100% of the capital costs of building the Light Rail Transit (LRT) in the City of Hamilton. The LRT system has higher passenger carrying capacity than conventional transit systems since it will operate on reserved transit lanes separated from general traffic. The LRT vehicles will also be equipped with low floors, along with multiple doors that are accessible to customers with all levels of mobility. The LRT will generally run along King Street West, from McMaster University to the Eastgate Square. It will include about 21 stations. Figure 5 illustrates the proposed LRT System in the City of Hamilton.

Figure 5 – Proposed Hamilton Light Rail Transit



Source: City of Hamilton website

It is anticipated that the LRT will help drive economic growth, reduce travel and connection times and improve quality of life for the residents of the City of Hamilton.

It is Nextrans' opinion that in order to achieve this objective, transit oriented and higher density developments should be encouraged in the Downtown area. In addition, a downtown wide parking management strategy such as parking rate reduction should also be encouraged for new developments in order to promote the use of public transit or other modes of transportation (walking, cycling and carpooling). In fact, reduced parking rates is the best and most effective Transportation Demand Management (TDM) strategy.

5.0 TRANSPORTATION DEMAND MANAGEMENT OPPORTUNITIES

In order to encourage other modes of transportation for the proposed developments such as walking, cycling, carpooling and public transit, the proposed development *should consider* the following Transportation Demand Management (TDM) measures and incentives:

- Reduce parking rates – to reduce the numbers of single-occupant vehicle trips to and from the proposed development;
- Provide direct and short pedestrian and cycling connections to surrounding streets and adjacent developments where appropriate;
- Provide bicycle parking at secured and convenient locations;
- Provide an information package to residents. The information package should include GO Train schedules, HSR schedules, community and cycling maps, where appropriate;
- Provide one-time pre-loaded PRESTO Cards with the starting value of \$25 (inclusive of the registration fee) to the residents on demand basis, where applicable. This will help the future residents to consider taking GO Transit and HSR as a primary mode of transportation, instead of driving. The pre-loaded PRESTO Cards can be distributed in conjunction with the Information Package through the property management office. It should be noted that this incentive is not applicable to rental apartments given the turn over rate and potential abuse of the Cards; and
- The following clause is suggested to be included in the rental/purchase agreement:

“It is the responsibility of the owner/tenant to ensure that the parking provided on site is sufficient for his/her needs. Parking in the surrounding neighbourhood is limited and highly restrictive and on-street parking permits/time limit exemption permits are not available to multi-tenant buildings”.

6.0 PROPOSED DEVELOPMENT

The proposed development at 117 Forest Avenue and 175 Catharine Street S consists of a ten-storey multiple dwelling with 78 residential units and 7 street townhouses that will be connected via an underground parking garage. The new underground parking garage will accommodate 41 new parking spaces (including two barrier-free) for the proposed development at 117 Forest Avenue and 175 Catharine Street S. The proposed underground parking layout prepared by mcCallumSather Architects is included in **Appendix C**. It should be noted that the proposed site statistics have not significantly changed from the last assessment, only the parking layout has been modified to address the City’s comments.

7.0 PROPOSED SITE PLAN REVIEW AND PARKING REQUIREMENT

The subject site is currently regulated by Zoning By-law 6593. This By-law requires the following ratio for parking: 1.0 spaces per townhouse dwelling and 0.8 spaces per unit in a multiple dwelling building and 0.16 spaces per unit for visitor.

Table 3 – Current Zoning By-law No. 6593 Vehicle Parking Requirements

Unit Type	No. of Unit	Parking Rate	Parking Requirement
Townhouse Units	7 units	1.00 spaces per unit	7
Multiple Dwelling Units	78 units	0.80 spaces per unit	62
Multiple Dwelling Visitor Parking	78 units	0.16 spaces per unit	12
<i>Total Parking Requirement</i>			<i>81</i>

Based on the City’s current Zoning By-law No. 6593, the proposed development will require 81 parking spaces.

If the existing percentage of the household without a car is applied to the current Zoning By-law parking rates, the proposed development only requires approximately 50 parking spaces (81 spaces x 39%).

If the existing average modal split is applied to the current Zoning By-law parking rates, the proposed development only requires 45 parking spaces (81 spaces x 45%).

8.0 ADJACENT SITES PARKING UTILIZATION

In order to understand the parking demand in the immediate area, the existing parking utilization for three adjacent residential development sites have been reviewed and summarized in Table 4. The parking utilization was recorded in December 2016. As requested by the City staff, the numbers of units rented as of December 2016 have also been included in the analysis.

Table 4 – Adjacent Sites Parking Utilization

Municipal Address	No. of Units	Rented Units as of December 2016	Parking Utilization	Parking Utilization Rates
175 Catharine St S	93 residential units	83 units	Rented to tenant – 48 Total 57 parking spaces	~ 0.58 spaces per unit
100 Forest Ave	228 residential units	218 units	Rented to tenant - 96 Total 175 parking spaces	~ 0.44 spaces per unit
123 Charlton Ave	240 residential units	233 units	Rented to tenants – 141 Total 203 parking spaces	~ 0.61 spaces per unit
<i>Average Parking Utilization Rates</i>				~ 0.54 spaces per unit

As indicated in Table 4, the average parking utilization is approximately 0.54 spaces per residential unit for the existing residential buildings in the vicinity of the proposed development.

9.0 PROPOSED PARKING RATES FOR THE DEVELOPMENT

The proposed parking rates for the subject development are summarized in Table 5.

Table 5 – Proposed Parking Rates for the Subject Development

Unit Type	No. of Unit	Parking Rate	Parking Requirement	Parking Provided
Townhouse Units	7 units	1.00 spaces per unit	7	11
Multiple Dwelling Units	78 units	0.39 spaces per unit	30	30
<i>Total Parking Requirement</i>			37	41

It is Nextrans' opinion that the proposed development is only required to provide a total of 41 parking spaces (including two barrier free parking spaces). The proposed parking rates are reasonable and justified based on the following assessment:

- Only 39% of residents own a car in the area, as well as very high modal share (up to 49%);
- The proposed development is located approximately 200 metres (less than 3 minute-walk) to the bus stops at John Street and Young Street, which service by HSR Bus Routes 22, 23, 24, 25, 26, 27;
- The proposed development is located approximately 500-600 metres (about 7-8 minute-walk) to the Hamilton Centre GO Train/Bus Station and Hamilton Transit Station;
- Future Metrolinx/Hamilton Light Rail Transit system will be available within Ward 2;
- The proposed development is surrounded by a complete network of sidewalk on both sides of public streets;
- The proposed development is located within 300 m – 500 m walk to various existing amenities and employment; and
- Suggested Transportation Demand Management measures outlined in this report.

We trust the enclosed sufficiently addresses your needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Nextrans Consulting Engineers

A Division of NextEng Consulting Group Inc.



Richard Pernicky, CET, MITE
Principal

Appendix A

Comments from the City of Hamilton



Hamilton

Planning and Economic
Development Department

Date: February 3, 2017
To: Gerry Tchisler
From: Tim Mendoza – Parking Technologist
Subject: **ZAC-17-008, 117 Forest Avenue, 175 Catherine Street South – Hamilton**

In response to your letter dated January 16, 2017 we provide the following information;

It has been determined that the parking justification report submitted by NexTrans Consulting dated December 21, 2016 is insufficient.

Section 3.4 “Existing On-Street and Paid Parking” - of the parking study submitted by NexTrans illustrates the parking regulations and the potential numbers of parking spaces are in the area, however it fails to demonstrate the availability of unoccupied spaces through a study/count on a typical day. From staffs observations’ parking in this area is heavily utilized as shown on the Google aerial and street images.

In addition residents on Catherine Street between Young Street and Augusta Street, have recently petitioned to have “Permit Parking” on this section of Catherine Street and has been approved and installed as



a result of competing demand for parking in this area. The closest paid parking lot to this development at Charlton Avenue East and John Street South is also at or near capacity given its location to the Hospital.



The applicant should be made aware that on-street parking permits/time limit exemption permits are not available to multi-tenant buildings.

Section 3.5 “Existing Non-Auto Model Share” – of the parking study discusses residents who choose to make non-auto trips based on “Transportation Tomorrow Surveys” however residents who choose to make non-auto trips may still own a vehicle. The study could have chosen to review the vehicle ownership in the area which would give a better understanding of the number of vehicles that will be utilizing a parking space.

Section 7.0 “Proposed Site Plan Review and Parking Requirement” – indicates a parking ratio of 1.6 spaces per townhouse and 0.96 spaces per multiple dwelling unit is required under Zoning By-law 6593, however it is unclear how these figures were derived. Under Zoning By-law 6593 “Street Townhouses” require one space per unit and “Multiple dwelling units” require 0.8 spaces per unit.

Section 8.0 “Adjacent Sites Parking Utilization” – discusses the parking utilization within the adjacent sites however it does not provide information on occupancy rates for each building, number of residents who choose to park on-street, or vehicle ownership.

Section 9.0 “Proposed Parking Rates for the Development” – the headings “Parking Requirements” in table 4 should read “Parking Proposed”. In page 9 of the parking report suggests that the parking rates were derived through (bullet 5) review of the available on-street and paid parking within walking distance, however parking studies/counts were not shown to have been conducted to determine the potential available number of unoccupied on-street parking spaces on a typical day, in addition parking along Catherine Street South between Young Street and Augusta Street is by “Permit Only” which is not available to multi-tenant buildings. Bullet 6 discusses non-auto trips however as previously discussed residents who make non-auto trips still own vehicles for those trips that cannot be made by transit or other modes of transportation.

This sites current use is a parking lot as such the parking which is currently occurring on-site may also be displaced to surrounding lots or on-street worsening parking conditions.

In view of the plan provided the applicant is showing a substandard driving aisle/manoeuvring space under the proposed 10 storey building, it is unclear how motorists will ingress and egress to and from those parking spaces with a substandard aisle.

Opportunity for parking in the surrounding area is limited as such it is recommended that a warning clause be implemented in the purchase/sale agreements stating that a clause be included as part of the purchase of sale agreement (and/or lease agreement) warning purchasers the following:

“It is the responsibility of the owner/tenant to ensure that the parking provided on site is sufficient for his/her needs. Parking in the surrounding neighbourhood is limited and highly restrictive and on-street parking permits/time limit exemption permits are not available to multi-tenant buildings”.

Should you have any questions or comments regarding the above please contact me.

Regards,

Tim Mendoza
Parking Technologist
City of Hamilton,
Planning and Economic Development Department
71 Main Street West, 5th Floor, L8P 4Y5
Tim.Mendoza@hamilton.ca
ph. 905-546-2424 ext. 6364



Hamilton

Planning and Economic
Development Department

Date: May 9, 2016
To: Gerry Tchisler
From: Tim Mendoza – Parking Technologist
Subject: **FC-16-055, 117 Forest Avenue & 175 Catherine Street South – Hamilton**

In response to your letter dated April 27, 2016 we provide the following information;

We have reviewed this application and as part of the formal application and in order to properly evaluate the application and the parking requirements within the Zoning By-Law, we will require additional information from the applicant on the proposed parking layout. We will require a detailed parking plan to scale identifying all the parking spaces appropriately dimensioned to ensure their proper use for parking.

It is recommended that the applicant provide Barrier-free parking spaces to accommodate persons with disabilities, preferably close to an elevator or entrance. Columns/walls be located at least 0.5 metres from the end of any parking stall to ensure adequate manoeuvring space.

Given that the applicant is showing a reduced number of parking spaces for the tower we will be requesting that the applicant provide a justification report to demonstrate that parking needs will be met on-site.

On-street parking in this neighbourhood is at high demand, as such is limited and leaving little opportunity for overflow parking in this area.

The applicant should ensure that all parking requirements are met on-site.

Regards,

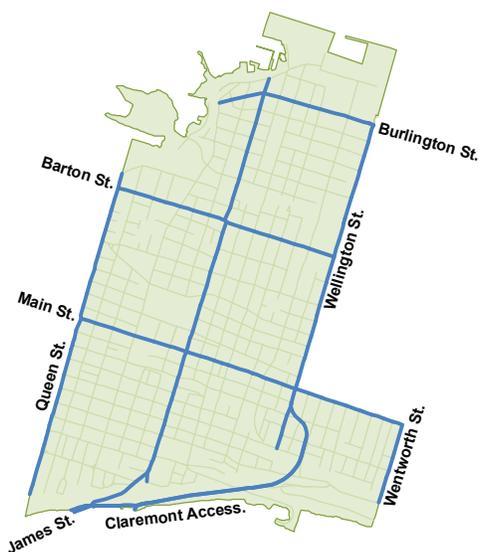
Tim Mendoza
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Appendix B

City of Hamilton 2011 TTS Data Summary

CITY OF HAMILTON

WARD 2



HOUSEHOLD CHARACTERISTICS

Households	Dwelling Type			Household Size					Number of Available Vehicles					Household Averages				
	House	Townhouse	Apartment	1	2	3	4	5+	0	1	2	3	4+	Trips/day (Household Average): Total number of trips by persons of age 11 and over divided by total number of households				
18,500	27%	1%	71%	48%	30%	9%	9%	4%	39%	47%	12%	1%	0%	1.9	0.9	1.1	0.8	3.5

POPULATION CHARACTERISTICS

Population	Age							Daily Trips per Person (age 11+)	Daily Work Trips per Worker	Population	Employment Type			Student	Licenced	Transit							
	0 - 10	11 - 15	16 - 25	26 - 45	46 - 64	65+	Median				Full Time	Part Time	At Home										
	35,600	10%	4%	12%	31%	28%	15%				40.6	2.0	0.71				17,100	37%	8%	3%	19%	62%	14%
												Male					Female						

TRIPS MADE BY RESIDENTS OF CITY OF HAMILTON - WARD 2

Time Period	Trips	% 24 hr	Trip Purpose				Mode of Travel						Median Trip Length (km)			
			HB-W	HB-S	HB-D	N-HB	Driver	Pass.	Transit	GO Train	Wlk & Cy	Other	Driver	Pass.	Transit	GO Train
6-9 AM	12,700	19.4%	50%	19%	20%	10%	49%	12%	17%	2%	18%	2%	5.1	2.3	3.4	58.4
24 Hours	65,300		30%	10%	41%	18%	52%	17%	16%	1%	12%	2%	3.6	3.5	3.1	58.4

TRIPS TO CITY OF HAMILTON - WARD 2

Time Period	Trips	% 24 hr	Trip Purpose				Mode of Travel						Median Trip Length (km)			
			Work	School	Home	Other	Driver	Pass.	Transit	GO Train	Wlk & Cy	Other	Driver	Pass.	Transit	GO Train
6-9 AM	24,900	29.0%	66%	12%	4%	19%	62%	11%	16%	1%	10%	0%	6.0	4.7	4.4	21.1
24 Hours	86,000		26%	4%	31%	39%	56%	15%	17%	1%	10%	1%	4.9	4.1	3.6	58.2

Appendix C

Proposed Underground Parking Layout

