2481 Barton Street East
City of Hamilton
Transportation Impact Study

Paradigm Transportation Solutions Limited

December 2022
220085

ptsl.com

Project Summary

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Client
Barton Street Developments Inc.
12 Chiavatti Drive
Markham, ON

Client Contact
Rajan Banwait
Development Manager

2481 Barton Street East
City of Hamilton
Transportation Impact Study

Consultant Project Team
Stew Elkins, BES
Scott Catton, C.E.T.
Adrian Soo, P.Eng.
Creighton Chartier

Adrian Soo, P.Eng.

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Paradigm Transportation Solutions Limited
5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684
www.ptsl.com

Executive Summary

Content

Barton Street East Developments Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS), for a proposed residential development located at 2481 Barton Street East in the City of Hamilton.

This study determines the impacts of the development traffic on the surrounding road network and identifies the recommended improvements to accommodate the site generated traffic.

Development Concept

The development concept includes a 17-story building containing 207 residential units and 475 m^2 (~5,000 sq.ft.) of ground floor retail space. Build-out is anticipated to occur by Year 2026.

Vehicle access is proposed via a private driveway to Barton Street East located approximately 115 metres east of Centennial Parkway North. The driveway is located towards the site's east property limit to accommodate the transit stop needs associated with the articulated buses utilizing the westbound stop at Centennial Parkway North. The driveway will be restricted to right-in/right-out through use of a raised centre median on Barton Street East.

The driveway will be restricted to right-in/right-out movements only through an extension of an existing raised centre median on Barton Street East. It is recommended that a one-way directional sign (Rb-21) be installed on the centre median island across from the site driveway. Additionally, the provision of a no left-turn sign (Rb-12) should be placed on the site driveway approach to Barton Street per OTM[1] guidance. Supplementary no left-turn signage may be required on the centre median at the City's discretion.

[1] Ontario Traffic Manual Book 5, December 2021

Conclusions

The main findings and conclusions of this study are as follows:

- **Study Area:** The intersections that form the study area include the Barton Street East intersections with Centennial Parkway North and the Intersection Pedestrian Signal just east of Covington Street.
- **Existing Traffic Conditions:** The Barton Street East/Centennial Parkway North intersection operates poorly under existing conditions. It is noted under the PM peak hour critical movements are identified on all intersection approaches.
- **Site Description:** The development concept is a mixed-use building containing 207 residential units and 475 m^2 (~5,000 sq.ft.) of ground floor retail space. Build-out is anticipated to occur by Year 2026 with timing subject to market conditions.

  Vehicle access is proposed by a restricted right-in/right-out driveway to Barton Street East located approximately 115 metres east of Centennial Parkway North.
- **Development Generated Traffic:** The subject site is estimated to generate approximately 69 new AM peak hour trips and approximately 89 new PM peak hour trips. No modal split reductions have been applied.
- **Forecast Traffic:** A five-year study horizon (Year 2031) from the anticipated build-out is assessed. The future traffic volumes near the subject site are estimated to consist of generalized background traffic growth at a rate of 2% per annum (compounded), traffic generated by adjacent other area background developments, and traffic generated by the subject site.
- **Background Traffic Conditions:** The existing capacity issues at the Barton Street East/Centennial Parkway North intersection are forecast to be exacerbated with background growth and consideration of site traffic contributions from the other area background development. The overall intersection v/c ratio for the intersection is forecast to exceed 1.00.

  The westbound through lanes at the Intersection Pedestrian Signal east of Covington Street is forecast operate within capacity; however, is noted to be approaching capacity with a reported v/c ratio of 0.85.
- **Total Traffic Conditions:** The capacity issues forecast to occur under the background traffic horizon are forecast with, or without the development of the subject site. Further noting no

additional critical movements are forecast at Barton Street East/Centennial Parkway North with the addition of site generated traffic.

The site driveway is expected to operate at a good level of service with delays in the LOS A range and with v/c ratios of less than 0.55 (i.e., well within capacity). The queue length of the driveway approach is forecast to be less than 70 metres (i.e., approximately 10 vehicles) and will be contained within the site. This vehicular queue is not expected to impact on-site circulation.

- **Remedial Measures:** The City of Hamilton should continue to evaluate and maintain the existing signal timing plans.

Recommendations

Based on the findings of this study, it is recommended that:

- The applicant extend the existing median on Barton Street East to restrict inbound and outbound left-turns at the site driveway. The existing break in the median will also be closed;
- A one-way directional sign (Rb-21) be installed on the centre median island across from the site driveway. A no left-turn sign (Rb-12) be placed on the site driveway approach to Barton Street East per OTM guidance. Supplementary no left-turn signage may be required on the centre median; and
- The City of Hamilton continue to evaluate and monitor signal timing along the Barton Street East and Centennial Parkway North corridors. Future signal timings should be identified using real-world traffic volumes.

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1 Introduction

1.1 Overview

Barton Street East Developments Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS), for a proposed residential development located at 2481 Barton Street East in the City of Hamilton.

Figure 1.1 illustrates the site location.

The scope of the study includes:

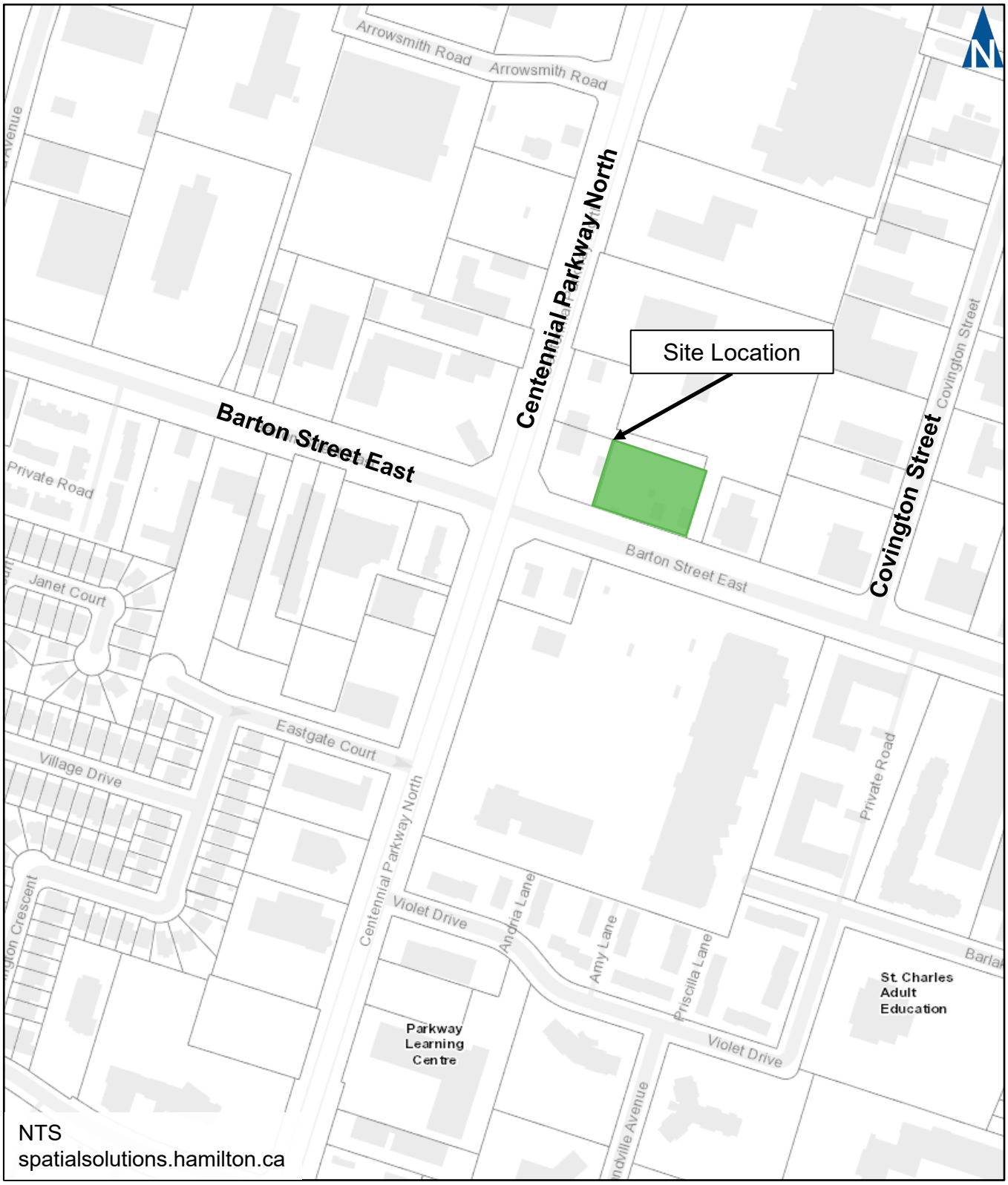
- An assessment of the current traffic and site conditions within the study area;
- Estimates of background traffic growth;
- Estimates of additional traffic generated by the subject site;
- Operational analyses to assess the traffic impact on the surrounding road network; and
- Recommendations to mitigate the site generated traffic in a satisfactory manner, if required.

Appendix A contains the pre-study consultation correspondence with the City of Hamilton. The study has been conducted in general accordance with the City of Hamilton's Traffic Impact Study Guidelines[2].

The study area intersections assessed in this study include:

- Barton Street East at Centennial Parkway North (signalized);
- Intersection Pedestrian Signal (Intersection Pedestrian Signal) on Barton Street just east of Covington Street; and
- Proposed right-in/right-out site driveway to Barton Street East (unsignalized).

[2] Traffic Impact Study Guidelines, City of Hamilton, July 2009.



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Location of Subject Site

2481 Barton Street East
220085

Figure 1.1

2 Existing Conditions

2.1 Road Network

The roadways of interest within the study area include:

- **Centennial Parkway North** is a north / south major arterial road[3] with a speed limit of 50 km/h. The road has a four-lane urban cross-section with a centre two-way left-turn lane. The intersection with Barton Street East is signalized.
- **Barton Street East** is an east / west minor arterial road[4] with a speed limit of 50 km/h. The road has a four-lane urban cross-section with a centre two-way left-turn lane.

Figure 2.1 illustrates the existing lane configuration and traffic control at the study area intersections. All roadways within the study area operate under the jurisdiction of the City of Hamilton.

2.2 Pedestrian Network

Sidewalks are provided on both sides of Barton Street East and Centennial Parkway North. Pedestrian push buttons and ladder crosswalks are provided on all 4-legs at the signalized Centennial Parkway North/Barton Street East intersection.

An Intersection Pedestrian Signal (IPS) is provided on Barton Street East adjacent to Covington Street (i.e., east leg of the intersection). The IPS provides a controlled crossing location for pedestrians.

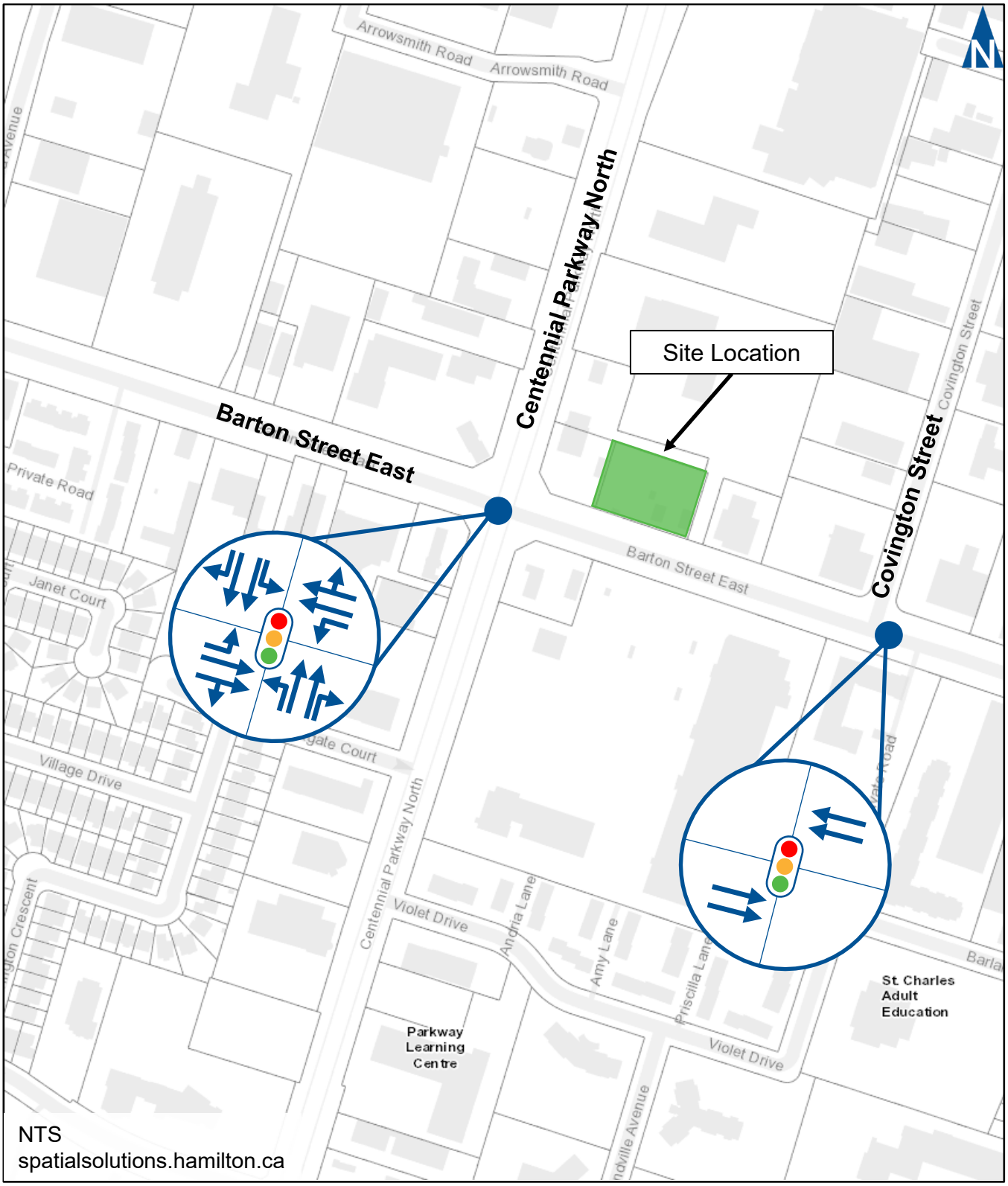
Figure 2.2 illustrates the existing pedestrian network.

2.3 Cycling Network

Currently no cycling facilities are provided within the study area. The City of Hamilton Cycling Masterplan Review and Update identifies planned infrastructure/improvements within the study area. Cycling routes (i.e., bike lanes) are planned along Barton Street East within the study area; however, the timing and implementation of these improvements is currently unknown.

Figure 2.3 illustrates the cycling network.

[3] Urban Hamilton Official Plan Schedule C, City of Hamilton, August 16, 2013.
[4] IBID



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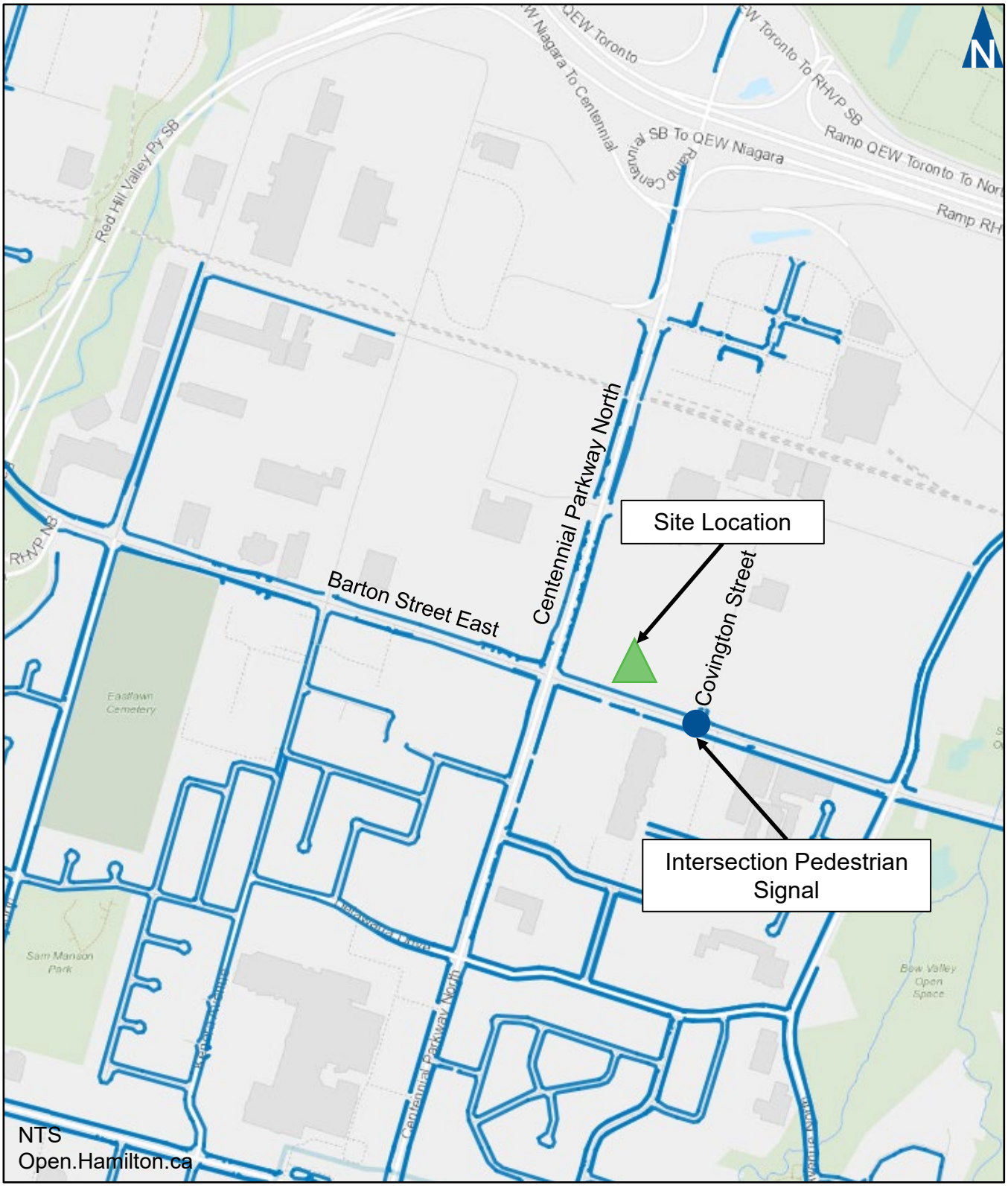
Existing Lane Configuration

2481 Barton Street East
220085

Figure 2.1



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Existing Pedestrian Network

2481 Barton Street East
220085

Figure 2.2

NTS
Hamilton Cycling Update 2018

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Cycling Network

2481 Barton Street East
220085

Figure 2.3

2.4 Transit Network

Hamilton Street Railway (HSR) operates the public transit system in the City of Hamilton.

Figure 2.4 illustrates the existing transit network.

Figure 2.5 illustrates the existing transit stops in the area. There are 14 transit stops within 500 metres (i.e., less than a five (5) minute walking distance) of the subject site.

Table 2.1 summarises the transit routes serving the study area.

Route	Description[5]
Route 02 – Barton	The BARTON route is an east – west route that stretches from downtown Hamilton in the west to Stoney Creek in the east. Stoney Creek Trans-Cab Service operates Weekdays, Saturdays, and Sundays as an extension of Route 2 when in service. Weekday headways range from 10 – 20 minutes depending on time of day. Weekend headways are in the order of 10 – 20 minutes.
Route 44 – Rymal	The RYMAL route travels east – west from Stoney Creek Walmart to Ancaster Business Park via Eastgate Square. Glanbrook Trans-Cab Service operates Weekdays, Saturdays, and Sundays as an extension of Route 44 when in service. Weekday headways range from 20 – 30 minutes depending on time of day. Weekend headways are in the order of 30 – 60 minutes.
Route 56 – Centennial	The CENTENNIAL route travels north – south from Eastgate Terminal Platform #3 to Lakeland Community Centre. Weekday service is not provided while weekend headways are in the order of 60 minutes.

The nearest existing transit stops to the subject site are as follows:

[5] www.hamilton.ca/hsr-bus-schedules-fares

- A northbound transit stop is located on the southeast corner of Centennial Parkway North and Barton Street East. The walking distance to the stop is approximately 105 metres (1 minute). Routes 44 and 56 are both accessible at this stop.
- A southbound transit stop is located on the northwest corner of Centennial Parkway North and Barton Street East. The walking distance to the stop is approximately 160 metres (2 minutes). Pedestrian crossings of Centennial Parkway North are facilitated at the traffic signal at Barton Street East. Routes 44 and 56 are both accessible at this stop.
- An eastbound stop is located on the northeast corner of Centennial Parkway North and Barton Street East. The walking distance to the stop is approximately 70 metres (1 minute). Route 2 can be accessed at this stop.
- A westbound stop is located on the southwest corner of Centennial Parkway North and Barton Street East. The walking distance to the stop is approximately 185 metres (2 minutes). Pedestrian crossings of Barton Street East are facilitated at the traffic signal at Centennial Parkway North. Route 2 can be accessed at this stop.

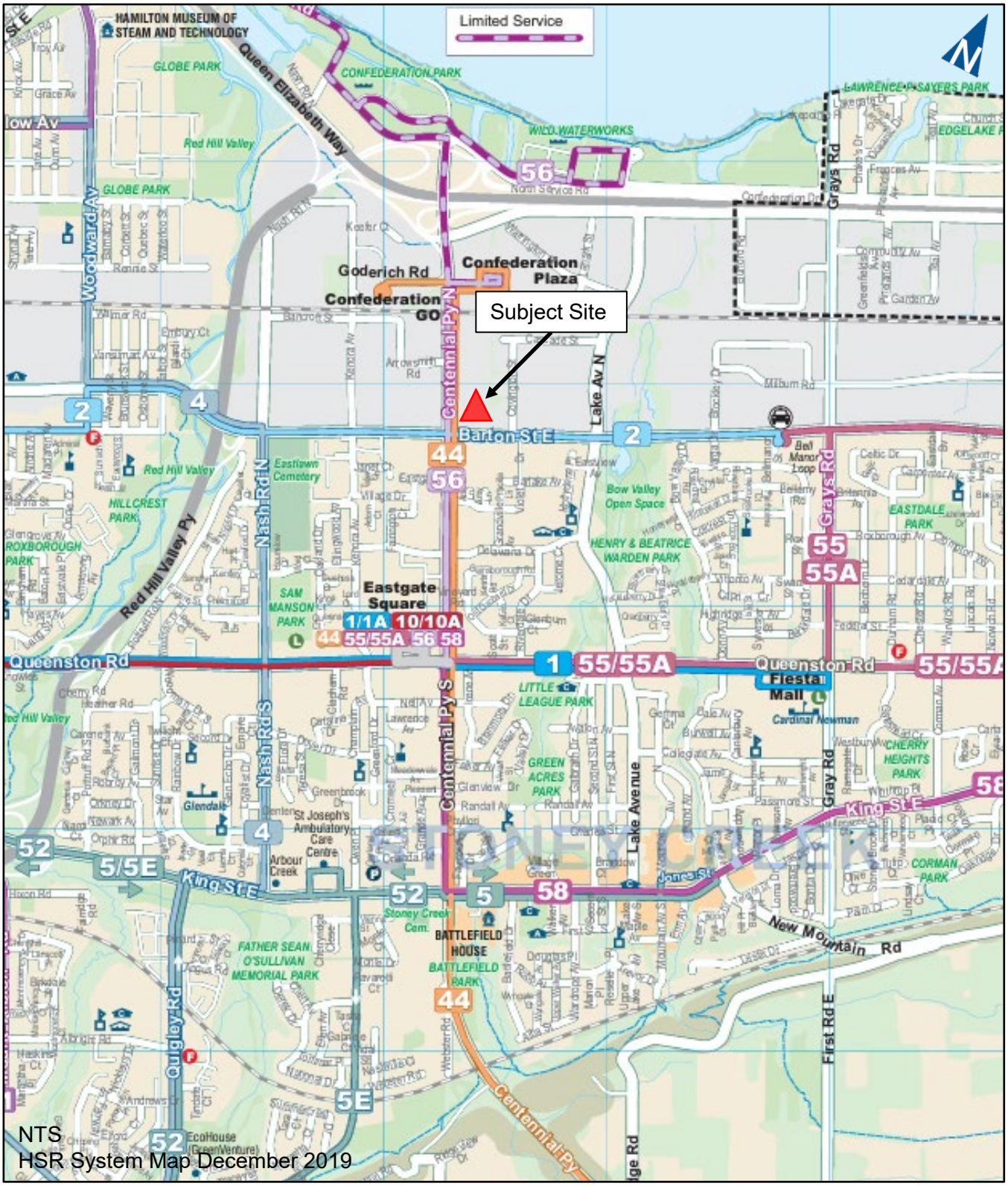
Routes 44 and 56 provide access to the Confederation GO station while Route 2 provides access to the Hamilton GO Centre. These local transit connections facilitate inter-regional travel.

The Confederation GO Station is located approximately 1.1 km from the subject site. The travel time is approximately 4-minutes via bike, 9-minutes via transit or 13-minutes via walking. Metrolinx's GO Transit network provides access to the greater Toronto Hamilton Area via GO Buses and Trains.

The City of Hamilton and Metrolinx plan to implement a Rapid Transit line along King Street, Queenston Road, Main Street between the Delta and the Queenston Circle. **Figure 2.6** illustrates the proposed Rapid Transit network for the City of Hamilton.

Additional future transit service improvements include the Blast Network. On this transit network the B-Line is planned to run from McMaster University to East Gate Square. Headways are planned at 6-minutes during peak hours. The closest planned stop to the subject site is located at East Gate Square. At East Gate Square, additional HSR routes are noted to be accessible. The travel distance to the stop is approximately 1.15 kilometres. The walk time is estimated at approximately 32-minutes, and 4-minutes via bike. The B-line is estimated to be completed by Year 2024.

As part of planned long-term improvements, the S-Line is identified and proposed to operate along Centennial Parkway North which is anticipated to provide an additional means of access to all parts of the City.



NTS
HSR System Map December 2019

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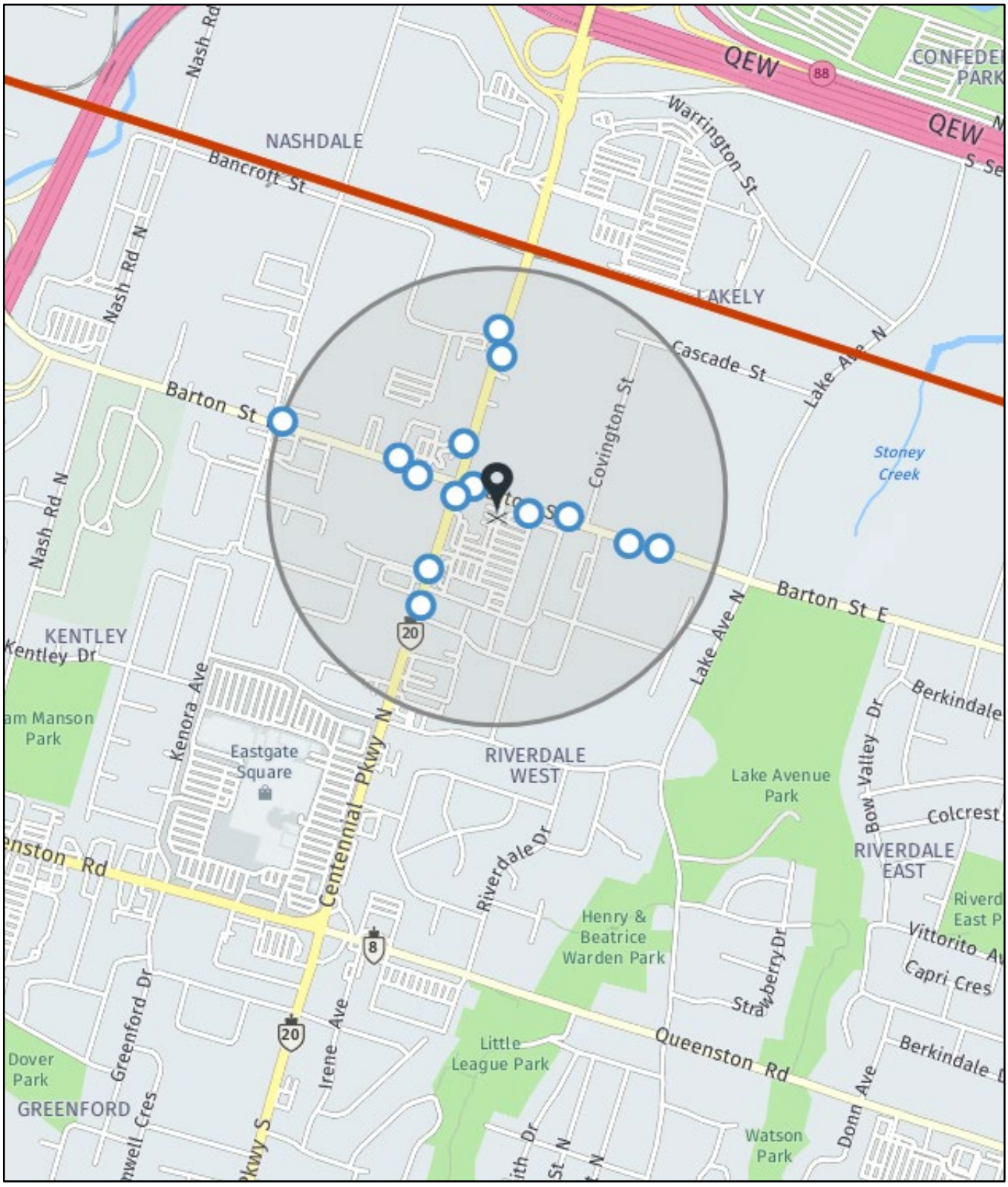
Existing Transit Network

2481 Barton Street East
220085

Figure 2.4



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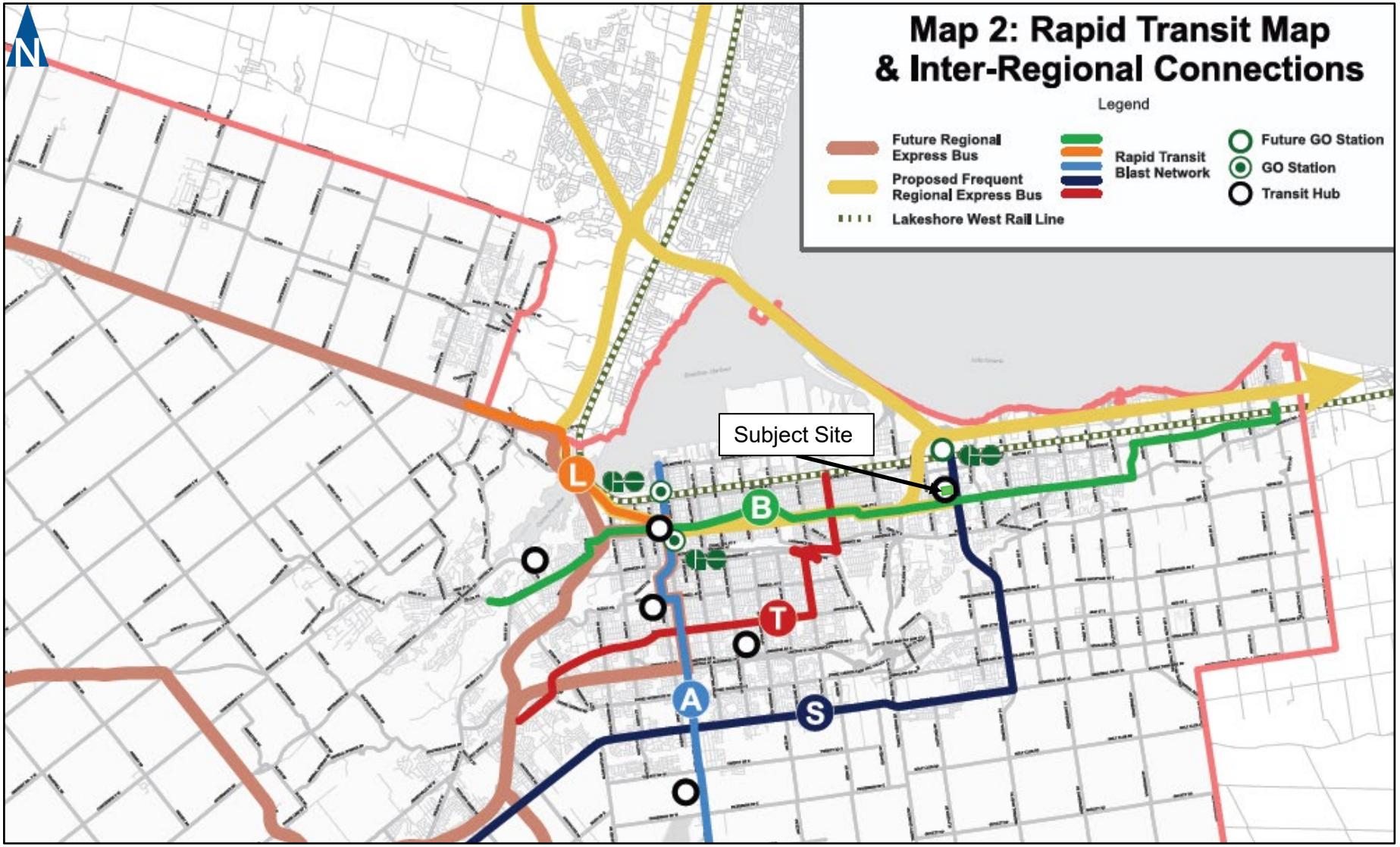
Existing Transit Stop

2481 Barton Street East
220085

Figure 2.5



Proposed Rapid Transit Network

2481 Barton Street
220085

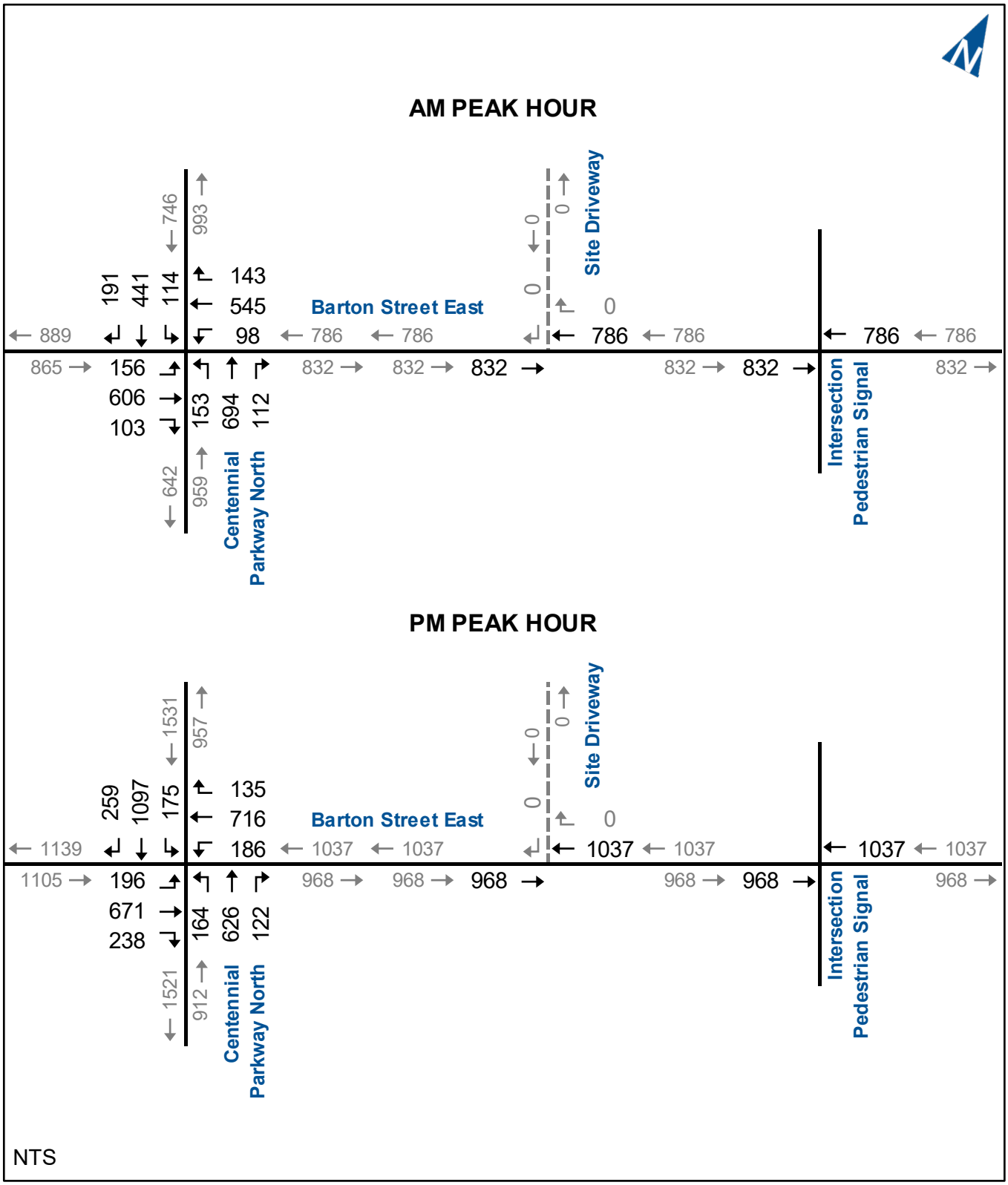
Figure 2.6

2.5 Traffic Volumes

Turning Movement Count (TMC) data was collected by the City of Hamilton at the Barton Street East and Centennial Parkway North intersection in November 2019. **Appendix B** contains the count data for reference.

To derive base year (Year 2022) traffic volumes, the 2019 TMC data was increased using a generalized growth rate of 2% per annum (compounded). The growth rate was identified by Transportation Planning Staff during the pre-study consultation process.

Figure 2.7 illustrates the base year weekday AM and PM peak hour traffic volumes.



Base Year Traffic Volumes

2481 Barton Street East
220085

Figure 2.7

2.6 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of traffic flow at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows. The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds at signalized intersections (50 seconds at unsignalized), the movement is considered to have a LOS F and remedial measures are usually implemented if they are feasible.

The operations of the study area intersections were evaluated under existing traffic volumes using Synchro 11 and Highway Capacity Manual 2000 procedures. The intersection analysis considered the following measures of performance:

- The LOS for each turning movement. LOS is based on the average control delay per vehicle;
- The volume to capacity ratio (V/C) for each intersection; and
- 95th percentile queue length (metres) using SimTraffic. Queues reported represent an average of ten (10) simulation runs.

Under the City's TIS Guidelines[6], the following criteria indicate critical conditions and signify that mitigation measures may need to be considered:

- Signalized intersections:
  - Overall intersection operations, through movements, or shared through/turning movements increased to 0.85 or above.
  - V/C ratios for exclusive left-turn movements increased to 0.90 or above; or
  - The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.
- Unsignalized intersections:

[6] Traffic Impact Guidelines, City of Hamilton, July 2009

- LOS, based on average delay per vehicle, on individual movements is expected to operate at a LOS “E” or worse; or
- The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

Table 2.1 summarizes the base year operational results

Barton Street East at Centennial Parkway North

- The overall intersection operates with a v/c ratio of 0.93 during the PM peak hour.
- The eastbound left-turn movement operates with delays in the LOS E range with a v/c ratio greater than 0.90 in the PM peak hour. The queue length is estimated to exceed the available storage by approximately 20 metres and 15 metres during the AM and PM peak hours, respectively.
- The eastbound shared through/right movement operates with delays in the LOS D - E range with a v/c ratio greater than 0.85 in the AM and PM peak hours.
- The westbound left-turn movement operates with delays in the LOS E range with a v/c ratio of 0.90 in the PM peak hour. The queue length is estimated to exceed the available storage by approximately 10 metres and 15 metres during the AM and PM peak hours, respectively.
- The westbound shared through/right movement operates with delays in the LOS D range with a v/c ratio greater than 0.85 in the AM and PM peak hours.
- The northbound left-turn lane queue length is estimated to exceed the available storage by approximately 5 metres during the PM peak hour.
- The northbound right-turn lane queue length is estimated to exceed the available storage by approximately 10 metres during the AM and PM peak hours.
- The southbound left-turn lane queue length is estimated to exceed the available storage by approximately 5 metres and 20 metres during the AM and PM peak hours, respectively.
- The southbound through movement operates with delays in the LOS D range with a v/c ratio greater than 0.90 in the PM peak hour.
- The southbound right-turn lane queue length is estimated to exceed the available storage by approximately 20 metres during the PM peak hour.

Appendix C contains the detailed Synchro and SimTraffic reports.

TABLE 2.1: BASE YEAR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	D	D	>	**D**	C	D	>	**D**	B	C	B	**C**	B	C	B	**B**	**C**
			Delay	48	47	>	**48**	31	50	>	**48**	15	23	19	**21**	16	21	19	**20**	**34**
			V/C	0.81	0.86	>		0.54	0.87	>		0.33	0.49	0.11		0.33	0.31	0.13		**0.63**
			95th	59	157	>		71	100	>		51	80	38		38	63	33		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-19	-	>		-11	-	>		4	-	-8		-3	-	3		
	Barton Street East & Covington Street IPS	TCS	LOS		B		**B**		B		**B**									**B**
			Delay		15		**15**		14		**14**									**14**
			V/C		0.55				0.52											**0.31**
			95th		78				62											
			Storage																	
			Avail.																	
PM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	E	E	>	**E**	E	D	>	**D**	D	C	C	**C**	C	D	C	**D**	**D**
			Delay	73	57	>	**60**	63	48	>	**50**	49	31	25	**33**	20	47	28	**41**	**46**
			V/C	0.95	0.96	>		0.90	0.90	>		0.84	0.55	0.14		0.53	0.92	0.36		**0.93**
			95th	54	192	>		76	105	>		60	83	40		51	178	55		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-14	-	>		-16	-	>		-5	-	-10		-16	-	-20		
	Barton Street East & Covington Street IPS	TCS	LOS		B		**B**		B		**B**									**B**
			Delay		16		**16**		17		**17**									**16**
			V/C		0.64				0.68											**0.39**
			95th		75				143											
			Storage																	
			Avail.																	

MOE - Measure of Effectiveness
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
LOS - Level of Service
V/C - Volume to Capacity Ratio
95th - 95th Percentile Queue Length
Ex. - Existing Storage (m)
Avail. - Available Storage (m)
> - Shared Right-Turn Lane
< - Shared Left-Turn Lane

3 Development Concept

3.1 Description

The subject site is located at 2481 Barton Street East in the City of Hamilton. The development concept includes a 17-story building containing 207 residential units and 475 m^2 (~5,000 sq.ft.) of ground floor retail space. Build-out is anticipated to occur by Year 2026 with timing subject to market conditions.

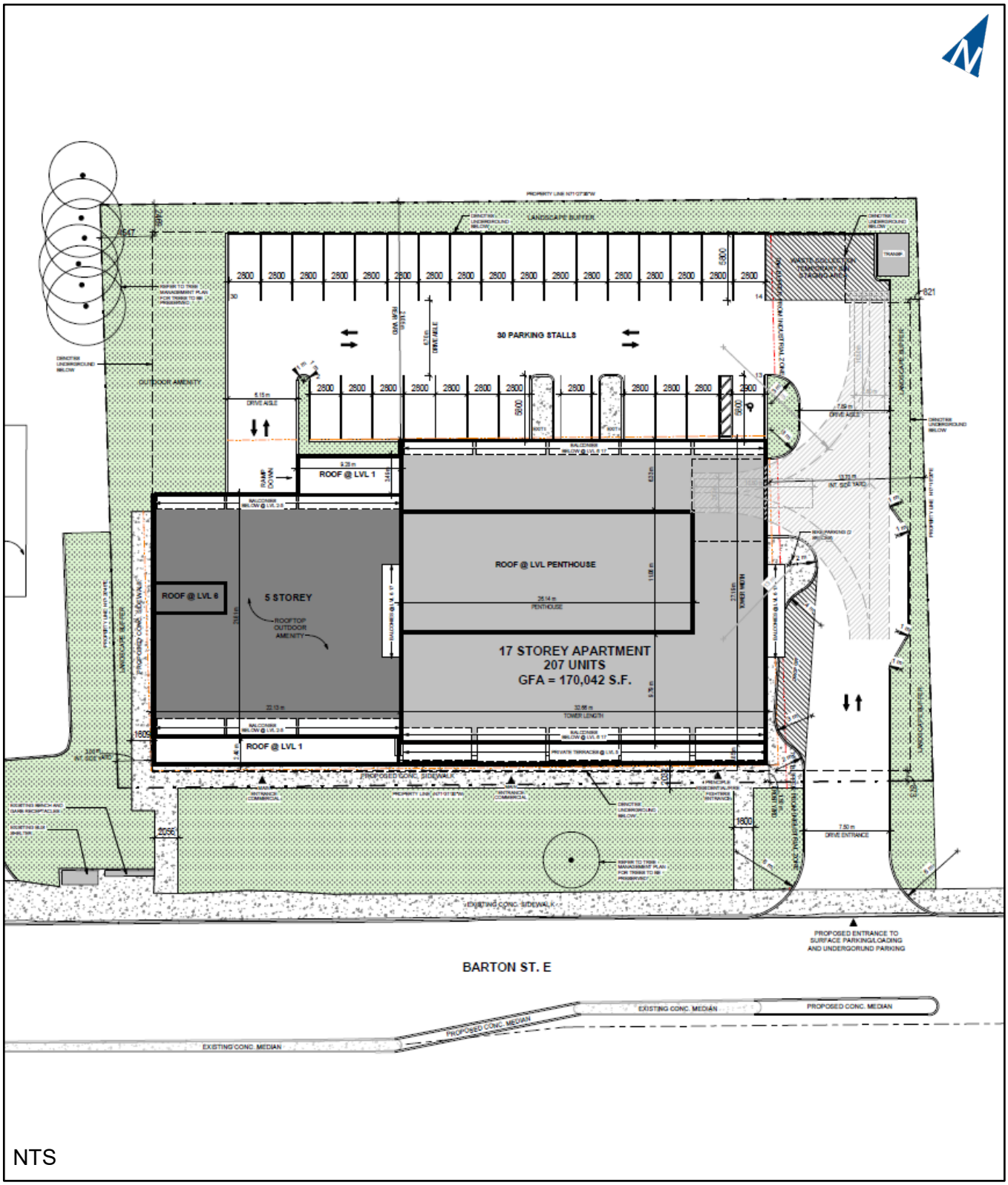
Vehicle access is proposed by via a private driveway to Barton Street East located approximately 115 metres east of Centennial Parkway North. The driveway is located towards the site's east property limit. The driveway has been placed towards the east property limit at the request of HSR to accommodate the transit stop needs associated with articulated buses which operate along Barton Street East.

The applicant is proposing to extend the existing median on Barton Street East to restrict inbound and outbound left-turn movements to and from the site. The existing break in the median will also be closed.

The driveway will be restricted to right-in/right-out through use of a raised centre median on Barton Street East. It is recommended that a one-way directional sign (Rb-21) be installed on the centre median island across from the site driveway. Additionally, the provision of a no left-turn sign (Rb-12) should be placed on the site driveway approach to Barton Street per OTM[7] guidance. Supplementary no left-turn signage may be required on the centre median at the City's discretion.

Figure 3.1 illustrates the site concept.

[7] Ontario Traffic Manual Book 5, December 2021



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Site Concept Plan

2481 Barton Street East
220085

Figure 3.1

3.2 Transportation Demand Management (TDM) Measures

Based on the current development concept, the following Transportation Demand Management (TDM) measures are proposed:

- **Walking** – Building entrances face Barton Street East, which provides a direct pedestrian connection to the existing municipal sidewalk. The landscaping plan will include pedestrian amenities (benches, landscaping, lighting) to establish a pedestrian realm.

  The sidewalks along Barton Street East will continue through the site driveway.

- **Cycling** – Long-term bicycle parking spaces are proposed in convenient and secure locations at a rate of 0.49 spaces per unit (102 spaces).

  Short-term bicycle parking spaces are proposed and located near the building's main entrance at a rate of 0.02 spaces per unit (5 spaces).

- **Parking** – Parking for occupants will be unbundled from the purchase/rental of residential units.

- **Wayfinding and Travel Planning** – Wayfinding and Travel Planning resources (transit and active transportation maps) are anticipated to be provided to residents upon occupancy. Wayfinding signage directing occupants and visitors to active transportation facilities (pedestrian pathways, bike network, trails) will be integrated into the site's landscaping plans.

3.3 Site Generated Traffic

The Institute of Transportation Engineers (ITE) Trip Generation Manual[8] was utilized to estimate the peak hour vehicular traffic generated by the proposed development. The following land use codes were used to estimate the site's trip generation:

- Multifamily Housing (High-Rise) (LUC 222); and
- Shopping Center (LUC 820).

Table 3.1 summarizes the estimated vehicular trip generation. The subject site is estimated to generate approximately 69 AM peak hour trips and 89 PM peak hour trips, accounting for pass-by trips related to the ground floor retail component. Per direction provided by

[8] Trip Generation Manual 11th Edition Institute of Transportation Engineers, Washington DC, September 2021

City staff pass-by for LUC 820 at 34% was accounted for under the PM peak hour.

A conservative approach was taken where no trip reductions for mode choice or internal capture were applied to the site's trip generation estimate (i.e., errs on the high side).

TABLE 3.1: ESTIMATED TRIP GENERATION

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Multifamily Housing (High-Rise) (LUC 222) – 207 Units	22	42	**64**	43	34	**77**
Shopping Center (LUC 820) – 475 m^2 GFA	3	2	**5**	9	9	**18**
Total Generation	**25**	**44**	**69**	**52**	**43**	**95**
Shopping Center (LUC 820) - Pass-By – 475 m^2 GFA	0	0	**0**	-3	-3	**-6**
Net Generation	**25**	**44**	**69**	**49**	**40**	**89**

Table 3.2 summarizes the estimated trip distribution. The distribution was developed using Transportation Tomorrow Survey[9] (TTS) data for the zone containing the subject site. **Appendix D** contains the TTS survey data.

TABLE 3.2: ESTIMATED TRIP DISTRIBUTION

Origin/Destination	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
North via Centennial Parkway North	70%	60%	60%	40%
South via Centennial Parkway North	20%	10%	10%	20%
East via Barton Street East	5%	10%	5%	15%
West via Barton Street East	5%	20%	25%	25%
Total	**100%**	**100%**	**100%**	**100%**

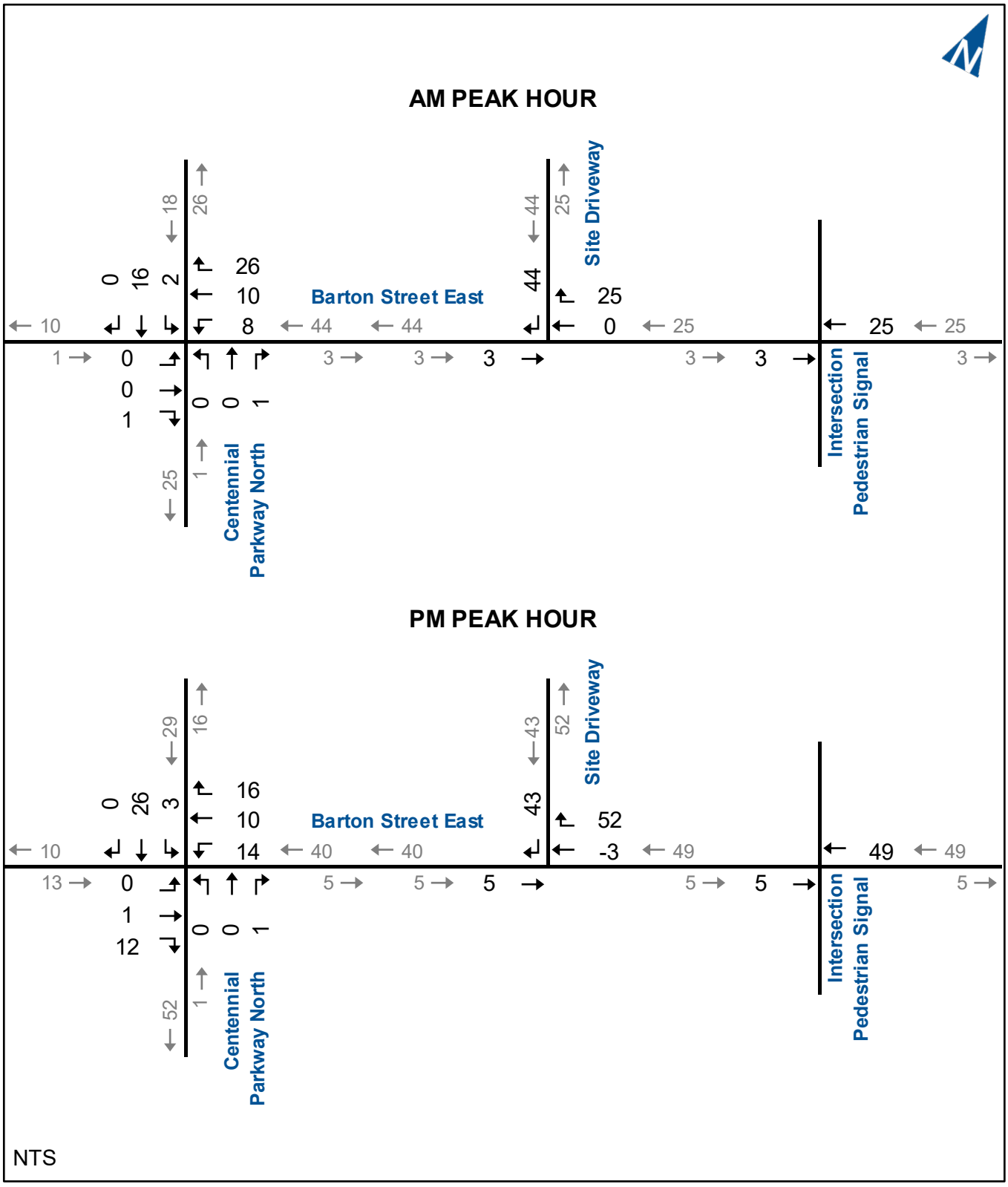
[9] *Transportation Tomorrow Survey 2016*, University of Toronto Data Management Group. Zones 5154,5153,5126,5123,5118,5113,5136,5237

The proposed site driveway limits movements to right-in/ right-out access only; therefore, all site generated traffic inbound to the site approaching from the east will have direct access.

Site generated traffic inbound to the site approaching from the west on Barton Street East could perform a U-turn manoeuvre at the intersection with Covington Street to access the subject site.

However, given the high levels of delay and queueing noted along Barton Street East, it is assumed that most drivers would elect to reroute their travel patterns rather than preforming unsafe U-turn manoeuvres. Drivers are anticipated to reroute their travel patterns using Centennial Parkway North, Delawana Drive, and Lake Avenue North to access the subject site. Delawana Drive and Lake Avenue North are both classified as collector roadways. The impact of site generated traffic on local area streets is expected to be minimal.

Figure 3.2 illustrates the site generated traffic with the assumption that U-turn manoeuvres will be performed at Covington Street and traffic will use Centennial Parkway North, Delawana Drive, and Lake Avenue North to access the subject site.



Site Generated Traffic

2481 Barton Street East
220085

Figure 3.2

4 Future Traffic Conditions

The assessment of future conditions in this section includes the following components:

- Future general background traffic growth estimates;
- Future site traffic generated by other area background developments;
- Operational analysis of background traffic conditions (pre-development);
- Future total traffic estimates (summation of background growth, other area development site traffic, and site generated traffic); and
- Operational analysis of total traffic conditions (post-development).

4.1 Traffic Volumes

A five-year study horizon (Year 2031) from the anticipated build-out is assessed. The future traffic volumes near the subject site are estimated to consist of:

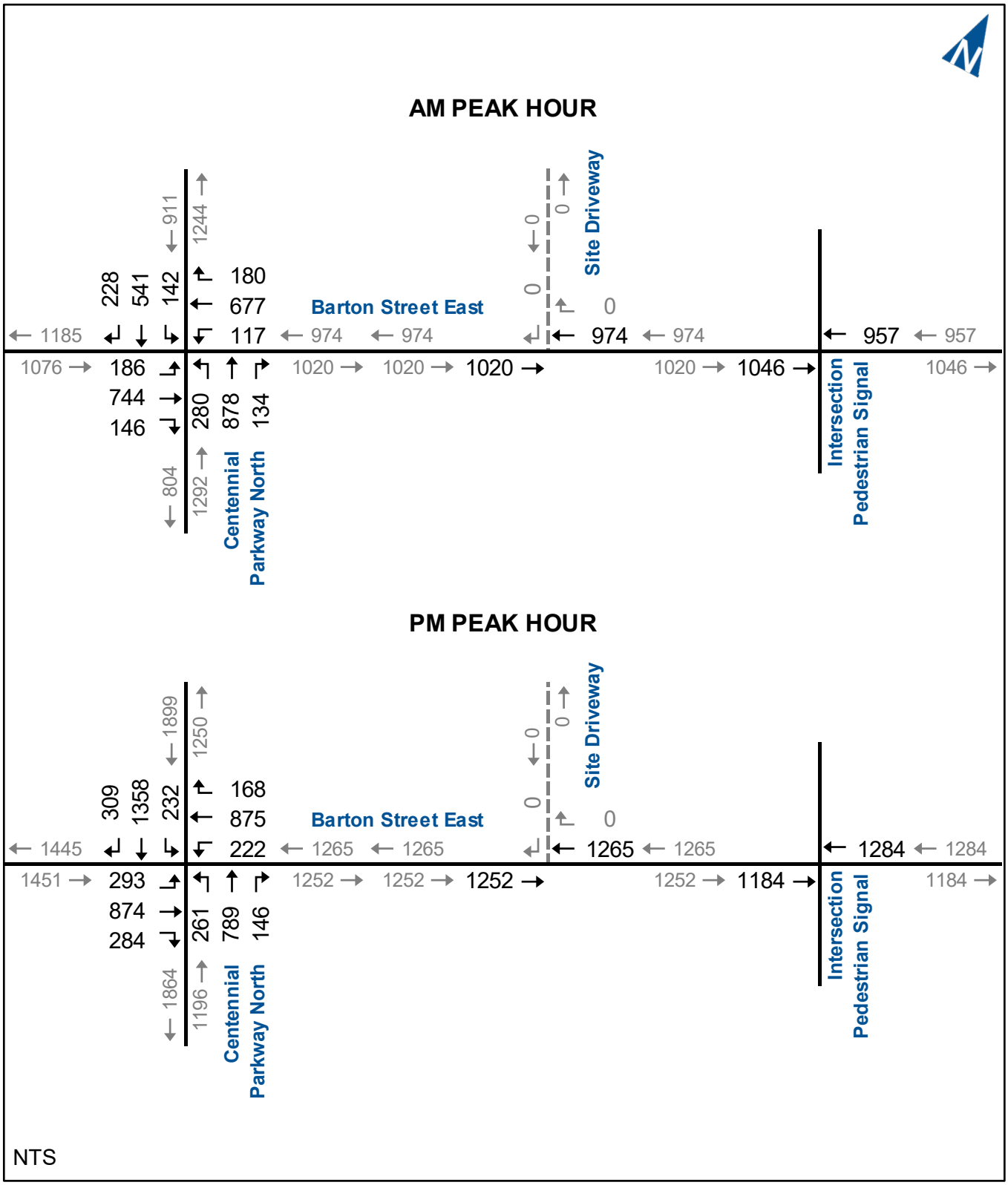
- Increased non-site traffic (generalized background traffic growth);
- Traffic generated by adjacent other area developments; and
- Traffic generated by the subject site.

The generalized background traffic growth forecast assumes an annual growth rate of 2% per annum (compounded).

The City of Hamilton identified the site of 200 Centennial Parkway North for inclusion in the background traffic forecasts. 200 Centennial Parkway North is a mixed-use development containing approximately six towers ranging from 9 to 20 stories with 1,150 residential units and 1,359 m^2 of retail space. Development is expected to occur in multiple phases. **Appendix E** contains the adjacent background development traffic forecasts.

Figure 4.1 illustrates the 2031 background traffic volumes.

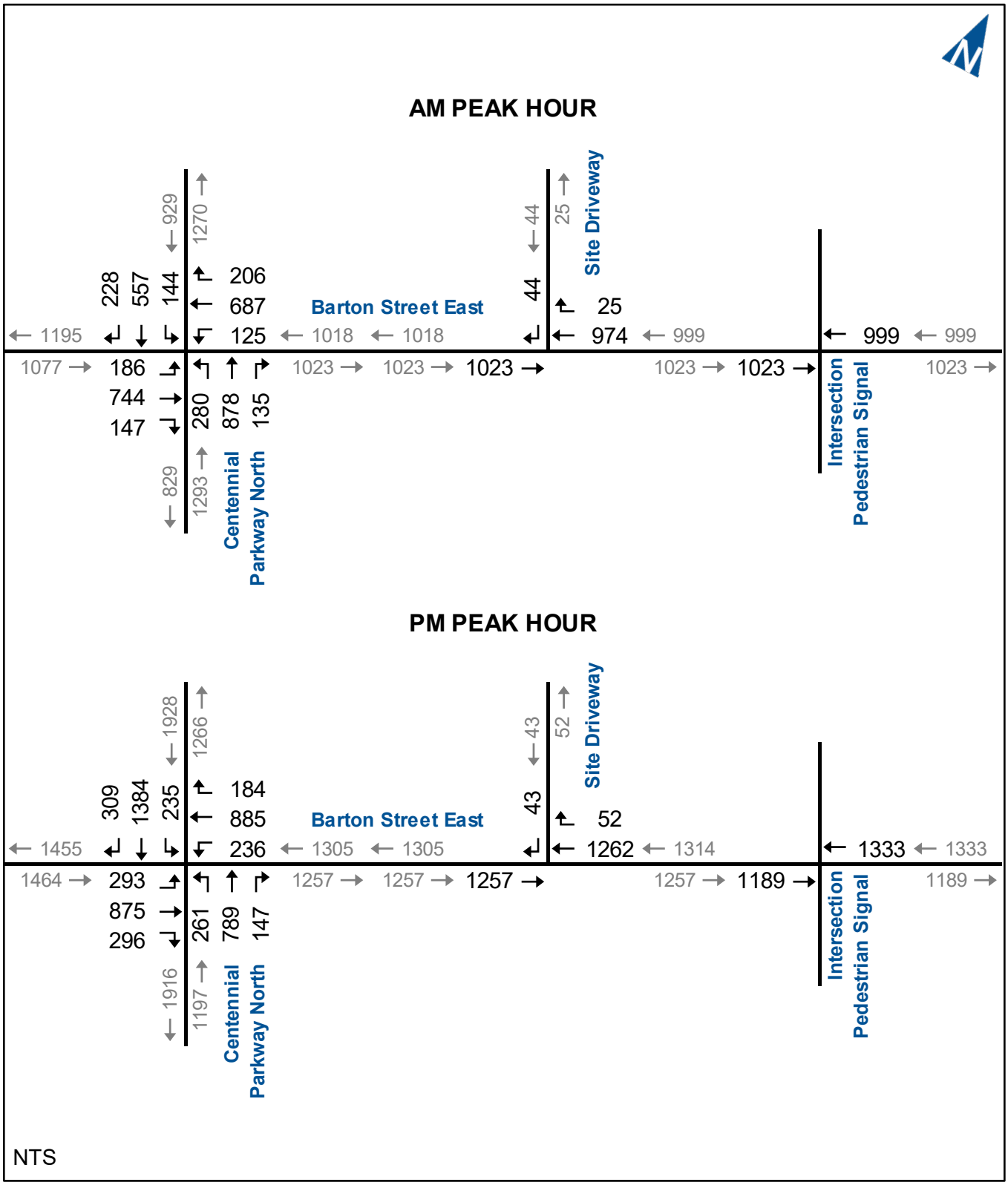
The future background traffic forecasts were combined with the site traffic assignments to determine the total traffic volumes. **Figure 4.2** illustrates the 2031 total traffic volumes.



Background Traffic Volumes

2481 Barton Street East
220085

Figure 4.1



paradigm TRANSPORTATION SOLUTIONS LIMITED

Total Traffic Volumes

2481 Barton Street East
220085

Figure 4.2

4.2 Traffic Operations

4.2.1 Background Traffic

The study area intersection operations analyses followed the same methodology used for existing conditions. No changes to the existing lane configurations, traffic control or signal timings are assumed.

Table 4.1 summarizes the background operational results. The critical movements identified under existing conditions are forecast to be further exacerbated under background conditions due to the forecast increases in non-site related traffic (i.e., background growth and site traffic contributions from the other area background development). The following additional critical movements have been identified:

Barton Street East at Centennial Parkway North

- The northbound left-turn lane is forecast to operate with delays in the LOS C - F range with a v/c ratio greater than 1.00 in the PM peak hour.
- The overall intersection v/c ratio is forecast to operate over-capacity at 1.35 during the PM peak hour.

Barton Street East and Covington Street Intersection Pedestrian Signal

- The westbound shared approach is forecast to operate with delays in the LOS C range with a v/c ratio of 0.85 in the PM peak hour.

Appendix F contains the detailed Synchro and SimTraffic reports.

TABLE 4.1: BACKGROUND FIVE-YEAR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	F	D	>	**D**	D	D	>	**D**	C	C	C	**C**	C	C	C	**C**	**D**
			Delay	84	49	>	**55**	35	50	>	**49**	26	32	23	**30**	24	28	25	**27**	**40**
			V/C	0.98	0.91	>		0.68	0.91	>		0.74	0.71	0.16		0.60	0.46	0.19		**0.89**
			95th	55	204	>		88	107	>		76	149	44		49	81	43		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-15	-	>		-28	-	>		-21	-	-14		-14	-	-8		
	Barton Street East & Covington Street IPS	TCS	LOS		B		**B**		B		**B**									**B**
			Delay		17		**17**		16		**16**									**16**
			V/C		0.69				0.63											**0.40**
			95th		88				122											
			Storage																	
			Avail.																	
PM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	F	F	>	**F**	F	E	>	**F**	F	D	C	**E**	D	F	C	**F**	**F**
			Delay	250	126	>	**151**	107	77	>	**83**	171	40	29	**67**	42	150	33	**118**	**108**
			V/C	1.44	1.17	>		1.06	1.04	>		1.24	0.77	0.20		0.84	1.24	0.49		**1.35**
			95th	50	204	>		80	102	>		67	236	49		52	184	56		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-10	-	>		-20	-	>		-12	-	-19		-17	-	-21		
	Barton Street East & Covington Street IPS	TCS	LOS		B		**B**		C		**C**									**C**
			Delay		19		**19**		22		**22**									**21**
			V/C		0.78				0.85											**0.49**
			95th		70				129											
			Storage																	
			Avail.																	

MOE - Measure of Effectiveness
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
LOS - Level of Service
V/C - Volume to Capacity Ratio
95th - 95th Percentile Queue Length
Ex. - Existing Storage (m)
Avail. - Available Storage (m)
> - Shared Right-Turn Lane
< - Shared Left-Turn Lane

4.2.1 Total Traffic

The study area intersection operations analyses followed the same methodology used for background traffic conditions. No changes to the existing lane configurations, traffic control or signal timings are assumed.

Table 4.2 summarizes the operational results. The critical movements forecast under background traffic conditions are anticipated to be further exacerbated for movements where site generated traffic is added. No additional critical movements are noted under total traffic conditions.

It is noted at the Barton Street East/Centennial Parkway North intersection the overall intersection v/c ratio is noted to increase by 0.01, from 1.35 to 1.36 with the addition of site generated traffic.

The site driveway is expected to operate at a good level of service with delays in the LOS A range and with v/c ratios of less than 0.55 (i.e., well within capacity). The queue length of the driveway approach is forecast to be less than 70 metres (i.e., approximately 10 vehicles) and will be contained within the site. This vehicular queue is not expected to impact on-site circulation.

The queue length for westbound vehicles on Barton Street East from the downstream signal at Centennial Parkway North is forecast to extend beyond the site's frontage.

Appendix G contains the detailed Synchro and SimTraffic reports.

TABLE 4.2: TOTAL FIVE-YEAR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	F	D	>	**D**	D	D	>	**D**	C	C	C	**C**	C	C	C	**C**	**D**
			Delay	84	46	>	**53**	37	52	>	**50**	29	33	23	**31**	25	29	26	**28**	**40**
			V/C	0.98	0.89	>		0.71	0.93	>		0.77	0.72	0.16		0.62	0.48	0.19		**0.90**
			95th	55	205	>		87	102	>		74	139	47		49	82	43		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-15	-	>		-27	-	>		-19	-	-17		-14	-	-8		
	Barton Street East & Covington Street IPS	TCS	LOS		B		**B**		B		**B**									**B**
			Delay		17		**17**		16		**16**									**17**
			V/C		0.67				0.66											**0.39**
			95th		86				92											
			Storage																	
			Avail.																	
	Site Driveway	TWSC	LOS		A		**A**		A	>	**A**						A	>	**A**	**A**
			Delay		0		**0**		0	>	**0**						10	>	**10**	**0**
			V/C		0.33				0.42	>							0.06	>		
			95th		0				221	>							67	>		
PM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	F	F	>	**F**	F	F	>	**F**	F	D	C	**E**	D	F	C	**F**	**F**
			Delay	250	131	>	**155**	128	86	>	**94**	171	40	29	**67**	43	160	33	**126**	**114**
			V/C	1.44	1.18	>		1.13	1.07	>		1.24	0.77	0.21		0.85	1.26	0.49		**1.36**
			95th	48	212	>		77	103	>		69	238	48		53	184	55		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-8	-	>		-17	-	>		-14	-	-18		-18	-	-20		
	Barton Street East & Covington Street IPS	TCS	LOS		B		**B**		C		**C**									**C**
			Delay		19		**19**		24		**24**									**22**
			V/C		0.78				0.88											**0.50**
			95th		68				128											
			Storage																	
			Avail.																	
	Site Driveway	TWSC	LOS		A		**A**		A	>	**A**						B	>	**B**	**A**
			Delay		0		**0**		0	>	**0**						11	>	**11**	**0**
			V/C		0.40				0.54	>							0.07	>		
			95th		0				208	>							59	>		

MOE - Measure of Effectiveness
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
LOS - Level of Service
V/C - Volume to Capacity Ratio
95th - 95th Percentile Queue Length
Ex. - Existing Storage (m)
Avail. - Available Storage (m)
> - Shared Right-Turn Lane
< - Shared Left-Turn Lane

5 Remedial Measures

5.1 Storage Lane Length

Based on the operational analyses conducted, the reported 95th percentile queue lengths for the existing turn lanes at the Barton Street East and Centennial Parkway North intersection are forecast to exceed existing storage provisions.

Table 5.1 summarizes the storage lengths for the auxiliary turn lanes at the Barton Street East and Centennial Parkway North intersection and the following is noted:

- Eastbound left-turn lane – The forecast 95th percentile queue length can be accommodated by the existing centre two-way left-turn lane on Barton Street East. No changes to the existing lane geometry is recommended.
- Westbound left-turn lane – The forecast 95th percentile queue length can be accommodated by the deceleration lane length. No changes to the existing lane geometry is recommended, apart from the extension of the existing centre median.
- Northbound left-turn lane – The forecast 95th percentile queue length can be accommodated by the existing centre two-way left-turn lane on Centennial Parkway North. No changes to the existing lane geometry is recommended.
- Northbound right-turn lane – The forecast 95th percentile queue length can be accommodated by the deceleration lane length. No changes to the existing lane geometry is recommended.
- Southbound left-turn lane – The forecast 95th percentile queue length can be accommodated by the existing centre two-way left-turn lane on Centennial Parkway North. No changes to the existing lane geometry is recommended.
- Southbound right-turn lane – The forecasted queue length can be accommodated by the deceleration lane length. No changes to the existing lane geometry is recommended.

The need for additional storage is not related to the subject site. The queue lengths under existing conditions are noted to exceed the available storage lane length. The additional storage needed for the movements can be accommodated by the existing centre two-way left-turn lanes on Barton Street East and Centennial Parkway North or by the existing deceleration lane lengths and tapers. No changes to the existing lane geometry is recommended.

Furthermore, the 95th percentile queues are estimates of the longest queue that could occur during the peak hour; however, this level of queuing only has a five (5) percent probability of occurring during the analysis period. It is not typical of what a motorist would experience on average.

TABLE 5.1: STORAGE LANE LENGTHS

Movement	Existing Storage	Forecast Required Storage (metres)			Additional Storage (metres)
		Base	Background	Total	
EBL	40	59	55	55	15
WBL	60	76	88	87	27
NBL	55	60	76	74	19
NBR	30	40	49	48	18
SBL	35	51	52	53	18
SBR	35	55	56	55	20

5.2 Signal Optimization

A sensitivity analysis was completed for the 2031 total traffic conditions to evaluate the effectiveness of optimizing the signal timing. It is acknowledged that changes to signal timing has the potential to impact intersections outside the study area (i.e., corridor progression, vehicle arrival flows, etc.).

Table 5.2 summarizes the changes in the signal timing plans assumed for the five-year horizon analysis. Actual future signal timings should be based on real-world traffic volumes. The City of Hamilton should continue to evaluate and monitor signal timing along the Barton Street East and Centennial Parkway North corridors.

Table 5.3 summarizes the level of service conditions for the total traffic conditions. Optimizing the signal timing for the five-year horizon helps in reducing delays and v/c ratios for several turning movements. The Barton Street East and Centennial Parkway North intersection is forecast to operate over-capacity during the PM peak hour.

Appendix H contains the detailed Synchro and SimTraffic reports.

5.3 Geometric Improvements

Geometric improvements to provide additional intersection capacity are not likely to be implemented. The City of Hamilton Transportation Master Plan[10] (TMP) does not identify any planned road network improvements within the study area.

The TMP modelling indicates there will be capacity deficiencies and pinch points along strategic road links (i.e., Barton Street East and Centennial Parkway North). Additionally, as Centennial Parkway North is identified as part of the City's Rapid Transit network, any geometric improvements implemented at the intersection will likely be geared towards supporting the development of the Rapid Transit network rather than intersection capacity improvements for vehicular traffic.

[10] City of Hamilton Transportation Master Plan Review and Update, City in Motion

TABLE 5.2: TOTAL FIVE-YEAR SIGNAL TIMINGS – SENSITIVITY

Barton Street East & Centennial Parkway North	Existing AM Maximum Green	Optimized AM Maximum Green	Difference	Existing PM Maximum Green	Optimized PM Maximum Green	Difference
Phase 1 - SBL	12	10	2	16	17.8	-1.8
Phase 2 - NBTL	43	40	3	40	46.2	-6.2
Phase 3 - EBL	12	13	-1	13	15	-2
Phase 4 - WBTL	43	37	6	41	41	0
Phase 5 - NBL	12	14	-2	13	13	0
Phase 6 - SBTL	43	36	7	43	51	-8
Phase 7 - WBL	12	10	2	13	12	1
Phase 8 - EBTL	43	40	3	41	44	-3
Cycle Length	110	100		110	120	

TABLE 5.3: TOTAL FIVE-YEAR TRAFFIC OPERATIONS – SENSITIVITY

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	D	D	>	D	D	D	>	D	C	C	C	C	C	C	C	C	D
			Delay	48	39	>	41	45	42	>	42	29	33	22	31	28	30	26	29	36
			V/C	0.86	0.87	>		0.69	0.95	>		0.78	0.76	0.15		0.67	0.53	0.19		0.88
			95th	56	217	>		84	114	>		76	167	47		51	88	44		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-16	-	>		-24	-	>		-21	-	-17		-16	-	-9		
PM Peak Hour	Barton Street East & Centennial Parkway North	TCS	LOS	F	F	>	F	F	F	>	F	F	D	C	E	C	F	C	F	F
			Delay	227	138	>	156	233	118	>	138	223	37	28	76	34	106	31	85	113
			V/C	1.37	1.19	>		1.32	1.17	>		1.36	0.70	0.17		0.79	1.13	0.46		1.38
			95th	53	208	>		77	101	>		63	234	46		52	185	57		
			Storage	40	-	>		60	-	>		55	-	30		35	-	35		
			Avail.	-13	-	>		-17	-	>		-8	-	-16		-17	-	-22		

MOE - Measure of Effectiveness
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
LOS - Level of Service
V/C - Volume to Capacity Ratio
95th - 95th Percentile Queue Length
Ex. - Existing Storage (m)
Avail. - Available Storage (m)
> - Shared Right-Turn Lane
< - Shared Left-Turn Lane

6 Conclusions and Recommendations

6.1 Conclusions

The main findings and conclusions of this study are as follows:

- **Study Area:** The intersections that form the study area include the Barton Street East intersections with Centennial Parkway North and the Intersection Pedestrian Signal just east of Covington Street.
- **Existing Traffic Conditions:** The Barton Street East/Centennial Parkway North intersection operates poorly under existing conditions. It is noted under the PM peak hour critical movements are identified on all intersection approaches.
- **Site Description:** The development concept is a mixed-use building containing 207 residential units and 475 m^2 (~5,000 sq.ft.) of ground floor retail space. Build-out is anticipated to occur by Year 2026 with timing subject to market conditions.

  Vehicle access is proposed by a restricted right-in/right-out driveway to Barton Street East located approximately 115 metres east of Centennial Parkway North.
- **Development Generated Traffic:** The subject site is estimated to generate approximately 69 new AM peak hour trips and approximately 89 new PM peak hour trips. No modal split reductions have been applied.
- **Forecast Traffic:** A five-year study horizon (Year 2031) from the anticipated build-out is assessed. The future traffic volumes near the subject site are estimated to consist of generalized background traffic growth at a rate of 2% per annum (compounded), traffic generated by adjacent other area background developments, and traffic generated by the subject site.
- **Background Traffic Conditions:** The existing capacity issues at the Barton Street East/Centennial Parkway North intersection are forecast to be exacerbated with background growth and consideration of site traffic contributions from the other area background development. The overall intersection v/c ratio for the intersection is forecast to exceed 1.00.

  The westbound through lanes at the Intersection Pedestrian Signal east of Covington Street is forecast operate within capacity; however, is noted to be approaching capacity with a reported v/c ratio of 0.85.

- **Total Traffic Conditions:** The capacity issues forecast to occur under the background traffic horizon are forecast with, or without the development of the subject site. Further noting no additional critical movements are forecast at Barton Street East/Centennial Parkway North with the addition of site generated traffic.

  The site driveway is expected to operate at a good level of service with delays in the LOS A range and with v/c ratios of less than 0.55 (i.e., well within capacity). The queue length of the driveway approach is forecast to be less than 70 metres (i.e., approximately 10 vehicles) and will be contained within the site. This vehicular queue is not expected to impact on-site circulation.
- **Remedial Measures:** The City of Hamilton should continue to evaluate and maintain the existing signal timing plans.

6.2 Recommendations

Based on the findings of this study, it is recommended that:

- The applicant extend the existing median on Barton Street East to restrict inbound and outbound left-turns at the site driveway. The existing break in the median will also be closed;
- A one-way directional sign (Rb-21) be installed on the centre median island across from the site driveway. A no left-turn sign (Rb-12) be placed on the site driveway approach to Barton Street East per OTM guidance. Supplementary no left-turn signage may be required on the centre median; and
- The City of Hamilton continue to evaluate and monitor signal timing along the Barton Street East and Centennial Parkway North corridors. Future signal timings should be identified using real-world traffic volumes.

Appendix A

Pre-Study Consultation Material and Responses

Creighton Chartier

From: Borys, Gregory <Gregory.Borys@hamilton.ca>
Sent: February 16, 2022 2:56 PM
To: Creighton Chartier
Cc: Radaelli, Matthew; Transportation Planning
Subject: RE: (220085) 2481 Barton Street East, Hamilton (Ward 5) FC-20-111

Good afternoon Creighton,

Thank you for providing the Terms of Reference for the proposed development application at 2481 Barton Street East, Transportation Planning have reviewed the TOR and have provided comments below in red. If you have any additional questions or concerns please feel free to contact me.

Regards,

Gregory Borys, C.E.T.
Transportation Planning Technologist, Transportation Planning Development Approvals
Transportation Planning
Planning and Economic Development Department
City of Hamilton

From: Creighton Chartier <cchartier@ptsl.com>
Sent: Wednesday, February 9, 2022 2:04 PM
To: Transportation Planning <Transportation.Planning@hamilton.ca>
Subject: (220085) 2481 Barton Street East, Hamilton (Ward 5) FC-20-111

Hello,

The subject site is located at 2481 Barton Street East in the City of Hamilton. The property owner is proposing to develop a 17-storey mixed use building containing approximately 207 residential units and approximately 500 m^2 of ground floor retail. Preliminary ITE trip generation estimates indicate approximately 69 new trips in the AM peak hour and 89 new trips in the PM peak hour. The build-out date to be confirmed by client.

Vehicle access is proposed by a right-in/right-out driveway to Barton Street East located approximately 75 metres east of Upper Centennial Parkway. Left-turns will be restricted by extending the existing median. A total parking supply of 160 spaces is proposed. The supply appears to exceed the City of Hamilton zoning requirements as currently planned. The preliminary site plan is attached.

Proposed TIS Terms of Reference

Study Area Intersections

- Barton Street East at Upper Centennial Parkway (signalized); and
- The site driveway to Barton Street East.
- Please include the pedestrian signal at Barton Street East and Covington Street

Existing Data

- The 2019 TMC data for Barton Street East at Upper Centennial Parkway will be obtained from the City and adjusted to a base year condition (Year 2022) using a 2% growth rate.
- Existing signal timings to be obtained from the City and used in the analysis with no adjustments.

Horizon Years

- Existing (year 2022); and
- Five years from build-out (year TBD).

Analysis Periods

- Weekday AM peak hour
- Weekday PM peak hour

Analysis

- Synchro 11 with HCM 2000 procedures

Background Traffic

- Generalized growth rate 2% per annum.
- Please advise if any specific development applications should be considered in the background traffic forecast. Please indicate the City Planner on the file(s) so we can contact them to obtain the required information. [Please include the proposed development at 200 Centennial Parkway, additional please visit https://www.hamilton.ca/develop-property/planning-applications/development-applications-mapping to identify any background developments. The consultant is required to conduct trip generation and assignment for the background development accordingly.]

Future Road Improvements

- Extension of the centre median along Barton Street East [Please note that no extension of the median is planned at this time, the consultant is permitted to consider this within the TIS assumptions].
- Other improvements to be identified by City Staff.

Trip Generation

- ITE Trip Generation Data 11th Edition.
    - Multifamily Housing (High-Rise) (LUC 222)
    - Shopping Center (LUC 820)
- PM peak hour 34% pass-by trips for LUC 820
- No modal split reductions.

Site Traffic Distribution

- Transportation Tomorrow Survey 2016

Report

- We will document the study methodologies, findings, and conclusions in a report with appendices containing the detailed analysis results and any data collected.

Additional Information:

- The City may have useable traffic volume counts available for purchase. The traffic consultant is to contact trafficops@hamilton.ca. Given the circumstances, Transportation Planning will accept traffic counts older than 2 years provided they are grown to 2021 current year volume utilizing an annual 2% growth rate as per the City of Hamilton Traffic Impact Study guidelines.
- For information on existing traffic signal timings at City of Hamilton traffic signals contact trafficops@hamilton.ca with a cc to tplanning@hamilton.ca, with a subject line of ADDRESS-FILE NUMBER (Ward #) traffic signal timings.
- Please provide all TTS data utilized for trip distribution assumptions within the appendices of the report.
- If new turning movement counts are to be collected, Transportation Planning requires the count information and methodology regarding adjustments to ‘normalized’ 2021 volume will be

provided to tplanning@hamilton.ca for approval prior to commencement of the report. See Additional Information below.

- TIS to include a comprehensive TDM section to identify specific measures and programs to reduce single-occupant-vehicle trips to/from the proposed development. TDM measures recommended within the report shall be consistent with what is indicated on the future site plan.
-

Please let us know your comments on the study.

Regards,

Creighton Chartier
Transportation Consultant

Paradigm Transportation Solutions Limited
5A-150 Pinebush Road, Cambridge ON N1R 8J8
p: 905.381.2229 x504
e: cchartier@ptsl.com
w: www.ptsl.com

Appendix B

Existing Traffic Counts and Signal Timings

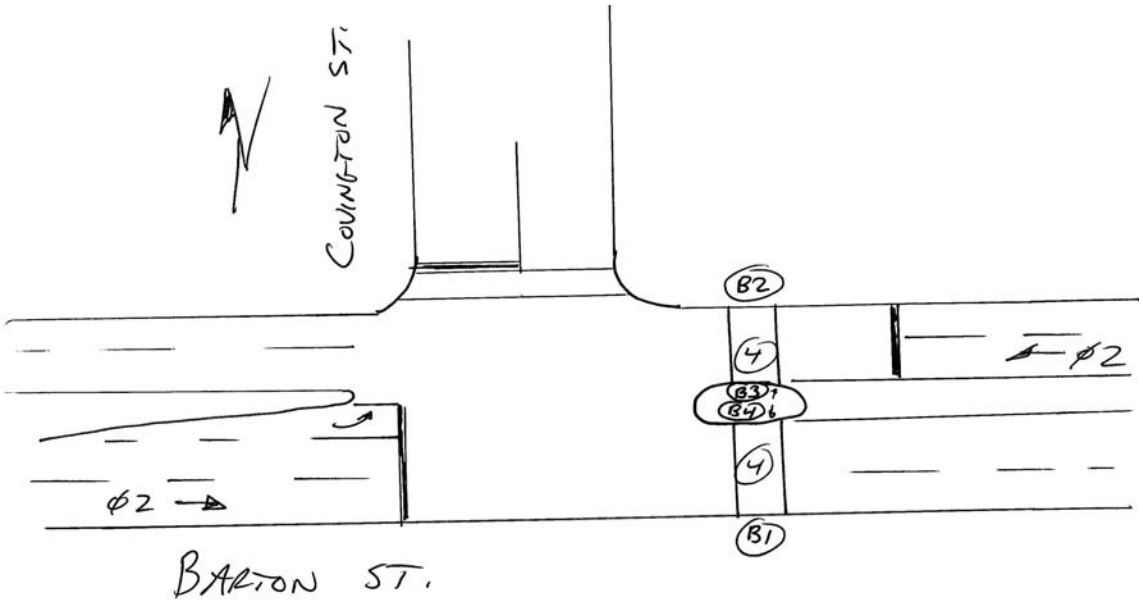
City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Barton & Covington**

Controller Type: **3000E** Page **1** of **9**

Programmed By: **RDG** Installed By:

Date: **Oct 8/14** Date:



ϕ1:
ϕ2: **Barton - EB/WB**
ϕ3:
ϕ4: **Covington - East Xwalk**
ϕ5:
ϕ6:
ϕ7:
ϕ8:

Flash Operation: **Red: Barton**
Red: Dark: Covington Xwalk

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														
	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	2	(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																
	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														
	CO PH 2				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		X														
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT		X														
	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																
	CNA 2																
	CNA 3																
	CNA 4																
	WRM																
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

CONTROLLER DATA

PHASE TIMES (MM-3-1-3-PGDN, etc.)

USE 1 TO ALL 4 TIMING PLANS

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**35**		**10**												
	Passage																
	Yellow		**3.3**		**3.0**												
	Red		**3.3**		**2.0**												
	Walk				**12**												
	Ped Clr				**14**												
	Max 1		**35**		**26**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

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	1	**All vehicle detector inputs must be left blank to**															
DET	2	**prevent vehicle calls on phases 4 & 8 via the door**															
ASSIGN-	3	**switch (which appear on the street as a Don't Walk**															
MENTS	4	**only). This gives the impression that the controller**															
	5	**is stuck. This, along with the non-lock function,**															
	6	**will prevent door switch calls on phase 4 from**															
	7	**being registered.**															
	8																

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2																
ASSIGN-	3																
MENTS	4				**X**												
	5																
	6																
	7																
	8																

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**0**	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.

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

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	**00**	**00**					**11(FRE)**	**ON**
2	**00**	**00**					**11(FRE)**	**ON**

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

CIRCUIT OVER-RIDES	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								
CIRCUIT OVER-RIDES	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

	HH	MM	
Time Clock Reset:	**00**	**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		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**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		0-255
	Master Identification		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 # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

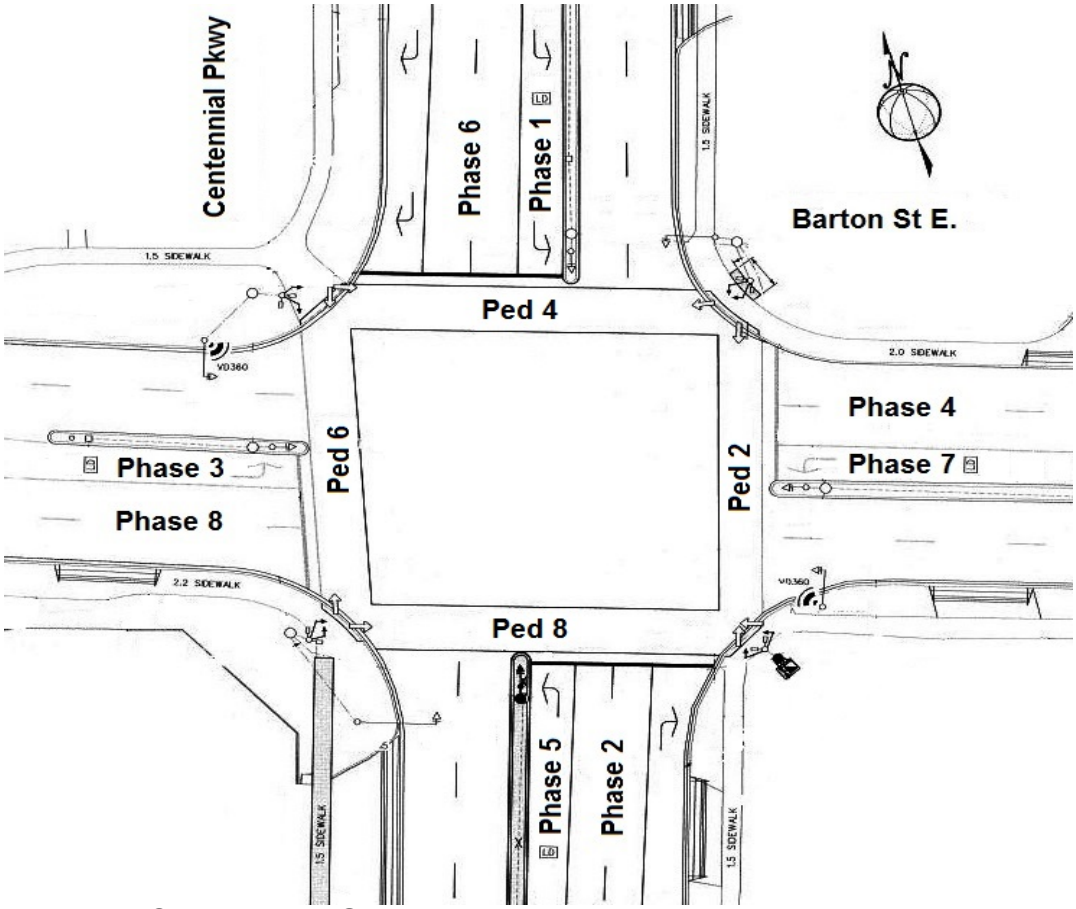
PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

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)

City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Barton Street East & Centennial Pkwy**
Controller Type: **3000E** Page **1** of **18**
Programmed By: **MF** Installed By: **MF**
Date: **Feb 26/16** Date: **Oct 22/2020**



ϕ1: **Centennial - SBLT**
ϕ2: **Centennial - NB, East Xwalk**
ϕ3: **Barton - EBLT**
ϕ4: **Barton - WB, North Xwalk**
ϕ5: **Centennial - NBLT**
ϕ6: **Centennial - SB, West Xwalk**
ϕ7: **Barton - WBLT**
ϕ8: **Barton - EB, South Xwalk**

Flash Operation: **Red: Centannial Pkwy**
Red: Barton St East

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**	**X**	**X**												
	Ring 2					**X**	**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**	**X**										
	CO PH 2			**X**	**X**			**X**	**X**								
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		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		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		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		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP3 PHASE RECALLS

(X = ENABLE)

		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		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		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		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

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																

PHASE TIMES (MM-3-1-3-PGDN, etc.)

USE 1 TO ALL 4 TIMING PLANS

TP1

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	5	20	5	20	5	20	5	20								
	Passage	1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0								
	Yellow	3.0	3.3	3.0	3.3	3.0	3.3	3.0	3.3								
	Red		2.9		3.2		2.9		3.2								
	Walk		7		7		7		7								
	Ped Clr		20		23		20		23								
	Max 1	10	45	10	40	10	45	10	40								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	**5**	**20**	**5**	**20**	**5**	**20**	**5**	**20**								
	Passage	**1.0**	**0.0**	**1.0**	**0.0**	**1.0**	**0.0**	**1.0**	**0.0**								
	Yellow	**3.0**	**3.3**	**3.0**	**3.3**	**3.0**	**3.3**	**3.0**	**3.3**								
	Red		**2.9**		**3.2**		**2.9**		**3.2**								
	Walk		**7**		**7**		**7**		**7**								
	Ped Clr		**20**		**23**		**20**		**23**								
	Max 1	**15**	**45**	**15**	**40**	**15**	**45**	**15**	**40**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	**5**	**20**	**5**	**20**	**5**	**20**	**5**	**20**								
	Passage	**1.0**	**0.0**	**1.0**	**0.0**	**1.0**	**0.0**	**1.0**	**0.0**								
	Yellow	**3.0**	**3.3**	**3.0**	**3.3**	**3.0**	**3.3**	**3.0**	**3.3**								
	Red		**2.9**		**3.2**		**2.9**		**3.2**								
	Walk		**7**		**7**		**7**		**7**								
	Ped Clr		**20**		**23**		**20**		**23**								
	Max 1	**15**	**45**	**15**	**40**	**15**	**45**	**15**	**40**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																

		TP4															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	**5**	**20**	**5**	**20**	**5**	**20**	**5**	**20**								
	Passage	**1.0**	**0.0**	**1.0**	**0.0**	**1.0**	**0.0**	**1.0**	**0.0**								
	Yellow	**3.0**	**3.3**	**3.0**	**3.3**	**3.0**	**3.3**	**3.0**	**3.3**								
	Red		**2.9**		**3.2**		**2.9**		**3.2**								
	Walk		**7**		**7**		**7**		**7**								
	Ped Clr		**20**		**23**		**20**		**23**								
	Max 1	**10**	**45**	**10**	**40**	**10**	**45**	**10**	**40**								
	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	1						X										
ENTRY	2						X										
ASSIGN-	3								X								
MENTS	4								X								
	5		X														
	6		X														
	7				X												
	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	1	X															
DET	2																
ASSIGN-	3			X													
MENTS	4																
	5					X											
	6																
	7							X									
	8																
	9																

ENHANCED OPTIONS
DYNAMIC OMITS (MM-3-1-9-1-1)

DYNAM OMITS GP1 ENABLE:	**Y**	Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

(X = ENABLE)

GRP1-1	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS	**X**															
OMITS	IF PH ON		**X**				**X**										
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-2	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS					**X**											
OMITS	IF PH ON		**X**				**X**										
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-3	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS			**X**													
OMITS	IF PH ON				**X**				**X**								
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-4	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS							**X**									
OMITS	IF PH ON				**X**				**X**								
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

DYNAMIC RECALLS (MM-3-1-9-1-2)

DYN. RECALL GP1 ENABLE:	**Y**	Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

(X = ENABLE)

GRP1-1	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS		**X**				**X**										
RECALLS	IF PH ON	**X**															
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-2	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS		**X**				**X**										
RECALLS	IF PH ON					**X**											
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-3	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS				**X**				**X**								
RECALLS	IF PH ON			**X**													
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-4	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS				**X**				**X**								
RECALLS	IF PH ON							**X**									
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2		X				X										
ASSIGN-	3																
MENTS	4				X				X								
	5																
	6		X				X										
	7																
	8				X				X								

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**0**	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:	**2**	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

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**	**4**		
	SPLIT 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 #	1/1	2/1	3/1	4/1			
	Length	**100**	**110**	**110**	**100**			
CYCLE	Offset 1	**96**	**55**	**30**	**96**			**Secs**
&	Offset 2							
OFFSETS	Offset 3							
	Offset 4							
	Offset 5							
	Max Dwell	**32**	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	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**										
COORD	**3-1**		**X**				**X**										
PHASES	**4-1**		**X**				**X**										

PHASE ALLOCATION (MM-3-2-6)

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

	PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE ALLO-CATION	**C1 S1**	**10**	**40**	**9**	**41**	**10**	**40**	**9**	**41**								
	C1 S2																
	C1 S3																
	C1 S4																
	C2 S1	**12**	**43**	**12**	**43**	**12**	**43**	**12**	**43**								
	C2 S2																
	C2 S3																
	C2 S4																
	C3 S1	**16**	**40**	**13**	**41**	**13**	**43**	**13**	**41**								
	C3 S2																
	C3 S3																
	C3 S4																
	C4 S1	**10**	**40**	**9**	**41**	**10**	**40**	**9**	**41**								
	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

Yield Percent	**0**	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 offfsets 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		4	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 ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	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 OVER-RIDES	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

	HH	MM	
Time Clock Reset:	**00**	**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		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**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		0-255
	Master Identification		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 # @ = , ! ; % \ &

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)

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 2397

Intersection: **Barton St E** **at** **Centennial Pkwy N** Total Vehicles: 24,947 Date: Tuesday
Direction: (East/West) (North/South) M.V.E./Year: 17.812 Nov 19, 2019
Road Condition: Dry Weather: Cloudy AWDT Factor: 2.1 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	24	198	16	29	103	11	14	56	36	15	95	24	621	0	2	0	2
7:30	32	182	14	24	116	10	15	72	32	17	117	25	656	0	1	1	6
7:45	32	174	21	32	155	16	20	88	34	18	116	21	727	0	3	4	3
8:00	30	183	34	36	195	17	28	103	39	12	137	23	837	1	6	3	4
8:15 *	48	180	37	37	134	21	25	106	42	16	122	41	809	0	5	2	4
8:30 *	31	146	22	27	147	29	36	96	41	20	122	32	749	2	0	1	1
8:45 *	36	160	26	41	139	16	25	96	48	21	128	28	764	1	7	6	4
9:00 *	29	168	21	42	151	31	21	118	49	35	142	34	841	2	5	4	3
9:15	41	144	27	31	111	29	28	101	42	22	117	26	719	0	5	1	3
9:30	41	163	25	37	113	30	23	114	42	23	125	41	777	1	2	3	4
9:45	38	127	14	44	124	27	21	122	36	29	115	36	733	2	4	0	1
10:00	28	120	25	32	119	44	29	101	54	25	105	25	707	0	2	2	6
13:45	52	160	36	31	145	36	36	146	47	44	123	35	891	2	7	0	5
14:00	49	169	27	44	107	48	36	151	59	32	145	38	905	1	4	3	4
14:15	43	163	41	33	145	48	23	150	60	30	145	28	909	1	4	4	3
14:30	50	187	37	45	164	48	40	171	58	35	139	32	1,006	1	5	3	2
14:45 *	45	146	32	34	159	50	34	185	65	29	134	39	952	1	14	5	8
15:00 *	45	122	30	39	144	52	39	199	54	40	136	27	927	0	5	8	2
15:15 *	44	149	38	37	198	51	43	210	56	42	178	24	1,070	3	3	4	9
15:30 *	41	151	38	36	152	30	47	230	53	53	183	34	1,048	4	8	3	5
16:15 *	40	154	27	43	151	56	44	267	57	41	163	30	1,073	1	12	5	1
16:30 *	38	137	29	48	152	55	51	258	61	48	162	32	1,071	5	20	6	5
16:45 *	40	160	30	50	161	53	42	244	54	45	192	33	1,104	3	6	1	9
17:00 *	37	139	29	44	168	60	28	265	72	41	158	32	1,073	1	10	10	8
17:15	43	138	28	32	143	47	34	266	49	47	187	27	1,041	5	3	4	8
17:30	32	155	36	36	150	73	36	277	45	43	178	15	1,076	4	2	3	2
17:45	37	145	32	48	130	49	33	263	41	40	126	15	959	2	5	5	7
18:00	35	124	33	37	146	41	27	250	48	38	108	15	902	2	6	5	5
TOTAL	1,081	4,344	805	1,049	4,022	1,078	878	4,705	1,374	901	3,898	812		45	156	96	124
APPR.		6,230			6,149			6,957			5,611		24,947			421	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	13	3	2	8	3	2	10	4	1	5	3	54
7:30	2	8	1	3	6	3	0	11	7	5	16	3	65
7:45	4	11	2	4	11	4	1	13	7	4	12	4	77
8:00	1	12	1	5	9	2	3	13	5	3	15	2	71
8:15 *	0	15	5	3	11	5	2	16	6	4	11	7	85
8:30 *	1	5	3	0	8	2	4	9	6	4	18	5	65
8:45 *	5	12	3	2	9	0	2	9	6	1	19	4	72
9:00 *	2	12	1	2	11	2	5	10	3	5	18	6	77
9:15	4	9	4	1	9	1	4	7	10	3	19	9	80
9:30	1	15	1	4	14	1	4	10	7	5	20	6	88
9:45	4	13	0	4	12	4	5	10	2	3	18	8	83
10:00	4	9	1	1	16	1	8	11	5	1	19	4	80
13:45	2	9	2	5	16	3	5	9	3	6	12	3	75
14:00	5	10	0	1	10	1	5	7	4	1	23	5	72
14:15	2	6	6	6	21	4	1	4	5	2	13	1	71
14:30	1	11	3	4	12	4	6	15	2	0	12	5	75
14:45 *	2	13	3	5	18	3	5	16	6	4	12	4	91
15:00 *	3	7	7	4	13	3	3	4	2	4	9	5	64
15:15 *	3	11	2	4	15	0	5	9	3	4	10	3	69
15:30 *	2	10	9	2	14	0	3	5	2	2	8	5	62
16:15 *	4	12	2	4	8	1	4	11	1	2	12	3	64
16:30 *	2	9	3	3	13	1	2	12	2	2	7	3	59
16:45 *	0	7	4	5	8	2	1	12	3	2	8	3	55
17:00 *	2	8	3	2	14	2	0	7	2	2	7	1	50
17:15	3	3	2	1	14	2	1	7	3	2	8	5	51
17:30	2	7	5	2	8	1	1	7	0	0	8	2	43
17:45	1	4	0	1	14	1	0	7	3	5	5	3	44
18:00	0	3	1	2	17	1	1	7	2	0	5	2	41
TOTAL	62	264	77	82	339	57	83	268	111	77	349	114	
APPR.		403			478			462			540		1,883

TRUCKS

7:15	0	10	3	2	5	3	1	7	4	0	4	3	42
7:30	2	7	1	2	1	2	0	10	7	4	13	3	52
7:45	2	11	2	4	6	3	1	12	7	4	9	3	64
8:00	0	11	0	5	6	2	2	13	5	3	12	2	61
8:15 *	0	12	5	3	8	4	1	15	6	3	9	7	73
8:30 *	1	4	1	0	6	1	4	8	6	4	15	5	55
8:45 *	3	11	3	2	7	0	2	8	6	1	14	4	61
9:00 *	1	10	0	2	9	2	5	7	3	5	16	6	66
9:15	3	9	4	1	5	1	4	7	10	3	16	9	72
9:30	1	12	0	3	10	1	4	7	7	5	16	6	72
9:45	4	12	0	4	10	4	5	10	2	3	16	7	77
10:00	4	7	1	1	14	1	8	9	5	1	17	4	72
13:45	2	9	2	5	15	3	5	9	3	6	8	3	70
14:00	5	9	0	1	7	1	5	6	4	1	21	5	65
14:15	2	5	6	6	19	3	1	3	5	2	10	1	63
14:30	1	10	3	4	11	4	6	13	2	0	7	5	66
14:45 *	1	12	3	5	13	3	4	16	6	3	10	4	80
15:00 *	2	7	7	4	10	3	3	3	2	3	6	5	55
15:15 *	3	10	2	4	8	0	5	8	3	4	5	3	55
15:30 *	2	10	8	2	10	0	3	4	2	2	6	5	54
16:15 *	3	12	1	4	6	1	4	11	1	2	6	2	53
16:30 *	2	7	3	3	9	1	2	11	2	2	5	3	50
16:45 *	0	6	4	5	6	2	1	11	2	2	5	3	47
17:00 *	2	7	3	2	12	1	0	6	2	2	5	1	43
17:15	3	3	2	1	10	1	1	5	3	2	5	5	41
17:30	2	5	5	2	7	1	1	7	0	0	6	2	38
17:45	1	3	0	1	11	1	0	7	3	5	2	3	37
18:00	0	2	1	2	13	1	1	6	2	0	3	2	33
TOTAL	52	233	70	80	254	50	79	239	110	72	267	111	
APPR.		355			384			428			450		1,617

Appendix C

Traffic Operations – Existing

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	3471	3476	3375	3307	3445	3390	3462
Vehs Exited	3464	3488	3373	3277	3449	3381	3451
Starting Vehs	73	82	91	67	77	71	77
Ending Vehs	80	70	93	97	73	80	88
Travel Distance (km)	1689	1706	1650	1590	1680	1642	1683
Travel Time (hr)	79.3	79.6	74.5	72.5	75.7	73.8	77.4
Total Delay (hr)	43.5	43.6	39.7	38.9	40.1	38.9	41.9
Total Stops	3531	3533	3327	3242	3450	3294	3448
Fuel Used (l)	191.4	192.5	184.2	178.0	186.7	182.7	189.3

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	3430	3463	3425	3424
Vehs Exited	3450	3416	3418	3416
Starting Vehs	87	70	65	76
Ending Vehs	67	117	72	83
Travel Distance (km)	1675	1664	1670	1665
Travel Time (hr)	80.2	105.2	78.5	79.7
Total Delay (hr)	44.8	69.9	43.2	44.5
Total Stops	3570	3663	3464	3452
Fuel Used (l)	190.5	211.8	189.2	189.6

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	3471	3476	3375	3307	3445	3390	3462
Vehs Exited	3464	3488	3373	3277	3449	3381	3451
Starting Vehs	73	82	91	67	77	71	77
Ending Vehs	80	70	93	97	73	80	88
Travel Distance (km)	1689	1706	1650	1590	1680	1642	1683
Travel Time (hr)	79.3	79.6	74.5	72.5	75.7	73.8	77.4
Total Delay (hr)	43.5	43.6	39.7	38.9	40.1	38.9	41.9
Total Stops	3531	3533	3327	3242	3450	3294	3448
Fuel Used (l)	191.4	192.5	184.2	178.0	186.7	182.7	189.3

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	3430	3463	3425	3424
Vehs Exited	3450	3416	3418	3416
Starting Vehs	87	70	65	76
Ending Vehs	67	117	72	83
Travel Distance (km)	1675	1664	1670	1665
Travel Time (hr)	80.2	105.2	78.5	79.7
Total Delay (hr)	44.8	69.9	43.2	44.5
Total Stops	3570	3663	3464	3452
Fuel Used (l)	190.5	211.8	189.2	189.6

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.4	155.6	139.0	67.4	97.4	100.7	59.6	92.0	79.5	37.5	42.4	70.8
Average Queue (m)	40.5	92.9	80.2	33.2	65.3	67.0	24.3	52.4	41.0	17.9	19.0	37.3
95th Queue (m)	59.0	157.1	142.8	70.9	99.0	99.6	50.9	80.3	71.7	37.8	38.1	63.0
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		5	2		7	9						
Queuing Penalty (veh)		0	0		29	36						
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	27	32		0	14		0	6	9	0	1	11
Queuing Penalty (veh)	82	50		1	14		0	9	10	1	2	12

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	58.0	40.9
Average Queue (m)	22.1	17.1
95th Queue (m)	46.9	32.5
Link Distance (m)	171.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	1	1
Queuing Penalty (veh)	2	1

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB
Directions Served	T	TR
Maximum Queue (m)	38.7	31.4
Average Queue (m)	3.2	3.3
95th Queue (m)	20.0	19.0
Link Distance (m)	198.7	198.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	78.6	82.9	73.8	58.4
Average Queue (m)	40.6	45.1	40.8	26.6
95th Queue (m)	72.7	78.0	62.1	49.7
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 249

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4387	4451	4339	4468	4303	4484	4489
Vehs Exited	4332	4392	4285	4376	4233	4412	4413
Starting Vehs	180	153	166	127	142	151	153
Ending Vehs	235	212	220	219	212	223	229
Travel Distance (km)	2076	2112	2048	2094	2019	2094	2105
Travel Time (hr)	333.5	334.3	323.6	284.5	359.5	344.8	318.0
Total Delay (hr)	289.6	289.6	280.3	240.1	316.7	300.6	273.4
Total Stops	6227	6290	6064	6157	5651	6144	6469
Fuel Used (l)	435.4	434.9	422.4	391.8	448.7	446.8	417.4

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4431	4337	4495	4418
Vehs Exited	4346	4260	4425	4347
Starting Vehs	130	147	149	151
Ending Vehs	215	224	219	222
Travel Distance (km)	2088	2040	2111	2079
Travel Time (hr)	298.9	349.2	300.4	324.7
Total Delay (hr)	254.6	305.9	255.8	280.7
Total Stops	5982	5939	6271	6120
Fuel Used (l)	407.8	442.7	405.7	425.4

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4387	4451	4339	4468	4303	4484	4489
Vehs Exited	4332	4392	4285	4376	4233	4412	4413
Starting Vehs	180	153	166	127	142	151	153
Ending Vehs	235	212	220	219	212	223	229
Travel Distance (km)	2076	2112	2048	2094	2019	2094	2105
Travel Time (hr)	333.5	334.3	323.6	284.5	359.5	344.8	318.0
Total Delay (hr)	289.6	289.6	280.3	240.1	316.7	300.6	273.4
Total Stops	6227	6290	6064	6157	5651	6144	6469
Fuel Used (l)	435.4	434.9	422.4	391.8	448.7	446.8	417.4

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4431	4337	4495	4418
Vehs Exited	4346	4260	4425	4347
Starting Vehs	130	147	149	151
Ending Vehs	215	224	219	222
Travel Distance (km)	2088	2040	2111	2079
Travel Time (hr)	298.9	349.2	300.4	324.7
Total Delay (hr)	254.6	305.9	255.8	280.7
Total Stops	5982	5939	6271	6120
Fuel Used (l)	407.8	442.7	405.7	425.4

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	193.0	193.4	67.5	106.8	105.5	62.1	97.0	88.1	37.5	42.4	175.1
Average Queue (m)	46.3	183.2	182.2	66.5	97.9	97.5	33.2	54.3	42.9	19.0	31.5	117.3
95th Queue (m)	53.5	190.5	192.2	76.1	102.8	105.3	59.9	83.4	73.3	40.0	51.3	178.1
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		76	65		89	63						4
Queuing Penalty (veh)		0	0		463	328						0
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	64	40		81	30		2	6	11	0	5	42
Queuing Penalty (veh)	213	78		291	55		5	10	13	1	25	73

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	165.0	42.5
Average Queue (m)	102.6	33.0
95th Queue (m)	165.4	54.8
Link Distance (m)	171.0	
Upstream Blk Time (%)	2	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	32	1
Queuing Penalty (veh)	83	8

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB
Directions Served	T	TR
Maximum Queue (m)	206.2	211.2
Average Queue (m)	178.7	176.2
95th Queue (m)	253.2	255.5
Link Distance (m)	198.7	198.7
Upstream Blk Time (%)	14	12
Queuing Penalty (veh)	73	64
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	78.6	81.2	125.2	124.5
Average Queue (m)	40.9	45.1	92.6	82.3
95th Queue (m)	70.3	75.3	141.3	143.2
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)			37	29
Queuing Penalty (veh)			0	0
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1785

Appendix D

Detailed Transportation Tomorrow Survey Data

Tue Feb 22 2022 16:32:45 GMT-0500 (Eastern Standard Time) - Run Time: 3266ms
Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest
Table: No. of trips made by person - n_pers_trip

RowG:
ColG:(5154,5153,5126,5123,5118,5113,5136,5237)
TblG:(0-99)

Filters:
(Start time of trip - start_time In 700-1000
and
Primary travel mode of trip - mode_prime In D,M,O,P,T,U)

Trip 2016
Table: 1

,1	
37	48
4010	19
4059	16
4080	19
5002	85
5009	46
5036	10
5041	43
5079	23
5088	27
5096	51
5100	43
5123	40
5133	10
5148	22
5169	32
5206	20
5210	22
5238	46
5246	23
6001	48
6006	12
6016	45
6022	34
6023	231
6100	22
6144	34
6193	18
6360	31
8011	32
8100	19
9068	5
9998	18

Tue Feb 22 2022 16:51:51 GMT-0500 (Eastern Standard Time) - Run Time: 3439ms
Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest
Column: 2006 GTA zone of origin - gta06_orig
Table: No. of trips made by person - n_pers_trip

RowG:
ColG:(5154,5153,5126,5123,5118,5113,5136,5237)
TblG:(0-99)

Filters:
(Start time of trip - start_time In 700-1000
and
Primary travel mode of trip - mode_prime In D,M,O,P,T,U)

Trip 2016
Table: 1

	1
3662	19
4041	23
4078	29
4085	32
5067	15
5069	39
5073	48
5076	22
5080	17
5090	33
5093	46
5106	29
5107	46
5113	15
5126	39
5128	22
5142	19
5144	13
5145	152
5159	25
5172	30
5184	14
5191	39
5195	33
5197	120
5201	27
5206	77
6023	115
6048	46
6098	12
6148	77
6202	12
7326	34

Tue Feb 22 2022 16:34:17 GMT-0500 (Eastern Standard Time) - Run Time: 3412ms
Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest
Table: No. of trips made by person - n_pers_trip

RowG:
ColG:(5154,5153,5126,5123,5118,5113,5136,5237)
TblG:(0-99)

Filters:
(Start time of trip - start_time In 1600-1800
and
Primary travel mode of trip - mode_prime In D,M,O,P,T,U)

Trip 2016
Table: 1

	1
3335	47
4022	22
4041	23
4068	15
4074	19
5047	19
5051	120
5086	35
5093	22
5100	34
5106	43
5108	35
5119	41
5123	48
5126	54
5136	20
5144	13
5145	153
5159	40
5173	33
5183	32
5184	14
5190	25
5197	120
5198	22
5206	76
5210	21
6023	115
6098	12
6202	12
7326	34

Tue Feb 22 2022 16:50:54 GMT-0500 (Eastern Standard Time) - Run Time: 3226ms
Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest
Column: 2006 GTA zone of origin - gta06_orig
Table: No. of trips made by person - n_pers_trip

RowG:
ColG:(5154,5153,5126,5123,5118,5113,5136,5237)
TblG:(0-99)

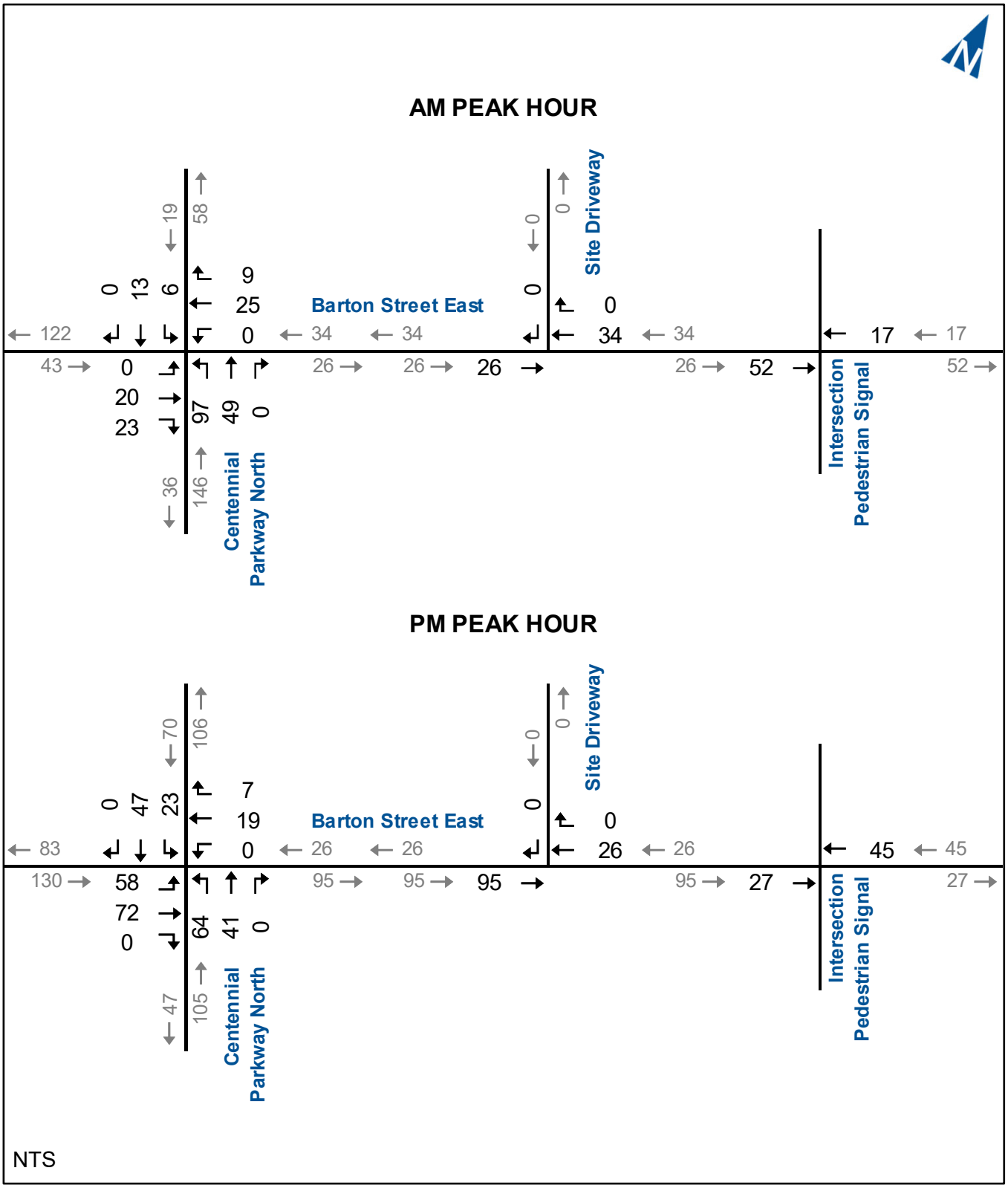
Filters:
(Start time of trip - start_time In 1600-1800
and
Primary travel mode of trip - mode_prime In D,M,O,P,T,U)

Trip 2016
Table: 1

	1
3813	15
4080	19
5002	85
5036	10
5041	21
5051	60
5061	55
5068	44
5079	23
5093	46
5096	101
5100	43
5108	16
5123	40
5126	12
5133	10
5148	22
5180	17
5183	64
5206	20
5237	20
5238	46
5250	46
6001	48
6005	14
6016	45
6022	34
6031	47
6353	40
8100	19
8947	5

Appendix E

200 Centennial North Detailed Traffic Estimate



200 Centennial Parkway North
Forecasted Traffic

2481 Barton Street East
220085

Appendix E

Appendix F

Background Traffic Operations – Five-Year Horizon

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4159	4345	4231	4292	4226	4245	4382
Vehs Exited	4151	4274	4161	4271	4160	4201	4318
Starting Vehs	202	120	146	150	145	170	145
Ending Vehs	210	191	216	171	211	214	209
Travel Distance (km)	1983	2072	2007	2045	2007	2018	2087
Travel Time (hr)	305.3	192.6	280.6	171.3	283.9	263.9	246.9
Total Delay (hr)	263.3	148.7	238.2	127.9	241.5	221.1	202.6
Total Stops	5427	5819	5649	5379	5567	5525	6097
Fuel Used (l)	402.7	316.1	383.4	297.1	385.2	370.8	361.4

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4179	4193	4172	4242
Vehs Exited	4123	4199	4162	4202
Starting Vehs	146	142	158	151
Ending Vehs	202	136	168	192
Travel Distance (km)	1984	2010	2001	2021
Travel Time (hr)	253.3	218.0	217.0	243.3
Total Delay (hr)	211.2	175.2	174.7	200.4
Total Stops	5490	5493	5524	5596
Fuel Used (l)	356.8	333.5	327.1	353.4

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4159	4345	4231	4292	4226	4245	4382
Vehs Exited	4151	4274	4161	4271	4160	4201	4318
Starting Vehs	202	120	146	150	145	170	145
Ending Vehs	210	191	216	171	211	214	209
Travel Distance (km)	1983	2072	2007	2045	2007	2018	2087
Travel Time (hr)	305.3	192.6	280.6	171.3	283.9	263.9	246.9
Total Delay (hr)	263.3	148.7	238.2	127.9	241.5	221.1	202.6
Total Stops	5427	5819	5649	5379	5567	5525	6097
Fuel Used (l)	402.7	316.1	383.4	297.1	385.2	370.8	361.4

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4179	4193	4172	4242
Vehs Exited	4123	4199	4162	4202
Starting Vehs	146	142	158	151
Ending Vehs	202	136	168	192
Travel Distance (km)	1984	2010	2001	2021
Travel Time (hr)	253.3	218.0	217.0	243.3
Total Delay (hr)	211.2	175.2	174.7	200.4
Total Stops	5490	5493	5524	5596
Fuel Used (l)	356.8	333.5	327.1	353.4

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	192.0	192.0	67.4	105.3	106.9	62.4	168.7	147.7	37.5	42.4	98.8
Average Queue (m)	45.8	181.7	179.4	53.2	97.1	97.2	50.9	86.0	74.8	20.8	28.6	50.5
95th Queue (m)	55.2	200.9	204.3	88.1	106.8	107.2	75.6	149.1	129.0	44.4	49.1	81.0
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		77	57		70	75		0				
Queuing Penalty (veh)		0	0		343	366		0				
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	74	35		6	70		15	13	26	1	3	20
Queuing Penalty (veh)	275	65		20	82		64	37	35	3	9	29

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	91.4	42.4
Average Queue (m)	38.4	23.2
95th Queue (m)	70.3	42.9
Link Distance (m)	171.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	6	2
Queuing Penalty (veh)	13	4

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB
Directions Served	T	TR
Maximum Queue (m)	194.9	194.5
Average Queue (m)	144.2	141.8
95th Queue (m)	248.2	245.9
Link Distance (m)	198.7	198.7
Upstream Blk Time (%)	9	9
Queuing Penalty (veh)	43	42
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	90.7	94.8	112.3	106.0
Average Queue (m)	46.4	51.7	70.5	59.6
95th Queue (m)	83.2	87.8	122.2	117.4
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)			13	10
Queuing Penalty (veh)			0	0
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1431

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4436	4547	4451	4490	4543	4547	4650
Vehs Exited	4405	4571	4477	4462	4511	4531	4574
Starting Vehs	213	270	246	254	235	246	205
Ending Vehs	244	246	220	282	267	262	281
Travel Distance (km)	2070	2146	2085	2107	2122	2121	2138
Travel Time (hr)	1185.9	1082.8	1151.5	1175.4	1034.5	1191.5	1095.0
Total Delay (hr)	1142.0	1037.4	1107.5	1130.7	989.6	1146.5	1049.8
Total Stops	6935	6874	6874	6640	6568	6912	6996
Fuel Used (l)	1159.2	1078.2	1134.8	1152.7	1036.1	1171.3	1084.6

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4418	4488	4634	4520
Vehs Exited	4413	4461	4635	4503
Starting Vehs	248	236	263	243
Ending Vehs	253	263	262	261
Travel Distance (km)	2053	2091	2177	2111
Travel Time (hr)	1087.1	1099.9	1085.7	1118.9
Total Delay (hr)	1043.6	1055.5	1039.6	1074.2
Total Stops	6585	6651	7190	6825
Fuel Used (l)	1077.3	1087.1	1080.3	1106.2

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4436	4547	4451	4490	4543	4547	4650
Vehs Exited	4405	4571	4477	4462	4511	4531	4574
Starting Vehs	213	270	246	254	235	246	205
Ending Vehs	244	246	220	282	267	262	281
Travel Distance (km)	2070	2146	2085	2107	2122	2121	2138
Travel Time (hr)	1185.9	1082.8	1151.5	1175.4	1034.5	1191.5	1095.0
Total Delay (hr)	1142.0	1037.4	1107.5	1130.7	989.6	1146.5	1049.8
Total Stops	6935	6874	6874	6640	6568	6912	6996
Fuel Used (l)	1159.2	1078.2	1134.8	1152.7	1036.1	1171.3	1084.6

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4418	4488	4634	4520
Vehs Exited	4413	4461	4635	4503
Starting Vehs	248	236	263	243
Ending Vehs	253	263	262	261
Travel Distance (km)	2053	2091	2177	2111
Travel Time (hr)	1087.1	1099.9	1085.7	1118.9
Total Delay (hr)	1043.6	1055.5	1039.6	1074.2
Total Stops	6585	6651	7190	6825
Fuel Used (l)	1077.3	1087.1	1080.3	1106.2

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	193.1	192.3	67.5	106.0	106.0	62.5	205.3	200.5	37.5	42.4	184.7
Average Queue (m)	47.1	183.5	179.2	64.9	97.8	97.7	61.9	185.4	164.4	23.4	37.2	176.8
95th Queue (m)	50.1	190.5	204.1	80.0	102.1	101.9	67.4	236.0	234.1	48.5	51.7	184.0
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		91	46		85	71		70	4			53
Queuing Penalty (veh)		0	0		537	446		0	0			0
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	90	21		62	43		91	4	37	1	23	50
Queuing Penalty (veh)	394	61		273	95		359	11	54	3	155	116

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	188.2	42.5
Average Queue (m)	177.2	34.8
95th Queue (m)	183.0	55.9
Link Distance (m)	171.0	
Upstream Blk Time (%)	54	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	54	2
Queuing Penalty (veh)	168	16

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB
Directions Served	T	TR
Maximum Queue (m)	209.6	211.4
Average Queue (m)	202.3	202.2
95th Queue (m)	207.2	208.3
Link Distance (m)	198.7	198.7
Upstream Blk Time (%)	21	23
Queuing Penalty (veh)	137	147
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	74.5	79.3	128.6	126.7
Average Queue (m)	37.3	41.9	118.2	116.8
95th Queue (m)	64.4	69.9	125.1	128.8
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)			82	77
Queuing Penalty (veh)			0	0
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 2972

Appendix G

Total Traffic Operations – Five-Year Horizon

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4140	4267	4221	4159	4238	4344	4315
Vehs Exited	4117	4251	4183	4095	4201	4294	4244
Starting Vehs	156	140	138	130	130	137	165
Ending Vehs	179	156	176	194	167	187	236
Travel Distance (km)	1998	2054	2021	1966	2038	2078	2056
Travel Time (hr)	249.4	246.8	258.7	215.5	223.6	254.4	299.7
Total Delay (hr)	207.0	203.1	216.0	173.7	180.3	210.1	256.0
Total Stops	5446	5770	5535	5161	5779	6029	5825
Fuel Used (l)	351.1	356.5	366.6	326.2	336.8	365.9	400.8

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4339	4171	4318	4253
Vehs Exited	4314	4100	4289	4209
Starting Vehs	149	127	150	142
Ending Vehs	174	198	179	188
Travel Distance (km)	2077	1982	2079	2035
Travel Time (hr)	227.3	276.7	272.6	252.5
Total Delay (hr)	183.2	234.5	228.4	209.2
Total Stops	5896	5480	5921	5684
Fuel Used (l)	345.1	376.0	379.9	360.5

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4140	4267	4221	4159	4238	4344	4315
Vehs Exited	4117	4251	4183	4095	4201	4294	4244
Starting Vehs	156	140	138	130	130	137	165
Ending Vehs	179	156	176	194	167	187	236
Travel Distance (km)	1998	2054	2021	1966	2038	2078	2056
Travel Time (hr)	249.4	246.8	258.7	215.5	223.6	254.4	299.7
Total Delay (hr)	207.0	203.1	216.0	173.7	180.3	210.1	256.0
Total Stops	5446	5770	5535	5161	5779	6029	5825
Fuel Used (l)	351.1	356.5	366.6	326.2	336.8	365.9	400.8

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4339	4171	4318	4253
Vehs Exited	4314	4100	4289	4209
Starting Vehs	149	127	150	142
Ending Vehs	174	198	179	188
Travel Distance (km)	2077	1982	2079	2035
Travel Time (hr)	227.3	276.7	272.6	252.5
Total Delay (hr)	183.2	234.5	228.4	209.2
Total Stops	5896	5480	5921	5684
Fuel Used (l)	345.1	376.0	379.9	360.5

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	193.4	193.5	67.4	103.7	106.4	62.4	152.3	137.7	37.5	42.4	92.7
Average Queue (m)	45.2	181.2	178.9	55.5	97.3	97.5	50.6	82.7	70.4	24.0	29.0	52.2
95th Queue (m)	55.4	201.0	204.8	86.6	101.1	101.8	74.2	139.3	121.5	47.3	48.6	82.0
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		77	59		72	76		0				
Queuing Penalty (veh)		0	0		364	385		0				
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	65	41		8	69		12	13	25	1	6	21
Queuing Penalty (veh)	242	77		28	86		52	37	34	3	15	30

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	79.6	42.5
Average Queue (m)	37.0	22.8
95th Queue (m)	67.2	43.4
Link Distance (m)	171.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	6	1
Queuing Penalty (veh)	14	3

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (m)	199.5	200.6	55.4
Average Queue (m)	129.5	127.7	43.1
95th Queue (m)	221.1	217.4	66.6
Link Distance (m)	198.7	198.7	52.6
Upstream Blk Time (%)	3	3	69
Queuing Penalty (veh)	15	15	0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	89.3	91.8	101.2	93.7
Average Queue (m)	45.9	51.7	56.9	46.2
95th Queue (m)	80.7	86.2	92.1	83.7
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)			1	1
Queuing Penalty (veh)			0	0
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1399

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4434	4488	4492	4629	4526	4538	4573
Vehs Exited	4439	4475	4472	4619	4473	4502	4578
Starting Vehs	272	252	236	253	220	242	256
Ending Vehs	267	265	256	263	273	278	251
Travel Distance (km)	2074	2082	2079	2167	2094	2112	2139
Travel Time (hr)	1300.1	1248.5	1118.0	1259.4	1190.1	1205.5	1237.7
Total Delay (hr)	1256.2	1204.4	1074.0	1213.4	1145.6	1160.7	1192.4
Total Stops	6960	6671	7320	7237	7037	6951	7014
Fuel Used (l)	1262.7	1220.8	1107.5	1223.7	1164.9	1180.5	1208.8

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4529	4699	4545	4547
Vehs Exited	4509	4609	4550	4522
Starting Vehs	255	193	262	243
Ending Vehs	275	283	257	266
Travel Distance (km)	2115	2172	2124	2116
Travel Time (hr)	1258.2	1199.7	1179.8	1219.7
Total Delay (hr)	1213.4	1153.7	1134.8	1174.9
Total Stops	7203	7346	7079	7079
Fuel Used (l)	1226.3	1181.7	1162.8	1194.0

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4434	4488	4492	4629	4526	4538	4573
Vehs Exited	4439	4475	4472	4619	4473	4502	4578
Starting Vehs	272	252	236	253	220	242	256
Ending Vehs	267	265	256	263	273	278	251
Travel Distance (km)	2074	2082	2079	2167	2094	2112	2139
Travel Time (hr)	1300.1	1248.5	1118.0	1259.4	1190.1	1205.5	1237.7
Total Delay (hr)	1256.2	1204.4	1074.0	1213.4	1145.6	1160.7	1192.4
Total Stops	6960	6671	7320	7237	7037	6951	7014
Fuel Used (l)	1262.7	1220.8	1107.5	1223.7	1164.9	1180.5	1208.8

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4529	4699	4545	4547
Vehs Exited	4509	4609	4550	4522
Starting Vehs	255	193	262	243
Ending Vehs	275	283	257	266
Travel Distance (km)	2115	2172	2124	2116
Travel Time (hr)	1258.2	1199.7	1179.8	1219.7
Total Delay (hr)	1213.4	1153.7	1134.8	1174.9
Total Stops	7203	7346	7079	7079
Fuel Used (l)	1226.3	1181.7	1162.8	1194.0

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	193.0	191.8	67.4	106.6	106.5	62.5	206.7	202.4	37.5	42.5	187.7
Average Queue (m)	47.3	183.6	175.0	65.5	97.6	97.9	61.8	186.2	166.7	23.3	35.2	177.5
95th Queue (m)	47.7	190.4	211.5	77.0	102.2	102.5	68.5	237.9	235.8	48.2	52.8	183.2
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		93	37		83	70		67	6			53
Queuing Penalty (veh)		0	0		543	457		0	0			0
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	93	19		59	46		90	7	40	1	17	53
Queuing Penalty (veh)	405	55		259	107		356	17	59	2	114	124

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	187.5	42.5
Average Queue (m)	177.7	35.1
95th Queue (m)	183.7	55.3
Link Distance (m)	171.0	
Upstream Blk Time (%)	55	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	55	2
Queuing Penalty (veh)	171	12

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (m)	209.8	210.9	56.6
Average Queue (m)	202.1	202.8	51.8
95th Queue (m)	206.5	207.6	59.0
Link Distance (m)	198.7	198.7	52.6
Upstream Blk Time (%)	19	23	96
Queuing Penalty (veh)	126	150	0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	75.5	78.7	129.3	126.8
Average Queue (m)	36.5	40.6	118.0	117.2
95th Queue (m)	64.5	68.3	124.2	128.3
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)			80	76
Queuing Penalty (veh)			0	0
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 2960

Appendix H

Total Traffic Operations – Five-Year Horizon – Remedial Measures

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4328	4340	4516	4356	4324	4315	4406
Vehs Exited	4290	4323	4512	4339	4297	4317	4353
Starting Vehs	137	113	144	137	88	102	95
Ending Vehs	175	130	148	154	115	100	148
Travel Distance (km)	2084	2084	2167	2086	2047	2076	2101
Travel Time (hr)	219.9	148.3	134.2	230.8	107.3	144.3	128.0
Total Delay (hr)	175.8	104.0	88.1	186.5	63.8	100.2	83.3
Total Stops	5374	5075	5421	5353	4510	4932	4793
Fuel Used (l)	332.4	273.9	272.9	346.3	238.9	271.2	261.3

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4283	4376	4404	4365
Vehs Exited	4296	4302	4403	4342
Starting Vehs	124	106	125	119
Ending Vehs	111	180	126	140
Travel Distance (km)	2067	2083	2129	2092
Travel Time (hr)	111.8	158.9	116.5	150.0
Total Delay (hr)	67.7	114.6	71.3	105.5
Total Stops	4605	5198	4918	5017
Fuel Used (l)	245.0	286.1	253.2	278.1

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4328	4340	4516	4356	4324	4315	4406
Vehs Exited	4290	4323	4512	4339	4297	4317	4353
Starting Vehs	137	113	144	137	88	102	95
Ending Vehs	175	130	148	154	115	100	148
Travel Distance (km)	2084	2084	2167	2086	2047	2076	2101
Travel Time (hr)	219.9	148.3	134.2	230.8	107.3	144.3	128.0
Total Delay (hr)	175.8	104.0	88.1	186.5	63.8	100.2	83.3
Total Stops	5374	5075	5421	5353	4510	4932	4793
Fuel Used (l)	332.4	273.9	272.9	346.3	238.9	271.2	261.3

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4283	4376	4404	4365
Vehs Exited	4296	4302	4403	4342
Starting Vehs	124	106	125	119
Ending Vehs	111	180	126	140
Travel Distance (km)	2067	2083	2129	2092
Travel Time (hr)	111.8	158.9	116.5	150.0
Total Delay (hr)	67.7	114.6	71.3	105.5
Total Stops	4605	5198	4918	5017
Fuel Used (l)	245.0	286.1	253.2	278.1

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	187.3	182.3	67.4	101.1	105.2	62.4	174.1	156.5	37.5	42.4	102.4
Average Queue (m)	45.0	141.8	131.3	46.2	84.9	87.4	53.8	95.9	81.7	24.4	30.5	55.7
95th Queue (m)	55.6	216.8	212.3	83.6	113.2	113.7	76.4	167.0	145.5	46.6	50.6	87.9
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		32	17		43	49		1	0			
Queuing Penalty (veh)		0	0		220	249		0	0			
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	52	34		2	53		23	15	30	1	6	24
Queuing Penalty (veh)	195	64		6	67		102	42	40	4	18	35

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	85.9	42.5
Average Queue (m)	39.9	24.2
95th Queue (m)	72.7	44.0
Link Distance (m)	171.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	6	1
Queuing Penalty (veh)	15	3

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (m)	109.2	116.4	45.8
Average Queue (m)	34.5	36.8	25.8
95th Queue (m)	113.0	115.5	59.4
Link Distance (m)	198.7	198.7	52.6
Upstream Blk Time (%)			27
Queuing Penalty (veh)			0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	48.6	49.9	73.6	67.5
Average Queue (m)	23.8	27.2	43.6	33.5
95th Queue (m)	41.3	44.6	67.1	59.7
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1060

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4577	4374	4457	4404	4517	4547	4551
Vehs Exited	4524	4362	4460	4393	4528	4531	4531
Starting Vehs	210	233	257	259	271	253	255
Ending Vehs	263	245	254	270	260	269	275
Travel Distance (km)	2102	2020	2065	2037	2107	2097	2097
Travel Time (hr)	1108.0	1268.6	1151.0	1208.5	1235.2	1176.3	1235.5
Total Delay (hr)	1063.4	1225.7	1107.2	1165.2	1190.6	1131.7	1191.0
Total Stops	5886	5741	6160	5585	6338	6053	5912
Fuel Used (l)	1093.6	1222.4	1130.7	1176.0	1202.8	1148.9	1202.3

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	6:57	6:57	6:57	6:57
End Time	8:12	8:12	8:12	8:12
Total Time (min)	75	75	75	75
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4400	4529	4569	4492
Vehs Exited	4369	4528	4542	4477
Starting Vehs	231	262	252	250
Ending Vehs	262	263	279	265
Travel Distance (km)	2022	2106	2105	2076
Travel Time (hr)	1185.1	1280.3	1236.7	1208.5
Total Delay (hr)	1142.3	1235.7	1192.1	1164.5
Total Stops	5789	5792	5608	5886
Fuel Used (l)	1157.1	1245.5	1209.2	1178.8

Interval #0 Information Seeding

Start Time	6:57
End Time	7:12
Total Time (min)	15

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	6	7
Vehs Entered	4577	4374	4457	4404	4517	4547	4551
Vehs Exited	4524	4362	4460	4393	4528	4531	4531
Starting Vehs	210	233	257	259	271	253	255
Ending Vehs	263	245	254	270	260	269	275
Travel Distance (km)	2102	2020	2065	2037	2107	2097	2097
Travel Time (hr)	1108.0	1268.6	1151.0	1208.5	1235.2	1176.3	1235.5
Total Delay (hr)	1063.4	1225.7	1107.2	1165.2	1190.6	1131.7	1191.0
Total Stops	5886	5741	6160	5585	6338	6053	5912
Fuel Used (l)	1093.6	1222.4	1130.7	1176.0	1202.8	1148.9	1202.3

Interval #1 Information Recording

Start Time	7:12
End Time	8:12
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	8	9	10	Avg
Vehs Entered	4400	4529	4569	4492
Vehs Exited	4369	4528	4542	4477
Starting Vehs	231	262	252	250
Ending Vehs	262	263	279	265
Travel Distance (km)	2022	2106	2105	2076
Travel Time (hr)	1185.1	1280.3	1236.7	1208.5
Total Delay (hr)	1142.3	1235.7	1192.1	1164.5
Total Stops	5789	5792	5608	5886
Fuel Used (l)	1157.1	1245.5	1209.2	1178.8

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (m)	47.5	192.7	193.7	67.5	105.1	105.5	62.5	205.5	200.6	37.5	42.4	189.1
Average Queue (m)	46.5	183.3	180.2	65.7	97.6	97.4	62.4	188.9	167.3	19.3	36.9	177.1
95th Queue (m)	52.6	190.2	208.1	77.0	101.4	101.0	62.6	226.1	234.0	46.1	51.5	185.0
Link Distance (m)		175.2	175.2		75.8	75.8		189.0	189.0			171.0
Upstream Blk Time (%)		85	57		88	70		74	3			50
Queuing Penalty (veh)		0	0		578	457		0	0			0
Storage Bay Dist (m)	40.0			60.0			55.0			30.0	35.0	
Storage Blk Time (%)	79	32		66	39		94	4	33	0	22	47
Queuing Penalty (veh)	344	93		294	93		371	11	49	1	156	111

Intersection: 101: Centennial Parkway North & Barton Street East

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	185.5	42.5
Average Queue (m)	176.6	33.8
95th Queue (m)	183.5	56.5
Link Distance (m)	171.0	
Upstream Blk Time (%)	49	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		35.0
Storage Blk Time (%)	50	2
Queuing Penalty (veh)	154	16

Intersection: 102: Barton Street East & Site Driveway

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (m)	209.4	212.9	55.3
Average Queue (m)	203.2	203.7	50.4
95th Queue (m)	206.8	214.8	58.6
Link Distance (m)	198.7	198.7	52.6
Upstream Blk Time (%)	31	32	92
Queuing Penalty (veh)	205	215	0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 103: PXO & Barton Street East

Movement	EB	EB	WB	WB
Directions Served	T	T	T	T
Maximum Queue (m)	30.8	33.5	128.4	127.3
Average Queue (m)	15.0	19.2	118.2	117.6
95th Queue (m)	26.5	31.0	124.3	125.9
Link Distance (m)	198.7	198.7	112.0	112.0
Upstream Blk Time (%)			90	85
Queuing Penalty (veh)			0	0
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 3147