

# **Appendix E**

**Multi-Modal Transportation Report**



# Brookdale EA Multi-Modal Transportation Report

## Municipal Class Environmental Assessment

City of Cornwall

08 May 2024

<b>Printed date</b>	
<b>Last saved date</b>	15 May 2024
<b>File name</b>	
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<b>Client name</b>	City of Cornwall
<b>Project name</b>	Cornwall Brookdale Avenue Municipal Class Environmental Assessment
<b>Document title</b>	Brookdale EA Multi-Modal Transportation Report   Municipal Class Environmental Assessment
<b>Revision version</b>	Rev 00
<b>Project number</b>	12628280

#### Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
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# Executive Summary

The City of Cornwall has undertaken a Municipal Class Environmental Assessment (MCEA) to evaluate and enhance transportation operations and safety along Brookdale Avenue from Seventh Street Court to Fourteenth Street West. This report presents the current transportation network context, the existing and future traffic conditions within the road network, as well as a summary of proposed transportation alternative solutions.

## Existing Conditions

**For pedestrians** within the study area, there is an existing concrete sidewalk on the east side of Brookdale Avenue for the entirety of the segment in question (from Seventh Street Court to Fourteenth Street West). On the west side of Brookdale Avenue, however, the concrete sidewalk extends from Ninth Street West to Fourteenth Street West. A pedestrian facility is lacking along the west side of Brookdale Avenue south of Ninth Street West, to the south approach of the traffic circle at the Brookdale Avenue and Seventh Street West intersection.

Regarding east-west travel, there are existing pedestrian crossings at the signalised intersections in the study area. The segments of roadway between the signalised intersections have no dedicated crossings facilities. Given the variety of land uses on either side of Brookdale Avenue between Ninth Street West and Thirteenth Street West, pedestrian desire lines are expected at various locations.

**For cyclists**, a notable gap exists along Brookdale Avenue, specifically within the study area between Seventh Street Court and Fourteenth Street West. This area is mostly void of cycling facilities, except for facilities at the north and south extremities of the study area. At the north approach of the Brookdale Avenue and Fourteenth Street West intersection, a southbound on-street bike lane ends, while a northbound bike lane begins.

At the southern limit of the study area, a multi-use path (MUP) is provided along the west side of Brookdale Avenue between the Harvey's development's north site access and Water Street West, and eventually connects to the Waterfront Trail.

**For transit**, there are several Cornwall Transit bus routes that travel through the study area. Those are bus line 3 – Brookdale, bus line 6 – Cumberland, the community bus service 61, and the express bus line 71.

In addition to the bus lines indicated above, bus line 4 – Riverland touches upon the southern limit of the study area and connects Ninth Street West with Brookdale Avenue south of the study area via Seventh Street Court.

**Regarding roadway safety**, collision data detailing recorded collisions between 2013 and 2022 within the study area was analysed. Based on the analysis, it was found that collisions during the subject timeframe occurred at every intersection along Brookdale Avenue between Seventh Street Court and Fourteenth Street West.

Among the total of 416 collisions that were recorded along the corridor, no fatalities were reported, 19% of them caused injuries, and the remainder were categorized as property-damage only or no damage incidents. Notable collision hotspots included the Seventh Street West traffic circle intersection, the Ninth Street West intersection, and the Thirteenth Street West / Vincent Massey Drive intersection.

Upon consideration of collision types, notable patterns included the turning movement collisions at Ninth Street West, Thirteenth Street West, and the Fourteenth Street West intersections with Brookdale Avenue, the rear end collisions at the Seventh Street West, Ninth Street West, and Vincent Massey Drive / Thirteenth Street West intersections with Brookdale Avenue, and the angle and sideswipe collisions at the Seventh Street West and Brookdale Avenue traffic circle intersection.

**Traffic data** was provided by the City and additional traffic counts were conducted by GHD in February 2024. Following a review of the data, the weekday noon peak hour was selected over the standard AM peak hour for analysis due to the commercial nature of the Brookdale Avenue corridor which yields an expected higher amount of traffic during the noon hour as opposed to the AM peak hour.

The base existing conditions operations have been assessed, and existing critical operations have been found at both the Brookdale Avenue and Ninth Street West intersection during the weekday PM peak hour conditions, and at the Brookdale Avenue and Rosemount Avenue intersection during both the weekday noon and PM peak hour conditions.

## **Future Conditions**

Based on the projected growth in Cornwall, a growth rate of 1.2% was applied to estimate traffic for the future 20-year horizon year. In addition, trips generated from an expected development along the future Ninth Street West corridor were added to the projected traffic volumes. The base future conditions operations which correspond to a **Scenario 1** “Do Nothing” option have been assessed, and anticipated critical operations are expected at the Brookdale Avenue and Fourteenth Street West intersection during the weekday PM peak hour and at the Brookdale Avenue intersections with Seventh Street West, Ninth Street West, Rosemount Avenue, and Thirteenth Street West / Vincent Massey Drive during both the weekday noon and PM peak hours. Comparatively, only the Brookdale Avenue intersections with Ninth Street West and Rosemont Avenue are above the critical threshold in existing conditions. The increase in the number of anticipated critical operations from the existing to future conditions can be attributed to the growth in traffic volumes along the Brookdale Avenue corridor.

To address the expected deficiencies in traffic operations and to address the need for additional multi-modal travel options, three additional alternative scenarios were developed. The various scenarios and their projected results are shown below.

## **Scenario 2**

### **Scenario Details**

- Replacing the traffic circle at Seventh Street West with a signalized intersection.
- Implementing dual left turn lanes in the southbound and eastbound directions at Ninth Street West.
- Changing the Rosemount Avenue and Twelfth Street West intersections into right-turn channels to prohibit through and left-turn movements. The existing exclusive southbound right-turn lane at the Rosemount Avenue intersection is also proposed to be removed.
- Adding a northbound left-turn lane at Thirteenth Street West / Vincent-Massey Drive.
- Replacing the existing two-way left turn lane along Brookdale Avenue between the Thirteenth Street West / Vincent-Massey Drive and Ninth Street West intersections with Brookdale Avenue with a continuous median that has median breaks at the Rosemount Avenue and Twelfth Street West intersections with Brookdale Avenue.

### **Projected Results**

- At the intersection of Brookdale Avenue and Ninth Street West, critical operations during the weekday PM peak hour are expected.
- At the intersection of Brookdale Avenue and Rosemount Avenue, critical operations during the weekday noon peak hour are expected.

## Scenario 3

### Scenario Details

- Replacing the traffic circle at Seventh Street West with a roundabout.
- Replacing the traffic signal at Ninth Street West with a roundabout.
- Replacing the traffic signal at Thirteenth Street West / Vincent Massey Drive with a roundabout.
- Replacing the existing two-way left turn lane along Brookdale Avenue between the Thirteenth Street West / Vincent-Massey Drive and Ninth Street West intersections with Brookdale Avenue with a continuous median.

### Projected Results

- None of the study area intersections are expected to experience critical operations in Scenario 3.

## Scenario 4

### Scenario Details

- Replacing the traffic circle at Seventh Street West with a roundabout.
- Replacing the traffic signal at Ninth Street West with a roundabout.
- Closing the west approach of the Thirteenth Street West / Vincent Massey Drive and Brookdale Avenue intersection.
- Adding a separate right-turn lane on the eastbound approach at Fourteenth Street West. Implementing dual northbound left-turn lanes.
- Changing the Rosemount Avenue and Twelfth Street West intersections into right-turn channels to prohibit through and left-turn movements. The existing exclusive southbound right-turn lane at the Rosemount Avenue intersection is also proposed to be removed.

### Projected Impacts

- None of the study area intersections are expected to experience critical operations in Scenario 4.

In addition to roadway geometry improvements, improvements to active transportation were also contemplated.

For **pedestrians**, it is recommended to implement a sidewalk that addresses the missing pedestrian link along the west side of Brookdale Avenue from Ninth Street West to Seventh Street Court. In addition, due to the absence of east-west pedestrian connections across Brookdale Avenue between Ninth Street West and Thirteenth Street West, a pedestrian crossing facility (pedestrian signals) is suggested near Twelfth Street West.

Also, new pedestrian crossings are also planned at the Seventh Street West/Court consolidated intersection as part of either the traffic signal or roundabout options for this intersection.

Regarding the **cycling network**, three improvement alternatives were considered as part of this EA project: physically separated bike lanes on both sides of Brookdale Avenue, cycle tracks on both sides of Brookdale Avenue, and a multi-use path (MUP) along the west side only of Brookdale Avenue. All alternatives were evaluated under the assumption that the existing two-way left-turn lane would be converted into a 1.5 m median with openings at the Brookdale Avenue intersections with Twelfth Street West and Rosemount Avenue.

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# 1. Introduction

This report is intended to support the City of Cornwall Municipal Class Environmental Assessment (MCEA) for Brookdale Avenue and shall act as a supplement to the Environmental Study Report (ESR). This report presents the City of Cornwall with an understanding of the current transportation network context, the existing and future traffic conditions within the road network, as well as a summary of proposed transportation alternative solutions.

## 1.1 Study Area

The City of Cornwall spans a total land area of 80 square kilometres, with the majority of its approximately 46,000 residents residing within a compact 30 square kilometres of the urban area. The focus of this study is the Brookdale Avenue corridor, extending from Seventh Street Court to Fourteenth Street West. Brookdale Avenue serves as a major arterial roadway, connecting a variety of neighbourhoods and commercial establishments within its vicinity. The Study Area is shown in **Figure 1**, attached.

## 1.2 Transportation Context

The proposed project involves evaluating and enhancing Brookdale Avenue from Seventh Street Court to Fourteenth Street West. The roadway asphalt condition has deteriorated and become poor at certain locations, and there is a need for improved roadway safety as well as facilities provided for active modes of transportation. In addition, some intersections along Brookdale Avenue currently operate at critical capacity and are only expected to worsen in the next 20 years. All of this necessitates an overall review of the transportation network along Brookdale Avenue to address and mitigate current and future transportation challenges.

A previous Harmonized Environmental Assessment (EA) was conducted in 2003 along Brookdale Avenue from Water Street to Seventh Street West. As a result, roadway infrastructure improvements along this segment of Brookdale Avenue were completed in 2016 by the Federal Bridge Corporation Limited (FBCL) and the City.

Additionally, an Environmental Assessment was also concluded along Brookdale Avenue from Fourteenth Street West to Tollgate Road West in 2005, preceding the subsequent reconstruction of this section of the roadway. As such, the subject section of Brookdale Avenue between Seventh Street West and Fourteenth Street West constitutes a missing link for reconstruction along the Brookdale Avenue corridor.

# 2. Existing Conditions

## 2.1 Road Network

Brookdale Avenue between Seventh Street Court and Fourteenth Street West is a north-south arterial road with a posted speed limit of 50 km/h. It is approximately 1.2 kilometres in length and has an annual average daily traffic (AADT) which typically ranges between 15,000 and 20,000 vehicles per day. The roadway cross-section within the study area typically consists of two lanes in each direction that are separated by a median between Seventh Street Court and Ninth Street West and between Thirteenth Street West and Fourteenth Street West, or a two-way left turn lane between Ninth Street West and Thirteenth Street West.

Within the Brookdale Avenue corridor study area, there are three signalized intersections located at Ninth Street West, Thirteenth Street West, and Fourteenth Street West, three stop-controlled intersections

located at Twelfth Street West, Rosemount Avenue and Henry Street, a traffic circle located at Seventh Street West, as well as a right-in, right-out yield intersection at Seventh Street Court. In addition, there are several commercial driveways along the corridor.

## 2.2 Active Transportation Network

### 2.2.1 Pedestrian Network

Within the study area, there is an existing concrete sidewalk on the east side of Brookdale Avenue for the entirety of the segment in question (from Seventh Street Court to Fourteenth Street West). On the west side of Brookdale Avenue, however, the concrete sidewalk extends from Ninth Street West to Fourteenth Street West. A pedestrian facility is lacking along the west side of Brookdale Avenue south of Ninth Street West, to the south approach of the traffic circle at the Brookdale Avenue and Seventh Street West intersection, where a multi-use path (MUP) connects to a concrete sidewalk that travels along the south side of the Seventh Street West west approach to the traffic circle. The transition between concrete sidewalk and the MUP occurs at the Harvey's restaurant's north site access to Brookdale Avenue.

Regarding east-west travel, there are existing pedestrian crossings at the signalised intersections in the study area. The segments of roadway between the signalised intersections have no dedicated crossings facilities. There is a nearly 500-meter stretch between Ninth Street West and Thirteenth Street West with no pedestrian crossing facilities. This gap, which would require pedestrians to take a notable detour, may prompt some pedestrians to "jaywalk". There are no dedicated pedestrian east-west crossing facilities south of the Ninth Street West intersection until the south extremity of the study area, where there is an informal and uncontrolled pedestrian crossing south of the Seventh Street traffic circle. This uncontrolled crossing has an increased risk to pedestrian safety due to the absence of signage and pavement markings associated with a PXO or pedestrian signals.

An overview of the land use surrounding the segment of Brookdale Avenue within the study limits indicates that the Brookdale Avenue corridor is predominantly commercial in nature and includes a variety of commercial/retail/services establishments on both sides of the street. On the east side, north of Ninth Street West, residential uses are also present behind the initial frontage of commercial uses. Given the variety of land uses on either side of Brookdale Avenue, pedestrian desire lines are expected at various locations. For example, a pedestrian desire line would be anticipated between the Century Hotel and Boston Pizza, or between Elect Inn 5 and Shoeless Joe's Sports Grill. A pedestrian desire line may also be expected between the employment and commercial uses along the east side of Brookdale Avenue at Seventh Street Court and the Harvey's located at the west side of the street.

It should be mentioned that according to the City's 2010 Bicycle and Pedestrian Master Plan, there are recommendations for a boulevard multi-use trail from Ninth Street West to the Waterfront Trail, a sidewalk along the west side of the Seventh Street West traffic circle that mirrors the east side in design, sidewalks on both sides of the Seventh Street West east approach of this intersection, and a sidewalk at the south side of Seventh Street Court roadway.

### 2.2.2 Cycling Network

The cycling infrastructure in the City of Cornwall spans an extensive 40 kilometres, with the Waterfront Trail as a central feature along the Saint Lawrence River. The existing cycling network is shown in **Figure 2**, attached.

A notable gap exists along Brookdale Avenue, specifically within the study area between Seventh Street Court and Fourteenth Street West. This area is mostly void of cycling facilities, except for facilities at the north and south extremities of the study area. At the north approach of the Brookdale Avenue and Fourteenth Street West intersection, a southbound on-street bike lane ends, while a northbound bike lane begins. The southbound bike lane begins at Sara Street north of the subject site. At the Brookdale

Avenue and Fourteenth Street West intersection, southbound cyclists using the bike lane are expected to merge with motorists and share the road after crossing the intersection towards the south. Regarding northbound cyclists, those have a bike lane provided up until the commercial shopping plaza just north of Tollgate Road West.

At the southern limit of the study area, a MUP is provided along the west side of Brookdale Avenue between the Harvey's development's north site access and Water Street West, and eventually connects to the Waterfront Trail.

In the east-west direction, existing cycling facilities within our study area include a MUP along the north side of Fourteenth Street West which connects to Vincent Massey Drive and the hydro corridor trail towards the west, and bike lanes along both sides of Seventh Street West between the Harvey's Seventh Street West access and Hoople Avenue towards the west. According to the City's 2010 Bicycle and Pedestrian Master Plan, a boulevard multi-use trail from the Waterfront Trail to Ninth Street West, and subsequent bike lanes extending from Ninth Street West to south of Tollgate Road West along both sides of Brookdale Avenue are proposed measures. Regarding the Brookdale Avenue and Seventh Street West traffic circle intersection, it is also proposed to add a paved shoulder with bike lane along the east approach.

## 2.3 Transit Network

There are several Cornwall Transit bus routes that travel through the study area. Those are bus line 3 – Brookdale, bus line 6 – Cumberland, the community bus service 61, and the express bus line 71.

Bus line 3 – Brookdale and the express bus line 71 both cover the study area from Seventh Street West to Fourteenth Street West and continue further northward. Bus line 6 – Cumberland serves the study area from Ninth Street West to Vincent Massey Drive and continues further north-westward along Vincent Massey Drive. The community bus line 61 traverses the study area between Ninth Street West and Seventh Street Court where it continues southward.

In addition to the bus lines indicated above, it should be mentioned that bus line 4 – Riverland touches upon the southern limit of the study area and connects Ninth Street West with Brookdale Avenue south of the study area via Seventh Street Court. **Figure 3** to **Figure 5** illustrate the bus line maps for all subject bus routes.

## 2.4 Safety

Collision data detailing recorded collisions between 2013 and 2022 within the study area was analysed. Based on the analysis, it was found that collisions during the subject timeframe occurred at every intersection along Brookdale Avenue between Seventh Street Court and Fourteenth Street West, as shown in **Figure 6**.

Among the total of 416 collisions that were recorded along the corridor, no fatalities were reported, 19% of them caused injuries, and the remainder were categorized as property-damage only or no damage incidents. Notable collision hotspots included the Seventh Street West traffic circle intersection (107 collisions), the Ninth Street West intersection (129 collisions), and the Thirteenth Street West / Vincent Massey Drive intersection (83 collisions).

Upon consideration of collision types, notable patterns included the turning movement collisions at Ninth Street West, Thirteenth Street West, and the Fourteenth Street West intersections with Brookdale Avenue, the rear end collisions at the Seventh Street West, Ninth Street West, and Vincent Massey Drive / Thirteenth Street West intersections with Brookdale Avenue, and the angle and sideswipe collisions at the Seventh Street West and Brookdale Avenue traffic circle intersection. Error! Reference source not

found. and **Table 2** show the total amount of reported collisions between 2013 and 2022 within the study area by severity and by type, respectively.

*Table 1 - Total Collisions by Severity*

<b>Total Collisions by Severity</b>									
<b>Severity/ intersection</b>	Seventh Street Court	Seventh Street West Traffic Circle	Ninth Street West	Twelfth Street West	Rosemount Avenue	Thirteenth Street West	Vincent Massey	Henry Street	Fourteenth Street West
<b>PDO</b>	2	75	80	3	10	59	16	0	22
<b>Injury</b>	0	15	24	1	4	16	5	2	12
<b>Fatal</b>	0	0	0	0	0	0	0	0	0
<b>No Damage</b>	0	17	25	1	1	8	8	0	10
<b>Individual Totals</b>	2	107	129	5	15	83	29	2	44
<b>Grand Total</b>	<b>416</b>								

*Table 2 – Total Collisions by Type*

<b>Total Collisions by Type</b>									
<b>Type/ intersection</b>	Seventh Street Court	Seventh Street West Traffic Circle	Ninth Street West	Twelfth Street West	Rosemount Avenue	Thirteenth Street West	Vincent Massey	Henry Street	Fourteenth Street West
<b>Approaching</b>	0	0	2	0	1	0	0	0	0
<b>Angle</b>	0	22	9	2	1	11	4	1	7
<b>Rear end</b>	2	23	69	0	3	34	17	0	13
<b>Sideswipe</b>	0	44	16	0	1	12	2	0	5
<b>Turning movement</b>	0	4	22	1	5	15	4	1	16
<b>SMV unattended vehicle</b>	0	2	3	0	0	1	0	0	0
<b>SMV other</b>	0	12	6	2	3	8	0	0	0
<b>Backed into</b>	0	0	2	0	0	1	2	0	1
<b>Other</b>	0	0	0	0	1	1	0	0	2
<b>Individual Totals</b>	2	107	129	5	15	83	29	2	44
<b>Grand Total</b>	<b>416</b>								

## 2.5 Data Collection

The city provided comprehensive 8-hour traffic counts at key intersections along the Brookdale Avenue corridor. Additionally, traffic counts were conducted by GHD in February 2024 at the commercial site accesses within the study area. These counts covered three peak hour periods: the weekday noon, the weekday PM, and the Saturday noon peak hours.

Regarding the weekday counts used for the sake of traffic operations analysis, the noon peak hour was selected over the standard AM peak hour due to the commercial nature of the Brookdale Avenue corridor which yields an expected higher amount of traffic during the noon hour as opposed to the AM peak hour.

A summary of the existing conditions traffic volumes at the various study area key intersections during the weekday noon and PM peak hours is presented in **Figure 7**.

## 2.6 Existing Traffic Operations

Using the existing conditions turning movement counts shown in **Figure 7** the study area intersections were analyzed through the Synchro 11 software package. Based on the City of Cornwall Traffic Impact Study Guidelines dated March 3, 2023, some of the criteria for identifying critical intersections are as follows:

- For signalized intersections, a volume to capacity (v/c) ratio that is greater than 0.85 for through movements, or shared through/turning movements, or greater than 0.90 for exclusive turning movements would be considered critical. These parameters for identifying critical operations were selected for this EA report as well.
- For unsignalized intersections, a level of service (LOS) value greater than D is considered critical. This parameter for identifying critical operations was selected for this EA report as well.

**Table 3** shows Level of Service criteria and descriptions for both signalized and unsignalized intersections, based on the Highway Capacity Manual (HCM), 6<sup>th</sup> Edition.

*Table 3 – Level of Service (LOS) Criteria and Descriptions*

Level of Service	Average Control Delay (Sec/Veh)		Description
	Signalized Intersection	Unsignalized Intersection	
<b>A</b>	≤ 10	≤ 10	Free Flow
<b>B</b>	> 10 and ≤ 20	> 10 and ≤ 15	Stable Flow (slight delays)
<b>C</b>	> 20 and ≤ 35	> 15 and ≤ 25	Stable Flow (acceptable delays)
<b>D</b>	> 35 and ≤ 55	> 25 and ≤ 35	Approaching Unstable Flow (tolerable delay)
<b>E</b>	> 55 and ≤ 80	> 35 and ≤ 50	Unstable Flow (intolerable delay)
<b>F</b>	> 80	> 50	Forced Flow (congested and queues fail to clear)

The following **Table 4** details traffic operations in existing conditions for the study area intersections during the weekday noon and PM peak hour periods. Detailed Synchro analysis output reports for existing conditions traffic operations are provided in **Appendix A**.

*Table 4 – Existing Conditions Traffic Operations*

Intersection	Overall Intersection				Critical Movements						
	Noon Peak Hour		PM Peak Hour		Movement	Noon Peak Hour			PM Peak Hour		
	LOS	Delay (s)	LOS	Delay (s)		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
<b>Signalized Intersections</b>											
<b>Fourteenth Street West</b>	B	11.6	B	10.6	-	-	-	-	-	-	-
<b>Vincent Massey - Thirteenth Street West</b>	B	17.8	B	18.5	-	-	-	-	-	-	-
<b>Ninth Street West</b>	C	30.0	D	39.4	WBR	-	-	-	F	82.4	0.99
<b>Unsignalized Intersections</b>											
<b>Rosemount Avenue</b>	A	2.2	A	2.6	EBLTR	E	44.3	0.50	E	44.6	0.58
<b>Twelfth Street West</b>	A	0.6	A	0.9	-	-	-	-	-	-	-
<b>Seventh Street West (Traffic Circle)</b>	A	6.1	A	7.3	-	-	-	-	-	-	-
<b>Seventh Street Court</b>	A	0.6	A	0.6	-	-	-	-	-	-	-

As per **Table 4**, intersection operations in existing conditions during both the weekday noon and PM peak hours are generally considered acceptable and below critical thresholds. The exceptions are:

- At the intersection of Brookdale Avenue and Ninth Street West, a critical v/c ratio of 0.99 for the westbound right-turn movement during the weekday PM peak hour conditions is noticed; and
- At the intersection of Brookdale Avenue and Rosemount Avenue, critical LOS values of 'E' for the shared eastbound left-turn, through, and right-turn lane during both the weekday noon and PM peak hour conditions are noticed.

### 3. Future Conditions

#### 3.1 Future Traffic Volumes

Upon review of historical volume data since 2010 at various intersections along Brookdale Avenue, and upon consideration of expected trends as well as growth rates that were used in previous transportation impact studies, a growth rate of 1.2% was selected for the purpose of anticipating future traffic within the study area. This growth rate accounts for future background developments which may not be known or confirmed at this time.

When considering at this time known and confirmed background projects within vicinity of the segment of Brookdale Avenue under review, there are currently undeveloped lands east of the Riverdale neighbourhood that are expected to be developed as residential and industrial properties within the study's horizon. Trips generated from these lands were added to the traffic volumes after the 1.2% growth rate to existing conditions volumes was applied. A summary of the future conditions traffic volumes is presented in **Figure 8**.

## 3.2 Future Traffic Operations

Using the projected future conditions turning movement counts shown in **Figure 8**, the study area intersections were analysed using the Synchro 11 software package.

The following **Table 5** details traffic operations in future conditions for the study area intersections during the weekday noon and PM peak hour periods. The results shown in this table are reflective of future conditions where no network improvements have been applied. As such, this base future conditions scenario is considered the first of four alternative scenarios for the Brookdale Avenue corridor that will be considered as part of this EA report and corresponds to the “Do Nothing” scenario. Detailed Synchro analysis output reports for future conditions (Scenario 1) traffic operations are provided in **Appendix B**.

Table 5 – Future Conditions Traffic Operations for Scenario 1

Intersection	Overall Intersection				Critical Movements							
	Noon Peak Hour		PM Peak Hour		Movement	Noon Peak Hour			PM Peak Hour			
	LOS	Delay (s)	LOS	Delay (s)		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C	
<b>Signalized Intersections</b>												
<b>Fourteenth Street West</b>	B	16.8	B	18.0	NBL	-	-	-	C	31.6	<b>0.91</b>	
<b>Vincent Massey - Thirteenth Street West</b>	C	25.3	D	35.2	NBT	C	32.7	<b>0.89</b>	F	53.2	<b>1.01</b>	
<b>Ninth Street West</b>	E	61.0	F	104.2	WBR	F	106.6	<b>1.06</b>	F	202.8	<b>1.32</b>	
					NBT	D	49.5	<b>0.88</b>	D	48.5	<b>0.86</b>	
					EBL	E	73.3	<b>0.98</b>	F	248.3	<b>1.45</b>	
					SBL	F	134.2	<b>1.17</b>	F	193.5	<b>1.32</b>	
<b>Unsignalized Intersections</b>												
<b>Rosemount Avenue</b>	D	27.8	E	38.9	EBLTR	<b>F</b>	876	2.50	<b>F</b>	957.4	2.77	
<b>Twelfth Street West</b>	A	4.2	A	5.0	-	-	-	-	-	-	-	
<b>Seventh Street West (Traffic Circle)</b>	B	11.8	C	17.9	EBL	<b>E</b>	41.7	0.67	<b>F</b>	57.0	0.80	
<b>Seventh Street Court</b>	A	0.7	A	0.7	-	-	-	-	-	-	-	

As shown in **Table 5**, study area intersections in future conditions during both the weekday noon and PM peak hours exhibit noticeably more critical operations than in existing conditions. The anticipated critical operations in future conditions are as follows:

- At the traffic circle intersection of Brookdale Avenue and Seventh Street West, critical LOS values of ‘E’ and ‘F’ during the weekday noon and PM peak hours respectively are expected for motorists at the eastbound yield bar (at the south side of the traffic circle).
- At the intersection of Brookdale Avenue and Ninth Street West, critical v/c ratios during both noon and PM peak hours are expected for the westbound right-turn, the northbound through, the eastbound left-turn, and the southbound left-turn movements.
- At the intersection of Brookdale Avenue and Rosemount Avenue, critical LOS values of ‘F’ for the shared eastbound left-turn, through, and right-turn lane during both the weekday noon and PM peak hours are expected.

- At the intersection of Brookdale Avenue and Thirteenth Street West / Vincent Massey Drive, critical v/c ratios of 0.89 and 1.01 during the weekday noon and PM peak hours respectively are expected for the northbound through movement.
- At the intersection of Brookdale Avenue and Fourteenth Street West, a critical v/c ratio of 0.91 during the weekday PM peak hour for the northbound left-turn movement is expected.

## 3.3 Potential Improvements

### 3.3.1 Overall Intersection and Corridor Enhancements

The present EA report suggests various potential improvement measures to both the Brookdale Avenue corridor and its intersections within the study area. As stated in **Section 3.2**, there are a total of four alternative future scenarios proposed, the first of which was simply the “Do Nothing” option that was assessed in the previous section. The following subsections identify and analyse the intersection and corridor enhancements that are proposed as part of the remaining three scenarios under review in this EA report.

#### 3.3.1.1 Scenario 2

In Scenario 2, the following intersection and corridor enhancements were proposed for consideration:

- Consolidating the Seventh Street West, Seventh Street Court, and Harvey’s development accesses into Brookdale Avenue into a single approach on each side of a newly signalized intersection at this location.
- Implementing intersection improvements at the Ninth Street West and Brookdale Avenue intersection by introducing dual left turn lanes in the southbound and eastbound directions, as well as by optimizing the current signal timing plans.
- Converting the Twelfth Street West and Rosemount Avenue intersections with Brookdale Avenue into right-turn channels to prohibit through and left-turn movements. The existing exclusive southbound right-turn lane at the Rosemount Avenue intersection is also proposed to be removed.
- Implementing intersection improvements at the Thirteenth Street West / Vincent-Massey Drive and Brookdale Avenue intersection by permitting motorists to perform the northbound left-turn movement which is currently prohibited. This is to be combined with optimization of the current signal timing plans.

As a result of allowing the northbound left-turn movement at the Thirteenth Street West / Vincent-Massey Drive and Brookdale Avenue intersection, this is expected to also improve conditions at the Fourteenth Street West and Brookdale Avenue intersection for the northbound left-turn movement.

- Replacing the existing two-way left turn lane along Brookdale Avenue between the Ninth Street West and Thirteenth Street West / Vincent-Massey Drive intersections with Brookdale Avenue with a continuous median that has median breaks at the Twelfth Street West and Rosemount Avenue intersections with Brookdale Avenue.

**Table 6** details traffic operations in future conditions for the study area intersections during the weekday noon and PM peak hour periods for Scenario 2. Detailed Synchro analysis output reports for future conditions traffic operations for Scenario 2 are provided in **Appendix C**.

Table 6 – Future Conditions Traffic Operations for Scenario 2

Intersection	Overall Intersection				Critical Movements						
	Noon Peak Hour		PM Peak Hour		Movement	Noon Peak Hour			PM Peak Hour		
	LOS	Delay (s)	LOS	Delay (s)		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
<b>Signalized Intersections</b>											
<b>Fourteenth Street West</b>	B	12.2	B	11.5	-	-	-	-	-	-	-
<b>Vincent Massey - Thirteenth Street West</b>	C	22.8	C	24.2	-	-	-	-	-	-	-
<b>Ninth Street West</b>	D	46.5	E	57.2	EBL	-	-	-	E	79.9	0.96
					SBL	-	-	-	F	80.6	0.96
					NBT	-	-	-	E	73.4	0.99
<b>Unsignalized Intersections</b>											
<b>Rosemount Avenue</b>	A	3.4	A	2.8	NBL	E	37.1	0.74	-	-	-
<b>Twelfth Street West</b>	A	0.6	A	0.9	-	-	-	-	-	-	-
<b>Seventh Street West (Traffic Circle)</b>	B	15.8	B	18.4	-	-	-	-	-	-	-

As shown in **Table 6**, through the proposed geometric and signal timing changes, the study area intersections in future conditions during both the weekday noon and PM peak hours generally exhibit much less critical operations than in Scenario 1 (the “Do Nothing” option). The anticipated critical operations in Scenario 2 are as follows:

- At the intersection of Brookdale Avenue and Ninth Street West, critical v/c ratios of 0.96, 0.96, and 0.99 for the eastbound left-turn, the southbound left-turn and the northbound through movements, respectively, are expected during the weekday PM peak hour.

Although these v/c ratios are considered critical, it should be mentioned that these v/c ratios are still not exceeding theoretical capacities of 1.0. For a future conditions scenario that is for 20 years in the future and that has conservatively been grown significantly from existing conditions, these v/c ratios that are below 1.0 may be considered acceptable at this time, with the understanding that further intersection modifications may or may not be necessary at a point even further into the future if further growth were to occur.

- At the intersection of Brookdale Avenue and Rosemount Avenue, a critical LOS value of ‘E’ for the northbound left-turn movement is noticed during the weekday noon peak hour.

Although this movement was not critical in Scenario 1, this movement has become critical in Scenario 2 due to the removal of the two-way left-turn lane along Brookdale Avenue, which is expected to cause northbound motorists looking to access businesses along the west side of Brookdale Avenue to look for the nearest median break to be able to turn around. This LOS value is still not failing at ‘F’ however, and it should be mentioned that in actual conditions in the future, not all northbound left-turning motorists that were assumed at this location are expected to consolidate at Rosemount Avenue as per this conservative scenario that was assessed. With a reduction of less than ten vehicles, the northbound left-turn volume at this intersection was found to operate with an acceptable LOS of ‘D’ during the weekday noon peak hour.

### 3.3.1.2 Scenario 3

In Scenario 3, the following intersection and corridor enhancements were proposed for consideration:

- Consolidating the Seventh Street West, Seventh Street Court, and Harvey's development accesses into Brookdale Avenue into a roundabout intersection at the current Seventh Street Court location. The roundabout would have two approach lanes in the northbound and southbound directions, but only one approach lane in the eastbound and westbound directions.
- Converting the Ninth Street West and Brookdale Avenue intersection into a roundabout. The roundabout would have at least two approach lanes in all directions. In addition, in the northbound direction, an exclusive right-turn channel would be proposed as well.
- Converting the Thirteenth Street West / Vincent Massey Drive and Brookdale Avenue intersection into a roundabout. The roundabout would have at least two approach lanes in all directions. In addition, in the northbound direction, an exclusive right-turn channel would be proposed as well. The south lane in the eastbound direction would also be an exclusive right-turn channel (as in existing conditions).

As a result of allowing the northbound left-turn movement at the Thirteenth Street West / Vincent-Massey Drive and Brookdale Avenue intersection through the implementation of a roundabout, this is expected to also improve conditions at the Fourteenth Street West and Brookdale Avenue intersection where the northbound left-turn movement is expected to be critical in future unmitigated conditions due to elevated volumes.

- Replacing the existing two-way left turn lane along Brookdale Avenue between the Ninth Street West and Thirteenth Street West / Vincent-Massey Drive intersections with Brookdale Avenue with a continuous median that has no breaks.

**Table 7** and **Figure 9** through **11** detail traffic operations in future conditions for the study area intersections during the weekday noon and PM peak hour periods for Scenario 3. Detailed Synchro analysis output reports for future conditions traffic operations for Scenario 3 (for non-roundabout intersections) are provided in **Appendix D**. Arcady output reports for roundabout analysis are also provided in **Appendix F**.

Table 7 – Future Conditions Traffic Operations for Scenario 3

Intersection	Overall Intersection				Critical Movements						
	Noon Peak Hour		PM Peak Hour		Movement	Noon Peak Hour			PM Peak Hour		
	LOS	Delay (s)	LOS	Delay (s)		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
<b>Signalized Intersection</b>											
<b>Fourteenth Street West</b>	B	12.2	B	11.5	-	-	-	-	-	-	-
<b>Unsignalized Intersections</b>											
<b>Vincent Massey – Thirteenth Street West</b>	A	5.0	A	7.8	-	-	-	-	-	-	-
<b>Ninth Street West</b>	A	7.9	B	14.8	-	-	-	-	-	-	-
<b>Rosemount Avenue</b>	A	0.7	A	1.0	-	-	-	-	-	-	-
<b>Twelfth Street West</b>	A	0.2	A	0.3	-	-	-	-	-	-	-
<b>Seventh Street Court</b>	A	3.7	A	4.0	-	-	-	-	-	-	-

As shown in **Table 7** and **Figure 9** through **11**, none of the study area intersections are expected to experience critical operations in Scenario 3 (the v/c ratio that is colour-coded in red for the Brookdale Avenue and Ninth Street West intersection in **Figure 10** is not actually considered “critical” in this report since for unsignalized intersections, LOS values are the indicators of critical operations as per the stated evaluation criteria in **Section 2.6**).

### 3.3.1.3 Scenario 4

In Scenario 4, the following intersection and corridor enhancements were proposed for consideration:

- Consolidating the Seventh Street West, Seventh Street Court, and Harvey’s development accesses into Brookdale Avenue into a roundabout intersection at the current Seventh Street West (traffic circle) location. The roundabout would have two approach lanes in the northbound and southbound directions, but only one approach lane in the eastbound and westbound directions.
- Converting the Ninth Street West and Brookdale Avenue intersection into a roundabout. The roundabout would have at least two approach lanes in all directions. In addition, in the northbound direction, an exclusive right-turn channel would be proposed as well.
- Converting the Twelfth Street West and Rosemount Avenue intersections with Brookdale Avenue into right-turn channels to prohibit through and left-turn movements. The existing exclusive southbound right-turn lane at the Rosemount Avenue intersection is also proposed to be removed.
- Removing the west approach of the Thirteenth Street West / Vincent Massey Drive and Brookdale Avenue intersection and therefore prohibiting the current southbound right-turn, westbound through, and all eastbound movements at this intersection.
- Implementing intersection improvements at the Fourteenth Street West and Brookdale Avenue intersection by splitting the current shared eastbound through and right-turn lane into separate exclusive through and right turn lanes, by introducing dual left-turn lanes in the northbound direction, as well as by optimizing the current signal timing plans.

**Table 8** details traffic operations in future conditions for the study area intersections during the weekday noon and PM peak hour periods for Scenario 4. Detailed Synchro analysis output reports for future conditions traffic operations for Scenario 4 (for non-roundabout intersections) are provided in **Appendix E**. Arcady output reports for roundabout analysis are also provided in **Appendix F**.

*Table 8 – Future Conditions Traffic Operations for Scenario 4*

Intersection	Overall Intersection				Critical Movements						
	Noon Peak Hour		PM Peak Hour		Movement	Noon Peak Hour			PM Peak Hour		
	LOS	Delay (s)	LOS	Delay (s)		LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
<b>Signalized Intersections</b>											
<b>Fourteenth Street West</b>	D	35.8	C	33.0	-	-	-	-	-	-	-
<b>Vincent Massey - Thirteenth Street West</b>	B	11.4	B	15.4	-	-	-	-	-	-	-
<b>Unsignalized Intersections</b>											
<b>Ninth Street West</b>	A	7.9	B	14.8	-	-	-	-	-	-	-
<b>Rosemount Avenue</b>	A	1.7	A	2.0	-	-	-	-	-	-	-
<b>Twelfth Street West</b>	A	0.4	A	0.7	-	-	-	-	-	-	-
<b>Seventh Street West</b>	A	3.7	A	4.0	-	-	-	-	-	-	-

As shown in **Table 8** and based on the roundabout analyses previously shown in **Figures 9** and **10** for Scenario 3 (which can also conservatively inform future conditions for Scenario 4), none of the study area intersections are expected to experience critical operations in Scenario 4.

## 3.3.2 Sustainable Modes of Transportation Enhancements

### 3.3.2.1 Pedestrian Network

Regarding the north-south pedestrian network, a continuous sidewalk is present in the study area along the east side of Brookdale Avenue. However, there is a missing pedestrian link along the west side of Brookdale Avenue from Ninth Street West to Seventh Street Court (at the Harvey's development's south access). Implementing a sidewalk in this gap is recommended to enhance pedestrian connectivity.

Regarding the east-west pedestrian network, there is currently no east-west pedestrian crossing facility across Brookdale Avenue between Ninth Street West and Thirteenth Street West (a distance between existing crosswalks of over 450 meters). This absence of connection may lead to instances of jaywalking at any of the pedestrian desire line locations outlined in **Section 2.2** of this report. To mitigate this issue and to consolidate the various nearby pedestrian desire lines, a pedestrian crossing facility is preliminarily recommended near Twelfth Street West. Due to high two-way vehicular volume along Brookdale Avenue and due to the roadway geometric conditions at that location however, it should be noted that pedestrian crossovers (PXOs) would not be recommended there according to the Ontario Traffic Manual (OTM) Book 15. As such, a pedestrian signal at that location near Twelfth Street West would be recommended instead.

In addition to a new crossing facility near Twelfth Street West, new pedestrian crosswalks are also planned to be implemented at the new Seventh Street West/Court consolidated intersection as part of the traffic signal or roundabout options for this intersection which are being proposed in Scenarios 2-4.

As for the rest of the study area intersections where pedestrian crosswalks currently exist, it should be mentioned that despite any intersection modification proposed as part of the various scenarios that were considered in **Section 3.3**, the existing pedestrian crossing facilities currently in place will be ensured to be maintained.

### 3.3.2.2 Cycling Network

Regarding the cycling network within the study area, three improvement alternatives were considered as part of this EA project, and in coordination with the Ontario Traffic Manual (OTM) Book 18. All these improvement alternatives are expected to improve cycling safety, comfort, and connectivity. The selection of one alternative over the other will depend on several factors including anticipated impacts on existing infrastructure, widening and space requirements, expected levels of safety and stakeholder support, and more.

The three alternatives include each of the following: physically separated bike lanes on both sides of Brookdale Avenue, cycle tracks on both sides of Brookdale Avenue, and a multi-use path (MUP) along the west side only of Brookdale Avenue. All alternatives were evaluated under the assumption that the existing two-way left-turn lane (5 meters) would be converted into a 1.5 m median with openings at Twelfth Street West and Rosemount Avenue. Each of the three alternatives have been described below.

#### ***Physically Separated Bike Lanes***

A physically separated bicycle lane is a portion of a roadway designated for cyclists, situated at the same level as the vehicle's lanes. It is separated from adjacent motor vehicle lanes by a horizontal buffer which contains vertical elements such as flex bollards or a barrier curb. The physically separated bike lanes alternative evaluated the addition of bike lanes on both sides of Brookdale Avenue, with recommended widths of 1.5 meters for the bike lane and 1.0 meter for the buffer zone – for a total combined width of 2.5 meters. Accommodating these bike lanes would require reconfiguring the existing boulevard and

sidewalks to meet the necessary width requirements but would not necessitate any land acquisition. Considering the large volume of vehicles along Brookdale Avenue, a physical separation is essential to provide a secure environment for cyclists. However, due to the numerous business accesses in the area, the physical separation has been found to be difficult to be maintained continuously along the corridor.

### ***Cycle Tracks***

Cycle tracks are a physically separated bikeway placed at the same level as the sidewalk. The project's cycle tracks alternative considered one-way cycle tracks on each side of Brookdale Avenue. Since the sidewalk and cycle track at each side of Brookdale Avenue would be placed at the same elevation and adjacent to one another, a tactile buffer strip would need to be provided between the two to assist the visually impaired with distinguishing the limits of each. Cycle tracks in this case would also need to be separated from the roadway by a horizontal buffer. As such, the recommended total cycling facility width in this case would be 2.0 meters – split into a 1.5 meters cycle track and a 0.5-meter curb and gutter buffer zone. This cycling facility would be split from a 1.5m sidewalk through a 0.6m tactile strip. Accommodating the cycle tracks on each side of Brookdale Avenue would require reconfiguring the existing boulevard and sidewalks to meet the necessary width requirements but would not necessitate any land acquisition.

### ***Multi-Use Path***

As is the case for cycle tracks, a multi-use path (MUP) is horizontally and vertically separated from motor vehicle traffic by a curb. It provides two-way travel and is shared between cyclists and pedestrians. For this option, the MUP would be considered on the west side of Brookdale Avenue to ensure continuity with the existing MUP south of Seventh Street Court (at the Harvey's development's south access). The sidewalk on the east side of Brookdale Avenue would remain. The recommended total width for the MUP would be 3.5 meters – split into a 3.0 meters-wide path and a 0.5-meter curb and gutter buffer zone. Implementing the MUP would involve reconfiguring the existing boulevard and removing the current sidewalk along the west side of Brookdale Avenue to meet the necessary width requirements, without requiring any land acquisition once again.

### **3.3.2.3 Transit Network**

While no transit enhancements have been considered as part of this report, the impacts to the existing transit network as a result of the proposed roadway modifications for the sake of the various other modes of transportation have been reviewed. These impacts on the existing transit network are described below by location within the Brookdale Avenue corridor.

#### ***Seventh Street West/Court and Brookdale Avenue***

The consolidation of the existing Seventh Street West and Seventh Street Court intersections into a single roundabout intersection (Scenarios 3 and 4) may have negligible impacts on bus line 4 with slight bus stop relocations. The consolidation of the existing Seventh Street West and Seventh Street Court intersections into a single signalized intersection (Scenario 2) would have impacts on lines 3 and 71. As these routes both use the existing traffic circle to redirect their routes from the southbound to the northbound direction on Brookdale Avenue after stopping at the Brookdale Centre, a bus path rerouting exercise would be required for both bus lines to be able to do this manoeuvre. A possible rerouting option for these bus line would be to perform a southbound left-turn movement at the newly signalized Seventh Street West/Court and Brookdale Avenue intersection, followed by an eastbound left-turn movement at the commercial plaza entrance off of Seventh Street West (west of Cumberland Street), before performing a northbound left-turn movement at Ninth Street West followed by a westbound right-turn movement at the Ninth Street West and Brookdale Avenue intersection.

### ***Ninth Street West and Brookdale Avenue***

None of improvement options presented at this intersection require bus line rerouting or relocation. As mentioned before however, a signalized intersection at and Seventh Street West/Court and Brookdale Avenue may necessitate bus lines 3 and 71 to be rerouted to perform a westbound right-turn movement at this Ninth Street West and Brookdale Avenue intersection.

### ***Thirteenth Street West / Vincent Massey Drive and Brookdale Avenue***

Most of the improvement options presented at this intersection do not require any bus line rerouting or relocation. However, for Scenario 4 where the west approach of the intersection is proposed to be closed, this would have clear impacts on bus line 6 which would need to be rerouted as this route currently arrives from Vincent Massey Drive and performs an eastbound right-turn movement at the Thirteenth Street West / Vincent Massey Drive and Brookdale Avenue intersection. A possible rerouting option for this bus line would be to perform a southbound left-turn movement at the Vincent Massey and Fourteenth Street West intersection, followed by an eastbound right-turn movement at the Fourteenth Street West and Brookdale Avenue intersection. However, it should be noted that neither the short-term transit plan (1-5 years) nor the long-term plan detailed in the City of Cornwall's Transit Master Plan include a route along Vincent Massey Drive. As such, although the Scenario 4 potential works mentioned in this EA report would require the immediate rerouting of bus line 6 to maintain existing service, this change where line 6 would be removed from Vincent Massey Drive (south of Fourteenth Street West in this case) would be in line with the City of Cornwall's transit vision anyways. Therefore, Scenario 4 would have minimal impacts on the transit network in the future when considering the recommendations of the City's Transit Master Plan.

### ***Fourteenth Street West and Brookdale Avenue***

None of improvement options presented at this intersection require bus line rerouting or relocation. As mentioned before however, the closure of the west approach of the Thirteenth Street West / Vincent Massey Drive and Brookdale Avenue intersection may necessitate bus line 6 to be rerouted to perform an eastbound right-turn movement at this Fourteenth Street West and Brookdale Avenue intersection.

### ***Overall Brookdale Avenue Corridor***

In addition to impacts on transit bus lines due to intersection modifications, bus stops and routes within the overall Brookdale Avenue corridor can also be affected by the proposed active transportation measures along Brookdale Avenue. Depending on the type of cycling facility selected for example, the existing bus stops along Brookdale Avenue near Twelfth Street West (both sides) and Henry Street (east side) may be impacted because of new interaction zones between cyclists and busses. This is another consideration for transit facilities.

# Figures



City of Cornwall  
 Cornwall Brookdale Avenue EA  
 Study Area

12628280

May 3, 2024

FIGURE 1

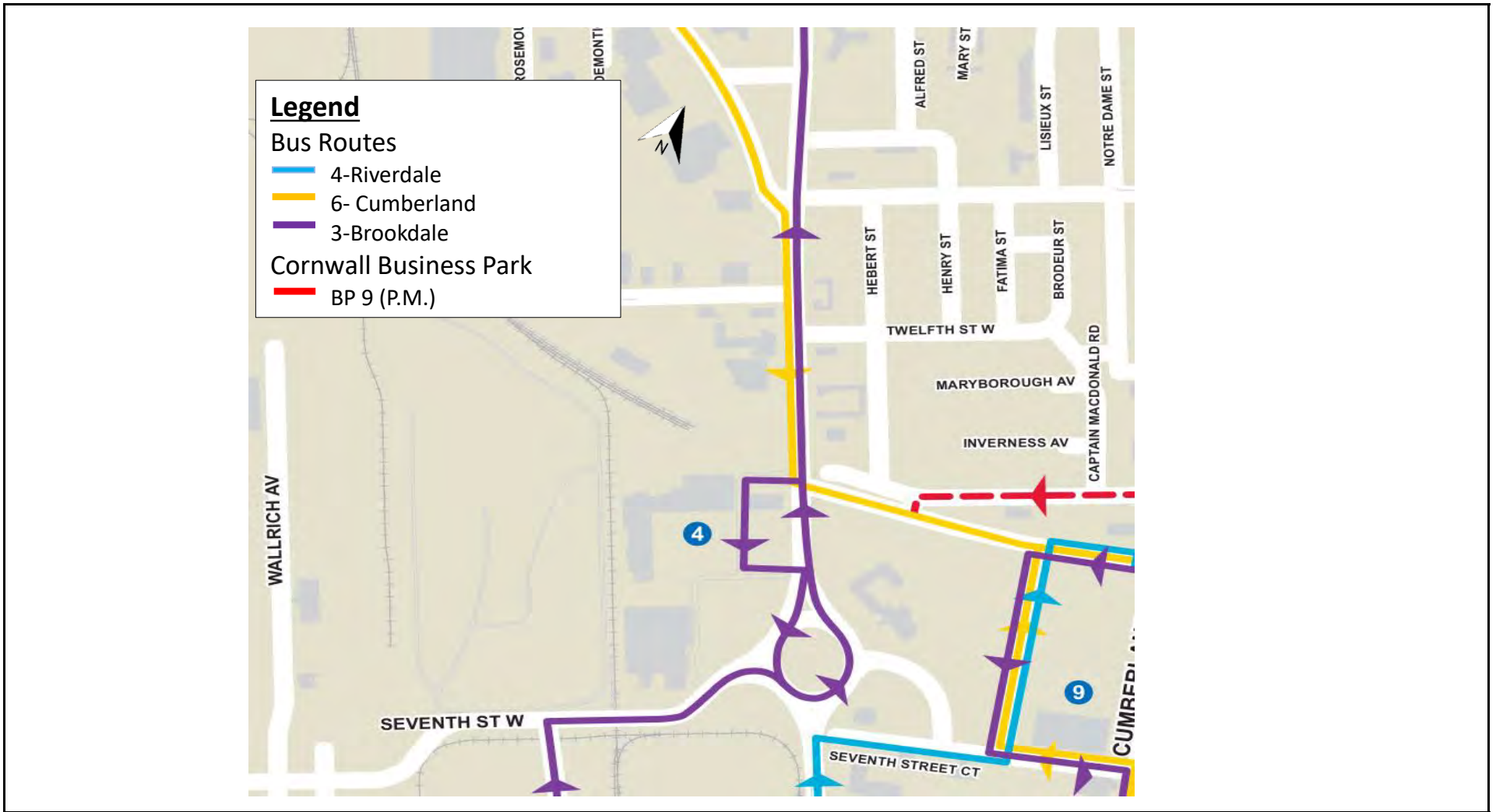


City of Cornwall  
 Cornwall Brookdale Avenue EA  
 Existing Cycling Network

12628280

May 3, 2024

FIGURE 2

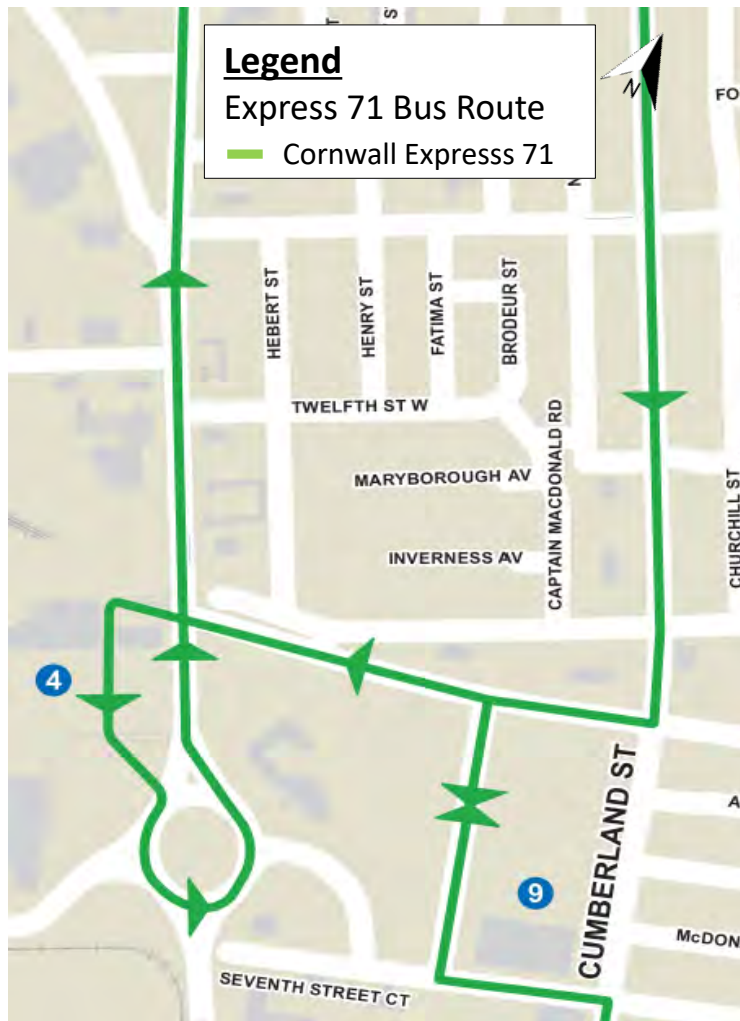


City of Cornwall  
 Cornwall Brookdale Avenue EA  
 Cornwall Transit Bus Routes

12628280

May 3, 2024

FIGURE 3



City of Cornwall  
 Cornwall Brookdale Avenue EA  
 Cornwall Transit Express 71 Bus Route

12628280

May 3, 2024

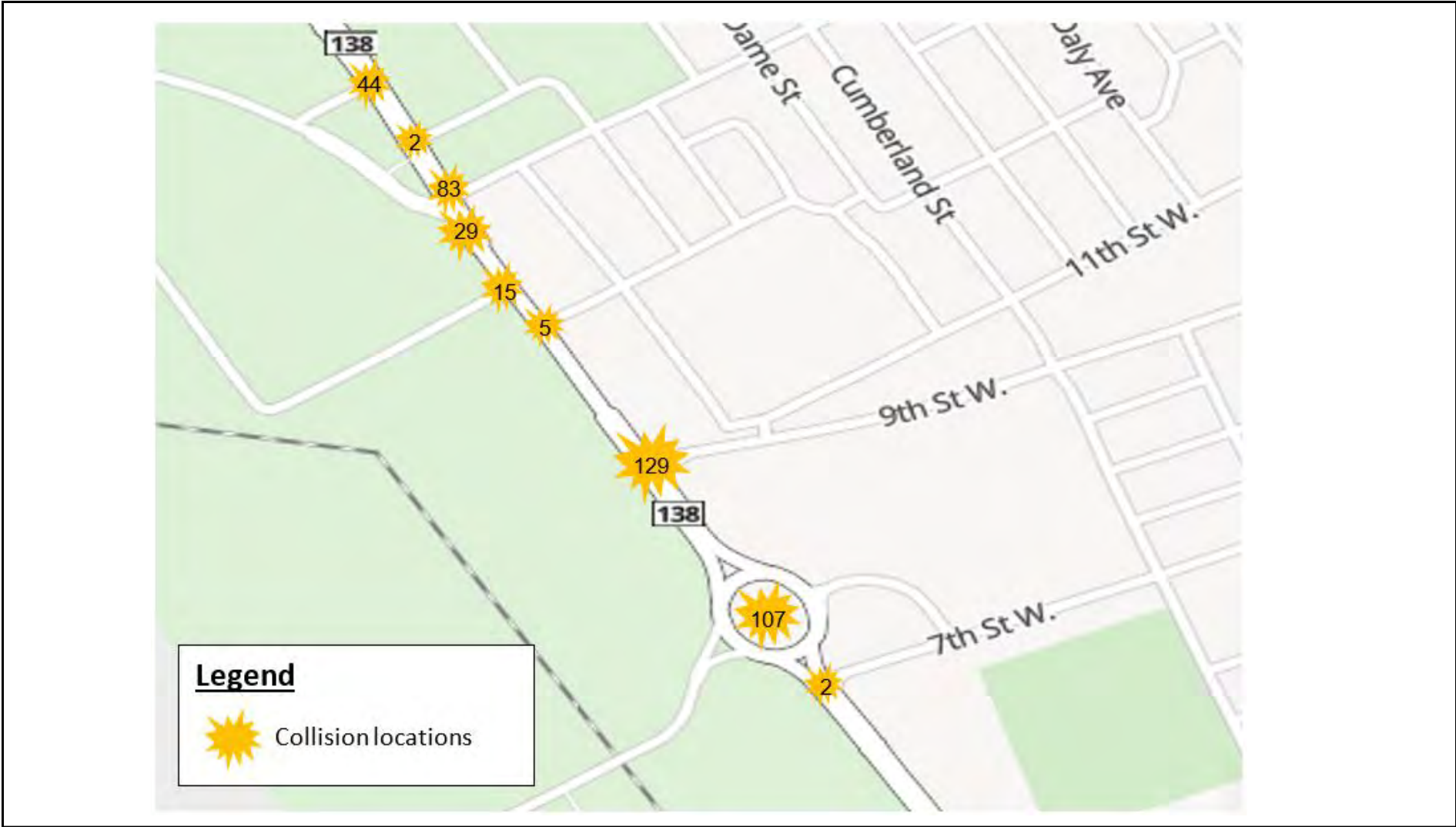
FIGURE 4



City of Cornwall  
Cornwall Brookdale Avenue EA  
Cornwall Transit Community Service 61 Bus Route

12628280  
May 3, 2024

FIGURE 5

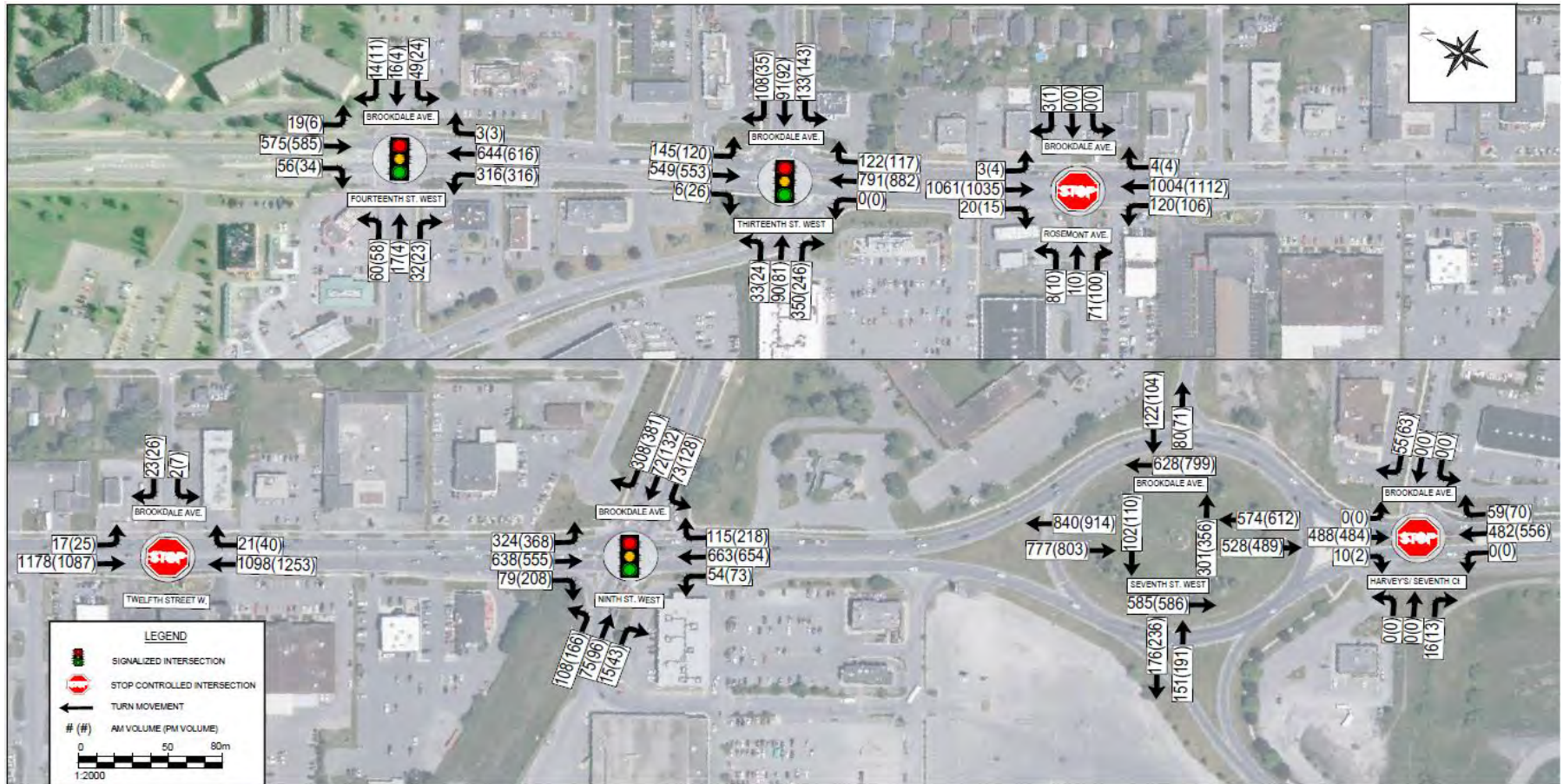


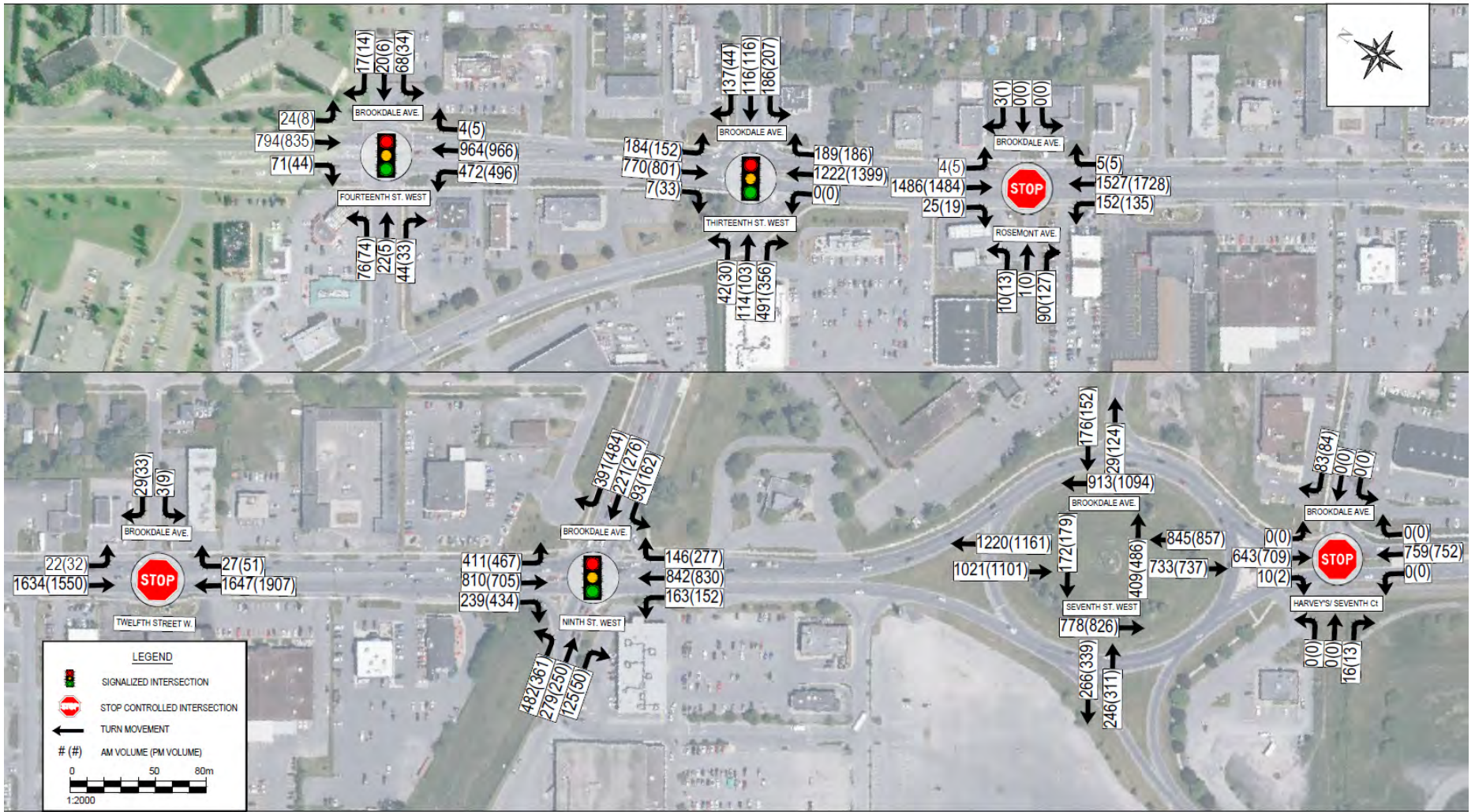
City of Cornwall  
 Cornwall Brookdale Avenue EA  
 Collision Locations within the Study Area

12628280

May 3, 2024

FIGURE 6





	MD							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
<b>C-95 - Future</b>														
<b>SB - Brookdale Ave</b>	1.8	2.89	0.45	A	3.70	A	51 %	<b>1.5</b>	<b>3.07</b>	<b>0.48</b>	<b>A</b>	3.97	A	49 %
<b>EB - Seventh St</b>	1.9	6.86	0.31	A			<b>3.0</b>	<b>7.75</b>	<b>0.40</b>	<b>A</b>	<b>[EB - Seventh St]</b>			
<b>NB - Brookdale Ave</b>	2.7	2.97	0.41	A			<b>2.6</b>	<b>3.12</b>	<b>0.42</b>	<b>A</b>				
<b>WB - Seventh St</b>	1.5	7.52	0.26	A			<b>1.3</b>	<b>7.58</b>	<b>0.24</b>	<b>A</b>				



	MD							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
<b>C-95 - Future</b>														
SB - Brookdale Ave	13.9	8.94	0.80	A	7.87	A	17 %	44.2	19.21	0.90	C	14.77	B	5 %
EB - Ninth St	2.9	6.19	0.53	A			6.3	10.22	0.71	B				
NB - Brookdale Ave	2.8	7.74	0.68	A			9.3	10.67	0.74	B				
WB - Ninth St	2.8	7.21	0.58	A			19.3	16.41	0.81	C				
							[SB - Brookdale Ave]							[SB - Brookdale Ave]



	MD							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
<b>C-95 - Future</b>														
SB - Brookdale Ave	1.5	5.23	0.58	A	7.49	A	18 %	1.7	5.50	0.60	A	8.30	A	16 %
EB - Vincent Massy Dr	2.4	12.97	0.36	B			[EB - Vincent Massy Dr]	1.5	11.97	0.30	B			[NB - Brookdale Ave]
NB - Brookdale Ave	7.0	7.22	0.76	A			17.3	9.28	0.81	A				
WB - Thirteenth St	3.1	5.48	0.40	A			2.6	5.81	0.37	A				



# Appendices

# **Appendix E-1**

**Synchro Analysis Output Reports for  
Existing Conditions Traffic Operations**

**Existing Conditions Traffic Operations  
2023 Noon**

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	122	762	80	0	796
Future Vol, veh/h	0	122	762	80	0	796
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	40	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	133	828	87	0	865

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	414	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	587	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	587	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 587	-
HCM Lane V/C Ratio	- 0.226	-
HCM Control Delay (s)	- 12.9	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.9	-

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕			↕
Traffic Vol, veh/h	0	55	482	59	0	488
Future Vol, veh/h	0	55	482	59	0	488
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	60	524	64	0	530

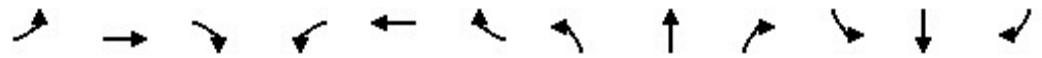
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	262	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	737	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	737	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 737	-
HCM Lane V/C Ratio	- 0.081	-
HCM Control Delay (s)	- 10.3	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.3	-

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Existing conditions 2023 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	17	32	49	16	14	316	644	3	19	575	56
Future Volume (veh/h)	60	17	32	49	16	14	316	644	3	19	575	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	65	18	35	53	17	15	343	700	3	21	625	61
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	280	92	179	261	149	131	622	2503	11	479	1915	854
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.12	0.69	0.69	0.54	0.54	0.54
Sat Flow, veh/h	1377	568	1104	1351	916	809	1781	3629	16	744	3554	1585
Grp Volume(v), veh/h	65	0	53	53	0	32	343	343	360	21	625	61
Grp Sat Flow(s),veh/h/ln	1377	0	1672	1351	0	1725	1781	1777	1868	744	1777	1585
Q Serve(g_s), s	3.9	0.0	2.5	3.2	0.0	1.5	7.0	6.8	6.8	1.2	9.0	1.7
Cycle Q Clear(g_c), s	5.3	0.0	2.5	5.8	0.0	1.5	7.0	6.8	6.8	1.2	9.0	1.7
Prop In Lane	1.00		0.66	1.00		0.47	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	280	0	271	261	0	280	622	1226	1288	479	1915	854
V/C Ratio(X)	0.23	0.00	0.20	0.20	0.00	0.11	0.55	0.28	0.28	0.04	0.33	0.07
Avail Cap(c_a), veh/h	701	0	782	673	0	807	838	1226	1288	479	1915	854
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.1	0.0	33.3	35.8	0.0	32.9	7.1	5.5	5.5	10.1	11.9	10.2
Incr Delay (d2), s/veh	0.2	0.0	0.1	0.1	0.0	0.1	1.1	0.6	0.5	0.2	0.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	1.1	1.2	0.0	0.7	3.2	3.1	3.2	0.3	4.1	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.3	0.0	33.4	35.9	0.0	32.9	8.2	6.0	6.0	10.2	12.3	10.3
LnGrp LOS	D	A	C	D	A	C	A	A	A	B	B	B
Approach Vol, veh/h		118			85			1046			707	
Approach Delay, s/veh		34.5			34.8			6.7			12.1	
Approach LOS		C			C			A			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		22.0	13.9	56.0		22.0				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		8.8		7.3	9.0	11.0		7.8				
Green Ext Time (p_c), s		9.1		0.4	1.8	8.1		0.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				11.6								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Existing conditions 2023 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	90	350	133	91	108	0	791	122	145	549	6
Future Volume (veh/h)	33	90	350	133	91	108	0	791	122	145	549	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	36	98	0	145	99	0	0	860	133	158	597	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	2
Cap, veh/h	395	341		412	413		0	1564	698	370	1989	23
Arrive On Green	0.05	0.18	0.00	0.08	0.22	0.00	0.00	0.44	0.44	0.08	0.55	0.55
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	0	3647	1585	1781	3597	42
Grp Volume(v), veh/h	36	98	0	145	99	0	0	860	133	158	295	309
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	0	1777	1585	1781	1777	1863
Q Serve(g_s), s	1.4	3.9	0.0	5.5	3.8	0.0	0.0	15.6	4.5	3.9	7.8	7.8
Cycle Q Clear(g_c), s	1.4	3.9	0.0	5.5	3.8	0.0	0.0	15.6	4.5	3.9	7.8	7.8
Prop In Lane	1.00		1.00	1.00		1.00	0.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	395	341		412	413		0	1564	698	370	982	1030
V/C Ratio(X)	0.09	0.29		0.35	0.24		0.00	0.55	0.19	0.43	0.30	0.30
Avail Cap(c_a), veh/h	577	600		526	600		0	1564	698	496	982	1030
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.5	30.8	0.0	24.2	28.0	0.0	0.0	18.1	14.9	12.5	10.5	10.5
Incr Delay (d2), s/veh	0.2	0.7	0.0	0.2	0.4	0.0	0.0	1.4	0.6	0.3	0.8	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	0.7	2.0	0.0	2.6	1.9	0.0	0.0	7.3	1.9	1.8	3.6	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.7	31.5	0.0	24.4	28.4	0.0	0.0	19.5	15.5	12.8	11.2	11.2
LnGrp LOS	C	C		C	C		A	B	B	B	B	B
Approach Vol, veh/h		134			244			993			762	
Approach Delay, s/veh		30.2			26.0			18.9			11.6	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	9.8	44.7	10.4	22.4		54.5	7.1	25.8				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5		6.2	3.0	6.5				
Max Green Setting (Gmax), s	30.0	32.3	13.0	28.0		48.3	13.0	28.0				
Max Q Clear Time (g_c+1/3), s	15.0	17.6	7.5	5.9		9.8	3.4	5.8				
Green Ext Time (p_c), s	0.2	4.8	0.1	0.7		9.5	0.1	0.7				

Intersection Summary

HCM 6th Ctrl Delay	17.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Existing conditions 2023 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	108	75	15	73	73	308	54	663	115	324	638	79
Future Volume (veh/h)	108	75	15	73	73	308	54	663	115	324	638	79
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	117	82	16	79	79	335	59	721	0	352	693	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	423	374	73	475	448	380	411	1204		459	1446	
Arrive On Green	0.09	0.25	0.25	0.08	0.24	0.24	0.08	0.34	0.00	0.15	0.41	0.00
Sat Flow, veh/h	1781	1520	297	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	117	0	98	79	79	335	59	721	0	352	693	0
Grp Sat Flow(s),veh/h/ln	1781	0	1817	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	4.8	0.0	4.4	3.2	3.4	20.7	2.0	17.1	0.0	12.3	14.6	0.0
Cycle Q Clear(g_c), s	4.8	0.0	4.4	3.2	3.4	20.7	2.0	17.1	0.0	12.3	14.6	0.0
Prop In Lane	1.00		0.16	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	423	0	447	475	448	380	411	1204		459	1446	
V/C Ratio(X)	0.28	0.00	0.22	0.17	0.18	0.88	0.14	0.60		0.77	0.48	
Avail Cap(c_a), veh/h	535	0	528	598	543	461	602	1204		529	1446	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.8	0.0	30.5	24.7	30.6	37.2	18.1	27.8	0.0	18.9	22.2	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.1	0.3	16.7	0.2	2.2	0.0	5.8	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	2.1	1.5	1.7	10.4	0.9	8.3	0.0	6.3	6.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.9	0.0	30.9	24.8	30.9	53.9	18.2	30.0	0.0	24.7	23.3	0.0
LnGrp LOS	C	A	C	C	C	D	B	C		C	C	
Approach Vol, veh/h		215			493			780			1045	
Approach Delay, s/veh		27.6			45.5			29.2			23.8	
Approach LOS		C			D			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	40.9	40.9	11.0	31.6	11.1	47.8	11.7	30.9				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	34.4	34.4	15.0	29.5	19.0	34.4	15.0	29.5				
Max Q Clear Time (g_c+1/3), s	19.1	19.1	5.2	6.4	4.0	16.6	6.8	22.7				
Green Ext Time (p_c), s	0.7	5.1	0.1	0.7	0.1	5.2	0.2	1.7				

Intersection Summary

HCM 6th Ctrl Delay	30.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	↕
Traffic Vol, veh/h	8	1	71	0	0	3	120	1004	4	3	1061	2
Future Vol, veh/h	8	1	71	0	0	3	120	1004	4	3	1061	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	1	77	0	0	3	130	1091	4	3	1153	2

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1965	2514	577	1936	2514	548	1155	0	0	1095	0	0
Stage 1	1159	1159	-	1353	1353	-	-	-	-	-	-	-
Stage 2	806	1355	-	583	1161	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	38	28	460	40	28	480	601	-	-	633	-	-
Stage 1	208	268	-	158	216	-	-	-	-	-	-	-
Stage 2	342	216	-	465	268	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	31	22	460	27	22	480	601	-	-	633	-	-
Mov Cap-2 Maneuver	31	22	-	27	22	-	-	-	-	-	-	-
Stage 1	163	267	-	124	169	-	-	-	-	-	-	-
Stage 2	266	169	-	384	267	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	44.3		12.6		1.3		0	
HCM LOS	E		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	601	-	-	175	480	633	-	-
HCM Lane V/C Ratio	0.217	-	-	0.497	0.007	0.005	-	-
HCM Control Delay (s)	12.6	-	-	44.3	12.6	10.7	-	-
HCM Lane LOS	B	-	-	E	B	B	-	-
HCM 95th %tile Q(veh)	0.8	-	-	2.4	0	0	-	-

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	23	1098	21	17	1178
Future Vol, veh/h	2	23	1098	21	17	1178
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	25	1193	23	18	1280

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1881	608	0	0	1216
Stage 1	1205	-	-	-	-
Stage 2	676	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	63	439	-	-	569
Stage 1	247	-	-	-	-
Stage 2	467	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	56	439	-	-	569
Mov Cap-2 Maneuver	165	-	-	-	-
Stage 1	247	-	-	-	-
Stage 2	416	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	0.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	388	569
HCM Lane V/C Ratio	-	-	0.07	0.032
HCM Control Delay (s)	-	-	15	11.5
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.2	0.1

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	16	0	482	488	10
Future Vol, veh/h	0	16	0	482	488	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	17	0	524	530	11

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	271	-	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	727	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	727	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	727	-	-
HCM Lane V/C Ratio	-	0.024	-	-
HCM Control Delay (s)	-	10.1	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	151	0	884	645	176
Future Vol, veh/h	0	151	0	884	645	176
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	Free
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	164	0	961	701	191

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	351	-	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	645	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	645	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT EBLn1	SBT
Capacity (veh/h)	- 645	-
HCM Lane V/C Ratio	- 0.254	-
HCM Control Delay (s)	- 12.5	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 1	-

**Existing Conditions Traffic Operations  
2023 PM**

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	104	848	72	0	797
Future Vol, veh/h	0	104	848	72	0	797
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	40	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	113	922	78	0	866

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	461	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	547	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	547	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 547	-
HCM Lane V/C Ratio	- 0.207	-
HCM Control Delay (s)	- 13.3	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.8	-

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕			↕
Traffic Vol, veh/h	0	63	556	70	0	484
Future Vol, veh/h	0	63	556	70	0	484
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	68	604	76	0	526

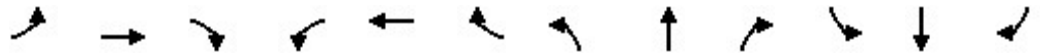
Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	302	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.94	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.32	-
Pot Cap-1 Maneuver	0	694	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	694	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 694	-
HCM Lane V/C Ratio	- 0.099	-
HCM Control Delay (s)	- 10.8	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.3	-

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Existing conditions 2023 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	4	23	24	4	11	316	616	3	6	585	34
Future Volume (veh/h)	58	4	23	24	4	11	316	616	3	6	585	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	4	25	26	4	12	343	670	3	7	636	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	289	35	221	276	65	196	627	2514	11	494	1927	860
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.12	0.69	0.69	0.54	0.54	0.54
Sat Flow, veh/h	1397	223	1396	1381	412	1236	1781	3628	16	765	3554	1585
Grp Volume(v), veh/h	63	0	29	26	0	16	343	328	345	7	636	37
Grp Sat Flow(s),veh/h/ln	1397	0	1619	1381	0	1648	1781	1777	1867	765	1777	1585
Q Serve(g_s), s	3.7	0.0	1.4	1.5	0.0	0.8	6.9	6.4	6.4	0.4	9.1	1.0
Cycle Q Clear(g_c), s	4.4	0.0	1.4	2.9	0.0	0.8	6.9	6.4	6.4	0.4	9.1	1.0
Prop In Lane	1.00		0.86	1.00		0.75	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	289	0	257	276	0	261	627	1231	1294	494	1927	860
V/C Ratio(X)	0.22	0.00	0.11	0.09	0.00	0.06	0.55	0.27	0.27	0.01	0.33	0.04
Avail Cap(c_a), veh/h	724	0	761	706	0	774	846	1231	1294	494	1927	860
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.6	0.0	33.0	34.2	0.0	32.7	7.0	5.3	5.3	9.7	11.7	9.8
Incr Delay (d2), s/veh	0.1	0.0	0.1	0.1	0.0	0.0	1.1	0.5	0.5	0.1	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.6	0.6	0.0	0.3	3.1	2.9	3.0	0.1	4.2	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.7	0.0	33.1	34.3	0.0	32.8	8.0	5.8	5.8	9.7	12.1	9.9
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	B	A
Approach Vol, veh/h		92			42			1016			680	
Approach Delay, s/veh		34.2			33.7			6.6			12.0	
Approach LOS		C			C			A			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		21.6	13.8	56.1		21.6				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		8.4		6.4	8.9	11.1		4.9				
Green Ext Time (p_c), s		8.6		0.3	1.8	7.8		0.1				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				10.6								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Existing conditions 2023 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	81	246	143	92	35	0	882	117	120	553	26
Future Volume (veh/h)	24	81	246	143	92	35	0	882	117	120	553	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	26	88	0	155	100	0	0	959	127	130	601	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	2
Cap, veh/h	383	339		426	437		0	1562	697	339	1902	89
Arrive On Green	0.04	0.18	0.00	0.09	0.23	0.00	0.00	0.44	0.44	0.08	0.55	0.55
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	0	3647	1585	1781	3457	161
Grp Volume(v), veh/h	26	88	0	155	100	0	0	959	127	130	309	320
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	0	1777	1585	1781	1777	1841
Q Serve(g_s), s	1.0	3.5	0.0	5.9	3.8	0.0	0.0	18.2	4.3	3.2	8.3	8.3
Cycle Q Clear(g_c), s	1.0	3.5	0.0	5.9	3.8	0.0	0.0	18.2	4.3	3.2	8.3	8.3
Prop In Lane	1.00		1.00	1.00		1.00	0.00		1.00	1.00		0.09
Lane Grp Cap(c), veh/h	383	339		426	437		0	1562	697	339	978	1013
V/C Ratio(X)	0.07	0.26		0.36	0.23		0.00	0.61	0.18	0.38	0.32	0.32
Avail Cap(c_a), veh/h	581	597		530	597		0	1562	697	467	978	1013
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.2	30.9	0.0	24.2	27.2	0.0	0.0	18.9	15.0	13.2	10.7	10.8
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.2	0.4	0.0	0.0	1.8	0.6	0.3	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	1.8	0.0	2.7	1.9	0.0	0.0	8.6	1.8	1.4	3.9	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.2	31.4	0.0	24.4	27.6	0.0	0.0	20.7	15.6	13.4	11.6	11.6
LnGrp LOS	C	C		C	C		A	C	B	B	B	B
Approach Vol, veh/h		114			255			1086			759	
Approach Delay, s/veh		30.5			25.6			20.1			11.9	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	9.7	44.8	10.9	22.4		54.5	6.3	27.0				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5		6.2	3.0	6.5				
Max Green Setting (Gmax), s	3.0	32.3	13.0	28.0		48.3	13.0	28.0				
Max Q Clear Time (g_c+1/2), s	15.2	20.2	7.9	5.5		10.3	3.0	5.8				
Green Ext Time (p_c), s	0.2	4.9	0.1	0.6		3.4	0.0	0.7				

Intersection Summary

HCM 6th Ctrl Delay	18.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Existing conditions 2023 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	166	96	43	128	132	381	73	654	218	368	555	208
Future Volume (veh/h)	166	96	43	128	132	381	73	654	218	368	555	208
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	180	104	47	139	143	414	79	711	0	400	603	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	401	337	152	464	493	418	429	1093		460	1393	
Arrive On Green	0.09	0.28	0.28	0.08	0.26	0.26	0.08	0.31	0.00	0.17	0.39	0.00
Sat Flow, veh/h	1781	1220	551	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	180	0	151	139	143	414	79	711	0	400	603	0
Grp Sat Flow(s),veh/h/ln	1781	0	1771	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	8.1	0.0	7.5	6.2	6.8	29.1	3.2	19.4	0.0	16.5	13.9	0.0
Cycle Q Clear(g_c), s	8.1	0.0	7.5	6.2	6.8	29.1	3.2	19.4	0.0	16.5	13.9	0.0
Prop In Lane	1.00		0.31	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	401	0	489	464	493	418	429	1093		460	1393	
V/C Ratio(X)	0.45	0.00	0.31	0.30	0.29	0.99	0.18	0.65		0.87	0.43	
Avail Cap(c_a), veh/h	476	0	489	561	493	418	586	1093		466	1393	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.9	0.0	32.0	26.4	32.8	41.0	21.9	33.5	0.0	22.7	24.9	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.5	0.1	0.5	41.4	0.2	3.0	0.0	16.0	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	3.8	0.0	3.6	2.9	3.4	17.0	1.5	9.5	0.0	9.6	6.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	0.0	32.5	26.5	33.3	82.4	22.1	36.5	0.0	38.7	25.9	0.0
LnGrp LOS	C	A	C	C	C	F	C	D		D	C	
Approach Vol, veh/h		331			696			790			1003	
Approach Delay, s/veh		29.1			61.1			35.1			31.0	
Approach LOS		C			E			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	31.6	40.9	11.9	37.5	12.1	50.3	13.3	36.1				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	19.0	34.4	15.0	29.5	19.0	34.4	15.0	29.5				
Max Q Clear Time (g_c+11g_s), s	19.5	21.4	8.2	9.5	5.2	15.9	10.1	31.1				
Green Ext Time (p_c), s	0.1	4.6	0.2	1.2	0.2	4.6	0.2	0.0				

Intersection Summary

HCM 6th Ctrl Delay	39.4
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	↕
Traffic Vol, veh/h	10	0	100	0	0	1	106	1112	4	4	1035	0
Future Vol, veh/h	10	0	100	0	0	1	106	1112	4	4	1035	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	0	109	0	0	1	115	1209	4	4	1125	0

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1968	2576	563	2012	2574	607	1125	0	0	1213	0	0
Stage 1	1133	1133	-	1441	1441	-	-	-	-	-	-	-
Stage 2	835	1443	-	571	1133	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	37	25	470	35	25	439	617	-	-	571	-	-
Stage 1	216	276	-	139	196	-	-	-	-	-	-	-
Stage 2	328	196	-	473	276	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	31	20	470	23	20	439	617	-	-	571	-	-
Mov Cap-2 Maneuver	31	20	-	23	20	-	-	-	-	-	-	-
Stage 1	176	274	-	113	160	-	-	-	-	-	-	-
Stage 2	266	160	-	361	274	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	44.6		13.2		1.1		0	
HCM LOS	E		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	617	-	-	205	439	571	-	-
HCM Lane V/C Ratio	0.187	-	-	0.583	0.002	0.008	-	-
HCM Control Delay (s)	12.2	-	-	44.6	13.2	11.4	-	-
HCM Lane LOS	B	-	-	E	B	B	-	-
HCM 95th %tile Q(veh)	0.7	-	-	3.2	0	0	-	-

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	26	1253	40	25	1087
Future Vol, veh/h	7	26	1253	40	25	1087
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	28	1362	43	27	1182

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	2029	703	0	0	1405
Stage 1	1384	-	-	-	-
Stage 2	645	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	50	380	-	-	482
Stage 1	198	-	-	-	-
Stage 2	484	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	42	380	-	-	482
Mov Cap-2 Maneuver	138	-	-	-	-
Stage 1	198	-	-	-	-
Stage 2	405	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.9	0	1.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	277	482
HCM Lane V/C Ratio	-	-	0.129	0.056
HCM Control Delay (s)	-	-	19.9	12.9
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.4	0.2

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	0	0	556	484	2
Future Vol, veh/h	0	0	0	556	484	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	604	526	2

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	264	-	0	0
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	734	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	734	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	0	-	-
HCM Lane LOS	-	A	-	-
HCM 95th %tile Q(veh)	-	-	-	-

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	191	0	952	606	237
Future Vol, veh/h	0	191	0	952	606	237
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	Free
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	208	0	1035	659	258

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	330	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.94	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.32	-
Pot Cap-1 Maneuver	0	666	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	666	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT EBLn1	SBT
Capacity (veh/h)	- 666	-
HCM Lane V/C Ratio	- 0.312	-
HCM Control Delay (s)	- 12.8	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 1.3	-

# **Appendix E-2**

**Synchro Analysis Output Reports for  
Future Conditions Traffic Operations –  
Scenario 1**

**Future Conditions Traffic Operations  
2043 Noon - Scenario 1**

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	22	44	68	20	17	472	964	4	24	794	71
Future Volume (veh/h)	76	22	44	68	20	17	472	964	4	24	794	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	83	24	48	74	22	18	513	1048	4	26	863	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	274	91	181	245	155	127	579	2503	10	336	1707	761
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.18	0.69	0.69	0.48	0.48	0.48
Sat Flow, veh/h	1367	557	1113	1328	952	779	1781	3631	14	536	3554	1585
Grp Volume(v), veh/h	83	0	72	74	0	40	513	513	539	26	863	77
Grp Sat Flow(s),veh/h/ln	1367	0	1670	1328	0	1730	1781	1777	1868	536	1777	1585
Q Serve(g_s), s	5.1	0.0	3.5	4.7	0.0	1.8	12.0	11.6	11.6	2.4	15.3	2.4
Cycle Q Clear(g_c), s	6.9	0.0	3.5	8.2	0.0	1.8	12.0	11.6	11.6	2.4	15.3	2.4
Prop In Lane	1.00		0.67	1.00		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	274	0	272	245	0	282	579	1225	1287	336	1707	761
V/C Ratio(X)	0.30	0.00	0.26	0.30	0.00	0.14	0.89	0.42	0.42	0.08	0.51	0.10
Avail Cap(c_a), veh/h	690	0	781	649	0	809	691	1225	1287	336	1707	761
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.0	0.0	33.7	37.3	0.0	33.0	13.0	6.2	6.2	13.1	16.4	13.1
Incr Delay (d2), s/veh	1.3	0.0	1.1	1.5	0.0	0.5	12.5	1.1	1.0	0.4	1.1	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	1.6	1.8	0.0	0.9	8.0	5.2	5.5	0.4	7.1	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.3	0.0	34.8	38.7	0.0	33.5	25.5	7.3	7.2	13.5	17.5	13.3
LnGrp LOS	D	A	C	D	A	C	C	A	A	B	B	B
Approach Vol, veh/h		155			114			1565			966	
Approach Delay, s/veh		36.1			36.9			13.2			17.0	
Approach LOS		D			D			B			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		22.1	19.2	50.7		22.1				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		13.6		8.9	14.0	17.3		10.2				
Green Ext Time (p_c), s		16.1		1.7	2.2	10.1		1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				16.8								
HCM 6th LOS				B								

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↑↑	↑↑	
Traffic Vol, veh/h	0	0	66	1160	1021	0
Future Vol, veh/h	0	0	66	1160	1021	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	72	1261	1110	0

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	555	1110	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-
Pot Cap-1 Maneuver	0	475	625	-	-
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	475	625	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT
Capacity (veh/h)	625	-	-	-
HCM Lane V/C Ratio	0.115	-	-	-
HCM Control Delay (s)	11.5	-	0	-
HCM Lane LOS	B	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	-

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Future Conditions 2043 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	114	491	186	116	137	0	1222	189	184	770	7
Future Volume (veh/h)	42	114	491	186	116	137	0	1222	189	184	770	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	46	124	0	202	126	0	0	1328	205	200	837	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	2
Cap, veh/h	399	332		429	441		0	1490	664	255	1936	18
Arrive On Green	0.05	0.18	0.00	0.11	0.24	0.00	0.00	0.42	0.42	0.08	0.54	0.54
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	0	3647	1585	1781	3607	34
Grp Volume(v), veh/h	46	124	0	202	126	0	0	1328	205	200	412	433
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	0	1777	1585	1781	1777	1864
Q Serve(g_s), s	1.8	5.3	0.0	7.9	5.0	0.0	0.0	31.2	7.8	5.4	12.6	12.6
Cycle Q Clear(g_c), s	1.8	5.3	0.0	7.9	5.0	0.0	0.0	31.2	7.8	5.4	12.6	12.6
Prop In Lane	1.00		1.00	1.00		1.00	0.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	399	332		429	441		0	1490	664	255	954	1000
V/C Ratio(X)	0.12	0.37		0.47	0.29		0.00	0.89	0.31	0.79	0.43	0.43
Avail Cap(c_a), veh/h	562	582		488	582		0	1490	664	362	954	1000
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	32.6	0.0	24.4	28.2	0.0	0.0	24.2	17.4	19.8	12.6	12.6
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.3	0.5	0.0	0.0	8.5	1.2	4.4	1.4	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	0.9	2.7	0.0	3.7	2.5	0.0	0.0	15.9	3.4	2.7	6.0	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.4	33.6	0.0	24.7	28.7	0.0	0.0	32.7	18.6	24.2	14.0	13.9
LnGrp LOS	C	C		C	C		A	C	B	C	B	B
Approach Vol, veh/h		170			328			1533			1045	
Approach Delay, s/veh		31.9			26.3			30.8			15.9	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	40.6	43.9	13.0	22.5		54.5	7.8	27.7				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5		6.2	3.0	6.5				
Max Green Setting (Gmax), s	33.0	32.3	13.0	28.0		48.3	13.0	28.0				
Max Q Clear Time (g_c+1), s	33.2	33.2	9.9	7.3		14.6	3.8	7.0				
Green Ext Time (p_c), s	0.2	0.0	0.1	0.9		4.8	0.0	0.9				

Intersection Summary

HCM 6th Ctrl Delay	25.3
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔		↔	↑	↔	↔	↑↑	↔	↔↔	↑↑	↔
Traffic Volume (veh/h)	361	250	50	93	221	391	163	842	146	411	810	239
Future Volume (veh/h)	361	250	50	93	221	391	163	842	146	411	810	239
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	392	272	54	101	240	425	177	915	0	447	880	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	750	456	91	367	520	441	316	1152		638	1226	
Arrive On Green	0.10	0.30	0.30	0.08	0.28	0.28	0.09	0.32	0.00	0.11	0.34	0.00
Sat Flow, veh/h	3456	1515	301	1781	1870	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	392	0	326	101	240	425	177	915	0	447	880	0
Grp Sat Flow(s),veh/h/ln	1728	0	1816	1781	1870	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	8.2	0.0	16.2	4.1	11.3	28.1	6.8	24.9	0.0	8.7	22.9	0.0
Cycle Q Clear(g_c), s	8.2	0.0	16.2	4.1	11.3	28.1	6.8	24.9	0.0	8.7	22.9	0.0
Prop In Lane	1.00		0.17	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	750	0	546	367	520	441	316	1152		638	1226	
V/C Ratio(X)	0.52	0.00	0.60	0.28	0.46	0.96	0.56	0.79		0.70	0.72	
Avail Cap(c_a), veh/h	881	0	546	476	520	441	468	1152		861	1226	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.0	0.0	31.6	24.1	31.7	37.8	22.8	32.6	0.0	23.3	30.3	0.0
Incr Delay (d2), s/veh	0.2	0.0	2.1	0.1	0.9	33.9	1.5	5.7	0.0	1.6	3.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	8.0	1.9	5.7	15.8	3.3	12.5	0.0	4.0	11.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.2	0.0	33.7	24.3	32.6	71.6	24.3	38.3	0.0	24.9	33.9	0.0
LnGrp LOS	C	A	C	C	C	E	C	D		C	C	
Approach Vol, veh/h		718			766			1092			1327	
Approach Delay, s/veh		28.0			53.2			36.1			30.9	
Approach LOS		C			D			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	40.9	11.5	38.5	12.9	43.1	14.0	36.1					
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	34.4	15.0	29.5	19.0	34.4	15.0	29.5					
Max Q Clear Time (g_c+110), s	26.9	6.1	18.2	8.8	24.9	10.2	30.1					
Green Ext Time (p_c), s	1.5	4.0	0.1	2.2	0.5	4.6	0.8	0.0				

Intersection Summary

HCM 6th Ctrl Delay	36.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

**Intersection**

Int Delay, s/veh 11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑				↑		↑↑				
Traffic Vol, veh/h	0	333	0	0	0	0	0	845	0	0	0	0
Future Vol, veh/h	0	333	0	0	0	0	0	845	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	362	0	0	0	0	0	918	0	0	0	0

Major/Minor	Minor2	Minor1	Major1
Conflicting Flow All	- 918	- -	- 459 - 0 -
Stage 1	- 0	- -	- - -
Stage 2	- 918	- -	- - -
Critical Hdwy	- 6.54	- -	- 6.94 - -
Critical Hdwy Stg 1	- -	- -	- - -
Critical Hdwy Stg 2	- 5.54	- -	- - -
Follow-up Hdwy	- 4.02	- -	- 3.32 - -
Pot Cap-1 Maneuver	0 ~ 270	0 0 0	549 0 - 0
Stage 1	0 -	0 0 0	- 0 - 0
Stage 2	0 ~ 349	0 0 0	- 0 - 0
Platoon blocked, %			-
Mov Cap-1 Maneuver	- ~ 270	- -	- 549 - -
Mov Cap-2 Maneuver	- ~ 270	- -	- - -
Stage 1	- -	- -	- - -
Stage 2	- ~ 349	- -	- - -

Approach	EB	WB	NB
HCM Control Delay, s	41.7	0	0
HCM LOS	E	A	

Minor Lane/Major Mvmt	NBT	EBLn1	EBLn2	WBLn1
Capacity (veh/h)	-	270	270	-
HCM Lane V/C Ratio	-	0.67	0.67	-
HCM Control Delay (s)	-	41.7	41.7	0
HCM Lane LOS	-	E	E	A
HCM 95th %tile Q(veh)	-	4.4	4.4	-

**Notes**

~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection												
Int Delay, s/veh	27.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↑↑	↕	↕	↑↑	↕
Traffic Vol, veh/h	10	1	90	0	0	3	152	1527	5	4	1486	25
Future Vol, veh/h	10	1	90	0	0	3	152	1527	5	4	1486	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	0	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	1	98	0	0	3	165	1660	5	4	1615	27

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	2783	3618	808	2806	3640	830	1642	0	0	1665	0	0
Stage 1	1623	1623	-	1990	1990	-	-	-	-	-	-	-
Stage 2	1160	1995	-	816	1650	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 9	5	324	8	5	313	390	-	-	382	-	-
Stage 1	107	160	-	62	104	-	-	-	-	-	-	-
Stage 2	208	104	-	337	155	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 6	3	324	3	3	313	390	-	-	382	-	-
Mov Cap-2 Maneuver	~ 6	3	-	3	3	-	-	-	-	-	-	-
Stage 1	62	158	-	36	60	-	-	-	-	-	-	-
Stage 2	119	60	-	231	153	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	\$ 876	16.6	1.9	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	390	-	-	44	313	382	-	-
HCM Lane V/C Ratio	0.424	-	-	2.495	0.01	0.011	-	-
HCM Control Delay (s)	20.8	-	-	\$ 876	16.6	14.5	-	-
HCM Lane LOS	C	-	-	F	C	B	-	-
HCM 95th %tile Q(veh)	2.1	-	-	11.7	0	0	-	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑↓			↔
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1	0	0	0	0	0
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	1021	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Platoon blocked, %						
Mov Cap-1 Maneuver	1021	-	-	-	-	-
Mov Cap-2 Maneuver	933	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	-	0	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	-

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗		↖						↖	↗
Traffic Vol, veh/h	0	0	0	0	66	0	0	0	0	0	1021	0
Future Vol, veh/h	0	0	0	0	66	0	0	0	0	0	1021	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	72	0	0	0	0	0	1110	0

Major/Minor	Minor2		Minor1			Major2		
Conflicting Flow All	-	-	555	-	1110	-	-	0
Stage 1	-	-	-	-	0	-	-	-
Stage 2	-	-	-	-	1110	-	-	-
Critical Hdwy	-	-	6.94	-	6.54	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-
Follow-up Hdwy	-	-	3.32	-	4.02	-	-	-
Pot Cap-1 Maneuver	0	0	475	0	208	0	0	0
Stage 1	0	0	-	0	-	0	0	0
Stage 2	0	0	-	0	283	0	0	0
Platoon blocked, %								-
Mov Cap-1 Maneuver	-	-	475	-	208	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	208	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	283	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	31.2	0
HCM LOS	A	D	

Minor Lane/Major Mvmt	EBLn1WBLn1	SBT
Capacity (veh/h)	- 208	-
HCM Lane V/C Ratio	- 0.345	-
HCM Control Delay (s)	0 31.2	-
HCM Lane LOS	A D	-
HCM 95th %tile Q(veh)	- 1.5	-

**Future Conditions Traffic Operations  
2043 PM - Scenario 1**

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	5	33	34	6	14	496	966	5	8	835	44
Future Volume (veh/h)	74	5	33	34	6	14	496	966	5	8	835	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	5	36	37	7	15	539	1050	5	9	908	48
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	287	32	229	269	86	184	591	2503	12	325	1636	730
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.20	0.69	0.69	0.46	0.46	0.46
Sat Flow, veh/h	1390	197	1418	1366	530	1136	1781	3627	17	535	3554	1585
Grp Volume(v), veh/h	80	0	41	37	0	22	539	514	541	9	908	48
Grp Sat Flow(s),veh/h/ln	1390	0	1615	1366	0	1666	1781	1777	1867	535	1777	1585
Q Serve(g_s), s	4.8	0.0	2.0	2.2	0.0	1.0	14.2	11.6	11.6	0.8	17.0	1.5
Cycle Q Clear(g_c), s	5.8	0.0	2.0	4.2	0.0	1.0	14.2	11.6	11.6	0.8	17.0	1.5
Prop In Lane	1.00		0.88	1.00		0.68	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	287	0	261	269	0	269	591	1227	1289	325	1636	730
V/C Ratio(X)	0.28	0.00	0.16	0.14	0.00	0.08	0.91	0.42	0.42	0.03	0.56	0.07
Avail Cap(c_a), veh/h	713	0	756	688	0	780	667	1227	1289	325	1636	730
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	0.0	33.1	34.9	0.0	32.7	15.2	6.2	6.2	13.6	18.0	13.8
Incr Delay (d2), s/veh	1.1	0.0	0.6	0.5	0.0	0.3	16.3	1.1	1.0	0.2	1.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.9	0.8	0.0	0.5	8.8	5.2	5.5	0.1	8.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.3	0.0	33.7	35.4	0.0	33.0	31.6	7.3	7.2	13.8	19.3	14.0
LnGrp LOS	D	A	C	D	A	C	C	A	A	B	B	B
Approach Vol, veh/h		121			59			1594			965	
Approach Delay, s/veh		35.4			34.5			15.5			19.0	
Approach LOS		D			C			B			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		21.9	21.1	48.8		21.9				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		13.6		7.8	16.2	19.0		6.2				
Green Ext Time (p_c), s		16.2		1.2	1.9	9.6		0.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				18.0								
HCM 6th LOS				B								

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↑↑	↑↑	
Traffic Vol, veh/h	0	0	56	1219	1101	0
Future Vol, veh/h	0	0	56	1219	1101	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	61	1325	1197	0

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	599	1197	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-
Pot Cap-1 Maneuver	0	445	579	-	-
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	445	579	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT
Capacity (veh/h)	579	-	-	-
HCM Lane V/C Ratio	0.105	-	-	-
HCM Control Delay (s)	11.9	-	0	-
HCM Lane LOS	B	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	-

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	103	356	207	116	44	0	1399	186	152	801	33
Future Volume (veh/h)	30	103	356	207	116	44	0	1399	186	152	801	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	0	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	112	0	225	126	0	0	1521	202	165	871	36
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	0	2	2	2	2	2
Cap, veh/h	379	328		453	474		0	1499	669	214	1845	76
Arrive On Green	0.04	0.18	0.00	0.12	0.25	0.00	0.00	0.42	0.42	0.08	0.53	0.53
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	0	3647	1585	1781	3478	144
Grp Volume(v), veh/h	33	112	0	225	126	0	0	1521	202	165	445	462
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	0	1777	1585	1781	1777	1844
Q Serve(g_s), s	1.3	4.8	0.0	9.0	4.9	0.0	0.0	38.4	7.7	4.5	14.3	14.3
Cycle Q Clear(g_c), s	1.3	4.8	0.0	9.0	4.9	0.0	0.0	38.4	7.7	4.5	14.3	14.3
Prop In Lane	1.00		1.00	1.00		1.00	0.00		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	379	328		453	474		0	1499	669	214	943	979
V/C Ratio(X)	0.09	0.34		0.50	0.27		0.00	1.01	0.30	0.77	0.47	0.47
Avail Cap(c_a), veh/h	556	575		491	575		0	1499	669	333	943	979
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.3	32.9	0.0	24.5	27.2	0.0	0.0	26.3	17.4	20.5	13.4	13.4
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.3	0.4	0.0	0.0	26.9	1.2	2.2	1.7	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	2.4	0.0	4.2	2.4	0.0	0.0	23.1	3.3	2.1	6.8	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.3	33.8	0.0	24.8	27.6	0.0	0.0	53.2	18.6	22.8	15.1	15.0
LnGrp LOS	C	C		C	C		A	F	B	C	B	B
Approach Vol, veh/h		145			351			1723			1072	
Approach Delay, s/veh		32.5			25.8			49.1			16.2	
Approach LOS		C			C			D			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	9.9	44.6	14.0	22.5		54.5	7.0	29.6				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5		6.2	3.0	6.5				
Max Green Setting (Gmax), s	33.0	32.3	13.0	28.0		48.3	13.0	28.0				
Max Q Clear Time (g_c+1/5), s	10.5	40.4	11.0	6.8		16.3	3.3	6.9				
Green Ext Time (p_c), s	0.2	0.0	0.1	0.8		5.3	0.0	1.0				

Intersection Summary

HCM 6th Ctrl Delay	35.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔		↔	↑	↔	↔	↑↑	↔	↔↔	↑↑	↔
Traffic Volume (veh/h)	482	279	125	162	276	484	152	830	277	467	705	434
Future Volume (veh/h)	482	279	125	162	276	484	152	830	277	467	705	434
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	524	303	136	176	300	526	165	902	0	508	766	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	729	370	166	294	497	421	341	1102		653	1229	
Arrive On Green	0.13	0.30	0.30	0.09	0.27	0.27	0.09	0.31	0.00	0.13	0.35	0.00
Sat Flow, veh/h	3456	1223	549	1781	1870	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	524	0	439	176	300	526	165	902	0	508	766	0
Grp Sat Flow(s),veh/h/ln	1728	0	1772	1781	1870	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	11.7	0.0	25.5	7.8	15.6	29.5	6.8	26.0	0.0	10.5	19.9	0.0
Cycle Q Clear(g_c), s	11.7	0.0	25.5	7.8	15.6	29.5	6.8	26.0	0.0	10.5	19.9	0.0
Prop In Lane	1.00		0.31	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	729	0	536	294	497	421	341	1102		653	1229	
V/C Ratio(X)	0.72	0.00	0.82	0.60	0.60	1.25	0.48	0.82		0.78	0.62	
Avail Cap(c_a), veh/h	759	0	536	375	497	421	486	1102		812	1229	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.1	0.0	35.9	28.1	35.6	40.7	23.5	35.4	0.0	24.7	30.3	0.0
Incr Delay (d2), s/veh	2.7	0.0	10.1	0.7	2.4	130.2	1.1	6.8	0.0	3.8	2.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	5.5	0.0	13.4	3.7	8.0	27.5	3.2	13.2	0.0	5.0	9.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.7	0.0	46.0	28.8	38.1	170.9	24.6	42.2	0.0	28.5	32.7	0.0
LnGrp LOS	C	A	D	C	D	F	C	D		C	C	
Approach Vol, veh/h		963			1002			1067			1274	
Approach Delay, s/veh		36.1			106.2			39.5			31.0	
Approach LOS		D			F			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.9	40.9	13.0	40.2	12.9	44.9	17.0	36.1				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	19.0	34.4	15.0	29.5	19.0	34.4	15.0	29.5				
Max Q Clear Time (g_c+1/2), s	11.7	28.0	9.8	27.5	8.8	21.9	13.7	31.5				
Green Ext Time (p_c), s	1.5	3.5	0.2	0.8	0.4	4.8	0.4	0.0				

Intersection Summary

HCM 6th Ctrl Delay	51.7
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	17.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑				↑		↑↑				
Traffic Vol, veh/h	0	391	0	0	0	0	0	857	0	0	0	0
Future Vol, veh/h	0	391	0	0	0	0	0	857	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	425	0	0	0	0	0	932	0	0	0	0

Major/Minor	Minor2	Minor1	Major1
Conflicting Flow All	- 932	- -	- 466 - 0 -
Stage 1	- 0	- -	- - -
Stage 2	- 932	- -	- - -
Critical Hdwy	- 6.54	- -	- 6.94 - -
Critical Hdwy Stg 1	- -	- -	- - -
Critical Hdwy Stg 2	- 5.54	- -	- - -
Follow-up Hdwy	- 4.02	- -	- 3.32 - -
Pot Cap-1 Maneuver	0 ~ 265	0 0 0	543 0 - 0
Stage 1	0 -	0 0 0	- 0 - 0
Stage 2	0 ~ 343	0 0 0	- 0 - 0
Platoon blocked, %			-
Mov Cap-1 Maneuver	- ~ 265	- -	- 543 - -
Mov Cap-2 Maneuver	- ~ 265	- -	- - -
Stage 1	- -	- -	- - -
Stage 2	- ~ 343	- -	- - -

Approach	EB	WB	NB
HCM Control Delay, s	57	0	0
HCM LOS	F	A	

Minor Lane/Major Mvmt	NBT	EBLn1	EBLn2	WBLn1
Capacity (veh/h)	-	265	265	-
HCM Lane V/C Ratio	-	0.802	0.802	-
HCM Control Delay (s)	-	57	57	0
HCM Lane LOS	-	F	F	A
HCM 95th %tile Q(veh)	-	6.2	6.2	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection												
Int Delay, s/veh	38.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↗	↗	↗	↗	↗
Traffic Vol, veh/h	13	0	127	0	0	1	135	1728	5	5	1484	19
Future Vol, veh/h	13	0	127	0	0	1	135	1728	5	5	1484	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	0	80	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	0	138	0	0	1	147	1878	5	5	1613	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	2856	3800	807	2989	3816	939	1634	0	0	1883	0	0
Stage 1	1623	1623	-	2172	2172	-	-	-	-	-	-	-
Stage 2	1233	2177	-	817	1644	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 8	4	324	6	4	265	393	-	-	314	-	-
Stage 1	107	160	-	48	84	-	-	-	-	-	-	-
Stage 2	187	84	-	337	156	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 6	2	324	2	2	265	393	-	-	314	-	-
Mov Cap-2 Maneuver	~ 6	2	-	2	2	-	-	-	-	-	-	-
Stage 1	67	157	-	30	53	-	-	-	-	-	-	-
Stage 2	117	53	-	190	154	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	957.4	18.6	1.4	0.1
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	393	-	-	55	265	314	-	-
HCM Lane V/C Ratio	0.373	-	-	2.767	0.004	0.017	-	-
HCM Control Delay (s)	19.5	-	-	957.4	18.6	16.7	-	-
HCM Lane LOS	C	-	-	F	C	C	-	-
HCM 95th %tile Q(veh)	1.7	-	-	15.8	0	0.1	-	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	0	0	0	0
Future Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1	0	0	0	0	0
Stage 1	0	-	-	-	-	-
Stage 2	1	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	1021	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Platoon blocked, %						
Mov Cap-1 Maneuver	1021	-	-	-	-	-
Mov Cap-2 Maneuver	933	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	1022	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	-	0	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	-

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗		↖						↖	↗
Traffic Vol, veh/h	0	0	0	0	56	0	0	0	0	0	1101	0
Future Vol, veh/h	0	0	0	0	56	0	0	0	0	0	1101	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	61	0	0	0	0	0	1197	0

Major/Minor	Minor2		Minor1			Major2			
Conflicting Flow All	-	-	599	-	1197	-	-	-	0
Stage 1	-	-	-	-	0	-	-	-	-
Stage 2	-	-	-	-	1197	-	-	-	-
Critical Hdwy	-	-	6.94	-	6.54	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	4.02	-	-	-	-
Pot Cap-1 Maneuver	0	0	445	0	185	0	0	-	0
Stage 1	0	0	-	0	-	0	0	-	0
Stage 2	0	0	-	0	257	0	0	-	0
Platoon blocked, %									-
Mov Cap-1 Maneuver	-	-	445	-	185	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	185	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	257	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	33.7	0
HCM LOS	A	D	

Minor Lane/Major Mvmt	EBLn1WBLn1	SBT
Capacity (veh/h)	- 185	-
HCM Lane V/C Ratio	- 0.329	-
HCM Control Delay (s)	0 33.7	-
HCM Lane LOS	A D	-
HCM 95th %tile Q(veh)	- 1.4	-

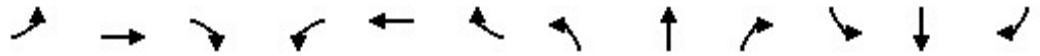
# **Appendix E-3**

**Synchro Analysis Output Reports for  
Future Conditions Traffic Operations –  
Scenario 2**

**Future Conditions Traffic Operations  
2043 Noon - Scenario 2**

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	22	44	68	20	17	236	964	4	24	794	71
Future Volume (veh/h)	76	22	44	68	20	17	236	964	4	24	794	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	83	24	48	74	22	18	257	1048	4	26	863	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	274	91	181	245	155	127	494	2503	10	380	2011	897
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.09	0.69	0.69	0.57	0.57	0.57
Sat Flow, veh/h	1367	557	1113	1328	952	779	1781	3631	14	536	3554	1585
Grp Volume(v), veh/h	83	0	72	74	0	40	257	513	539	26	863	77
Grp Sat Flow(s),veh/h/ln	1367	0	1670	1328	0	1730	1781	1777	1868	536	1777	1585
Q Serve(g_s), s	5.1	0.0	3.5	4.7	0.0	1.8	5.0	11.6	11.6	2.0	12.8	2.0
Cycle Q Clear(g_c), s	6.9	0.0	3.5	8.2	0.0	1.8	5.0	11.6	11.6	2.3	12.8	2.0
Prop In Lane	1.00		0.67	1.00		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	274	0	272	245	0	282	494	1225	1287	380	2011	897
V/C Ratio(X)	0.30	0.00	0.26	0.30	0.00	0.14	0.52	0.42	0.42	0.07	0.43	0.09
Avail Cap(c_a), veh/h	690	0	781	649	0	809	759	1225	1287	380	2011	897
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.0	0.0	33.7	37.3	0.0	33.0	7.7	6.2	6.2	9.2	11.5	9.1
Incr Delay (d2), s/veh	1.3	0.0	1.1	1.5	0.0	0.5	1.2	1.1	1.0	0.3	0.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	1.6	1.8	0.0	0.9	2.3	5.2	5.5	0.3	5.8	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.3	0.0	34.8	38.7	0.0	33.5	8.9	7.3	7.2	9.6	12.1	9.3
LnGrp LOS	D	A	C	D	A	C	A	A	A	A	B	A
Approach Vol, veh/h		155			114			1309			966	
Approach Delay, s/veh		36.1			36.9			7.6			11.8	
Approach LOS		D			D			A			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		22.1	11.4	58.5		22.1				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		13.6		8.9	7.0	14.8		10.2				
Green Ext Time (p_c), s		16.1		1.7	1.4	10.8		1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.2								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
12: Seventh Street West

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↑↑		↕	↑↑	
Traffic Volume (veh/h)	194	27	25	35	23	118	8	828	8	112	674	235
Future Volume (veh/h)	194	27	25	35	23	118	8	828	8	112	674	235
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	211	29	27	38	25	128	9	900	9	122	733	255
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	345	40	33	114	89	291	344	1567	16	455	1527	531
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.43	0.43	0.43	0.11	0.59	0.59
Sat Flow, veh/h	994	155	129	212	347	1135	570	3605	36	1781	2586	900
Grp Volume(v), veh/h	267	0	0	191	0	0	9	444	465	122	504	484
Grp Sat Flow(s),veh/h/ln	1278	0	0	1694	0	0	570	1777	1864	1781	1777	1708
Q Serve(g_s), s	7.4	0.0	0.0	0.0	0.0	0.0	0.7	13.5	13.5	2.2	11.7	11.7
Cycle Q Clear(g_c), s	14.3	0.0	0.0	6.9	0.0	0.0	1.1	13.5	13.5	2.2	11.7	11.7
Prop In Lane	0.79		0.10	0.20		0.67	1.00		0.02	1.00		0.53
Lane Grp Cap(c), veh/h	417	0	0	495	0	0	344	772	810	455	1049	1009
V/C Ratio(X)	0.64	0.00	0.00	0.39	0.00	0.00	0.03	0.57	0.57	0.27	0.48	0.48
Avail Cap(c_a), veh/h	929	0	0	1103	0	0	344	772	810	524	1049	1009
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	0.0	22.5	0.0	0.0	11.9	15.3	15.3	9.0	8.4	8.4
Incr Delay (d2), s/veh	1.6	0.0	0.0	0.5	0.0	0.0	0.1	3.1	3.0	0.3	1.6	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	0.0	0.0	3.0	0.0	0.0	0.1	6.7	6.9	1.0	5.4	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	0.0	0.0	23.0	0.0	0.0	12.1	18.4	18.3	9.3	10.0	10.1
LnGrp LOS	C	A	A	C	A	A	B	B	B	A	A	B
Approach Vol, veh/h		267			191			918			1110	
Approach Delay, s/veh		26.9			23.0			18.3			9.9	
Approach LOS		C			C			B			A	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	1.2	37.8		23.0		49.0		23.0				
Change Period (Y+Rc), s	3.0	6.5		4.5		6.5		4.5				
Max Green Setting (Gmax), s	1.0	28.5		46.5		42.5		46.5				
Max Q Clear Time (g_c+14), s	1.0	15.5		16.3		13.7		8.9				
Green Ext Time (p_c), s	0.2	5.6		2.2		9.1		1.5				

Intersection Summary

HCM 6th Ctrl Delay	15.8
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Future Conditions 2043 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	114	491	186	116	137	333	986	189	184	770	7
Future Volume (veh/h)	42	114	491	186	116	137	333	986	189	184	770	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	46	124	0	202	126	0	362	1072	205	200	837	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	344	322		355	365		439	1674	747	326	1641	16
Arrive On Green	0.05	0.17	0.00	0.08	0.19	0.00	0.10	0.47	0.47	0.08	0.45	0.45
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3554	1585	1781	3607	34
Grp Volume(v), veh/h	46	124	0	202	126	0	362	1072	205	200	412	433
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1585	1781	1777	1864
Q Serve(g_s), s	1.9	5.5	0.0	7.0	5.4	0.0	9.0	21.2	7.3	5.5	15.3	15.3
Cycle Q Clear(g_c), s	1.9	5.5	0.0	7.0	5.4	0.0	9.0	21.2	7.3	5.5	15.3	15.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	344	322		355	365		439	1674	747	326	808	848
V/C Ratio(X)	0.13	0.39		0.57	0.35		0.82	0.64	0.27	0.61	0.51	0.51
Avail Cap(c_a), veh/h	384	563		355	563		439	1674	747	355	808	848
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.8	34.1	0.0	30.3	32.3	0.0	16.9	18.6	14.9	15.2	18.0	18.0
Incr Delay (d2), s/veh	0.1	1.1	0.0	1.4	0.8	0.0	12.1	1.9	0.9	1.7	2.3	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	0.9	2.8	0.0	1.2	2.7	0.0	5.5	10.0	3.1	2.6	7.4	7.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.8	35.2	0.0	31.7	33.1	0.0	29.1	20.5	15.9	16.9	20.3	20.2
LnGrp LOS	C	D		C	C		C	C	B	B	C	C
Approach Vol, veh/h		170			328			1639			1045	
Approach Delay, s/veh		33.5			32.2			21.8			19.6	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	50.0	10.0	22.5	12.0	48.5	7.9	24.6					
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5	3.0	6.2	3.0	6.5				
Max Green Setting (Gmax), s	42.3	7.0	28.0	9.0	42.3	7.0	28.0					
Max Q Clear Time (g_c+1), s	23.2	9.0	7.5	11.0	17.3	3.9	7.4					
Green Ext Time (p_c), s	0.1	7.1	0.0	0.9	0.0	4.6	0.0	0.9				

Intersection Summary

HCM 6th Ctrl Delay	22.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔		↔	↔	↔	↔	↔↔	↔	↔↔	↔↔	↔
Traffic Volume (veh/h)	361	250	50	93	221	391	163	842	146	464	810	239
Future Volume (veh/h)	361	250	50	93	221	391	163	842	146	464	810	239
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	392	272	54	101	240	425	177	915	0	504	880	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	441	445	88	328	411	604	338	1090		559	1412	
Arrive On Green	0.13	0.29	0.29	0.07	0.22	0.22	0.09	0.31	0.00	0.16	0.40	0.00
Sat Flow, veh/h	3456	1515	301	1781	1870	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	392	0	326	101	240	425	177	915	0	504	880	0
Grp Sat Flow(s),veh/h/ln	1728	0	1816	1781	1870	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	14.0	0.0	19.4	5.3	14.4	27.5	8.4	30.1	0.0	17.9	24.8	0.0
Cycle Q Clear(g_c), s	14.0	0.0	19.4	5.3	14.4	27.5	8.4	30.1	0.0	17.9	24.8	0.0
Prop In Lane	1.00		0.17	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	441	0	533	328	411	604	338	1090		559	1412	
V/C Ratio(X)	0.89	0.00	0.61	0.31	0.58	0.70	0.52	0.84		0.90	0.62	
Avail Cap(c_a), veh/h	442	0	533	460	411	604	510	1090		580	1412	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	53.7	0.0	38.1	34.0	43.7	32.8	26.6	40.5	0.0	51.5	30.2	0.0
Incr Delay (d2), s/veh	18.8	0.0	2.4	0.2	2.6	4.0	1.3	7.8	0.0	17.1	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	0.0	9.7	2.5	7.4	12.5	4.0	15.3	0.0	9.6	12.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.6	0.0	40.5	34.2	46.3	36.8	27.8	48.3	0.0	68.6	32.3	0.0
LnGrp LOS	E	A	D	C	D	D	C	D		E	C	
Approach Vol, veh/h		718			766			1092			1384	
Approach Delay, s/veh		58.0			39.4			45.0			45.5	
Approach LOS		E			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.2	44.9	11.7	43.3	13.9	56.3	21.0	34.1				
Change Period (Y+Rc), s	5.0	6.5	3.0	6.6	3.0	6.5	5.0	6.6				
Max Green Setting (Gmax), s	21.0	38.4	18.0	27.5	23.0	38.4	16.0	27.5				
Max Q Clear Time (g_c+119), s	119.0	32.1	7.3	21.4	10.4	26.8	16.0	29.5				
Green Ext Time (p_c), s	0.3	3.5	0.1	1.4	0.5	5.3	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	46.5
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗	↗	↕			↕	
Traffic Vol, veh/h	0	0	101	0	0	3	256	1569	10	0	1522	25
Future Vol, veh/h	0	0	101	0	0	3	256	1569	10	0	1522	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	30	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	110	0	0	3	278	1705	11	0	1654	27

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	841	-	-	858	1681	0	0	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	308	0	0	300	377	-	-	0	-	-
Stage 1	0	0	-	0	0	-	-	-	-	0	-	-
Stage 2	0	0	-	0	0	-	-	-	-	0	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	-	-	308	-	-	300	377	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23	17.1	5.2	0
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBT	SBR
Capacity (veh/h)	377	-	-	308	300	-
HCM Lane V/C Ratio	0.738	-	-	0.356	0.011	-
HCM Control Delay (s)	37.1	-	-	23	17.1	-
HCM Lane LOS	E	-	-	C	C	-
HCM 95th %tile Q(veh)	5.8	-	-	1.6	0	-

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕		↖	↕
Traffic Vol, veh/h	0	32	1744	27	71	1731
Future Vol, veh/h	0	32	1744	27	71	1731
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	30	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	35	1896	29	77	1882

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	963	0	0	1925
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22
Pot Cap-1 Maneuver	0	256	-	-	303
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	-	256	-	-	303
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

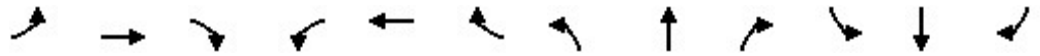
Approach	WB	NB	SB
HCM Control Delay, s	21.3	0	0.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	256	303
HCM Lane V/C Ratio	-	-	0.136	0.255
HCM Control Delay (s)	-	-	21.3	20.9
HCM Lane LOS	-	-	C	C
HCM 95th %tile Q(veh)	-	-	0.5	1

**Future Conditions Traffic Operations  
2043 PM - Scenario 2**

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↕		↖	↗	↖
Traffic Volume (veh/h)	74	5	33	34	6	14	248	966	5	8	835	44
Future Volume (veh/h)	74	5	33	34	6	14	248	966	5	8	835	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	5	36	37	7	15	270	1050	5	9	908	48
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	287	32	229	269	86	184	490	2503	12	379	2000	892
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.09	0.69	0.69	0.56	0.56	0.56
Sat Flow, veh/h	1390	197	1418	1366	530	1136	1781	3627	17	535	3554	1585
Grp Volume(v), veh/h	80	0	41	37	0	22	270	514	541	9	908	48
Grp Sat Flow(s),veh/h/ln	1390	0	1615	1366	0	1666	1781	1777	1867	535	1777	1585
Q Serve(g_s), s	4.8	0.0	2.0	2.2	0.0	1.0	5.3	11.6	11.6	0.7	13.8	1.3
Cycle Q Clear(g_c), s	5.8	0.0	2.0	4.2	0.0	1.0	5.3	11.6	11.6	0.7	13.8	1.3
Prop In Lane	1.00		0.88	1.00		0.68	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	287	0	261	269	0	269	490	1227	1289	379	2000	892
V/C Ratio(X)	0.28	0.00	0.16	0.14	0.00	0.08	0.55	0.42	0.42	0.02	0.45	0.05
Avail Cap(c_a), veh/h	713	0	756	688	0	780	747	1227	1289	379	2000	892
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	0.0	33.1	34.9	0.0	32.7	8.1	6.2	6.2	8.9	11.8	9.1
Incr Delay (d2), s/veh	1.1	0.0	0.6	0.5	0.0	0.3	1.4	1.1	1.0	0.1	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.9	0.8	0.0	0.5	2.4	5.2	5.5	0.1	6.3	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.3	0.0	33.7	35.4	0.0	33.0	9.5	7.3	7.2	9.0	12.5	9.2
LnGrp LOS	D	A	C	D	A	C	A	A	A	A	B	A
Approach Vol, veh/h		121			59			1325			965	
Approach Delay, s/veh		35.4			34.5			7.7			12.3	
Approach LOS		D			C			A			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		21.9	11.7	58.2		21.9				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		13.6		7.8	7.3	15.8		6.2				
Green Ext Time (p_c), s		16.2		1.2	1.5	10.5		0.6				

Intersection Summary

HCM 6th Ctrl Delay	11.5
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary  
12: Seventh Street West

Future Conditions 2043 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕		↙	↕	
Traffic Volume (veh/h)	239	31	40	35	12	105	9	831	17	121	661	319
Future Volume (veh/h)	239	31	40	35	12	105	9	831	17	121	661	319
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	260	34	43	38	13	114	10	903	18	132	718	347
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	392	40	51	142	71	346	285	1452	29	417	1296	626
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.41	0.41	0.41	0.11	0.56	0.56
Sat Flow, veh/h	1035	135	171	281	240	1163	530	3563	71	1781	2323	1122
Grp Volume(v), veh/h	337	0	0	165	0	0	10	450	471	132	549	516
Grp Sat Flow(s),veh/h/ln	1342	0	0	1683	0	0	530	1777	1858	1781	1777	1668
Q Serve(g_s), s	12.1	0.0	0.0	0.0	0.0	0.0	0.9	15.3	15.3	2.8	15.1	15.1
Cycle Q Clear(g_c), s	17.9	0.0	0.0	5.9	0.0	0.0	4.6	15.3	15.3	2.8	15.1	15.1
Prop In Lane	0.77		0.13	0.23		0.69	1.00		0.04	1.00		0.67
Lane Grp Cap(c), veh/h	483	0	0	560	0	0	285	724	757	417	991	931
V/C Ratio(X)	0.70	0.00	0.00	0.29	0.00	0.00	0.04	0.62	0.62	0.32	0.55	0.55
Avail Cap(c_a), veh/h	903	0	0	1038	0	0	285	724	757	477	991	931
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.1	0.0	0.0	20.8	0.0	0.0	15.9	17.9	17.9	11.1	10.8	10.8
Incr Delay (d2), s/veh	1.8	0.0	0.0	0.3	0.0	0.0	0.2	4.0	3.8	0.4	2.2	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.4	0.0	0.0	2.6	0.0	0.0	0.1	7.7	8.0	1.3	7.1	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	0.0	0.0	21.1	0.0	0.0	16.2	21.9	21.7	11.5	13.0	13.2
LnGrp LOS	C	A	A	C	A	A	B	C	C	B	B	B
Approach Vol, veh/h		337			165			931			1197	
Approach Delay, s/veh		26.9			21.1			21.8			12.9	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	1.4	37.6		27.2		49.0		27.2				
Change Period (Y+Rc), s	3.0	6.5		4.5		6.5		4.5				
Max Green Setting (Gmax), s	1.0	28.5		46.5		42.5		46.5				
Max Q Clear Time (g_c+1/4), s	1.0	17.3		19.9		17.1		7.9				
Green Ext Time (p_c), s	0.2	5.1		2.8		9.6		1.3				

Intersection Summary

HCM 6th Ctrl Delay	18.4
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	103	356	207	116	44	362	1151	186	152	801	33
Future Volume (veh/h)	30	103	356	207	116	44	362	1151	186	152	801	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	112	0	225	126	0	393	1251	202	165	871	36
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	318	305		341	360		467	1789	798	286	1537	64
Arrive On Green	0.04	0.16	0.00	0.07	0.19	0.00	0.13	0.50	0.50	0.07	0.44	0.44
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3554	1585	1781	3478	144
Grp Volume(v), veh/h	33	112	0	225	126	0	393	1251	202	165	445	462
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1585	1781	1777	1844
Q Serve(g_s), s	1.5	5.2	0.0	7.0	5.7	0.0	11.2	26.4	7.1	4.9	18.3	18.3
Cycle Q Clear(g_c), s	1.5	5.2	0.0	7.0	5.7	0.0	11.2	26.4	7.1	4.9	18.3	18.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	318	305		341	360		467	1789	798	286	785	815
V/C Ratio(X)	0.10	0.37		0.66	0.35		0.84	0.70	0.25	0.58	0.57	0.57
Avail Cap(c_a), veh/h	370	534		341	534		467	1789	798	395	785	815
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.6	36.5	0.0	33.9	34.3	0.0	15.8	18.6	13.8	16.7	20.4	20.4
Incr Delay (d2), s/veh	0.1	1.0	0.0	3.7	0.8	0.0	13.0	2.3	0.8	0.7	3.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	0.7	2.7	0.0	2.4	2.9	0.0	6.6	12.5	3.0	2.3	9.0	9.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.6	37.5	0.0	37.6	35.1	0.0	28.8	21.0	14.6	17.4	23.3	23.2
LnGrp LOS	C	D		D	D		C	C	B	B	C	C
Approach Vol, veh/h		145			351			1846			1072	
Approach Delay, s/veh		36.2			36.7			21.9			22.4	
Approach LOS		D			D			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	0.0	55.5	10.0	22.5	16.0	49.5	7.1	25.3				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5	3.0	6.2	3.0	6.5				
Max Green Setting (Gmax), s	3.0	43.3	7.0	28.0	13.0	43.3	7.0	28.0				
Max Q Clear Time (g_c+1/3), s	3.0	28.4	9.0	7.2	13.2	20.3	3.5	7.7				
Green Ext Time (p_c), s	0.2	7.4	0.0	0.8	0.0	4.9	0.0	0.9				

Intersection Summary

HCM 6th Ctrl Delay	24.2
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔		↔	↑	↔	↔	↑↑	↔	↔↔	↑↑	↔
Traffic Volume (veh/h)	482	279	125	162	276	484	152	830	277	511	705	434
Future Volume (veh/h)	482	279	125	162	276	484	152	830	277	511	705	434
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	524	303	136	176	300	526	165	902	0	555	766	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	549	387	174	308	438	635	334	914		576	1255	
Arrive On Green	0.16	0.32	0.32	0.09	0.23	0.23	0.09	0.26	0.00	0.17	0.35	0.00
Sat Flow, veh/h	3456	1223	549	1781	1870	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	524	0	439	176	300	526	165	902	0	555	766	0
Grp Sat Flow(s),veh/h/ln	1728	0	1772	1781	1870	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	18.9	0.0	28.4	9.3	18.4	29.5	8.4	31.8	0.0	20.1	22.4	0.0
Cycle Q Clear(g_c), s	18.9	0.0	28.4	9.3	18.4	29.5	8.4	31.8	0.0	20.1	22.4	0.0
Prop In Lane	1.00		0.31	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	549	0	561	308	438	635	334	914		576	1255	
V/C Ratio(X)	0.96	0.00	0.78	0.57	0.69	0.83	0.49	0.99		0.96	0.61	
Avail Cap(c_a), veh/h	549	0	561	455	438	635	505	914		576	1255	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	52.6	0.0	39.1	33.3	44.0	33.9	30.5	46.6	0.0	52.1	33.6	0.0
Incr Delay (d2), s/veh	27.3	0.0	7.5	0.6	4.9	9.3	1.1	26.8	0.0	28.5	2.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ft	0.8	0.0	14.4	4.4	9.8	17.2	4.1	18.4	0.0	11.5	10.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.9	0.0	46.6	33.9	48.9	43.1	31.6	73.4	0.0	80.6	35.8	0.0
LnGrp LOS	E	A	D	C	D	D	C	E		F	D	
Approach Vol, veh/h		963			1002			1067			1321	
Approach Delay, s/veh		64.7			43.2			66.9			54.6	
Approach LOS		E			D			E			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	36.0	38.9	14.6	46.5	13.9	51.0	25.0	36.1				
Change Period (Y+Rc), s	5.0	6.5	3.0	6.6	3.0	6.5	5.0	6.6				
Max Green Setting (Gmax), s	21.0	32.4	22.0	29.5	23.0	32.4	20.0	29.5				
Max Q Clear Time (g_c+Q), s	22.5	33.8	11.3	30.4	10.4	24.4	20.9	31.5				
Green Ext Time (p_c), s	0.0	0.0	0.3	0.0	0.5	3.6	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	57.2
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗	↗	↕			↕	
Traffic Vol, veh/h	0	0	140	0	0	1	218	1752	10	0	1514	19
Future Vol, veh/h	0	0	140	0	0	1	218	1752	10	0	1514	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	30	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	152	0	0	1	237	1904	11	0	1646	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	834	-	-	958	1667	0	0	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	311	0	0	258	382	-	-	0	-	-
Stage 1	0	0	-	0	0	-	-	-	-	0	-	-
Stage 2	0	0	-	0	0	-	-	-	-	0	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	311	-	-	258	382	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	27.2		19		3.2		0	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	382	-	-	311	258	-	-
HCM Lane V/C Ratio	0.62	-	-	0.489	0.004	-	-
HCM Control Delay (s)	28.6	-	-	27.2	19	-	-
HCM Lane LOS	D	-	-	D	C	-	-
HCM 95th %tile Q(veh)	4	-	-	2.5	0	-	-

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕		↖	↕
Traffic Vol, veh/h	0	41	1998	51	79	1623
Future Vol, veh/h	0	41	1998	51	79	1623
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	30	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	45	2172	55	86	1764

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	1114	0	0	2227
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22
Pot Cap-1 Maneuver	0	203	-	-	230
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	-	203	-	-	230
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.7	0	1.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	203	230
HCM Lane V/C Ratio	-	-	0.22	0.373
HCM Control Delay (s)	-	-	27.7	29.7
HCM Lane LOS	-	-	D	D
HCM 95th %tile Q(veh)	-	-	0.8	1.6

# **Appendix E-4**

**Synchro Analysis Output Reports for  
Future Conditions Traffic Operations –  
Scenario 3**

**Future Conditions Traffic Operations  
2043 Noon - Scenario 3**

HCM 6th TWSC  
4: Seventh Street West (East Approach)

Future Conditions 2043 Noon  
05/02/2024

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	176	1050	127	0	1067
Future Vol, veh/h	0	176	1050	127	0	1067
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	40	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	191	1141	138	0	1160

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	571	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	464	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	464	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 464	-
HCM Lane V/C Ratio	- 0.412	-
HCM Control Delay (s)	- 18.1	-
HCM Lane LOS	- C	-
HCM 95th %tile Q(veh)	- 2	-

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕			↕
Traffic Vol, veh/h	0	83	759	0	0	643
Future Vol, veh/h	0	83	759	0	0	643
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	90	825	0	0	699

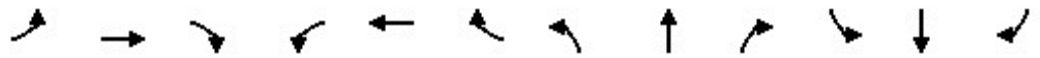
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	413	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	588	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	588	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 588	-
HCM Lane V/C Ratio	- 0.153	-
HCM Control Delay (s)	- 12.2	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.5	-

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	22	44	68	20	17	236	964	4	24	794	71
Future Volume (veh/h)	76	22	44	68	20	17	236	964	4	24	794	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	83	24	48	74	22	18	257	1048	4	26	863	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	274	91	181	245	155	127	494	2503	10	380	2011	897
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.09	0.69	0.69	0.57	0.57	0.57
Sat Flow, veh/h	1367	557	1113	1328	952	779	1781	3631	14	536	3554	1585
Grp Volume(v), veh/h	83	0	72	74	0	40	257	513	539	26	863	77
Grp Sat Flow(s),veh/h/ln	1367	0	1670	1328	0	1730	1781	1777	1868	536	1777	1585
Q Serve(g_s), s	5.1	0.0	3.5	4.7	0.0	1.8	5.0	11.6	11.6	2.0	12.8	2.0
Cycle Q Clear(g_c), s	6.9	0.0	3.5	8.2	0.0	1.8	5.0	11.6	11.6	2.3	12.8	2.0
Prop In Lane	1.00		0.67	1.00		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	274	0	272	245	0	282	494	1225	1287	380	2011	897
V/C Ratio(X)	0.30	0.00	0.26	0.30	0.00	0.14	0.52	0.42	0.42	0.07	0.43	0.09
Avail Cap(c_a), veh/h	690	0	781	649	0	809	759	1225	1287	380	2011	897
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.0	0.0	33.7	37.3	0.0	33.0	7.7	6.2	6.2	9.2	11.5	9.1
Incr Delay (d2), s/veh	1.3	0.0	1.1	1.5	0.0	0.5	1.2	1.1	1.0	0.3	0.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	1.6	1.8	0.0	0.9	2.3	5.2	5.5	0.3	5.8	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.3	0.0	34.8	38.7	0.0	33.5	8.9	7.3	7.2	9.6	12.1	9.3
LnGrp LOS	D	A	C	D	A	C	A	A	A	A	B	A
Approach Vol, veh/h		155			114			1309			966	
Approach Delay, s/veh		36.1			36.9			7.6			11.8	
Approach LOS		D			D			A			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		22.1	11.4	58.5		22.1				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+l1), s		13.6		8.9	7.0	14.8		10.2				
Green Ext Time (p_c), s		16.1		1.7	1.4	10.8		1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.2								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Future Conditions 2043 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	114	491	186	116	137	589	986	189	184	770	7
Future Volume (veh/h)	42	114	491	186	116	137	589	986	189	184	770	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	46	124	0	202	126	0	640	1072	205	200	837	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	399	332		429	441		338	1490	664	303	1936	18
Arrive On Green	0.05	0.18	0.00	0.11	0.24	0.00	0.42	0.42	0.42	0.08	0.54	0.54
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	652	3554	1585	1781	3607	34
Grp Volume(v), veh/h	46	124	0	202	126	0	640	1072	205	200	412	433
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	652	1777	1585	1781	1777	1864
Q Serve(g_s), s	1.8	5.3	0.0	7.9	5.0	0.0	35.7	22.6	7.8	5.4	12.6	12.6
Cycle Q Clear(g_c), s	1.8	5.3	0.0	7.9	5.0	0.0	37.7	22.6	7.8	5.4	12.6	12.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	399	332		429	441		338	1490	664	303	954	1000
V/C Ratio(X)	0.12	0.37		0.47	0.29		1.89	0.72	0.31	0.66	0.43	0.43
Avail Cap(c_a), veh/h	562	582		488	582		338	1490	664	410	954	1000
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	32.6	0.0	24.4	28.2	0.0	31.4	21.7	17.4	17.4	12.6	12.6
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.3	0.5	0.0	411.8	3.0	1.2	0.9	1.4	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	0.9	2.7	0.0	3.7	2.5	0.0	46.8	10.9	3.4	2.5	6.0	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.4	33.6	0.0	24.7	28.7	0.0	443.2	24.8	18.6	18.3	14.0	13.9
LnGrp LOS	C	C		C	C		F	C	B	B	B	B
Approach Vol, veh/h		170			328			1917			1045	
Approach Delay, s/veh		31.9			26.3			163.8			14.8	
Approach LOS		C			C			F			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	40.6	43.9	13.0	22.5		54.5	7.8	27.7				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5		6.2	3.0	6.5				
Max Green Setting (Gmax), s	33.0	32.3	13.0	28.0		48.3	13.0	28.0				
Max Q Clear Time (g_c+1), s	39.7	39.7	9.9	7.3		14.6	3.8	7.0				
Green Ext Time (p_c), s	0.2	0.0	0.1	0.9		4.8	0.0	0.9				

Intersection Summary

HCM 6th Ctrl Delay	99.3
HCM 6th LOS	F

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
16: Food Basics/Ninth Street West

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	361	250	50	93	221	391	163	842	146	539	810	239
Future Volume (veh/h)	361	250	50	93	221	391	163	842	146	539	810	239
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	392	272	54	101	240	425	177	915	0	586	880	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	399	464	92	356	472	400	320	1045		381	1307	
Arrive On Green	0.13	0.31	0.31	0.07	0.25	0.25	0.09	0.29	0.00	0.16	0.37	0.00
Sat Flow, veh/h	1781	1515	301	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	392	0	326	101	240	425	177	915	0	586	880	0
Grp Sat Flow(s),veh/h/ln	1781	0	1816	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	15.0	0.0	17.8	4.7	12.9	29.5	8.0	28.6	0.0	19.0	24.3	0.0
Cycle Q Clear(g_c), s	15.0	0.0	17.8	4.7	12.9	29.5	8.0	28.6	0.0	19.0	24.3	0.0
Prop In Lane	1.00		0.17	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	399	0	556	356	472	400	320	1045		381	1307	
V/C Ratio(X)	0.98	0.00	0.59	0.28	0.51	1.06	0.55	0.88		1.54	0.67	
Avail Cap(c_a), veh/h	399	0	556	453	472	400	452	1045		381	1307	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	33.5	0.0	34.3	28.8	37.5	43.8	26.2	39.3	0.0	31.7	31.1	0.0
Incr Delay (d2), s/veh	39.9	0.0	1.9	0.2	1.3	62.8	1.5	10.3	0.0	255.2	2.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.3	0.0	8.8	2.2	6.5	19.3	3.8	14.9	0.0	34.7	11.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.3	0.0	36.2	28.9	38.8	106.6	27.7	49.5	0.0	286.9	33.9	0.0
LnGrp LOS	E	A	D	C	D	F	C	D		F	C	
Approach Vol, veh/h		718			766			1092			1466	
Approach Delay, s/veh		56.5			75.1			46.0			135.0	
Approach LOS		E			E			D			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	22.0	40.9	11.7	42.4	13.4	49.5	18.0	36.1				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	19.0	34.4	15.0	29.5	19.0	34.4	15.0	29.5				
Max Q Clear Time (g_c+Y), s	21.0	30.6	6.7	19.8	10.0	26.3	17.0	31.5				
Green Ext Time (p_c), s	0.0	2.3	0.1	2.0	0.4	4.1	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	85.7
HCM 6th LOS	F

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↕			↕	↗
Traffic Vol, veh/h	0	0	101	0	0	3	0	1793	10	0	1522	25
Future Vol, veh/h	0	0	101	0	0	3	0	1793	10	0	1522	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	110	0	0	3	0	1949	11	0	1654	27

Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	-	-	827	-	-	980	-	0
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-
Pot Cap-1 Maneuver	0	0	315	0	0	249	0	-
Stage 1	0	0	-	0	0	-	0	-
Stage 2	0	0	-	0	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	315	-	-	249	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	22.4		19.7		0		0	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	-	-	315	249	-	-
HCM Lane V/C Ratio	-	-	0.349	0.013	-	-
HCM Control Delay (s)	-	-	22.4	19.7	-	-
HCM Lane LOS	-	-	C	C	-	-
HCM 95th %tile Q(veh)	-	-	1.5	0	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕			↕
Traffic Vol, veh/h	0	32	1763	49	0	1705
Future Vol, veh/h	0	32	1763	49	0	1705
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	35	1916	53	0	1853

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	985	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	247	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	247	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.9	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	247
HCM Lane V/C Ratio	-	-	0.141
HCM Control Delay (s)	-	-	21.9
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	0.5

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	16	0	759	643	10
Future Vol, veh/h	0	16	0	759	643	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	17	0	825	699	11

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	355	-	0	0
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	641	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	641	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	641	-	-
HCM Lane V/C Ratio	-	0.027	-	-
HCM Control Delay (s)	-	10.8	-	-
HCM Lane LOS	-	B	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-

Intersection						
Int Delay, s/veh	1.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	246	0	1226	821	266
Future Vol, veh/h	0	246	0	1226	821	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	Free
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	267	0	1333	892	289

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	446	-	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	560	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	560	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT EBLn1	SBT
Capacity (veh/h)	- 560	-
HCM Lane V/C Ratio	- 0.477	-
HCM Control Delay (s)	- 17.2	-
HCM Lane LOS	- C	-
HCM 95th %tile Q(veh)	- 2.6	-

**Future Conditions Traffic Operations  
2043 PM - Scenario 3**

Intersection						
Int Delay, s/veh	1.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	152	1123	125	0	1128
Future Vol, veh/h	0	152	1123	125	0	1128
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	40	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	165	1221	136	0	1226

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	611	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	437	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	437	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 437	-
HCM Lane V/C Ratio	- 0.378	-
HCM Control Delay (s)	- 18.2	-
HCM Lane LOS	- C	-
HCM 95th %tile Q(veh)	- 1.7	-

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕			↕
Traffic Vol, veh/h	0	84	752	0	0	709
Future Vol, veh/h	0	84	752	0	0	709
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	91	817	0	0	771

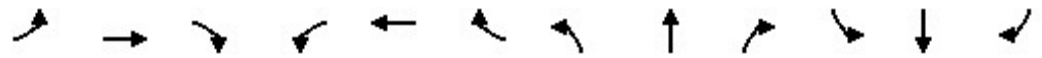
Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	409	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.94	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.32	-
Pot Cap-1 Maneuver	0	592	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	592	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 592	-
HCM Lane V/C Ratio	- 0.154	-
HCM Control Delay (s)	- 12.2	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.5	-

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	5	33	34	6	14	248	966	5	8	835	44
Future Volume (veh/h)	74	5	33	34	6	14	248	966	5	8	835	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	5	36	37	7	15	270	1050	5	9	908	48
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	287	32	229	269	86	184	490	2503	12	379	2000	892
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.09	0.69	0.69	0.56	0.56	0.56
Sat Flow, veh/h	1390	197	1418	1366	530	1136	1781	3627	17	535	3554	1585
Grp Volume(v), veh/h	80	0	41	37	0	22	270	514	541	9	908	48
Grp Sat Flow(s),veh/h/ln	1390	0	1615	1366	0	1666	1781	1777	1867	535	1777	1585
Q Serve(g_s), s	4.8	0.0	2.0	2.2	0.0	1.0	5.3	11.6	11.6	0.7	13.8	1.3
Cycle Q Clear(g_c), s	5.8	0.0	2.0	4.2	0.0	1.0	5.3	11.6	11.6	0.7	13.8	1.3
Prop In Lane	1.00		0.88	1.00		0.68	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	287	0	261	269	0	269	490	1227	1289	379	2000	892
V/C Ratio(X)	0.28	0.00	0.16	0.14	0.00	0.08	0.55	0.42	0.42	0.02	0.45	0.05
Avail Cap(c_a), veh/h	713	0	756	688	0	780	747	1227	1289	379	2000	892
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	0.0	33.1	34.9	0.0	32.7	8.1	6.2	6.2	8.9	11.8	9.1
Incr Delay (d2), s/veh	1.1	0.0	0.6	0.5	0.0	0.3	1.4	1.1	1.0	0.1	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.9	0.8	0.0	0.5	2.4	5.2	5.5	0.1	6.3	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.3	0.0	33.7	35.4	0.0	33.0	9.5	7.3	7.2	9.0	12.5	9.2
LnGrp LOS	D	A	C	D	A	C	A	A	A	A	B	A
Approach Vol, veh/h		121			59			1325			965	
Approach Delay, s/veh		35.4			34.5			7.7			12.3	
Approach LOS		D			C			A			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		69.9		21.9	11.7	58.2		21.9				
Change Period (Y+Rc), s		6.5		7.1	3.0	6.5		7.1				
Max Green Setting (Gmax), s		63.4		43.0	22.0	37.4		43.0				
Max Q Clear Time (g_c+I1), s		13.6		7.8	7.3	15.8		6.2				
Green Ext Time (p_c), s		16.2		1.2	1.5	10.5		0.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				11.5								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 13: Vincent Massey Drive/Thirteenth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	103	356	207	116	44	580	1151	186	152	801	33
Future Volume (veh/h)	30	103	356	207	116	44	580	1151	186	152	801	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	112	0	225	126	0	630	1251	202	165	871	36
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	379	328		453	474		309	1499	669	253	1845	76
Arrive On Green	0.04	0.18	0.00	0.12	0.25	0.00	0.42	0.42	0.42	0.08	0.53	0.53
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	615	3554	1585	1781	3478	144
Grp Volume(v), veh/h	33	112	0	225	126	0	630	1251	202	165	445	462
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	615	1777	1585	1781	1777	1844
Q Serve(g_s), s	1.3	4.8	0.0	9.0	4.9	0.0	34.0	28.6	7.7	4.5	14.3	14.3
Cycle Q Clear(g_c), s	1.3	4.8	0.0	9.0	4.9	0.0	38.4	28.6	7.7	4.5	14.3	14.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	379	328		453	474		309	1499	669	253	943	979
V/C Ratio(X)	0.09	0.34		0.50	0.27		2.04	0.83	0.30	0.65	0.47	0.47
Avail Cap(c_a), veh/h	556	575		491	575		309	1499	669	373	943	979
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.3	32.9	0.0	24.5	27.2	0.0	32.9	23.5	17.4	19.4	13.4	13.4
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.3	0.4	0.0	478.9	5.6	1.2	1.1	1.7	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr	0.6	2.4	0.0	4.2	2.4	0.0	48.5	14.2	3.3	2.1	6.8	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.3	33.8	0.0	24.8	27.6	0.0	511.8	29.1	18.6	20.4	15.1	15.0
LnGrp LOS	C	C		C	C		F	C	B	C	B	B
Approach Vol, veh/h		145			351			2083			1072	
Approach Delay, s/veh		32.5			25.8			174.1			15.9	
Approach LOS		C			C			F			B	
Timer - Assigned Phs	1	2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s	9.9	44.6	14.0	22.5		54.5	7.0	29.6				
Change Period (Y+Rc), s	3.0	6.2	3.0	6.5		6.2	3.0	6.5				
Max Green Setting (Gmax), s	13.0	32.3	13.0	28.0		48.3	13.0	28.0				
Max Q Clear Time (g_c+1), s	10.5	40.4	11.0	6.8		16.3	3.3	6.9				
Green Ext Time (p_c), s	0.2	0.0	0.1	0.8		5.3	0.0	1.0				

Intersection Summary

HCM 6th Ctrl Delay	107.7
HCM 6th LOS	F

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	482	279	125	162	276	484	152	830	277	590	705	434
Future Volume (veh/h)	482	279	125	162	276	484	152	830	277	590	705	434
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	524	303	136	176	300	526	165	902	0	641	766	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	362	355	159	276	472	400	352	1045		384	1320	
Arrive On Green	0.13	0.29	0.29	0.09	0.25	0.25	0.09	0.29	0.00	0.16	0.37	0.00
Sat Flow, veh/h	1781	1223	549	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	524	0	439	176	300	526	165	902	0	641	766	0
Grp Sat Flow(s),veh/h/ln	1781	0	1772	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	15.0	0.0	27.4	8.4	16.7	29.5	7.4	28.1	0.0	19.0	20.2	0.0
Cycle Q Clear(g_c), s	15.0	0.0	27.4	8.4	16.7	29.5	7.4	28.1	0.0	19.0	20.2	0.0
Prop In Lane	1.00		0.31	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	362	0	514	276	472	400	352	1045		384	1320	
V/C Ratio(X)	1.45	0.00	0.85	0.64	0.64	1.32	0.47	0.86		1.67	0.58	
Avail Cap(c_a), veh/h	362	0	514	343	472	400	490	1045		384	1320	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	32.6	0.0	39.2	30.8	39.0	43.8	25.6	39.1	0.0	31.2	29.5	0.0
Incr Delay (d2), s/veh	215.7	0.0	13.6	1.2	3.2	159.0	1.0	9.4	0.0	312.3	1.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	25.6	0.0	14.7	4.0	8.7	30.0	3.5	14.5	0.0	41.1	9.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	248.3	0.0	52.8	32.0	42.2	202.8	26.5	48.5	0.0	343.4	31.3	0.0
LnGrp LOS	F	A	D	C	D	F	C	D		F	C	
Approach Vol, veh/h		963			1002			1067			1407	
Approach Delay, s/veh		159.2			124.7			45.1			173.5	
Approach LOS		F			F			D			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	32.0	40.9	13.6	40.5	13.0	49.9	18.0	36.1				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	19.0	34.4	15.0	29.5	19.0	34.4	15.0	29.5				
Max Q Clear Time (g_c+Y), s	19.0	30.1	10.4	29.4	9.4	22.2	17.0	31.5				
Green Ext Time (p_c), s	0.0	2.5	0.2	0.1	0.4	4.7	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	128.5
HCM 6th LOS	F

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↕			↕	↗
Traffic Vol, veh/h	0	0	140	0	0	1	0	1950	10	0	1513	19
Future Vol, veh/h	0	0	140	0	0	1	0	1950	10	0	1513	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	152	0	0	1	0	2120	11	0	1645	21

Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	-	-	823	-	-	1066	-	0
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-
Pot Cap-1 Maneuver	0	0	317	0	0	218	0	-
Stage 1	0	0	-	0	0	-	-	0
Stage 2	0	0	-	0	0	-	-	0
Platoon blocked, %	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	317	-	-	218	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	26.4		21.6		0		0	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	-	-	317	218	-	-
HCM Lane V/C Ratio	-	-	0.48	0.005	-	-
HCM Control Delay (s)	-	-	26.4	21.6	-	-
HCM Lane LOS	-	-	D	C	-	-
HCM 95th %tile Q(veh)	-	-	2.5	0	-	-

Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕			↕
Traffic Vol, veh/h	0	42	1998	83	0	1673
Future Vol, veh/h	0	42	1998	83	0	1673
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	46	2172	90	0	1818

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	1131	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	197	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	197	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.7	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	197
HCM Lane V/C Ratio	-	-	0.232
HCM Control Delay (s)	-	-	28.7
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	0.9

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	13	0	752	709	2
Future Vol, veh/h	0	13	0	752	709	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	14	0	817	771	2

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	387	-	0	0
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	611	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	611	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT EBLn1	SBT	SBR
Capacity (veh/h)	- 611	-	-
HCM Lane V/C Ratio	- 0.023	-	-
HCM Control Delay (s)	- 11	-	-
HCM Lane LOS	- B	-	-
HCM 95th %tile Q(veh)	- 0.1	-	-

**Intersection**

Int Delay, s/veh 2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	
Traffic Vol, veh/h	0	311	0	1275	817	340
Future Vol, veh/h	0	311	0	1275	817	340
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	Free
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	338	0	1386	888	370

**Major/Minor**

	Minor2	Major1	Major2
Conflicting Flow All	-	444	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.94	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.32	-
Pot Cap-1 Maneuver	0	561	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	561	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

**Approach**

	EB	NB	SB
HCM Control Delay, s	20.7	0	0
HCM LOS	C		

**Minor Lane/Major Mvmt**

	NBT EBLn1	SBT
Capacity (veh/h)	- 561	-
HCM Lane V/C Ratio	- 0.603	-
HCM Control Delay (s)	- 20.7	-
HCM Lane LOS	- C	-
HCM 95th %tile Q(veh)	- 4	-

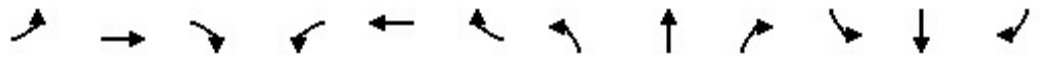
# **Appendix E-5**

**Synchro Analysis Output Reports for  
Future Conditions Traffic Operations –  
Scenario 4**

**Future Conditions Traffic Operations  
2043 Noon - Scenario 4**

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	104	22	663	68	20	17	588	964	4	24	794	78
Future Volume (veh/h)	104	22	663	68	20	17	588	964	4	24	794	78
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	113	24	721	74	22	18	639	1048	4	26	863	85
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	494	623	854	292	317	260	711	2009	8	224	1087	485
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.21	0.55	0.55	0.31	0.31	0.31
Sat Flow, veh/h	1367	1870	1585	715	952	779	3456	3631	14	536	3554	1585
Grp Volume(v), veh/h	113	24	721	74	0	40	639	513	539	26	863	85
Grp Sat Flow(s),veh/h/ln	1367	1870	1585	715	0	1730	1728	1777	1868	536	1777	1585
Q Serve(g_s), s	7.4	1.0	40.0	9.3	0.0	1.9	21.6	21.7	21.7	4.2	26.7	4.7
Cycle Q Clear(g_c), s	9.3	1.0	40.0	10.4	0.0	1.9	21.6	21.7	21.7	4.2	26.7	4.7
Prop In Lane	1.00		1.00	1.00		0.45	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	494	623	854	292	0	577	711	983	1034	224	1087	485
V/C Ratio(X)	0.23	0.04	0.84	0.25	0.00	0.07	0.90	0.52	0.52	0.12	0.79	0.18
Avail Cap(c_a), veh/h	494	623	854	292	0	577	749	983	1034	224	1087	485
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.5	27.0	23.4	30.5	0.0	27.3	46.4	16.8	16.8	30.4	38.2	30.5
Incr Delay (d2), s/veh	0.5	0.1	8.5	1.0	0.0	0.1	13.8	2.0	1.9	1.1	6.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.5	20.8	1.8	0.0	0.9	11.3	10.4	10.9	0.7	13.4	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.0	27.1	31.8	31.5	0.0	27.4	60.2	18.8	18.7	31.4	44.2	31.3
LnGrp LOS	C	C	C	C	A	C	E	B	B	C	D	C
Approach Vol, veh/h		858			114			1691			974	
Approach Delay, s/veh		31.6			30.1			34.4			42.7	
Approach LOS		C			C			C			D	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		72.9		47.1	29.7	43.2		47.1				
Change Period (Y+Rc), s		6.5		7.1	5.0	6.5		7.1				
Max Green Setting (Gmax), s		66.4		40.0	26.0	35.4		40.0				
Max Q Clear Time (g_c+I1), s		23.7		42.0	23.6	28.7		12.4				
Green Ext Time (p_c), s		15.4		0.0	1.1	4.5		1.6				

Intersection Summary

HCM 6th Ctrl Delay	35.8
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary  
12: Seventh Street West

Future Conditions 2043 Noon  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕		↙	↕	
Traffic Volume (veh/h)	194	27	25	35	23	118	8	828	8	112	674	235
Future Volume (veh/h)	194	27	25	35	23	118	8	828	8	112	674	235
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	211	29	27	38	25	128	9	900	9	122	733	255
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	345	40	33	114	89	291	364	1667	17	477	1599	556
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.46	0.46	0.46	0.11	0.62	0.62
Sat Flow, veh/h	994	155	129	212	347	1135	570	3605	36	1781	2586	900
Grp Volume(v), veh/h	267	0	0	191	0	0	9	444	465	122	504	484
Grp Sat Flow(s),veh/h/ln	1278	0	0	1694	0	0	570	1777	1864	1781	1777	1708
Q Serve(g_s), s	7.4	0.0	0.0	0.0	0.0	0.0	0.6	12.9	12.9	2.1	10.9	10.9
Cycle Q Clear(g_c), s	14.3	0.0	0.0	6.9	0.0	0.0	0.6	12.9	12.9	2.1	10.9	10.9
Prop In Lane	0.79		0.10	0.20		0.67	1.00		0.02	1.00		0.53
Lane Grp Cap(c), veh/h	417	0	0	495	0	0	364	822	862	477	1099	1056
V/C Ratio(X)	0.64	0.00	0.00	0.39	0.00	0.00	0.02	0.54	0.54	0.26	0.46	0.46
Avail Cap(c_a), veh/h	929	0	0	1103	0	0	364	822	862	546	1099	1056
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	0.0	22.5	0.0	0.0	10.6	13.9	13.9	8.0	7.3	7.3
Incr Delay (d2), s/veh	1.6	0.0	0.0	0.5	0.0	0.0	0.1	2.5	2.4	0.3	1.4	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	0.0	0.0	3.0	0.0	0.0	0.1	6.2	6.5	0.9	5.0	4.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	0.0	0.0	23.0	0.0	0.0	10.7	16.4	16.3	8.2	8.7	8.7
LnGrp LOS	C	A	A	C	A	A	B	B	B	A	A	A
Approach Vol, veh/h		267			191			918			1110	
Approach Delay, s/veh		26.9			23.0			16.3			8.7	
Approach LOS		C			C			B			A	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	1.2	37.8		23.0		49.0		23.0				
Change Period (Y+Rc), s	3.0	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	1.0	30.5		46.5		44.5		46.5				
Max Q Clear Time (g_c+1/4), s	1.0	14.9		16.3		12.9		8.9				
Green Ext Time (p_c), s	0.2	6.2		2.2		9.4		1.5				

Intersection Summary

HCM 6th Ctrl Delay	14.5
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary  
13: Thirteenth Street West

Future Conditions 2043 Noon  
05/02/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	186	253	1222	189	312	1261
Future Volume (veh/h)	186	253	1222	189	312	1261
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	202	0	1328	205	339	1371
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	246		2234	996	382	2677
Arrive On Green	0.14	0.00	0.63	0.63	0.09	0.75
Sat Flow, veh/h	1781	1585	3647	1585	1781	3647
Grp Volume(v), veh/h	202	0	1328	205	339	1371
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1585	1781	1777
Q Serve(g_s), s	9.3	0.0	18.8	4.7	5.1	13.1
Cycle Q Clear(g_c), s	9.3	0.0	18.8	4.7	5.1	13.1
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	246		2234	996	382	2677
V/C Ratio(X)	0.82		0.59	0.21	0.89	0.51
Avail Cap(c_a), veh/h	673		2234	996	475	2677
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.5	0.0	9.3	6.7	14.5	4.2
Incr Delay (d2), s/veh	2.6	0.0	1.2	0.5	13.8	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	8.4	1.9	6.3	5.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	38.1	0.0	10.5	7.2	28.3	4.9
LnGrp LOS	D		B	A	C	A
Approach Vol, veh/h	202		1533			1710
Approach Delay, s/veh	38.1		10.1			9.5
Approach LOS	D		B			A
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	60.6	59.4		14.7		70.0
Change Period (Y+Rc), s	3.0	6.2		3.0		6.2
Max Green Setting (Gmax), s	42.0	48.8		32.0		63.8
Max Q Clear Time (g_c+11), s	20.8			11.3		15.1
Green Ext Time (p_c), s	0.4	10.8		0.5		11.9

Intersection Summary

HCM 6th Ctrl Delay		11.4				
HCM 6th LOS			B			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 Noon  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔		↔	↔	↔	↔	↔↔	↔	↔↔	↔↔	↔
Traffic Volume (veh/h)	361	250	50	93	221	391	163	842	146	411	810	239
Future Volume (veh/h)	361	250	50	93	221	391	163	842	146	411	810	239
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	392	272	54	101	240	425	177	915	0	447	880	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	447	458	91	356	465	631	319	1080		516	1298	
Arrive On Green	0.13	0.30	0.30	0.08	0.25	0.25	0.09	0.30	0.00	0.15	0.37	0.00
Sat Flow, veh/h	3456	1515	301	1781	1870	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	392	0	326	101	240	425	177	915	0	447	880	0
Grp Sat Flow(s),veh/h/ln	1728	0	1816	1781	1870	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	12.6	0.0	17.3	4.6	12.5	25.0	7.6	27.4	0.0	14.3	23.7	0.0
Cycle Q Clear(g_c), s	12.6	0.0	17.3	4.6	12.5	25.0	7.6	27.4	0.0	14.3	23.7	0.0
Prop In Lane	1.00		0.17	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	447	0	549	356	465	631	319	1080		516	1298	
V/C Ratio(X)	0.88	0.00	0.59	0.28	0.52	0.67	0.55	0.85		0.87	0.68	
Avail Cap(c_a), veh/h	454	0	549	455	486	649	460	1080		579	1298	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	48.5	0.0	33.7	28.0	36.7	28.1	25.0	37.0	0.0	47.1	30.4	0.0
Incr Delay (d2), s/veh	16.5	0.0	2.1	0.2	1.3	3.0	1.5	8.2	0.0	12.0	2.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.8	0.0	8.6	2.2	6.4	10.9	3.7	14.0	0.0	7.5	11.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.0	0.0	35.8	28.2	38.0	31.1	26.5	45.2	0.0	59.2	33.3	0.0
LnGrp LOS	E	A	D	C	D	C	C	D		E	C	
Approach Vol, veh/h		718			766			1092			1327	
Approach Delay, s/veh		51.7			32.9			42.2			42.0	
Approach LOS		D			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	30.0	41.0	11.6	40.9	13.0	47.9	17.7	34.8				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	19.0	34.5	14.9	29.5	19.0	34.5	14.9	29.5				
Max Q Clear Time (g_c+11g), s	11.0	29.4	6.6	19.3	9.6	25.7	14.6	27.0				
Green Ext Time (p_c), s	0.6	2.9	0.1	2.1	0.4	4.4	0.1	1.2				

Intersection Summary

HCM 6th Ctrl Delay	42.0
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗	↗	↕		↗	↕	
Traffic Vol, veh/h	0	0	104	0	0	3	155	1537	6	4	1486	25
Future Vol, veh/h	0	0	104	0	0	3	155	1537	6	4	1486	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	30	-	-	30	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	113	0	0	3	168	1671	7	4	1615	27

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	821	-	-	839	1642	0	0	1678	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	318	0	0	309	390	-	-	378	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	318	-	-	309	390	-	-	378	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	22.4		16.8		1.9		0			
HCM LOS	C		C							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	390	-	-	318	309	378	-	-
HCM Lane V/C Ratio	0.432	-	-	0.355	0.011	0.012	-	-
HCM Control Delay (s)	21.1	-	-	22.4	16.8	14.6	-	-
HCM Lane LOS	C	-	-	C	C	B	-	-
HCM 95th %tile Q(veh)	2.1	-	-	1.6	0	0	-	-

**Intersection**

Int Delay, s/veh 0.4

**Movement** WBL WBR NBT NBR SBL SBT

Lane Configurations		↗	↕		↖	↕
Traffic Vol, veh/h	0	43	1647	27	33	1637
Future Vol, veh/h	0	43	1647	27	33	1637
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	30	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	47	1790	29	36	1779

**Major/Minor** Minor1 Major1 Major2

Conflicting Flow All	-	910	0	0	1819	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	277	-	-	333	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	277	-	-	333	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

**Approach** WB NB SB

HCM Control Delay, s	20.6	0	0.3
HCM LOS	C		

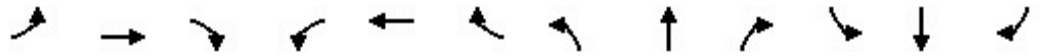
**Minor Lane/Major Mvmt** NBT NBRWBLn1 SBL SBT

Capacity (veh/h)	-	-	277	333	-
HCM Lane V/C Ratio	-	-	0.169	0.108	-
HCM Control Delay (s)	-	-	20.6	17.1	-
HCM Lane LOS	-	-	C	C	-
HCM 95th %tile Q(veh)	-	-	0.6	0.4	-

**Future Conditions Traffic Operations  
2043 PM - Scenario 4**

HCM 6th Signalized Intersection Summary  
7: Fourteenth Street

Future Conditions 2043 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	94	5	502	34	6	14	612	966	5	8	835	77
Future Volume (veh/h)	94	5	502	34	6	14	612	966	5	8	835	77
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	102	5	546	37	7	15	665	1050	5	9	908	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	473	570	823	322	162	346	741	2092	10	233	1134	506
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.21	0.58	0.58	0.32	0.32	0.32
Sat Flow, veh/h	1390	1870	1585	857	530	1136	3456	3627	17	535	3554	1585
Grp Volume(v), veh/h	102	5	546	37	0	22	665	514	541	9	908	84
Grp Sat Flow(s),veh/h/ln	1390	1870	1585	857	0	1666	1728	1777	1867	535	1777	1585
Q Serve(g_s), s	6.4	0.2	29.1	3.6	0.0	1.1	21.5	19.8	19.8	1.3	26.9	4.4
Cycle Q Clear(g_c), s	7.5	0.2	29.1	3.8	0.0	1.1	21.5	19.8	19.8	1.3	26.9	4.4
Prop In Lane	1.00		1.00	1.00		0.68	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	473	570	823	322	0	508	741	1025	1077	233	1134	506
V/C Ratio(X)	0.22	0.01	0.66	0.11	0.00	0.04	0.90	0.50	0.50	0.04	0.80	0.17
Avail Cap(c_a), veh/h	533	650	891	359	0	579	781	1025	1077	233	1134	506
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.8	27.9	20.3	29.2	0.0	28.2	44.0	14.5	14.5	27.1	35.9	28.2
Incr Delay (d2), s/veh	0.5	0.0	2.5	0.3	0.0	0.1	13.1	1.8	1.7	0.3	6.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.1	12.4	0.8	0.0	0.5	11.2	9.5	9.9	0.2	13.5	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.3	27.9	22.8	29.5	0.0	28.2	57.1	16.3	16.2	27.5	41.8	28.9
LnGrp LOS	C	C	C	C	A	C	E	B	B	C	D	C
Approach Vol, veh/h		653			59			1720			1001	
Approach Delay, s/veh		24.1			29.1			32.0			40.6	
Approach LOS		C			C			C			D	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		72.9		42.2	29.7	43.2		42.2				
Change Period (Y+Rc), s		6.5		7.1	5.0	6.5		7.1				
Max Green Setting (Gmax), s		66.4		40.0	26.0	35.4		40.0				
Max Q Clear Time (g_c+I1), s		21.8		31.1	23.5	28.9		5.8				
Green Ext Time (p_c), s		15.7		4.0	1.1	4.4		0.7				

Intersection Summary

HCM 6th Ctrl Delay	33.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary  
12: Seventh Street West

Future Conditions 2043 PM  
05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕		↙	↕	
Traffic Volume (veh/h)	239	31	40	35	12	105	9	831	17	121	661	319
Future Volume (veh/h)	239	31	40	35	12	105	9	831	17	121	661	319
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	260	34	43	38	13	114	10	903	18	132	718	347
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	392	40	51	142	71	346	285	1452	29	417	1296	626
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.41	0.41	0.41	0.11	0.56	0.56
Sat Flow, veh/h	1035	135	171	281	240	1163	530	3563	71	1781	2323	1122
Grp Volume(v), veh/h	337	0	0	165	0	0	10	450	471	132	549	516
Grp Sat Flow(s),veh/h/ln	1342	0	0	1683	0	0	530	1777	1858	1781	1777	1668
Q Serve(g_s), s	12.1	0.0	0.0	0.0	0.0	0.0	0.9	15.3	15.3	2.8	15.1	15.1
Cycle Q Clear(g_c), s	17.9	0.0	0.0	5.9	0.0	0.0	4.6	15.3	15.3	2.8	15.1	15.1
Prop In Lane	0.77		0.13	0.23		0.69	1.00		0.04	1.00		0.67
Lane Grp Cap(c), veh/h	483	0	0	560	0	0	285	724	757	417	991	931
V/C Ratio(X)	0.70	0.00	0.00	0.29	0.00	0.00	0.04	0.62	0.62	0.32	0.55	0.55
Avail Cap(c_a), veh/h	903	0	0	1038	0	0	285	724	757	477	991	931
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.1	0.0	0.0	20.8	0.0	0.0	15.9	17.9	17.9	11.1	10.8	10.8
Incr Delay (d2), s/veh	1.8	0.0	0.0	0.3	0.0	0.0	0.2	4.0	3.8	0.4	2.2	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.4	0.0	0.0	2.6	0.0	0.0	0.1	7.7	8.0	1.3	7.1	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	0.0	0.0	21.1	0.0	0.0	16.2	21.9	21.7	11.5	13.0	13.2
LnGrp LOS	C	A	A	C	A	A	B	C	C	B	B	B
Approach Vol, veh/h		337			165			931			1197	
Approach Delay, s/veh		26.9			21.1			21.8			12.9	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	1.4	37.6		27.2		49.0		27.2				
Change Period (Y+Rc), s	3.0	6.5		4.5		6.5		4.5				
Max Green Setting (Gmax), s	1.0	28.5		46.5		42.5		46.5				
Max Q Clear Time (g_c+1/4), s	1.0	17.3		19.9		17.1		7.9				
Green Ext Time (p_c), s	0.2	5.1		2.8		9.6		1.3				

Intersection Summary

HCM 6th Ctrl Delay	18.4
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary  
 13: Thirteenth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	207	160	1399	186	265	1157
Future Volume (veh/h)	207	160	1399	186	265	1157
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	225	0	1521	202	288	1258
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	267		2073	925	326	2529
Arrive On Green	0.15	0.00	0.58	0.58	0.09	0.71
Sat Flow, veh/h	1781	1585	3647	1585	1781	3647
Grp Volume(v), veh/h	225	0	1521	202	288	1258
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1585	1781	1777
Q Serve(g_s), s	11.0	0.0	27.9	5.5	6.2	14.2
Cycle Q Clear(g_c), s	11.0	0.0	27.9	5.5	6.2	14.2
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	267		2073	925	326	2529
V/C Ratio(X)	0.84		0.73	0.22	0.88	0.50
Avail Cap(c_a), veh/h	572		2073	925	395	2529
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	0.0	13.6	8.9	20.0	5.8
Incr Delay (d2), s/veh	2.8	0.0	2.3	0.5	16.1	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0	12.9	2.3	8.0	6.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	39.8	0.0	15.9	9.5	36.1	6.5
LnGrp LOS	D		B	A	D	A
Approach Vol, veh/h	225		1723			1546
Approach Delay, s/veh	39.8		15.2			12.0
Approach LOS	D		B			B
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	1.5	58.5		19.6		70.0
Change Period (Y+Rc), s	3.0	6.2		6.2		6.2
Max Green Setting (Gmax), s	12.0	48.8		28.8		63.8
Max Q Clear Time (g_c+1.0), s	10.2	29.9		13.0		16.2
Green Ext Time (p_c), s	0.3	10.4		0.5		10.3

Intersection Summary

HCM 6th Ctrl Delay			15.4			
HCM 6th LOS			B			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary  
 16: Food Basics/Ninth Street West

Future Conditions 2043 PM  
 05/02/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔		↔	↔	↔	↔	↔↔	↔	↔↔	↔↔	↔
Traffic Volume (veh/h)	482	279	125	162	276	484	152	830	277	467	705	434
Future Volume (veh/h)	482	279	125	162	276	484	152	830	277	467	705	434
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	524	303	136	176	300	526	165	902	0	508	766	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	563	381	171	302	449	637	335	995		558	1269	
Arrive On Green	0.16	0.31	0.31	0.09	0.24	0.24	0.08	0.28	0.00	0.16	0.36	0.00
Sat Flow, veh/h	3456	1223	549	1781	1870	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	524	0	439	176	300	526	165	902	0	508	766	0
Grp Sat Flow(s),veh/h/ln	1728	0	1772	1781	1870	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	18.4	0.0	27.9	9.0	17.8	29.5	8.0	30.1	0.0	17.8	21.7	0.0
Cycle Q Clear(g_c), s	18.4	0.0	27.9	9.0	17.8	29.5	8.0	30.1	0.0	17.8	21.7	0.0
Prop In Lane	1.00		0.31	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	563	0	552	302	449	637	335	995		558	1269	
V/C Ratio(X)	0.93	0.00	0.80	0.58	0.67	0.83	0.49	0.91		0.91	0.60	
Avail Cap(c_a), veh/h	563	0	552	429	449	637	475	995		563	1269	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	50.7	0.0	38.7	32.3	42.2	32.9	28.1	42.7	0.0	50.6	32.3	0.0
Incr Delay (d2), s/veh	22.1	0.0	8.3	0.7	4.2	9.1	1.1	13.3	0.0	18.9	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ft	0.2	0.0	14.3	4.3	9.4	16.8	3.8	16.0	0.0	9.6	10.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.8	0.0	47.0	32.9	46.5	42.1	29.3	56.0	0.0	69.6	34.5	0.0
LnGrp LOS	E	A	D	C	D	D	C	E		E	C	
Approach Vol, veh/h		963			1002			1067			1274	
Approach Delay, s/veh		61.1			41.8			51.8			48.5	
Approach LOS		E			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	32.8	40.9	14.2	44.9	13.4	50.4	23.0	36.1				
Change Period (Y+Rc), s	3.0	6.5	3.0	6.6	3.0	6.5	3.0	6.6				
Max Green Setting (Gmax), s	20.0	34.4	20.0	29.5	20.0	34.4	20.0	29.5				
Max Q Clear Time (g_c+119), s	119.8	32.1	11.0	29.9	10.0	23.7	20.4	31.5				
Green Ext Time (p_c), s	0.1	1.4	0.3	0.0	0.4	4.4	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	50.6
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗	↗	↕		↗	↕	
Traffic Vol, veh/h	0	0	149	0	0	1	144	1741	5	5	1484	19
Future Vol, veh/h	0	0	149	0	0	1	144	1741	5	5	1484	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Stop	-	-	Stop	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	30	-	-	30	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	162	0	0	1	157	1892	5	5	1613	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	817	-	-	949	1634	0	0	1897	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	320	0	0	261	393	-	-	310	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	320	-	-	261	393	-	-	310	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	27.2		18.9		1.5		0.1	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	393	-	-	320	261	310	-	-
HCM Lane V/C Ratio	0.398	-	-	0.506	0.004	0.018	-	-
HCM Control Delay (s)	20.1	-	-	27.2	18.9	16.8	-	-
HCM Lane LOS	C	-	-	D	C	C	-	-
HCM 95th %tile Q(veh)	1.9	-	-	2.7	0	0.1	-	-

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕		↖	↕
Traffic Vol, veh/h	0	55	1907	51	45	1559
Future Vol, veh/h	0	55	1907	51	45	1559
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	-	0	-	-	30	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	60	2073	55	49	1695

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	1064	0	0	2128
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22
Pot Cap-1 Maneuver	0	219	-	-	252
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	-	219	-	-	252
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.5	0	0.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	219	252
HCM Lane V/C Ratio	-	-	0.273	0.194
HCM Control Delay (s)	-	-	27.5	22.7
HCM Lane LOS	-	-	D	C
HCM 95th %tile Q(veh)	-	-	1.1	0.7

# **Appendix E-6**

**Arcady Roundabout Analysis Output  
Reports for Future Conditions Traffic  
Operations**

May 2, 2024

Vanessa Skelton, P.Eng.  
Transportation Planning and Traffic Engineering Lead - Canada  
GHD  
179 Colonnade Road South, Suite 400  
Ottawa, ON K2E 7J4

**Attention: Ms. Vanessa Skelton**

**RE: Brookdale Avenue Roundabout Analysis Summary**

Dear Vanessa,

CIMA+ has conducted an analysis of three possible roundabouts along Brookdale Avenue in Cornwall as part of a Municipal Class Environmental Assessment (MCEA) between Seventh Street and Fourteenth Street. The analysis was done in ARCADY v9, and the purpose was to determine lane configurations for the roundabouts to provide appropriate capacity for the future peak hour forecast traffic.

The lane configurations are described below, and corresponding ARCADY analysis summary sheets are attached. It was assumed that 2% of all traffic is heavy vehicles.

## Seventh Street

The proposed roundabout lane configuration at Seventh Street is:

- Northbound and southbound on Brookdale Avenue, two lanes (left/thru + thru/right).
- Eastbound and westbound, one lane.

The configuration, with two-lane entries and exits north-south and single-lane entries and exits east-west, is known as a partial multi-lane roundabout or “2x1” design. It should provide for low delays and queues, and overall level of service (LOS) ‘A’ during the future mid-day and PM peak hours.

## Ninth Street

The proposed roundabout lane configuration at Ninth Street is:

- Northbound, three lanes (left/thru + thru + right). The right turn could be a “smart channel” design.
- Southbound, two lanes (left/thru + thru/right).
- Eastbound, two lanes (left/thru + thru/right).
- Westbound, two lanes (left/thru + thru/right), or three lanes (left + thru + right). The latter will allow for a single-lane exit to the plaza on the west side of Brookdale Avenue, if that is desirable, and the right turn could be a “smart channel” design.



This configuration is essentially “2x2” design, since it has two-lane entries and exits on all approaches (plus exclusive right-turn lanes). It should provide for overall LOS ‘A’ in the future mid-day peak hour and LOS ‘B’ in the PM peak hour. The critical approaches are southbound (LOS ‘C’ in the PM peak hour) and westbound with the lane configuration of left + thru + right (LOS ‘D’ in the PM peak hour).

## Thirteenth Street

The proposed roundabout lane configuration at Thirteenth Street is:

- Northbound, three lanes (left/thru + thru + right). The right turn could be a “smart channel” design.
- Southbound, two lanes (left/thru + thru/right).
- Eastbound, two lanes (left/thru + right). Here it probably makes sense for the exclusive right to be fully-channelized, like existing.
- Westbound, two lanes (left/thru + thru/right) or (left + thru/right). The latter will allow for a single-lane exit to Vincent Massey Drive, if that is desirable.

This configuration (with either lane configuration option westbound) should provide for overall LOS ‘A’ in the future mid-day and PM peak hours.

We hope the foregoing is helpful. Please contact the undersigned should you have questions or require further information.

Sincerely,

**Phil Weber, P.Eng.**

Senior Project Manager

[Phil.Weber@cima.ca](mailto:Phil.Weber@cima.ca)

cc: Jason Endrawis, GHD

## 1 Traffic Volumes

### Future Mid-Day Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brookdale Ave	235	674	112	0	1021
EB - Seventh St	25	27	194	0	246
NB - Brookdale Ave	8	828	8	0	844
WB - Seventh St	118	23	35	0	176
<b>Total</b>	<b>386</b>	<b>1552</b>	<b>349</b>	<b>0</b>	<b>-</b>

### Future PM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brookdale Ave	319	661	121	0	1101
EB - Seventh St	40	31	239	0	310
NB - Brookdale Ave	17	831	9	0	857
WB - Seventh St	105	12	35	0	152
<b>Total</b>	<b>481</b>	<b>1535</b>	<b>404</b>	<b>0</b>	<b>-</b>

## 2 Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage intercept adjustment (%)
SB - Brookdale Ave	7.00	8.00	20.0	20.0	45.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00
EB - Seventh St	3.50	4.25	20.0	20.0	45.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00
NB - Brookdale Ave	7.00	8.00	20.0	20.0	45.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00
WB - Seventh St	3.50	4.25	20.0	20.0	45.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00

## 3 Analysis Results

	MD							PM							
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	
<b>C-95 - Future</b>															
SB - Brookdale Ave	1.8	2.89	0.45	A	3.70	A	51 % [WB - Seventh St]	1.5	3.07	0.48	A	3.97	A	49 % [EB - Seventh St]	
EB - Seventh St	1.9	6.86	0.31	A				3.0	7.75	0.40	A				
NB - Brookdale Ave	2.7	2.97	0.41	A				2.6	3.12	0.42	A				
WB - Seventh St	1.5	7.52	0.26	A				1.3	7.58	0.24	A				

### Notes

1. Because ARCADY was developed in the United Kingdom, where roundabouts are more common than in Canada, a y-intercept adjustment of the capacity prediction in ARCADY should be applied to account for driver unfamiliarity. Based on research and observation it is appropriate to apply a 10% downwards adjustment soon after opening, and a lesser 5% adjustment after several years of operation.
2. Queue lengths are given in 95th percentile values in vehicles by approach. They can be converted to metres per lane by multiplying by 7 and dividing by number of lanes, accounting for the storage effects of flared entries where appropriate.
3. Residual capacity is defined as the percent growth in traffic for one of the legs to reach level of service (LOS) 'E' as per Exhibit 17-2 of the Highway Capacity Manual (2010).



## 1 Traffic Volumes

### Future Mid-Day Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brookdale Ave	239	810	411	128	1588
EB - Ninth St	50	250	361	0	661
NB - Brookdale Ave	146	842	163	0	1151
WB - Ninth St	391	221	93	0	705
<b>Total</b>	<b>826</b>	<b>2123</b>	<b>1028</b>	<b>128</b>	<b>-</b>

### Future PM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brookdale Ave	434	705	467	123	1729
EB - Ninth St	125	279	482	0	886
NB - Brookdale Ave	277	830	152	0	1259
WB - Ninth St	484	276	162	0	922
<b>Total</b>	<b>1320</b>	<b>2090</b>	<b>1263</b>	<b>123</b>	<b>-</b>

## 2 Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage intercept adjustment (%)
SB - Brookdale Ave	7.00	8.00	20.0	25.0	50.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00
EB - Ninth St	7.00	8.00	20.0	25.0	50.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00
NB - Brookdale Ave	7.00	8.00	20.0	25.0	50.0	20.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	95.00
WB - Ninth St	7.00	8.00	20.0	25.0	50.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00

## 3 Analysis Results

	MD							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
<b>C-95 - Future</b>														
SB - Brookdale Ave	13.9	8.94	0.80	A	7.87	A	17 %	44.2	19.21	0.90	C	14.77	B	5 % [SB - Brookdale Ave]
EB - Ninth St	2.9	6.19	0.53	A			6.3	10.22	0.71	B				
NB - Brookdale Ave	2.8	7.74	0.68	A			9.3	10.67	0.74	B				
WB - Ninth St	2.8	7.21	0.58	A			19.3	16.41	0.81	C				

### Notes

1. Because ARCADY was developed in the United Kingdom, where roundabouts are more common than in Canada, a y-intercept adjustment of the capacity prediction in ARCADY should be applied to account for driver unfamiliarity. Based on research and observation it is appropriate to apply a 10% downwards adjustment soon after opening, and a lesser 5% adjustment after several years of operation.
2. Queue lengths are given in 95th percentile values in vehicles by approach. They can be converted to metres per lane by multiplying by 7 and dividing by number of lanes, accounting for the storage effects of flared entries where appropriate.
3. Residual capacity is defined as the percent growth in traffic for one of the legs to reach level of service (LOS) 'E' as per Exhibit 17-2 of the Highway Capacity Manual (2010).

## 1 Traffic Volumes

### Future Mid-Day Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brookdale Ave	7	770	184	0	961
EB - Vincent Massy Dr	491	114	42	0	647
NB - Brookdale Ave	189	986	236	353	1764
WB - Thirteenth St	137	116	186	0	439
<b>Total</b>	<b>824</b>	<b>1986</b>	<b>648</b>	<b>353</b>	<b>-</b>

### Future PM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brookdale Ave	33	801	152	0	986
EB - Vincent Massy Dr	356	103	30	0	489
NB - Brookdale Ave	186	1151	248	332	1917
WB - Thirteenth St	44	116	207	0	367
<b>Total</b>	<b>619</b>	<b>2171</b>	<b>637</b>	<b>332</b>	<b>-</b>

## 2 Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage intercept adjustment (%)
SB - Brookdale Ave	7.00	8.00	20.0	20.0	50.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00
EB - Vincent Massy Dr	3.75	4.25	20.0	20.0	50.0	20.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	95.00
NB - Brookdale Ave	7.00	8.00	20.0	20.0	50.0	20.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	95.00
WB - Thirteenth St	7.00	8.00	20.0	20.0	50.0	20.0	<input type="checkbox"/>	<input type="checkbox"/>	95.00

## 3 Analysis Results

	MD							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
<b>C-95 - Future</b>														
SB - Brookdale Ave	1.5	5.23	0.58	A	7.49	A	18 %	1.7	5.50	0.60	A	8.30	A	16 %
EB - Vincent Massy Dr	2.4	12.97	0.36	B			[EB - Vincent Massy Dr]	1.5	11.97	0.30	B			[NB - Brookdale Ave]
NB - Brookdale Ave	7.0	7.22	0.76	A			17.3	9.28	0.81	A				
WB - Thirteenth St	3.1	5.48	0.40	A			2.6	5.81	0.37	A				

### Notes

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