



143 Columbia Street West Mixed-Use Development Transportation Impact Study

Paradigm Transportation Solutions Limited

November 2022
210573



Project Summary



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143 Columbia Street West Mixed-Use Development Transportation Impact Study



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Executive Summary

Content

143 Columbia Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) for a proposed mixed-use development located at 143 Columbia Street West in Waterloo, Ontario.

The impact assessment includes an analysis of existing traffic conditions, a description of the proposed development, traffic forecasts for five years from the date of the TIS (2027), and recommendations to improve future traffic conditions, if necessary.

Development Description

The proposed development consists of the following:

- ▶ **Residential:** 591 high-rise units between three 25-storey buildings;
- ▶ **Commercial:** approximately 1,280 ft² of ground-floor commercial retail; and
- ▶ **Parking:** 162 vehicle spaces, and 172 Type A/B bicycle spaces.

Access to the proposed development is provided via one all-moves access to Columbia Street West.

Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** All study area intersections are currently operating within acceptable levels of service except for critical movements at the intersection of **Lester Street and Columbia Street West**, and **Albert Street and Columbia Street West**;
- ▶ **Proposed Development:** The full build-out of the site is forecast to generate 122 and 147 trips during weekday AM and PM peak hours, respectively;
- ▶ **2027 Background Traffic Conditions:** All study area intersections are forecast to operate at acceptable levels of service under the 2027 Background conditions except for the northbound movements on **Lester Street and Columbia Street West**;



- ▶ **2027 Total Traffic Conditions:** The 2027 total traffic conditions are forecast to operate similarly to the 2027 background conditions with the same intersections with critical movements intersections with the addition of northbound movements at the **Site Driveway and Columbia Street West**;
- ▶ **Remedial Measures:**
 - **Traffic Signal Control Justification:** Traffic signal control is not justified at **Lester Street and Columbia Street West**, or **Site Driveway and Columbia Street West**;
 - **Left-Turn Lane Warrants:** It was found that a left-turn lane is forecast to be warranted on **Columbia Street West at Site Driveway**, but design constraints exist; and
 - **Additional Intersection Improvements:** No additional improvements were justified by the additional traffic from the subject development, but the City and Region should continue to regularly monitor traffic operations at this intersection regardless of whether the development proceeds.

Recommendations

Based on the findings of this study, it is recommended that the City of Waterloo consider if the warranted westbound left-turn lane should be constructed on Columbia Street West at the Site Driveway. Otherwise, it is recommended that the proposed development be constructed with no further intersection improvements required.



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1 Introduction

1.1 Overview

143 Columbia Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) for a proposed mixed-use development located at 143 Columbia Street West in Waterloo, Ontario.

Figure 1.1 details the location of the subject development.

The scope of the study includes:

- ▶ assessment of the current traffic and site conditions within the study area;
- ▶ traffic forecasts for an assumed horizon of five years from the date of the TIS (2027);
- ▶ forecasts of additional traffic generated by the subject site;
- ▶ analyses of the impact of the future traffic on the surrounding road network;
- ▶ analyses of the location of the proposed road connections; and
- ▶ recommendations necessary to mitigate the site generated traffic in a satisfactory manner, if necessary.

The impact assessment will focus on the following study area intersections:

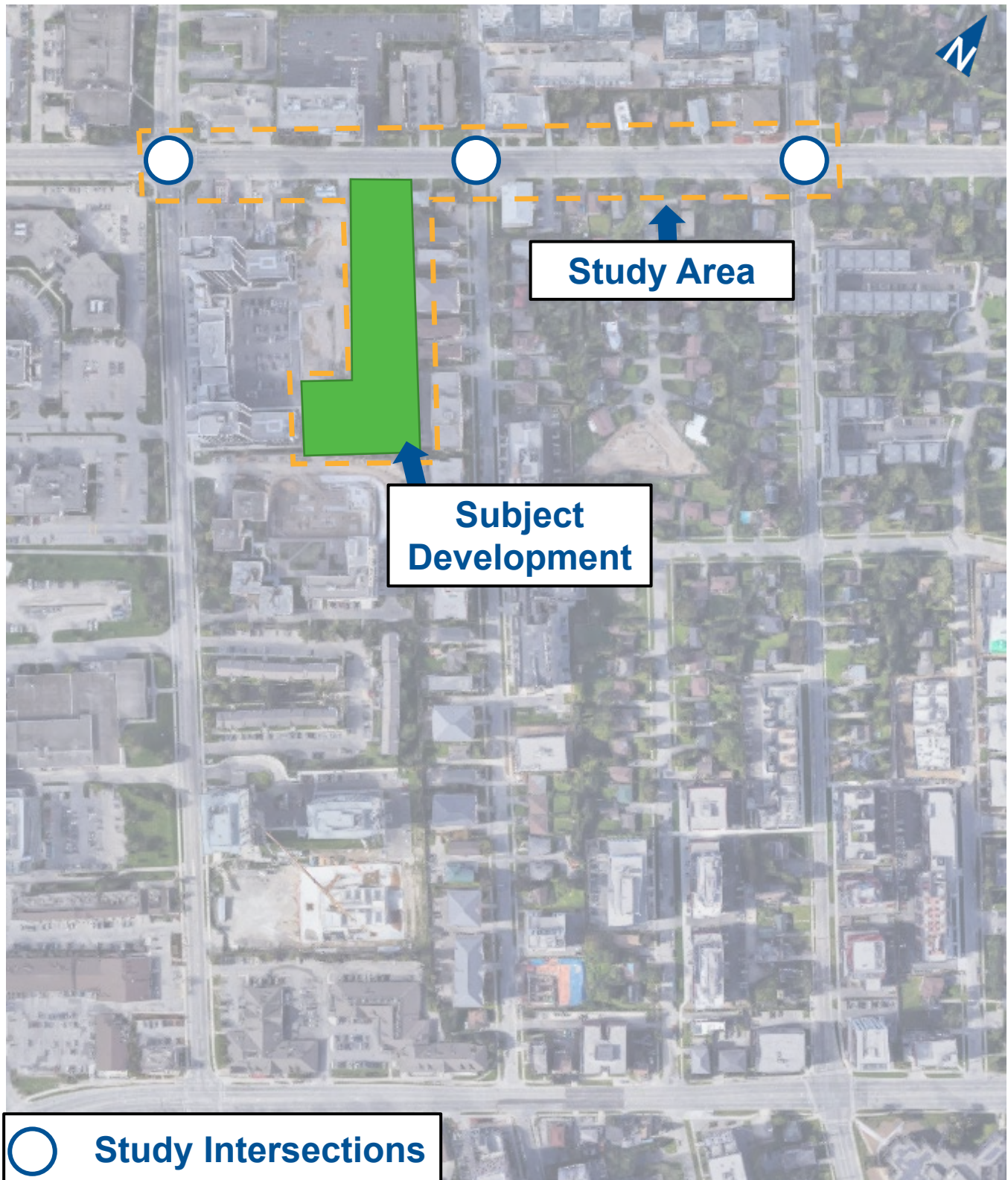
- ▶ Philip Street and Columbia Street West (signalized);
- ▶ Lester Street and Columbia Street West (unsignalized);
- ▶ Albert Street and Columbia Street West (signalized); and
- ▶ Site Driveway and Columbia Street West (proposed unsignalized).

This study has been prepared in consultation with the City of Waterloo (the City), and in accordance with the requirements of the Region TIS Guidelines¹.

Appendix A contains the pre-study conference form.

¹ Transportation Impact Study Guidelines, Region of Waterloo, 22 July 2014





2 Existing Conditions

This section documents current traffic conditions, operational deficiencies, and constraints experienced by the public travelling at the intersections within the study area. The operational deficiencies and constraints identified at this stage will be fundamental to the process of defining the required remedial measures.

2.1 Road Network

The study area roadways include:

- ▶ **Philip Street** is a 2-lane major collector with a speed limit of 50 km/h;
- ▶ **Columbia Street West** is a 4-lane city arterial with a speed limit of 50 km/h within the study area;
- ▶ **Lester Street** is a 2-lane local road with a speed limit of 50 km/h; and
- ▶ **Albert Street** is a 2-lane major collector with a speed limit of 50 km/h.

The study area is primarily bordered by residential and commercial land uses.

Figure 2.1 displays the existing lane configuration and traffic controls of intersections within the study area.

2.2 Transit Network

Transit service in the study area is substantial, with the proposed development being located within the University of Waterloo area and 800 metres from an ION Rapid Transit Station at the University of Waterloo. The transit routes which operate within walking distance of the development include:

- ▶ Route 9 (Lakeshore);
- ▶ Routes 13 (Laurelwood);
- ▶ Route 19 (Hazel);
- ▶ Route 30 (Ring Road);
- ▶ Route 31 (Columbia);
- ▶ Route 201 (i-Xpress Fischer Hallman); and
- ▶ Route 301 (ION Rapid Transit).



Figure 2.2 illustrates the Grand River Transit Route.

2.3 Cycling and Pedestrian Facilities

Sidewalks are provided on both sides of all roads within the study area. Access to Laurel Trail is provided approximately 430 metres from the proposed development location. This trail travels from Uptown Waterloo to University Avenue at Marsland Drive and connects to both the Spur Line and Hillside trails. Additionally, the pedestrian signal on Erb Street East at Peppler Street provides safe crossing to pedestrians and encourages usage by cyclists.

As a part of the Region's separated cycle lane project, bollards separate the bicycle lanes from the vehicular traffic on Columbia Street West through the study area. Albert Street also has separated bike lanes.

Philip Street provides bike lanes on both sides of the road within the study area.

Figure 2.3 illustrates the City of Waterloo trails map.

2.4 Traffic Volumes

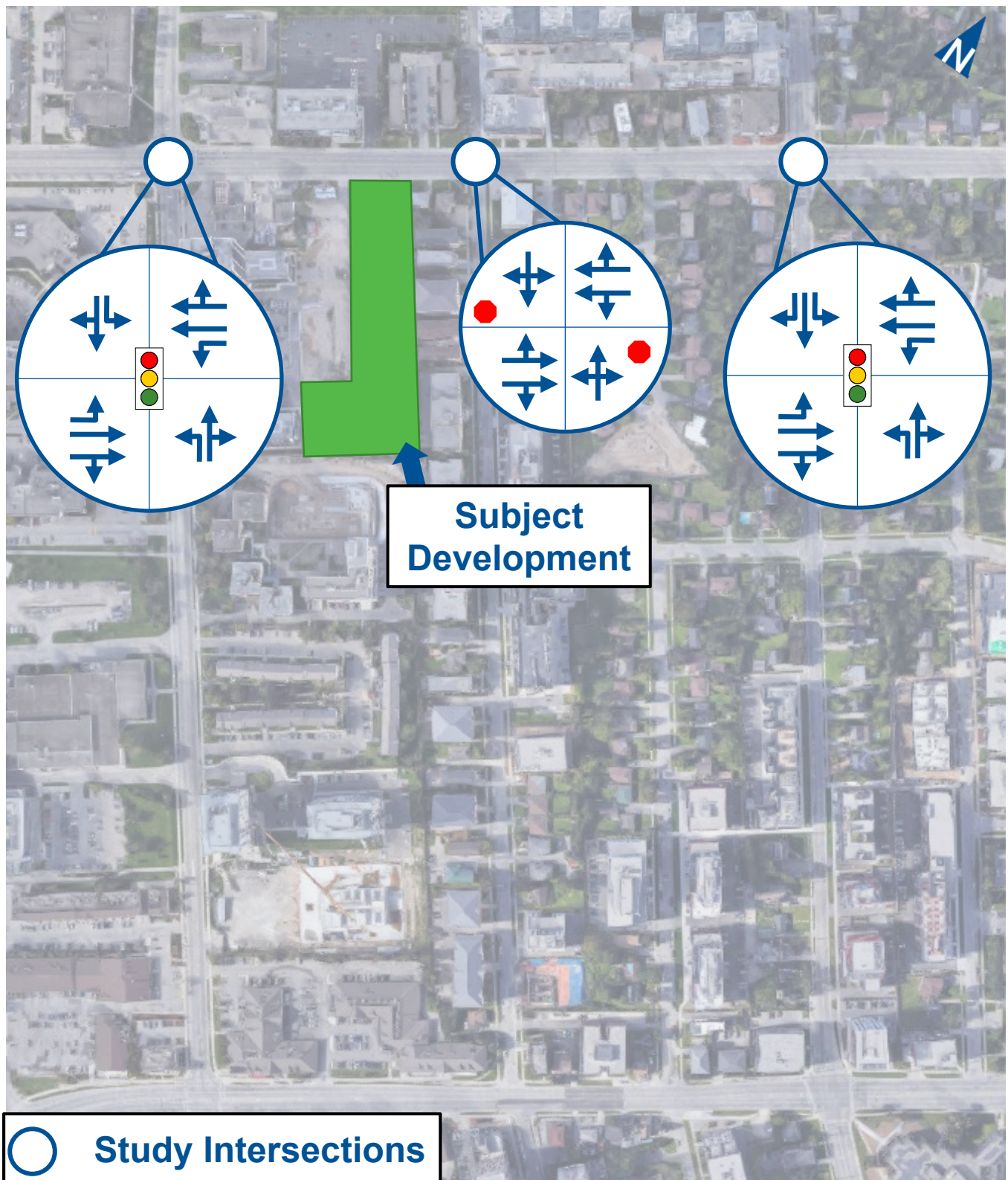
Traffic counts were collected by Paradigm in June 2018 and increased using the growth rate for the generalized traffic near the site, assumed to be 2.0% for both local and regional roads, established by City staff, to the current year.

Current signal timings were provided by the Region in March 2022.

Figure 2.4 summarizes the existing AM and PM peak hour traffic volumes.

Appendix B contains the existing count data and signal timings.

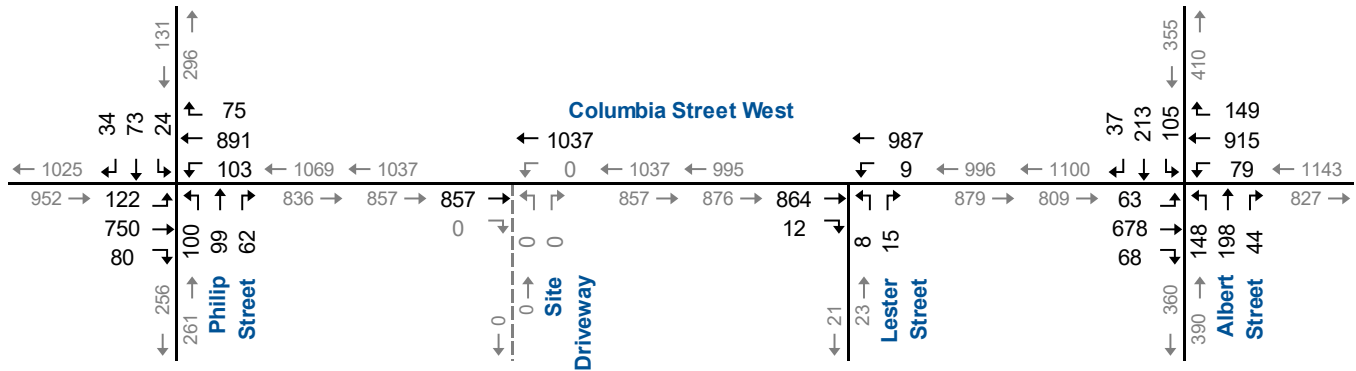




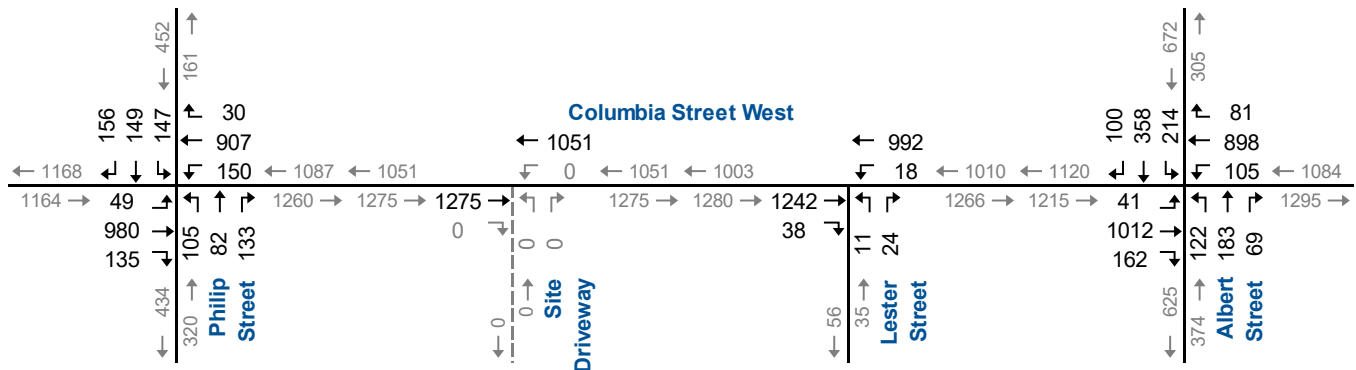




AM Peak Hour



PM Peak Hour



NTS



Existing Traffic Volumes

143 Columbia St W, TIS
210573

Figure 2.4

2.5 Traffic Operations

The operations of the intersections in the study area were evaluated using the existing lane configurations, traffic controls and the existing traffic peak volumes.

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

The level of service conditions on the existing road network have been assessed using Synchro 10. The criteria, as defined by the Region, for identifying “critical” intersections are:

The criteria for identifying “critical” intersections are:

- ▶ overall Level of Service E or F (i.e., average control delay per vehicle greater than 55 seconds) for signalized intersections; and
- ▶ overall Level of Service E or F (i.e., average control delay per vehicle greater than 35 seconds) for unsignalized intersections.

The criteria for identifying “critical” movements are:

- ▶ the average control delay for individual movements is greater than 55 seconds;
- ▶ estimated 95th percentile queue length for an exclusive movement exceeds the available storage space;
- ▶ estimated 95th percentile queue length for an individual movement will block an existing access;
- ▶ exclusive turning lanes are inaccessible because of queue lengths in adjacent through lanes; and
- ▶ poor quality of service for non-auto.

Table 2.1 summarizes the level of service and other performance results. The analyses indicate that all intersections and individual



movements within the study area are currently operating at acceptable levels of service except for:

▶ **Lester Street and Columbia Street:**

- northbound through-left movement operate at a LOS E during the PM peak hour.

▶ **Albert Street and Columbia Street:**

- eastbound through-right movement operate at a LOS E during the PM peak hour.

Appendix C contains the detailed Synchro reports.



TABLE 2.1: EXISTING TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Philip Street & Columbia Street	TCS	LOS Delay V/C Q	B 20 0.46 4	C 24 0.59 26	C 25 0.59 25	C 24 0.59 25	B 18 0.35 4	C 28 0.69 34	C 28 0.69 33	C 27 0.69 33	C 23 0.24 6	A 0 0.00 0	C 22 0.28 10	C 22 0.28 10	C 26 0.06 2	A 0 0.00 0	C 28 0.25 9	C 28 0.25 9	C 25
	Lester Street & Columbia Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	A 0 0.00 0	A 0 0.00 0	B 11 0.01 0	A 0 0.00 0		A 0 0.00 0	C 24 0.10 2		> > >	C 24 0.10 2					
	Albert Street & Columbia Street	TCS	LOS Delay V/C Q	C 23 0.35 2	C 27 0.61 23	C 28 0.62 23	C 27 0.62 23	B 19 0.29 3	D 41 0.87 48	D 42 0.87 48	D 40 0.87 48	B 19 0.34 6	A 0 0.00 0	C 25 0.45 15	C 23 0.45 15	B 20 0.26 4	C 24 0.35 13	C 21 0.08 2	C 22 0.08 2	C 31
PM Peak Hour	Philip Street & Columbia Street	TCS	LOS Delay V/C Q	B 19 0.19 2	C 33 0.80 54	C 34 0.80 52	C 33 0.80 52	C 29 0.65 8	C 23 0.60 29	C 23 0.60 30	C 24 0.60 30	C 30 0.42 9	A 0 0.00 0	D 41 0.57 27	D 37 0.57 27	C 28 0.45 12	A 0 0.00 0	D 46 0.73 41	D 40 0.73 41	C 31
	Lester Street & Columbia Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	A 0 0.00 0	A 0 0.00 0	B 13 0.04 1	A 1 0.00 0		A 1 0.00 0	E 46 0.27 8		> > >	E 46 0.27 8					
	Albert Street & Columbia Street	TCS	LOS Delay V/C Q	C 21 0.21 2	E 58 0.97 73	E 59 0.97 73	E 57 0.97 73	C 25 0.58 4	C 31 0.75 34	C 31 0.75 34	C 31 0.75 34	C 21 0.37 5	A 0 0.00 0	C 28 0.51 17	C 26 0.51 17	C 24 0.56 10	C 28 0.58 25	C 22 0.21 6	C 26 0.21 6	D 39

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



3 Development Concept

3.1 Development Description

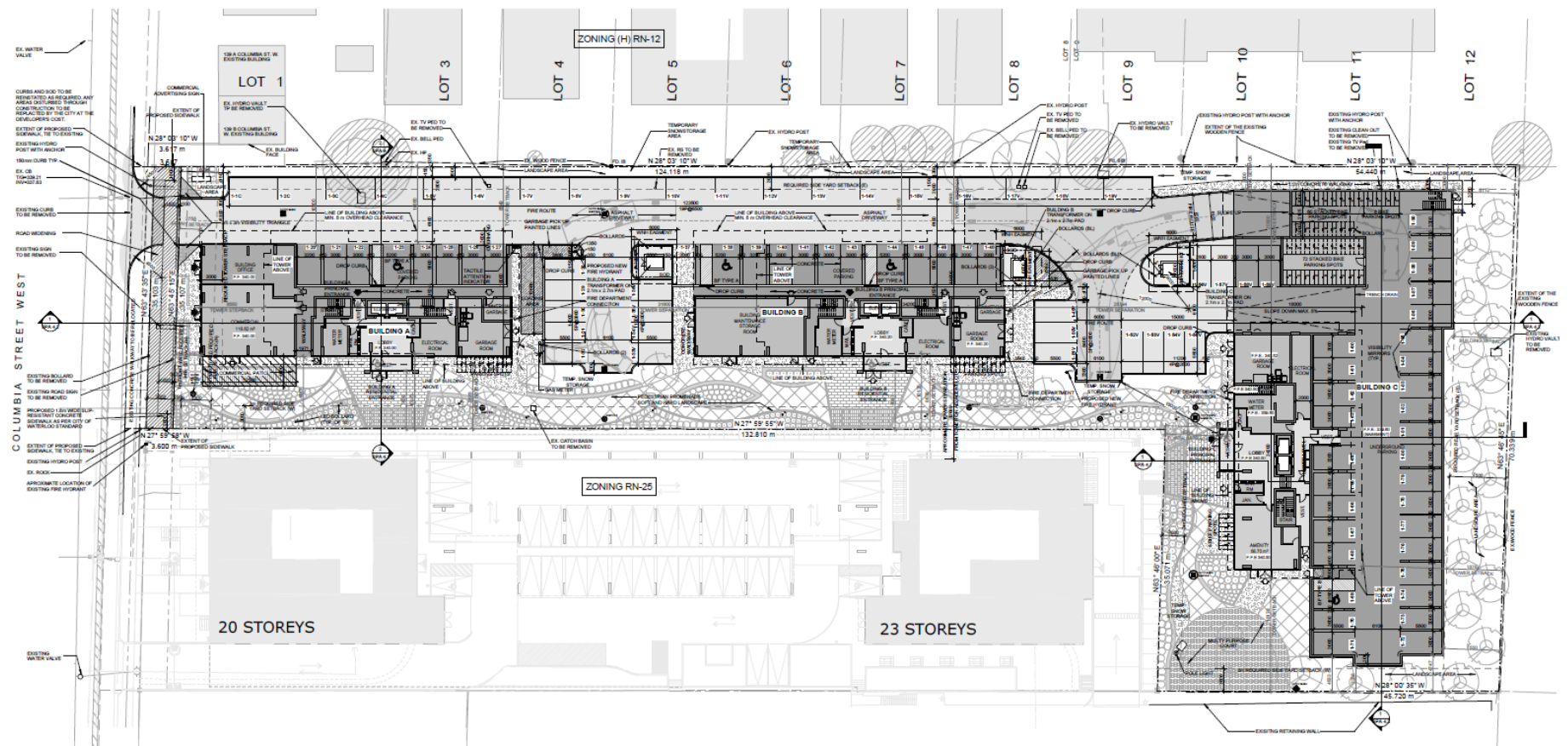
The proposed development consists of the following:

- ▶ **Residential:** 591 high-rise units between three 25-storey buildings;
- ▶ **Commercial:** approximately 1,280 ft² of ground-floor commercial retail; and
- ▶ **Parking:** 162 vehicle spaces, and 172 Type A/B bicycle spaces.

Access to the proposed development is provided via one all-moves access to Columbia Street West.

Figure 3.1 shows the proposed site plan.





3.2 Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation² rates and equations were used to estimate the peak hour site-generate traffic volumes. Land Use Codes (LUC) 222 (Multifamily Housing (High-Rise)), and 820 (Shopping Center) were used in this study. This results in 160 and 205 new trips forecast to be generated in the AM and PM peaks, respectively.

- ▶ **LUC 222 (Multifamily Housing (High-Rise)):** High-rise multifamily housing includes apartments, townhouses, and condominiums that have more than 10 levels (floors). They are likely to have one or more elevators; and
- ▶ **LUC 822 (Strip Retail Plaza (<40k)):** A strip retail plaza is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. Each study site in this land use has less than 40,000 square feet of gross leasable area (GLA). Because a strip retail plaza is open-air, the GLA is the same as the gross floor area of the building.

3.2.1 Mode Share

Due to the proposed development location near the University of Waterloo and the City's / Region of Waterloo's encouragement of non-auto transportation use, there is a high potential for the use of active and transit modes including:

- ▶ the Columbia Street protected cycle lanes;
- ▶ the Laurel Creek trail;
- ▶ ample sidewalks and high-order pedestrian crossing facilities;
- ▶ access to the ION LRT for both north and south travel provided within 800 metres of the proposed development; and
- ▶ access to multiple high-priority transit routes with 15-minute headways.

With substantial access to additional modes of travel and guidance from the Region's Transportation Master Plan³, mode shares of 10% and 11% have been assumed for transit and active transportation modes, respectively. Given the opportunities for active transportation and transit, as well as the proximity to the University of Waterloo, the

² Trip Generation Manual, 11th Edition, Institute of Transportation Engineers, 2021.

³ Moving Forward:2018 Transportation Master Plan, IBI and Region of Waterloo, June 2019



mode share for non-auto trips may be higher than what is assumed in this forecast.

3.2.2 ITE Trip Reductions

ITE Internal Capture calculations were used to determine the internal capture rates between all uses and a mode share reduction was applied. **Appendix D** contains the internal capture calculations.

The estimated trip generation assumes a 40% pass-by trip reduction (for PM peak hour only for the retail land use) as per ITE LUC 821. This rate has been assumed as LUC 822 does not have a passby study currently, but the LUC 821 description closely matches the LUC 822 land use, and the land use in this development.

3.2.3 Net Trip Generation

With the reductions from the mode share, the ITE internal capture and pass-by trips, the estimated net trip generation for this development is 124 and 148 trips during the AM and PM peak hours, respectively.

Table 3.1 summarizes the total trip generation for the site including the above-described reductions.

TABLE 3.1: TRIP GENERATION

Land Use Code	Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
222: Multifamily Housing (High-Rise) Not Close to Rail	591 Units	[1]	51	98	149	[2]	99	78	177
822: Strip Retail Plaza (<40K)	1.3 x1000 Sq. ft	[3]	4	3	7	[4]	9	9	18
Total Trips			55	101	156		108	87	195
<i>ITE Internal Capture</i>			<i>1</i>	<i>1</i>	<i>2</i>		<i>3</i>	<i>3</i>	<i>6</i>
<i>Mode Split</i>									
<i>Active</i>		<i>10%</i>	<i>5</i>	<i>10</i>	<i>15</i>	<i>10%</i>	<i>10</i>	<i>8</i>	<i>18</i>
<i>Transit</i>		<i>11%</i>	<i>6</i>	<i>11</i>	<i>17</i>	<i>11%</i>	<i>11</i>	<i>9</i>	<i>20</i>
<i>Pass-By Trips</i>		<i>0%</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>40%</i>	<i>2</i>	<i>2</i>	<i>4</i>
Net Total Trips			43	79	122		82	65	147

[1] $T = 0.22X + 18.85$

[3] $\ln(T) = 0.66\ln X + 1.84$

[2] $T = 0.26X + 23.12$

[4] $\ln(T) = 0.71\ln X + 2.72$

3.3 Trip Distribution and Assignment

Table 3.2 displays the breakdown of directional trip distribution and trip assignment used in this study.

The trip distribution was determined based on travel to and from the TTS Zones (zone 7039, 7042, 7043, 7048 and 7050 was used), which includes the subject site, and all site uses.



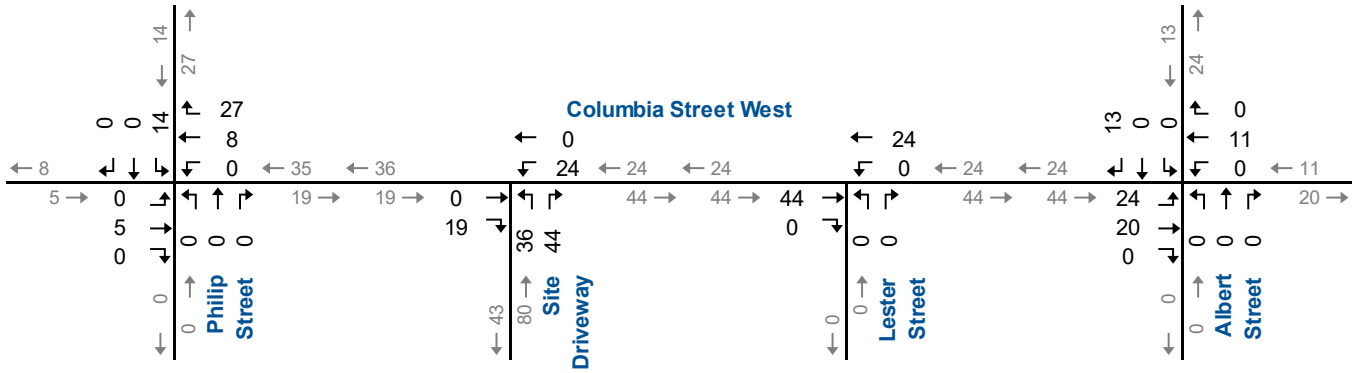
TABLE 3.2: TRIP DISTRIBUTION

Direction	Residential	Commercial
South via Albert Street	30%	20%
South via Philip Street	35%	10%
East via Columbia Street	25%	45%
West via Columbia Street	10%	25%
<i>Total</i>	<i>100%</i>	<i>100%</i>

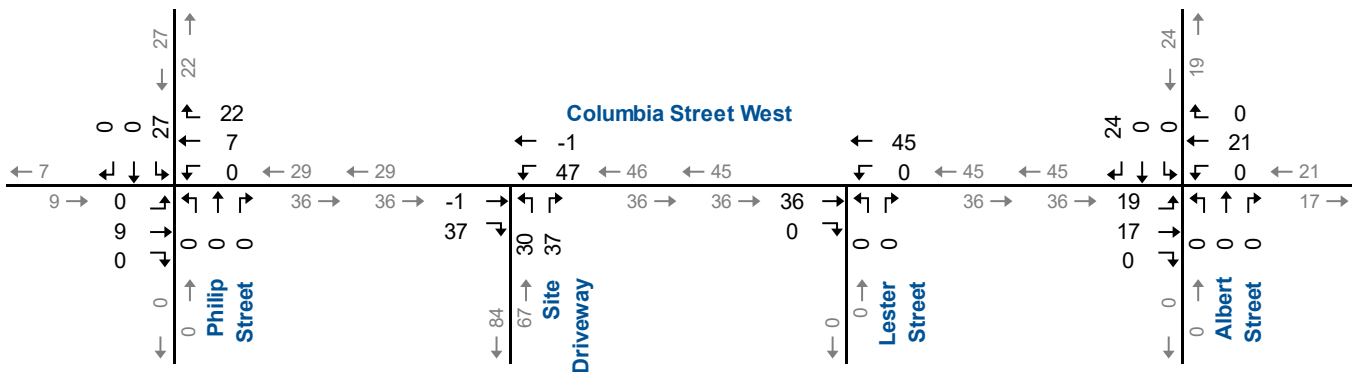
Figure 3.2 shows the trip assignment for the trips forecast to be generated by the subject development.



AM Peak Hour



PM Peak Hour



NTS



Site Generated Traffic Volumes

143 Columbia St W, TIS
210573

Figure 3.2

4 Evaluation of Future Traffic Conditions

Future traffic conditions assessed include estimates of future background and total traffic analysis for the 2027 horizon. The future traffic volumes near the development will likely consist of increased non-site traffic volumes (background traffic), and the traffic forecast to be generated by the proposed development.

4.0.1 Background Growth Rate

The growth rate for the generalized traffic near the site was assumed to be 2.0% for both local and regional roads, established by City and Regional staff.

4.1 2027 Horizon

4.1.1 Background Traffic Operations

Based on the 2027 background traffic volume forecasts, Level of Service analyses have been conducted using Synchro 10, for the weekday AM and PM peak hour conditions for the intersections in the study area.

Figure 4.1 displays the 2027 background traffic volumes for the weekday AM and PM peak hours.

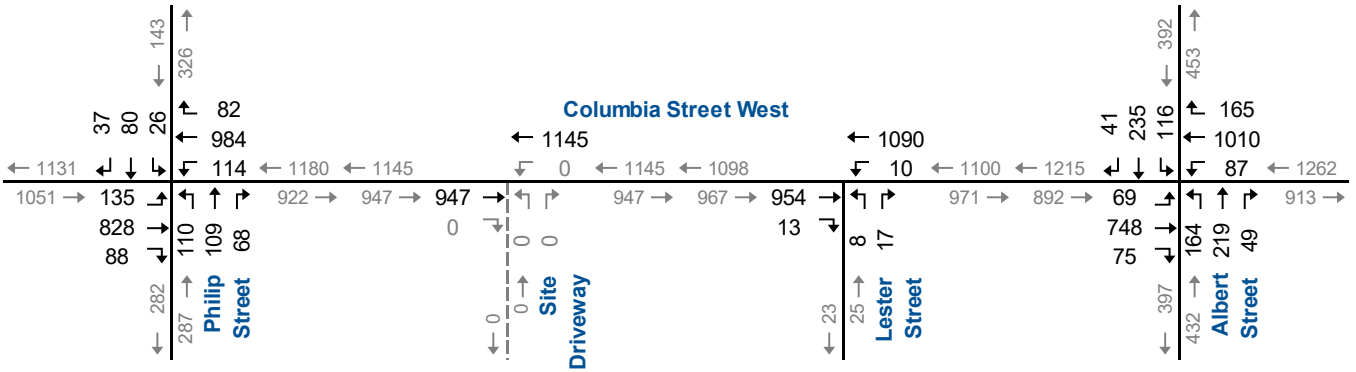
Table 4.1 summarizes the analysis results, indicating the levels of service (LOS), volume to capacity ratios (V/C) and 95th percentile queues experienced at the study area intersections.

All observed intersections have acceptable operational values except for the northbound movements on **Lester Street at Columbia Street West**, which are forecast to operate at LOS F during the PM peak hour, an increase from LOS E from the existing conditions.

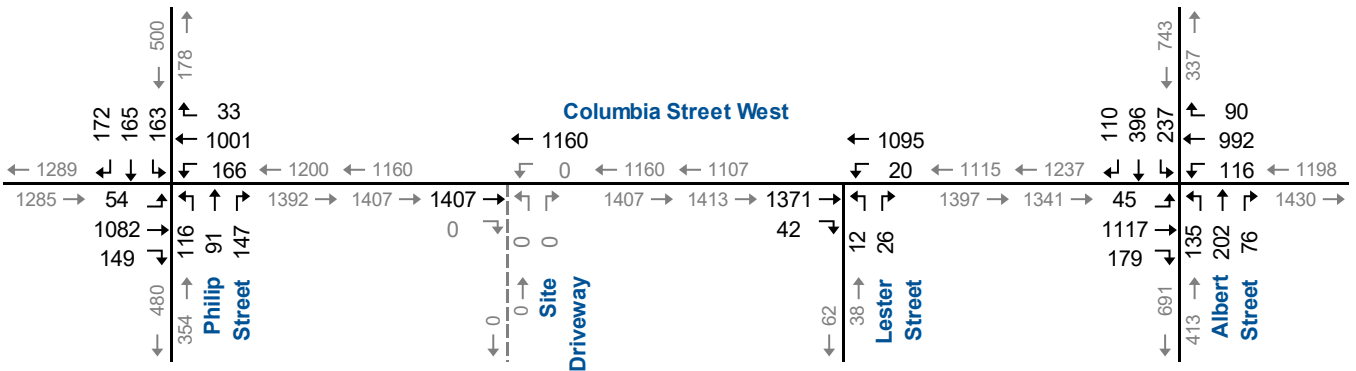
Appendix E includes the detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



NTS



2027 Background Traffic Volumes AM Peak Hour

TABLE 4.1: 2027 BACKGROUND TRAFFIC OPERATION

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																	Overall
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	Philip Street & Columbia Street	TCS	LOS Delay V/C Q	C 22.55	C 26.65	C 27.65	C 26	B 19.42	C 32.77	C 32.77	C 31	C 23.27	A 0.00	C 23.31	C 23	C 26.08	A 0.00	C 30.28	C 29	C 28	
	Lester Street & Columbia Street	TWSC	LOS Delay V/C Q		A 0.00	A 0.00	A 0	B 11.01	A 0.00		A 0	D 29.14		> > >	D 29						
	Albert Street & Columbia Street	TCS	LOS Delay V/C Q	C 22.38	C 25.61	C 26.61	C 25	B 18.31	D 38.87	D 39.87	D 37	C 24.44	A 0.00	C 30.54	C 28	C 22.35	C 26.40	C 22.09	C 25	C 31	
PM Peak Hour	Philip Street & Columbia Street	TCS	LOS Delay V/C Q	C 21.23	D 42.89	D 44.90	D 42	D 43.79	C 25.66	C 25.66	C 28	C 32.52	A 0.00	D 45.64	D 40	C 29.52	A 0.00	D 53.82	D 45	D 37	
	Lester Street & Columbia Street	TWSC	LOS Delay V/C Q		A 0.00	A 0.00	A 0	B 14.05	A 1.00		A 1	F 66.39		> > >	F 66						
	Albert Street & Columbia Street	TCS	LOS Delay V/C Q	B 20.22	D 53.96	D 55.97	D 53	C 28.64	C 29.75	C 29.75	C 29	C 26.53	A 0.00	C 32.58	C 30	D 42.77	C 34.68	C 25.25	D 35	D 39	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



4.1.2 Total Traffic Operations

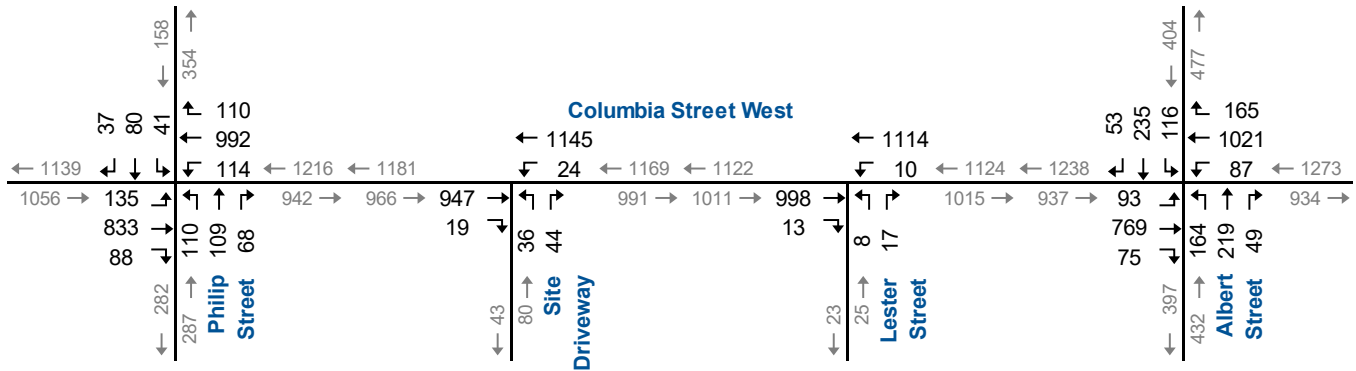
Figure 4.2 illustrate the 2027 total traffic volume forecasts, including both background traffic and development traffic, for the AM and PM peaks.

Table 4.2 summarizes the Level of Service analysis for the 2027 total traffic conditions. All intersections in the study area forecast to have acceptable operational values with the same exceptions as noted under background conditions, listed in **Section 4.1.1**. In addition, the northbound movements, exiting the **Site Driveway onto Columbia Street West**, are forecast to operate at LOS F during both peak hours, and with a v/c greater than 1.0 during the PM peak hour.

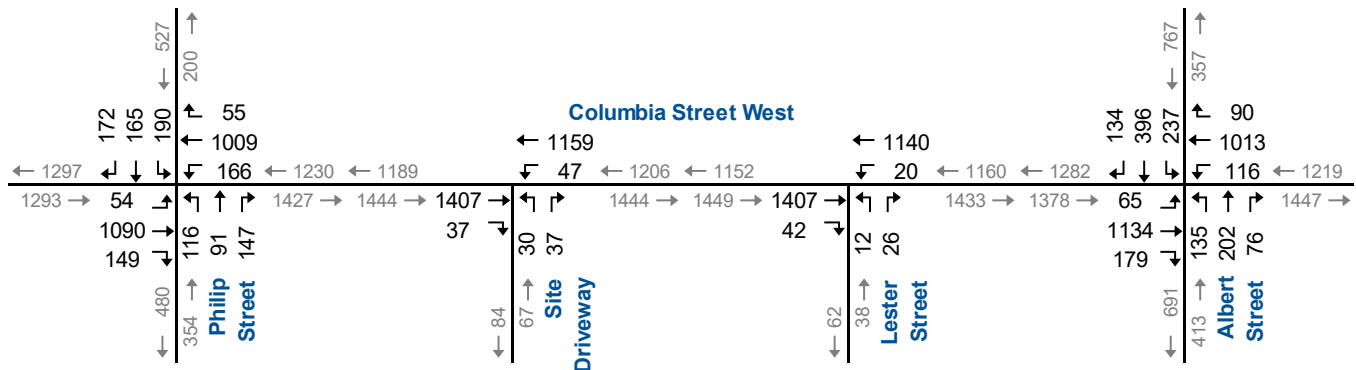
Appendix F includes the detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



NTS



2027 Total Traffic Volumes

143 Columbia St W, TIS
210573

Figure 4.2

TABLE 4.2: 2027 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Philip Street & Columbia Street	TCS	LOS Delay V/C Q	C 23 0.58 5	C 26 0.65 32	C 27 0.65 30	C 26 0.65 30	B 19 0.42 4	C 34 0.80 47	C 35 0.80 45	C 33 0.80 45	C 23 0.27 7	A 0 0.00 0	C 23 0.31 11	C 23 0.31 11	C 27 0.12 3	A 0 0.00 0	C 30 0.28 10	C 29 0.28 10	C 29
	Lester Street & Columbia Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	A 0 0.00 0	A 0 0.00 0	B 11 0.02 0	A 0 0.00 0		A 0 0.00 0	D 31 0.15 4		> > >	D 31 0.15 4					
	Albert Street & Columbia Street	TCS	LOS Delay V/C Q	C 24 0.50 4	C 26 0.62 25	C 26 0.62 25	C 26 0.62 25	B 18 0.32 3	D 40 0.88 52	D 41 0.89 53	D 39 0.89 53	C 24 0.44 9	A 0 0.00 0	C 30 0.54 21	C 28 0.54 21	C 23 0.35 6	C 27 0.40 16	C 23 0.12 3	C 25 0.12 3	C 32
	Site Driveway & Columbia Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	A 0 0.00 0	A 0 0.00 0	B 11 0.04 1	A 1 0.00 0		A 1 0.00 0	F 68 0.63 25		> > >	F 68 0.63 25					
PM Peak Hour	Philip Street & Columbia Street	TCS	LOS Delay V/C Q	C 21 0.24 3	D 43 0.89 75	D 45 0.90 74	D 43 0.89 75	D 44 0.80 15	C 26 0.68 38	C 26 0.68 38	C 28 0.68 38	C 33 0.52 10	A 0 0.00 0	D 47 0.68 34	D 43 0.68 34	C 30 0.59 16	A 0 0.00 0	D 53 0.82 51	D 45 0.82 51	D 38
	Lester Street & Columbia Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	A 0 0.00 0	A 0 0.00 0	B 15 0.05 2	A 1 0.00 0		A 1 0.00 0	F 74 0.42 13		> > >	F 74 0.42 13					
	Albert Street & Columbia Street	TCS	LOS Delay V/C Q	B 20 0.30 2	D 51 0.96 71	D 53 0.96 74	D 51 0.96 74	C 25 0.63 4	C 30 0.76 34	C 30 0.76 35	C 29 0.76 35	C 27 0.55 8	A 0 0.00 0	C 33 0.60 23	C 31 0.60 23	D 46 0.80 22	D 35 0.70 34	C 27 0.32 10	D 37 0.32 10	D 39
	Site Driveway & Columbia Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	A 0 0.00 0	A 0 0.00 0	B 15 0.12 3	A 3 0.00 0		A 3 0.00 0	F 492 1.58 52		> > >	F 492 1.58 52					

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

</> - Shared with through movement



5 Remedial Measures

5.1 Traffic Signal Control Justification

OTM Book 12 Justification 7⁴ analyses reveal that under the 2027 total traffic conditions, new traffic control signals are not justified as per the following:

- ▶ **Lester Street and Columbia Street:** Warrant 1 is met to 17.2% and Warrant 2 to 14.7%. Under Justification 7 existing intersections require either Warrant to be fulfilled to 120% to justify traffic signal control; and
- ▶ **Site Driveway and Columbia Street:** Warrant 1 is met to 14.4% and Warrant 2 to 21.9%. Under Justification 7 new intersections require either Warrant to be fulfilled to 150% to justify traffic signal control.

Appendix G includes signal warrant worksheets.

5.2 Left-Turn Lane Warrants

The need for designated left-turning lanes at unsignalized intersections within the study area was assessed using MTO procedures detailed in the Geometric Design Manual⁵. With the posted speed limit of 50 km/h, standard practice in the Region of Waterloo considers a design speed of 60 km/h considering the urban characteristics of the immediate area and the restricted flow of traffic.

Turn lane warrants were assessed for the westbound left on **Columbia Street at Site Driveway** under 2027 Total traffic conditions. It was found that a left-turn lane with 30 metres is forecast to be warranted under the PM peak hour.

Figure 5.1 illustrates the left-turn lane warrant.

It should be noted that multiple driveways and unsignalized intersections exist on Columbia Street West without left-turn lanes. Additionally, the potential for active transportation and transit trips at this location may result in an over-estimation of the peak hour trips. Therefore, it may not be desirable to construct a left-turn lane at this location, as it may not conform to the character of the road and may impact the separated bicycle lanes and sidewalks.

⁴ OTM Book 12: Traffic Signals, *Ministry of Transportation of Ontario*, 2012

⁵ Geometric Design Standards For Ontario Highways, *Ministry of Transportation of Ontario*, 1986



5.3 Additional Intersection Improvements

Owing to existing and background traffic increases alone, the following intersections are forecast to have movements with poor operations under the 2027 background conditions:

- ▶ Lester Street and Columbia Street West.

The impact of the traffic forecast to be generated by the subject development was investigated.

Under 2027 total conditions, the following additional intersections are forecast to have movements with poor operations:

- ▶ Columbia Street West and Site Driveway.

5.3.1 Lester Street and Columbia Street West

As noted in **Section 4.1** the side street (northbound) movements at this intersection are forecast to operate at LOS F critical movements under 2027 Background conditions, regardless of whether this development is approved. The additional traffic related to the subject development has very little impact on the conditions at this intersection under the 2027 Total horizon as it represents about 3% of the total traffic. The proposed development is not expected to add any significant volumes to the northbound movements.

Additionally, with an increased focus on the use of transit and active modes planned by the City and Region leaving the intersections as is may encourage auto users to modify their travel habits

The City should continue to regularly monitor traffic operations at this intersection regardless of whether the development proceeds.

5.4 Impacts on Non-Auto Transportation Operations

In addition to the forecast future traffic operations, the impacts to the surrounding non-auto modes have been assessed, including:

- ▶ Transit routes and infrastructure;
- ▶ Pedestrian facilities; and
- ▶ Cycling facilities.

5.4.1 Transit Routes and Infrastructure

There are several routes operating near the proposed development location, including Route 201 and 31 which pass by the development.



From the traffic analysis it is seen that the signal delays and increase to traffic that would impact this route caused by the proposed development are insignificant.

Additionally, the increase to ridership to these routes may have little impact as these routes operate on 10 – 15 minute headways, which provide ample capacity.

5.4.2 Pedestrian Facilities

As the cycle lengths and split timings of the signalized intersections in the study area are coordinated, they have not been affected by the proposed development, causing no impact to pedestrians. Additionally, there are adequate pedestrian crossing facilities provided in the area to prevent unprotected mid block crossings.

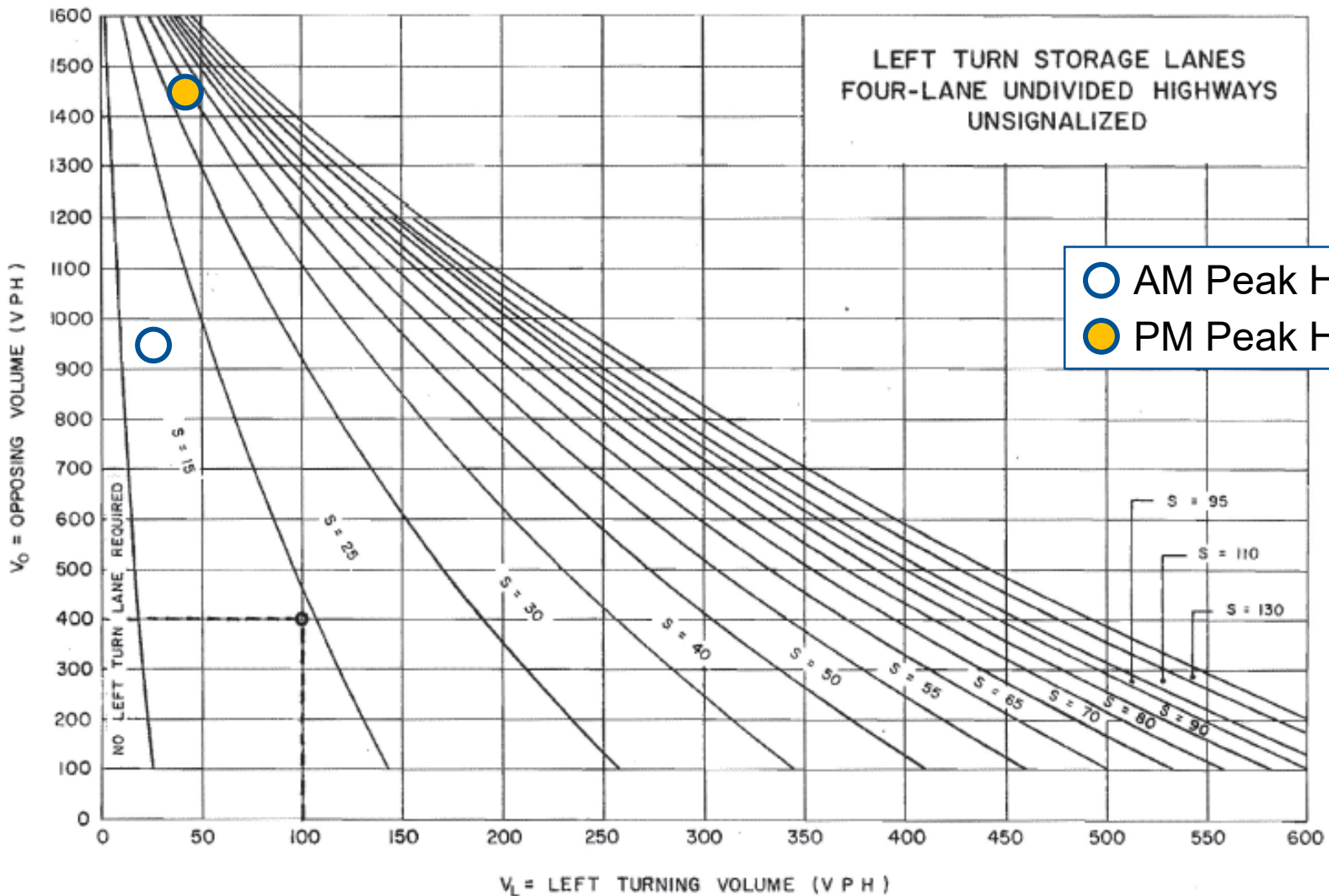
5.4.3 Cycling Facilities

Like the pedestrian crossing facilities, since the cycle lengths and split timings of the signalized intersections are not affected, the travel of the protected cycle lanes are not impacted by the proposed development.

5.4.4 Impacts of Improvements

The westbound left-turn lane warranted at the site entrance on Columbia Street West would require a widening of the road. There are currently separated cycle lanes and sidewalks on Columbia Street West that would be impacted by constructing this left-turn lane. As the taper for the westbound left-turn lane on Columbia Street West at the signal at Philip Street is present at the proposed site access location, it is reasonable this existing left-turn lane be extended to accommodate the new left-turn lane, if constructed.





6 Conclusions and Recommendations

6.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** All study area intersections are currently operating within acceptable levels of service except for critical movements at the intersection of **Lester Street and Columbia Street West**, and **Albert Street and Columbia Street West**;
- ▶ **Proposed Development:** The full build-out of the site is forecast to generate 122 and 147 trips during weekday AM and PM peak hours, respectively;
- ▶ **2027 Background Traffic Conditions:** All study area intersections are forecast to operate at acceptable levels of service under the 2027 Background conditions except for the northbound movements on **Lester Street and Columbia Street West**;
- ▶ **2027 Total Traffic Conditions:** The 2027 total traffic conditions are forecast to operate similarly to the 2027 background conditions with the same intersections with critical movements intersections with the addition of northbound movements at the **Site Driveway and Columbia Street West**;
- ▶ **Remedial Measures:**
 - **Traffic Signal Control Justification:** Traffic signal control is not justified at **Lester Street and Columbia Street West**, or **Site Driveway and Columbia Street West**;
 - **Left-Turn Lane Warrants:** It was found that a left-turn lane is forecast to be warranted on **Columbia Street West at Site Driveway**, but design constraints exist; and
 - **Additional Intersection Improvements:** No additional improvements were justified by the additional traffic from the subject development, but the City and Region should continue to regularly monitor traffic operations at this intersection regardless of whether the development proceeds.

6.2 Recommendations

Based on the findings of this study, it is recommended that the City of Waterloo consider if the warranted westbound left-turn lane should be constructed on Columbia Street West at the Site Driveway. Otherwise,



it is recommended that the proposed development be constructed with no further intersection improvements required.



Appendix A

Pre-Study Conference Notes



(210573) 143 Columbia Street
PRE-STUDY CONFERENCE FORM

Item	Description	Details
ISSUES		
1	List any issues expected that may impact the content or recommendations of the subject Transportation Impact Study.	
INTRODUCTION		
2	Nature of application (Attach a drawing)	- Official Plan Amendment - Zoning Amendment - Site Plan Control Application - Plan of Subdivision - Community Plan - Other
3	TIS process, and relevant policies, procedures and approvals	- Guidelines for the preparation of Transportation Impact - Studies in Support of Development Applications - Transportation Impact Studies Requirements for Capacity - Analysis, Roundabouts, Turn Lanes - Safety Analysis Checklist
4	Public Meeting	- Required - Not Required
CONTEXT		
5	Study intersections (Intersections to be analyzed) Note: the consultant is responsible to identify any further intersections impacted as the study progresses.	Driveway and Columbia Street;
		Philip Street and Columbia Street;
		Lester Street and Columbia; and
		Albert Street and Columbia Street.
6	Size and number of phases of development	600 High-Rise units; and - Commercial Space (221 m²).
7	Approved and pending approval development applications	City to send the other developments / trip generations.
8	Planned transportation system improvements	TBD
TRAVEL DEMAND		
9	Horizon years	- Region of Waterloo Guidelines 5 years from the date the study is commissioned

Item	Description	Details
10	Peak hour determination	- o AM weekday peak hour of adjacent roadway - o PM weekday peak hour of adjacent roadway
11	Background	• Background Growth Rate – 2% • ROW travel demand forecasts • Approved and pending approval development applications • Other...
12	Trip generation	• ITE fitted equation, if appropriate. Otherwise, average rates
13	Trip reductions (TDM, internal, pass-by)	• Internal Capture and Pass-by reductions
14	Trip distribution	• 2016 Transportation Tomorrow Survey
15	Trip assignment	- o Local traffic pattern - o Site layout and access design - o Existing turning movements - o ~~Other...~~
EVALUATION OF IMPACTS		
16	Traffic impact analysis (Use approved software)	- o Unsignalized intersections - o left turn warrant analysis - o signal warrant analysis - o Signalized intersections - o LOS, v/c, delay, queuing - o ROW saturation flow rates - o Existing signal timings for existing conditions - o Optimize signal timings for future conditions - o Use existing cycle length to respect coordinated corridor - o Queuing analysis - o Roundabouts - o Other...

Item	Description	Details
17	Roundabout feasibility (Use approved software)	○ Initial screening ○ Intersection control study (10-year horizon)
18	Transit assessment	○ Frequency and hours of service ○ Presence of bus stops ○ Reliability of service ○ Passenger loads ○ Travel time ○ Other
19	Pedestrian assessment	• Presence, connectivity, and width of sidewalks • Barriers and buffers from traffic • Crossing opportunities at intersections • Delay at intersections • Number of driveways and traffic volumes at the driveways • Presence of illumination • Future needs (desire lines / policy / accessibility / demand) • Other
20	Cycling assessment	○ Presence of a dedicated facility ○ Network connectivity ○ Number and width of travel lanes adjacent to the route ○ Volume and speed of traffic ○ Percentage of trucks and buses encountered ○ Pavement condition ○ Presence of parking /showers/change rooms ○ Future needs (desire lines / policy / demand) ○ Other
21	Safety analysis	○ Road safety review ○ Collision risk analysis ○ Access conflict evaluation
22	Site access and circulation	○ Review sight distances at all new access points ○ Loading facilities and access ○ Service/maintenance vehicle access ○ Emergency vehicle access
23	Submission format	○ No need for the hard copies ○ Electronic copy of complete report and all appendices ○ Electronic copy of operational analysis files (e.g. Synchro, Arcady) ○ Electronic copy of all signal warrant calculation files ○ Other

Appendix B

Traffic Count and Signal Timing Data



CURRENT TRAFFIC SIGNAL TIMING

INT # **20**

Columbia Street @ Phillip Street

T08-50/ **17W**

Date Prepared: **March 30, 2022**

Mode of Control **Fixed Time**

<u>Left Info</u>	Actuated	EB LT - Columbia Street
	Actuated	WB LT - Columbia Street
	Actuated	NB LT - Phillip Street
	Actuated	SB LT - Phillip Street

*Offsets are a percentage of the cycle length and refers to the beginning of Main Street green

Pattern #1 07:00 - 10:00 Monday to Friday

Columbia Street

EBL Green Arrow	Min	5.0	seconds	WBL Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	10.0	seconds		Max	7.0	seconds
EBL Amber Arrow		3.0	seconds	WBL Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		38.0	seconds				
Amber		4.0	seconds	Walk	25.0	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	

Phillip Street

NB Green Arrow	Min	5.0	seconds				
	Ext	3.0	seconds				
	Max	7.0	seconds				
NB Amber Arrow		3.0	seconds				
All Red		1.0	seconds				
Green		25.0	seconds				
Amber		4.0	seconds	Walk	12.0	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	
TOTAL		100.0	seconds				

Pattern 2

10:00-15:00, 18:00-21:00 Monday to Friday, 8:30 - 21:00 Sat, 11:00 - 18:00 Sun

Columbia Street

EB Green Arrow	Min	5.0	seconds	WB Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	7.0	seconds		Max	7.0	seconds
EB Amber Arrow		3.0	seconds	WB Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		39.0	seconds				
Amber		4.0	seconds	Walk	26.0	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	

Phillip Street

NB Green Arrow	Min	5.0	seconds	SB Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	7.0	seconds		Max	7.0	seconds
NB Amber Arrow		3.0	seconds	SB Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		27.0	seconds				
Amber		4.0	seconds	Walk	14.0	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	
TOTAL		100.0	seconds				

Pattern 3

15:00-18:00 Monday to Friday

Columbia Street

EB Green Arrow	Min	5.0	seconds	WB Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	8.1	seconds		Max	8.1	seconds
EB Amber Arrow		3.0	seconds	WB Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		44.6	seconds				
Amber		4.0	seconds	Walk	31.6	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	

Phillip Street

NB Green Arrow	Min	5.0	seconds	SB Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	7.0	seconds		Max	11.4	seconds
NB Amber Arrow		3.0	seconds	SB Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		25.9	seconds				
Amber		4.0	seconds	Walk	12.9	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	
TOTAL		110.0	seconds				

Min=Minimum Time
Ext=Extension Time
Max=Maximum Time

**This signal timing cannot be
presented as evidence in a court of law.**

Pattern 4**All Other Times****Columbia Street**

Green	29.0	seconds			
Amber	4.0	seconds	Walk	16.0	seconds
All Red	2.0	seconds	FDW	13.0	seconds

Phillip Street

Green	29.0	seconds			
Amber	4.0	seconds	Walk	16.0	seconds
All Red	2.0	seconds	FDW	13.0	seconds
TOTAL	70.0	seconds			



CURRENT TRAFFIC SIGNAL TIMING

INT # **24**

COLUMBIA STREET @ Albert Street

T08-50/ **3W**

Date Prepared: **March 30, 2022**

Mode of Control **Fixed Time**

<u>Left Info</u>	Actuated	EB LT	- COLUMBIA STREET
	Actuated	WB LT	- COLUMBIA STREET
	Actuated	NB LT	- Albert Street
	Actuated	SB LT	- Albert Street

*Offsets are a percentage of the cycle length and refers to the beginning of Main Street green

Pattern 1

7:00-10:00 & 15:00-18:00 Monday - Friday

COLUMBIA STREET

EBL Green Arrow	Min	5.0	seconds	WBL Green Arrow	Min	5.0	seconds	OFFSET	71%
	Ext	3.0	seconds		Ext	3.0	seconds		
	Max	6.8	seconds		Max	6.8	seconds		
EBL Amber Arrow		3.0	seconds	WBL Amber Arrow		3.0	seconds		
All Red		1.0	seconds	All Red		1.0	seconds		
Green		30.0	seconds						
Amber		4.0	seconds	Walk	17.0	seconds			
All Red		2.0	seconds	FDW	13.0	seconds			

Albert Street

SBL Green Arrow	Min	5.0	seconds	NBL Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	6.8	seconds		Max	6.8	seconds
SBL Amber Arrow		3.0	seconds	NBL Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		26.4	seconds				
Amber		4.0	seconds	Walk	12.4	seconds	
All Red		2.0	seconds	FDW	14.0	seconds	
TOTAL		90.0	seconds				

Min=Minimum Time
Ext=Extension Time
Max=Maximum Time

**This signal timing cannot be
presented as evidence in a court of law.**

Pattern 2

10:00-15:00 & 18:00-21:00 M-F; 8:30-21:00 SaT; 11:00-18:00 SuN

COLUMBIA STREET

OFFSET 5%

EBL Green Arrow	Min	5.0	seconds	WBL Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	6.4	seconds		Max	6.4	seconds
EBL Amber Arrow		3.0	seconds	WBL Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		22.8	seconds				
Amber		4.0	seconds	Walk	9.8	seconds	
All Red		2.0	seconds	FDW	13.0	seconds	

Albert Street

SBL Green Arrow	Min	5.0	seconds	NBL Green Arrow	Min	5.0	seconds
	Ext	3.0	seconds		Ext	3.0	seconds
	Max	6.4	seconds		Max	6.4	seconds
SBL Amber Arrow		3.0	seconds	NBL Amber Arrow		3.0	seconds
All Red		1.0	seconds	All Red		1.0	seconds
Green		24.4	seconds				
Amber		4.0	seconds	Walk	10.4	seconds	
All Red		2.0	seconds	FDW	14.0	seconds	
TOTAL		80.0	seconds				

Pattern 3

All other times

COLUMBIA STREET

OFFSET 17%

Green	31.1	seconds					
Amber	4.0	seconds	Walk	18.1	seconds		
All Red	2.0	seconds	FDW	13.0	seconds		

Albert Street

Green	26.9	seconds					
Amber	4.0	seconds	Walk	12.9	seconds		
All Red	2.0	seconds	FDW	14.0	seconds		
TOTAL	70.0	seconds					

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

Full Length (7:30 AM-10:30 AM, 12 PM-2 PM, 3 PM-6 PM)

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Albert Street Northbound						Albert Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 7:30AM	8	97	7	0	112	5	24	112	6	0	142	3	7	19	10	0	36	4	3	25	10	0	38	7	328
7:45AM	11	180	19	0	210	7	36	175	18	0	229	4	10	24	19	0	53	4	4	37	17	0	58	10	550
Hourly Total	19	277	26	0	322	12	60	287	24	0	371	7	17	43	29	0	89	8	7	62	27	0	96	17	878
8:00AM	20	171	11	0	202	17	31	193	18	0	242	16	13	33	44	0	90	22	7	51	36	0	94	34	628
8:15AM	15	155	12	0	182	10	32	225	26	0	283	13	6	47	44	0	97	15	11	48	18	0	77	16	639
8:30AM	13	124	17	0	154	14	32	200	16	0	248	5	11	48	28	0	87	9	6	49	26	0	81	11	570
8:45AM	15	176	18	0	209	5	43	227	13	0	283	7	11	55	21	0	87	13	10	49	17	0	76	12	655
Hourly Total	63	626	58	0	747	46	138	845	73	0	1056	41	41	183	137	0	361	59	34	197	97	0	328	73	2492
9:00AM	19	130	17	0	166	9	25	191	18	0	234	5	20	43	20	0	83	7	10	43	18	0	71	12	554
9:15AM	25	148	18	0	191	9	27	195	19	0	241	9	12	46	17	0	75	14	14	42	16	0	72	10	579
9:30AM	12	140	15	0	167	18	22	172	8	0	202	17	8	27	23	0	58	19	11	32	16	0	59	18	486
9:45AM	22	148	11	0	181	10	26	170	12	0	208	10	7	45	26	0	78	19	11	34	6	0	51	20	518
Hourly Total	78	566	61	0	705	46	100	728	57	0	885	41	47	161	86	0	294	59	46	151	56	0	253	60	2137
10:00AM	15	103	10	0	128	4	18	115	15	0	148	12	8	36	14	0	58	14	7	42	11	0	60	9	394
10:15AM	18	118	7	0	143	6	16	132	10	0	158	8	9	22	19	0	50	13	10	20	14	0	44	0	395
Hourly Total	33	221	17	0	271	10	34	247	25	0	306	20	17	58	33	0	108	27	17	62	25	0	104	9	789
12:00PM	22	171	15	0	208	10	11	112	13	0	136	6	13	24	18	0	55	10	14	45	30	0	89	10	488
12:15PM	16	173	10	0	199	3	17	133	15	0	165	7	17	33	15	0	65	10	15	37	15	0	67	7	496
12:30PM	28	146	8	0	182	20	16	143	20	0	179	8	15	36	20	0	71	18	7	39	20	0	66	8	498
12:45PM	20	176	11	0	207	14	19	161	19	0	199	10	14	44	27	0	85	8	26	29	27	0	82	10	573
Hourly Total	86	666	44	0	796	47	63	549	67	0	679	31	59	137	80	0	276	46	62	150	92	0	304	35	2055
1:00PM	21	168	15	0	204	13	15	168	9	0	192	3	12	47	29	0	88	12	13	31	25	0	69	14	553
1:15PM	10	149	8	0	167	11	20	151	18	0	189	12	6	36	24	0	66	9	13	42	18	0	73	10	495
1:30PM	5	142	17	0	164	5	19	134	11	0	164	3	7	36	16	0	59	4	7	26	16	0	49	5	436
1:45PM	7	121	12	0	140	2	14	151	11	0	176	2	7	32	10	0	49	5	13	33	19	0	65	4	430
Hourly Total	43	580	52	0	675	31	68	604	49	0	721	20	32	151	79	0	262	30	46	132	78	0	256	33	1914
3:00PM	14	193	13	0	220	8	5	174	24	0	203	2	8	39	19	0	66	10	11	19	22	0	52	4	541
3:15PM	12	180	6	0	198	4	15	154	18	0	187	2	18	29	13	0	60	4	18	39	20	0	77	8	522
3:30PM	15	171	13	0	199	12	17	186	20	0	223	6	14	39	17	0	70	8	9	47	21	0	77	8	569
3:45PM	26	194	7	0	227	15	17	170	23	0	210	6	16	36	25	0	77	10	19	54	30	0	103	6	617
Hourly Total	67	738	39	0	844	39	54	684	85	0	823	16	56	143	74	0	273	32	57	159	93	0	309	26	2249
4:00PM	32	262	8	0	302	7	7	157	19	0	183	15	19	54	19	0	92	22	22	41	37	0	100	9	677
4:15PM	35	244	12	0	291	7	16	191	21	0	228	4	10	40	30	0	80	11	12	61	33	0	106	14	705
4:30PM	32	259	17	0	308	19	18	197	17	0	232	5	19	40	29	0	88	7	24	51	50	0	125	12	753
4:45PM	50	248	7	0	305	15	22	206	25	0	253	2	10	35	27	0	72	9	21	79	40	0	140	12	770
Hourly Total	149	1013	44	0	1206	48	63	751	82	0	896	26	58	169	105	0	332	49	79	232	160	0	471	47	2905
5:00PM	32	214	13	0	259	10	23	200	24	0	247	7	16	38	26	0	80	12	20	87	58	0	165	9	751
5:15PM	29	253	7	0	289	21	13	217	24	0	254	14	14	50	29	0	93	14	27	95	56	0	178	15	814
5:30PM	39	220	11	0	270	8	17	207	24	0	248	15	24	46	31	0	101	6	24	70	44	0	138	15	757
5:45PM	29	184	11	0	224	12	15	182	27	0	224	19	14	49	29	0	92	14	10	58	23	0	91	15	631
Hourly Total	129	871	42	0	1042	51	68	806	99	0	973	55	68	183	115	0	366	46	81	310	181	0	572	54	2953
Total	667	5558	383	0	6608	330	648	5501	561	0	6710	257	395	1228	738	0	2361	356	429	1455	809	0	2693	354	18372
% Approach	10.1%	84.1%	5.8%	0%	-	-	9.7%	82.0%	8.4%	0%	-	-	16.7%	52.0%	31.3%	0%	-	-	15.9%	54.0%	30.0%	0%	-	-	-
% Total	3.6%	30.3%	2.1%	0%	36.0%	-	3.5%	29.9%	3.1%	0%	36.5%	-	2.2%	6.7%	4.0%	0%	12.9%	-	2.3%	7.9%	4.4%	0%	14.7%	-	-
Motorcycles	0	0	0	0	0	-	0	0	1	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	1
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0.2%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Lights	654	5354	375	0	6383	-	628	5293	546	0	6467	-	390	1210	732	0	2332	-	415	1425	793	0	2633	-	17815
% Lights	98.1%	96.3%	97.9%	0%	96.6%	-	96.9%	96.2%	97.3%	0%	96.4%	-	98.7%	98.5%	99.2%	0%	98.8%	-	96.7%	97.9%	98.0%	0%	97.8%	-	97.0%
Single-Unit Trucks	6	65	5	0	76	-	16	42	6	0	64	-	4	10	6	0	20	-	4	17	14	0	35	-	195
% Single-Unit Trucks	0.9%	1.2%	1.3%	0%	1.2%	-	2.5%	0.8%	1.1%	0%	1.0%	-	1.0%	0.8%	0.8%	0%	0.8%	-	0.9%	1.2%	1.7%	0%	1.3%	-	1.1%
Articulated Trucks	0	22	1	0	23	-	1	19	0	0	20	-	0	1	0	0	1	-	2	0	2	0	4	-	48
% Articulated Trucks	0%	0.4%	0.3%	0%	0.3%	-	0.2%	0.3%	0%	0%	0.3%	-	0%	0.1%	0%	0%	0%	-	0.5%	0%	0.2%	0%	0.1%	-	0.3%
Buses	6	112	2	0	120	-	3	128	8	0	139	-	1	6	0	0	7	-	2	11	0	0	13	-	279
% Buses	0.9%	2.0%	0.5%	0%	1.8%	-	0.5%	2.3%	1.4%	0%	2.1%	-	0.3%	0.5%	0%	0%	0.3%	-	0.5%	0.8%	0%	0%	0.5%	-	1.5%
Bicycles on Road	1	5	0	0	6	-	0	19	0	0	19	-	0	1	0	0	1	-	6	2	0	0	8	-	34
% Bicycles on Road	0.1%	0.1%	0%	0%	0.1%	-	0%	0.3%	0%	0%	0.3%	-	0%	0.1%	0%	0%	0%	-	1.4%	0.1%	0%	0%	0.3%	-	0.2%
Pedestrians	-	-	-	-	-	323	-	-	-	-	-	256	-	-	-	-	-	349	-	-	-	-	-	339	-
% Pedestrians	-	-	-	-	-	97.9%	-	-	-	-	-	99.6%	-	-	-	-	-	98.0%	-	-	-	-	-	95.8%	-

Leg Direction	Columbia Street Eastbound							Columbia Street Westbound							Albert Street Northbound							Albert Street Southbound							
Time	R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*	Int	
Bicycles on Crosswalk	-	-	-	-	-	7		-	-	-	-	-	1		-	-	-	-	-	7		-	-	-	-	-	15		
% Bicycles on Crosswalk	-	-	-	-	-	2.1%		-	-	-	-	-	0.4%		-	-	-	-	-	2.0%		-	-	-	-	-	4.2%		

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

Full Length (7:30 AM-10:30 AM, 12 PM-2 PM, 3 PM-6 PM)

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Albert Street

Total: 4952

In: 2693 Out: 2259

429
1455
809

177

177

159

114

648

5501

561

383

5558

667

171

143

201

738

1228

395

155

Out: 2683 In: 2361

Total: 5044

[S] Albert Street

[W] Columbia Street

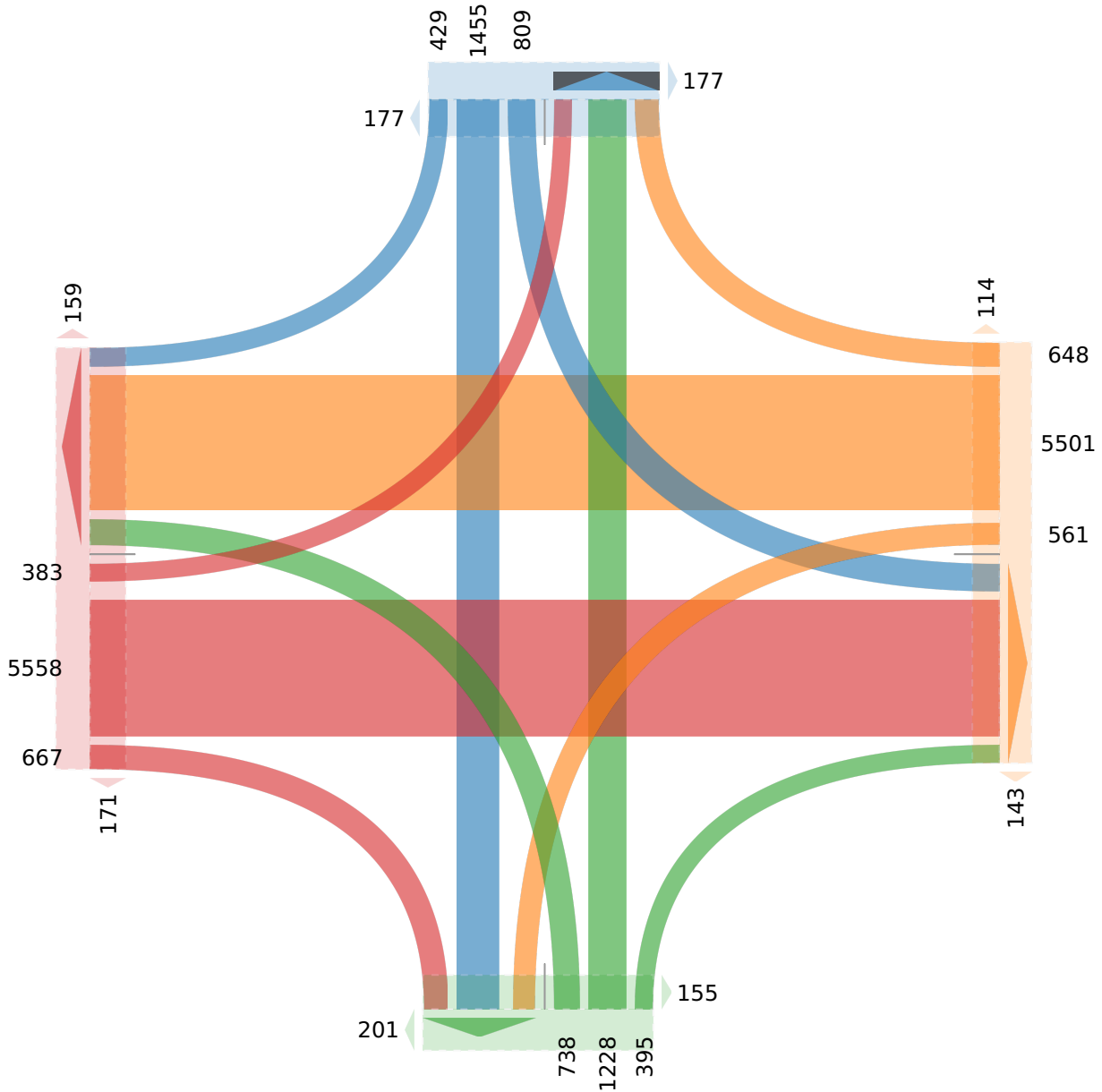
Total: 13276

In: 6608 Out: 6668

[E] Columbia Street

Out: 6762 In: 6710

Total: 13472



Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

AM Peak (8 AM - 9 AM)

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Albert Street Northbound						Albert Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 8:00AM	20	171	11	0	202	17	31	193	18	0	242	16	13	33	44	0	90	22	7	51	36	0	94	34	628
8:15AM	15	155	12	0	182	10	32	225	26	0	283	13	6	47	44	0	97	15	11	48	18	0	77	16	639
8:30AM	13	124	17	0	154	14	32	200	16	0	248	5	11	48	28	0	87	9	6	49	26	0	81	11	570
8:45AM	15	176	18	0	209	5	43	227	13	0	283	7	11	55	21	0	87	13	10	49	17	0	76	12	655
Total	63	626	58	0	747	46	138	845	73	0	1056	41	41	183	137	0	361	59	34	197	97	0	328	73	2492
% Approach	8.4%	83.8%	7.8%	0%	-	-	13.1%	80.0%	6.9%	0%	-	-	11.4%	50.7%	38.0%	0%	-	-	10.4%	60.1%	29.6%	0%	-	-	-
% Total	2.5%	25.1%	2.3%	0%	30.0%	-	5.5%	33.9%	2.9%	0%	42.4%	-	1.6%	7.3%	5.5%	0%	14.5%	-	1.4%	7.9%	3.9%	0%	13.2%	-	-
PHF	0.788	0.888	0.806	-	0.892	-	0.802	0.932	0.702	-	0.931	-	0.788	0.832	0.778	-	0.930	-	0.825	0.961	0.674	-	0.867	-	0.951
Motorcycles	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Lights	62	592	56	0	710	-	133	804	70	0	1007	-	41	181	137	0	359	-	31	191	97	0	319	-	2395
% Lights	98.4%	94.6%	96.6%	0%	95.0%	-	96.4%	95.1%	95.9%	0%	95.4%	-	100%	98.9%	100%	0%	99.4%	-	91.2%	97.0%	100%	0%	97.3%	-	96.1%
Single-Unit Trucks	0	10	1	0	11	-	2	12	0	0	14	-	0	1	0	0	1	-	0	2	0	0	2	-	28
% Single-Unit Trucks	0%	1.6%	1.7%	0%	1.5%	-	1.4%	1.4%	0%	0%	1.3%	-	0%	0.5%	0%	0%	0.3%	-	0%	1.0%	0%	0%	0.6%	-	1.1%
Articulated Trucks	0	3	0	0	3	-	0	3	0	0	3	-	0	1	0	0	1	-	1	0	0	0	1	-	8
% Articulated Trucks	0%	0.5%	0%	0%	0.4%	-	0%	0.4%	0%	0%	0.3%	-	0%	0.5%	0%	0%	0.3%	-	2.9%	0%	0%	0%	0.3%	-	0.3%
Buses	1	20	1	0	22	-	3	20	3	0	26	-	0	0	0	0	0	-	1	3	0	0	4	-	52
% Buses	1.6%	3.2%	1.7%	0%	2.9%	-	2.2%	2.4%	4.1%	0%	2.5%	-	0%	0%	0%	0%	0%	-	2.9%	1.5%	0%	0%	1.2%	-	2.1%
Bicycles on Road	0	1	0	0	1	-	0	6	0	0	6	-	0	0	0	0	0	-	1	1	0	0	2	-	9
% Bicycles on Road	0%	0.2%	0%	0%	0.1%	-	0%	0.7%	0%	0%	0.6%	-	0%	0%	0%	0%	0%	-	2.9%	0.5%	0%	0%	0.6%	-	0.4%
Pedestrians	-	-	-	-	-	45	-	-	-	-	-	41	-	-	-	-	-	59	-	-	-	-	-	71	
% Pedestrians	-	-	-	-	-	97.8%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	97.3%	-
Bicycles on Crosswalk	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	
% Bicycles on Crosswalk	-	-	-	-	-	2.2%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	2.7%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

AM Peak (8 AM - 9 AM)

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Albert Street

Total: 707

In: 328 Out: 379

34 197 97

35

38

6

10

138

845

73

58

626

63

40

31

50

9

137

183

41

Out: 333 In: 361

Total: 694

[S] Albert Street

[W] Columbia Street

Total: 1763

In: 747 Out: 1016

Out: 764 In: 1056

Total: 1820

[E] Columbia Street

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

Midday Peak (12:15 PM - 1:15 PM)

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation
Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Albert Street Northbound						Albert Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 12:15PM	16	173	10	0	199	3	17	133	15	0	165	7	17	33	15	0	65	10	15	37	15	0	67	7	496
12:30PM	28	146	8	0	182	20	16	143	20	0	179	8	15	36	20	0	71	18	7	39	20	0	66	8	498
12:45PM	20	176	11	0	207	14	19	161	19	0	199	10	14	44	27	0	85	8	26	29	27	0	82	10	573
1:00PM	21	168	15	0	204	13	15	168	9	0	192	3	12	47	29	0	88	12	13	31	25	0	69	14	553
Total	85	663	44	0	792	50	67	605	63	0	735	28	58	160	91	0	309	48	61	136	87	0	284	39	2120
% Approach	10.7%	83.7%	5.6%	0%	-	-	9.1%	82.3%	8.6%	0%	-	-	18.8%	51.8%	29.4%	0%	-	-	21.5%	47.9%	30.6%	0%	-	-	-
% Total	4.0%	31.3%	2.1%	0%	37.4%	-	3.2%	28.5%	3.0%	0%	34.7%	-	2.7%	7.5%	4.3%	0%	14.6%	-	2.9%	6.4%	4.1%	0%	13.4%	-	-
PHF	0.759	0.940	0.733	-	0.955	-	0.882	0.897	0.788	-	0.926	-	0.853	0.851	0.784	-	0.878	-	0.615	0.872	0.806	-	0.881	-	0.928
Motorcycles	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Lights	84	637	43	0	764	-	64	584	63	0	711	-	57	158	90	0	305	-	58	135	85	0	278	-	2058
% Lights	98.8%	96.1%	97.7%	0%	96.5%	-	95.5%	96.5%	100%	0%	96.7%	-	98.3%	98.8%	98.9%	0%	98.7%	-	95.1%	99.3%	97.7%	0%	97.9%	-	97.1%
Single-Unit Trucks	1	16	1	0	18	-	3	6	0	0	9	-	1	2	1	0	4	-	0	1	2	0	3	-	34
% Single-Unit Trucks	1.2%	2.4%	2.3%	0%	2.3%	-	4.5%	1.0%	0%	0%	1.2%	-	1.7%	1.3%	1.1%	0%	1.3%	-	0%	0.7%	2.3%	0%	1.1%	-	1.6%
Articulated Trucks	0	2	0	0	2	-	0	4	0	0	4	-	0	0	0	0	0	-	1	0	0	0	1	-	7
% Articulated Trucks	0%	0.3%	0%	0%	0.3%	-	0%	0.7%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	1.6%	0%	0%	0%	0.4%	-	0.3%
Buses	0	7	0	0	7	-	0	9	0	0	9	-	0	0	0	0	0	-	0	0	0	0	0	-	16
% Buses	0%	1.1%	0%	0%	0.9%	-	0%	1.5%	0%	0%	1.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.8%
Bicycles on Road	0	1	0	0	1	-	0	2	0	0	2	-	0	0	0	0	0	-	2	0	0	0	2	-	5
% Bicycles on Road	0%	0.2%	0%	0%	0.1%	-	0%	0.3%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	3.3%	0%	0%	0%	0.7%	-	0.2%
Pedestrians	-	-	-	-	-	48	-	-	-	-	-	28	-	-	-	-	-	48	-	-	-	-	-	36	-
% Pedestrians	-	-	-	-	-	96.0%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	92.3%	-
Bicycles on Crosswalk	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-
% Bicycles on Crosswalk	-	-	-	-	-	4.0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	7.7%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

Midday Peak (12:15 PM - 1:15 PM)

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Albert Street

Total: 555

In: 284 Out: 271

61
136
87

19

20

14

67

605

63

In: 735

Total: 1543

Out: 808

[E] Columbia Street

14

25

91
160
58

Out: 284 In: 309

Total: 593

[S] Albert Street

[W] Columbia Street

Total: 1549

Out: 757

In: 792

28

44

663

85

22

23

61

136

87

19

20

14

67

605

63

In: 735

Total: 1543

Out: 808

[E] Columbia Street

14

25

91
160
58

Out: 284 In: 309

Total: 593

[S] Albert Street

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation
Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Albert Street Northbound						Albert Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 4:45PM	50	248	7	0	305	15	22	206	25	0	253	2	10	35	27	0	72	9	21	79	40	0	140	12	770
5:00PM	32	214	13	0	259	10	23	200	24	0	247	7	16	38	26	0	80	12	20	87	58	0	165	9	751
5:15PM	29	253	7	0	289	21	13	217	24	0	254	14	14	50	29	0	93	14	27	95	56	0	178	15	814
5:30PM	39	220	11	0	270	8	17	207	24	0	248	15	24	46	31	0	101	6	24	70	44	0	138	15	757
Total	150	935	38	0	1123	54	75	830	97	0	1002	38	64	169	113	0	346	41	92	331	198	0	621	51	3092
% Approach	13.4%	83.3%	3.4%	0%	-	-	7.5%	82.8%	9.7%	0%	-	-	18.5%	48.8%	32.7%	0%	-	-	14.8%	53.3%	31.9%	0%	-	-	-
% Total	4.9%	30.2%	1.2%	0%	36.3%	-	2.4%	26.8%	3.1%	0%	32.4%	-	2.1%	5.5%	3.7%	0%	11.2%	-	3.0%	10.7%	6.4%	0%	20.1%	-	-
PHF	0.750	0.924	0.731	-	0.920	-	0.815	0.955	0.970	-	0.985	-	0.667	0.845	0.911	-	0.856	-	0.852	0.871	0.853	-	0.872	-	0.949
Motorcycles	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Lights	150	917	37	0	1104	-	75	814	96	0	985	-	63	169	112	0	344	-	92	329	197	0	618	-	3051
% Lights	100%	98.1%	97.4%	0%	98.3%	-	100%	98.1%	99.0%	0%	98.3%	-	98.4%	100%	99.1%	0%	99.4%	-	100%	99.4%	99.5%	0%	99.5%	-	98.7%
Single-Unit Trucks	0	3	0	0	3	-	0	1	1	0	2	-	1	0	1	0	2	-	0	2	1	0	3	-	10
% Single-Unit Trucks	0%	0.3%	0%	0%	0.3%	-	0%	0.1%	1.0%	0%	0.2%	-	1.6%	0%	0.9%	0%	0.6%	-	0%	0.6%	0.5%	0%	0.5%	-	0.3%
Articulated Trucks	0	1	1	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	2
% Articulated Trucks	0%	0.1%	2.6%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Buses	0	14	0	0	14	-	0	14	0	0	14	-	0	0	0	0	0	-	0	0	0	0	0	-	28
% Buses	0%	1.5%	0%	0%	1.2%	-	0%	1.7%	0%	0%	1.4%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.9%
Bicycles on Road	0	0	0	0	0	-	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	1
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	54	-	-	-	-	-	37	-	-	-	-	-	41	-	-	-	-	-	46	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	97.4%	-	-	-	-	-	100%	-	-	-	-	-	90.2%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	5	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	2.6%	-	-	-	-	-	0%	-	-	-	-	-	9.8%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Albert Street - TMC

Thu Nov 1, 2018

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

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

All Movements

ID: 582383, Location: 43.478619, -80.535257



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Albert Street

Total: 903

In: 621 Out: 282

92 331 198

26 25

[W] Columbia Street

Total: 2158

In: 1123 Out: 1035

39 38 935 150 15

13 113 169 64 28

Out: 578 In: 346

Total: 924

[S] Albert Street

Out: 1197 In: 1002

Total: 2199

[E] Columbia Street

75 830 97

21 17

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

Full Length (7:30 AM-10:30 AM, 12 PM-2 PM, 3 PM-6 PM)

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation
Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Phillip Street Northbound						Phillip Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 7:30AM	16	103	20	0	139	8	11	101	15	0	127	0	10	19	13	0	42	10	5	4	3	0	12	9	320
7:45AM	11	179	30	0	220	21	16	152	16	0	184	0	16	28	15	0	59	21	7	14	3	0	24	12	487
Hourly Total	27	282	50	0	359	29	27	253	31	0	311	0	26	47	28	0	101	31	12	18	6	0	36	21	807
8:00AM	17	198	28	0	243	15	11	193	22	0	226	6	17	20	22	0	59	58	7	19	5	0	31	27	559
8:15AM	22	157	27	0	206	60	12	238	29	0	279	6	8	17	21	0	46	96	9	24	9	0	42	40	573
8:30AM	17	151	30	0	198	24	20	191	20	0	231	1	20	29	18	0	67	45	5	12	5	0	22	20	518
8:45AM	18	187	28	0	233	16	26	201	24	0	251	2	12	25	31	0	68	50	10	12	3	0	25	15	577
Hourly Total	74	693	113	0	880	115	69	823	95	0	987	15	57	91	92	0	240	249	31	67	22	0	120	102	2227
9:00AM	11	146	34	0	191	26	23	161	16	0	200	3	13	41	24	0	78	33	10	18	8	0	36	16	505
9:15AM	10	182	21	0	213	16	19	182	25	0	226	9	16	28	17	0	61	46	11	11	4	0	26	22	526
9:30AM	10	154	11	0	175	34	25	147	21	0	193	10	15	21	17	0	53	80	9	9	6	0	24	23	445
9:45AM	27	166	9	0	202	34	16	147	29	0	192	6	19	14	15	0	48	128	15	8	6	0	29	36	471
Hourly Total	58	648	75	0	781	110	83	637	91	0	811	28	63	104	73	0	240	287	45	46	24	0	115	97	1947
10:00AM	16	117	9	0	142	25	10	106	13	0	129	8	21	17	17	0	55	44	11	9	3	0	23	26	349
10:15AM	16	119	4	0	139	15	11	123	22	0	156	6	14	13	12	0	39	28	7	9	5	0	21	15	355
Hourly Total	32	236	13	0	281	40	21	229	35	0	285	14	35	30	29	0	94	72	18	18	8	0	44	41	704
12:00PM	50	144	9	0	203	17	7	109	22	0	138	6	19	20	19	0	58	23	19	30	27	0	76	14	475
12:15PM	26	165	9	0	200	21	8	111	32	0	151	7	23	19	31	0	73	32	12	20	10	0	42	12	466
12:30PM	28	154	11	0	193	28	9	132	24	0	165	10	21	25	31	0	77	63	9	25	12	0	46	25	481
12:45PM	21	174	11	0	206	25	11	162	27	0	200	12	34	27	33	0	94	82	20	12	8	0	40	31	540
Hourly Total	125	637	40	0	802	91	35	514	105	0	654	35	97	91	114	0	302	200	60	87	57	0	204	82	1962
1:00PM	25	147	17	0	189	22	23	148	23	0	194	9	36	30	32	0	98	55	20	9	9	0	38	18	519
1:15PM	16	121	10	0	147	17	9	127	29	0	165	7	35	23	29	0	87	34	15	17	7	0	39	15	438
1:30PM	19	118	9	0	146	9	9	136	17	0	162	5	31	13	19	0	63	23	12	9	9	0	30	8	401
1:45PM	20	111	3	0	134	18	6	131	24	0	161	4	28	13	23	0	64	13	12	12	11	0	35	14	394
Hourly Total	80	497	39	0	616	66	47	542	93	0	682	25	130	79	103	0	312	125	59	47	36	0	142	55	1752
3:00PM	14	153	10	0	177	20	2	185	20	0	207	6	34	12	17	0	63	26	13	22	17	0	52	14	499
3:15PM	12	161	7	0	180	12	4	137	27	0	168	3	25	17	23	0	65	16	14	14	15	0	43	11	456
3:30PM	21	155	7	0	183	17	10	162	26	0	198	8	29	15	17	0	61	31	22	14	13	0	49	4	491
3:45PM	30	181	9	0	220	24	10	183	27	0	220	11	28	13	19	0	60	40	14	10	9	0	33	18	533
Hourly Total	77	650	33	0	760	73	26	667	100	0	793	28	116	57	76	0	249	113	63	60	54	0	177	47	1979
4:00PM	29	258	7	0	294	24	8	175	19	0	202	6	48	16	29	0	93	69	23	14	28	0	65	20	654
4:15PM	15	240	9	0	264	18	6	195	37	0	238	3	33	10	16	0	59	39	18	22	10	0	50	17	611
4:30PM	18	247	8	0	273	12	7	216	13	0	236	4	36	23	25	0	84	50	42	25	23	0	90	17	683
4:45PM	22	241	15	0	278	22	10	187	33	0	230	4	36	23	24	0	83	29	33	24	30	0	87	12	678
Hourly Total	84	986	39	0	1109	76	31	773	102	0	906	17	153	72	94	0	319	187	116	85	91	0	292	66	2626
5:00PM	25	198	9	0	232	45	5	199	25	0	229	23	25	22	21	0	68	33	49	50	47	0	146	19	675
5:15PM	31	238	14	0	283	17	5	225	44	0	274	25	34	11	30	0	75	70	34	32	29	0	95	23	727
5:30PM	47	228	7	0	282	21	8	227	37	0	272	34	28	20	22	0	70	54	28	32	30	0	90	6	714
5:45PM	36	173	5	0	214	15	5	161	40	0	206	21	38	13	21	0	72	60	24	29	27	0	80	8	572
Hourly Total	139	837	35	0	1011	98	23	812	146	0	981	103	125	66	94	0	285	217	135	143	133	0	411	56	2688
Total	696	5466	437	0	6599	698	362	5250	798	0	6410	265	802	637	703	0	2142	1481	539	571	431	0	1541	567	16692
% Approach	10.5%	82.8%	6.6%	0%	-	-	5.6%	81.9%	12.4%	0%	-	-	37.4%	29.7%	32.8%	0%	-	-	35.0%	37.1%	28.0%	0%	-	-	-
% Total	4.2%	32.7%	2.6%	0%	39.5%	-	2.2%	31.5%	4.8%	0%	38.4%	-	4.8%	3.8%	4.2%	0%	12.8%	-	3.2%	3.4%	2.6%	0%	9.2%	-	-
Motorcycles	0	1	0	0	1	-	0	1	0	0	1	-	0	1	2	0	3	-	0	0	0	0	0	-	5
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.2%	0.3%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%
Lights	685	5277	427	0	6389	-	355	5061	778	0	6194	-	781	619	669	0	2069	-	530	543	418	0	1491	-	16143
% Lights	98.4%	96.5%	97.7%	0%	96.8%	-	98.1%	96.4%	97.5%	0%	96.6%	-	97.4%	97.2%	95.2%	0%	96.6%	-	98.3%	95.1%	97.0%	0%	96.8%	-	96.7%
Single-Unit Trucks	9	44	0	0	53	-	5	46	8	0	59	-	14	16	10	0	40	-	6	11	10	0	27	-	179
% Single-Unit Trucks	1.3%	0.8%	0%	0%	0.8%	-	1.4%	0.9%	1.0%	0%	0.9%	-	1.7%	2.5%	1.4%	0%	1.9%	-	1.1%	1.9%	2.3%	0%	1.8%	-	1.1%
Articulated Trucks	2	10	1	0	13	-	2	15	6	0	23	-	4	0	2	0	6	-	0	4	3	0	7	-	49
% Articulated Trucks	0.3%	0.2%	0.2%	0%	0.2%	-	0.6%	0.3%	0.8%	0%	0.4%	-	0.5%	0%	0.3%	0%	0.3%	-	0%	0.7%	0.7%	0%	0.5%	-	0.3%
Buses	0	122	9	0	131	-	0	120	4	0	124	-	0	1	20	0	21	-	2	7	0	0	9	-	285
% Buses	0%	2.2%	2.1%	0%	2.0%	-	0%	2.3%	0.5%	0%	1.9%	-	0%	0.2%	2.8%	0%	1.0%	-	0.4%	1.2%	0%	0%	0.6%	-	1.7%
Bicycles on Road	0	12	0	0	12	-	0	7	2	0	9	-	3	0	0	0	3	-	1	6	0	0	7	-	31
% Bicycles on Road	0%	0.2%	0%	0%	0.2%	-	0%	0.1%	0.3%	0%	0.1%	-	0.4%	0%	0%	0%	0.1%	-	0.2%	1.1%	0%	0%	0.5%	-	0.2%
Pedestrians	-	-	-	-	-	691	-	-	-	-	-	264	-	-	-	-	-	1442	-	-	-	-	-	561	
% Pedestrians	-	-	-	-	-	99.0%	-	-	-	-	-	99.6%	-	-	-	-	-	97.4%	-	-	-	-	-	98.9%	-

Leg Direction	Columbia Street Eastbound							Columbia Street Westbound							Phillip Street Northbound							Phillip Street Southbound							
Time	R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*	Int	
Bicycles on Crosswalk	-	-	-	-	-	7		-	-	-	-	-	1		-	-	-	-	-	39		-	-	-	-	-	6		
% Bicycles on Crosswalk	-	-	-	-	-	1.0%		-	-	-	-	-	0.4%		-	-	-	-	-	2.6%		-	-	-	-	-	1.1%		-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

Full Length (7:30 AM-10:30 AM, 12 PM-2 PM, 3 PM-6 PM)

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Phillip Street

Total: 2977

In: 1541 Out: 1436

539
571
431

386

181

232

90

362

5250

798

In: 6410

Total: 13109

[E] Columbia Street

Out: 6699

175

562

919

703
637
802

Out: 2065 In: 2142

Total: 4207

[S] Phillip Street

[W] Columbia Street

Total: 13091

Out: 6492

In: 6599

437

5466

696

466

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

AM Peak (8 AM - 9 AM)

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation
Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Phillip Street Northbound						Phillip Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 8:00AM	17	198	28	0	243	15	11	193	22	0	226	6	17	20	22	0	59	58	7	19	5	0	31	27	559
8:15AM	22	157	27	0	206	60	12	238	29	0	279	6	8	17	21	0	46	96	9	24	9	0	42	40	573
8:30AM	17	151	30	0	198	24	20	191	20	0	231	1	20	29	18	0	67	45	5	12	5	0	22	20	518
8:45AM	18	187	28	0	233	16	26	201	24	0	251	2	12	25	31	0	68	50	10	12	3	0	25	15	577
Total	74	693	113	0	880	115	69	823	95	0	987	15	57	91	92	0	240	249	31	67	22	0	120	102	2227
% Approach	8.4%	78.8%	12.8%	0%	-	-	7.0%	83.4%	9.6%	0%	-	-	23.8%	37.9%	38.3%	0%	-	-	25.8%	55.8%	18.3%	0%	-	-	-
% Total	3.3%	31.1%	5.1%	0%	39.5%	-	3.1%	37.0%	4.3%	0%	44.3%	-	2.6%	4.1%	4.1%	0%	10.8%	-	1.4%	3.0%	1.0%	0%	5.4%	-	-
PHF	0.841	0.880	0.942	-	0.910	-	0.663	0.862	0.810	-	0.882	-	0.713	0.784	0.742	-	0.882	-	0.775	0.762	0.611	-	0.750	-	0.964
Motorcycles	0	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	1	-	0	0	0	0	0	-	1
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	1.1%	0%	0.4%	-	0%	0%	0%	0%	0%	-	0%
Lights	73	663	108	0	844	-	66	791	92	0	949	-	53	90	87	0	230	-	31	61	20	0	112	-	2135
% Lights	98.6%	95.7%	95.6%	0%	95.9%	-	95.7%	96.1%	96.8%	0%	96.1%	-	93.0%	98.9%	94.6%	0%	95.8%	-	100%	91.0%	90.9%	0%	93.3%	-	95.9%
Single-Unit Trucks	1	6	0	0	7	-	2	9	0	0	11	-	2	1	1	0	4	-	0	0	2	0	2	-	24
% Single-Unit Trucks	1.4%	0.9%	0%	0%	0.8%	-	2.9%	1.1%	0%	0%	1.1%	-	3.5%	1.1%	1.1%	0%	1.7%	-	0%	0%	9.1%	0%	1.7%	-	1.1%
Articulated Trucks	0	0	1	0	1	-	1	1	2	0	4	-	2	0	0	0	2	-	0	1	0	0	1	-	8
% Articulated Trucks	0%	0%	0.9%	0%	0.1%	-	1.4%	0.1%	2.1%	0%	0.4%	-	3.5%	0%	0%	0%	0.8%	-	0%	1.5%	0%	0%	0.8%	-	0.4%
Buses	0	21	4	0	25	-	0	20	0	0	20	-	0	0	3	0	3	-	0	2	0	0	2	-	50
% Buses	0%	3.0%	3.5%	0%	2.8%	-	0%	2.4%	0%	0%	2.0%	-	0%	0%	3.3%	0%	1.3%	-	0%	3.0%	0%	0%	1.7%	-	2.2%
Bicycles on Road	0	3	0	0	3	-	0	2	1	0	3	-	0	0	0	0	0	-	0	3	0	0	3	-	9
% Bicycles on Road	0%	0.4%	0%	0%	0.3%	-	0%	0.2%	1.1%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	4.5%	0%	0%	2.5%	-	0.4%
Pedestrians	-	-	-	-	-	112	-	-	-	-	-	15	-	-	-	-	-	243	-	-	-	-	-	99	
% Pedestrians	-	-	-	-	-	97.4%	-	-	-	-	-	100%	-	-	-	-	-	97.6%	-	-	-	-	-	97.1%	-
Bicycles on Crosswalk	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	6	-	-	-	-	-	3	
% Bicycles on Crosswalk	-	-	-	-	-	2.6%	-	-	-	-	-	0%	-	-	-	-	-	2.4%	-	-	-	-	-	2.9%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

AM Peak (8 AM - 9 AM)

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Phillip Street

Total: 393

In: 120 Out: 273

31 67 22

93

9

[W] Columbia Street

Total: 1826

In: 880 Out: 946

113

693

74

88

69

823

95

Out: 772 In: 987

Total: 1759

[E] Columbia Street

229

92

91

57

20

Out: 236 In: 240

Total: 476

[S] Phillip Street

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

Midday Peak (12:15 PM - 1:15 PM)

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation
Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Phillip Street Northbound						Phillip Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 12:15PM	26	165	9	0	200	21	8	111	32	0	151	7	23	19	31	0	73	32	12	20	10	0	42	12	466
12:30PM	28	154	11	0	193	28	9	132	24	0	165	10	21	25	31	0	77	63	9	25	12	0	46	25	481
12:45PM	21	174	11	0	206	25	11	162	27	0	200	12	34	27	33	0	94	82	20	12	8	0	40	31	540
1:00PM	25	147	17	0	189	22	23	148	23	0	194	9	36	30	32	0	98	55	20	9	9	0	38	18	519
Total	100	640	48	0	788	96	51	553	106	0	710	38	114	101	127	0	342	232	61	66	39	0	166	86	2006
% Approach	12.7%	81.2%	6.1%	0%	-	-	7.2%	77.9%	14.9%	0%	-	-	33.3%	29.5%	37.1%	0%	-	-	36.7%	39.8%	23.5%	0%	-	-	-
% Total	5.0%	31.9%	2.4%	0%	39.3%	-	2.5%	27.6%	5.3%	0%	35.4%	-	5.7%	5.0%	6.3%	0%	17.0%	-	3.0%	3.3%	1.9%	0%	8.3%	-	-
PHF	0.893	0.918	0.706	-	0.955	-	0.554	0.853	0.847	-	0.886	-	0.792	0.842	0.962	-	0.872	-	0.763	0.660	0.813	-	0.902	-	0.928
Motorcycles	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Motorcycles	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Lights	97	620	48	0	765	-	50	537	103	0	690	-	112	97	126	0	335	-	59	64	38	0	161	-	1951
% Lights	97.0%	96.9%	100%	0%	97.1%	-	98.0%	97.1%	97.2%	0%	97.2%	-	98.2%	96.0%	99.2%	0%	98.0%	-	96.7%	97.0%	97.4%	0%	97.0%	-	97.3%
Single-Unit Trucks	1	11	0	0	12	-	0	6	1	0	7	-	2	3	0	0	5	-	1	0	1	0	2	-	26
% Single-Unit Trucks	1.0%	1.7%	0%	0%	1.5%	-	0%	1.1%	0.9%	0%	1.0%	-	1.8%	3.0%	0%	0%	1.5%	-	1.6%	0%	2.6%	0%	1.2%	-	1.3%
Articulated Trucks	2	1	0	0	3	-	1	1	1	0	3	-	0	0	0	0	0	-	0	1	0	0	1	-	7
% Articulated Trucks	2.0%	0.2%	0%	0%	0.4%	-	2.0%	0.2%	0.9%	0%	0.4%	-	0%	0%	0%	0%	0%	-	0%	1.5%	0%	0%	0.6%	-	0.3%
Buses	0	7	0	0	7	-	0	9	0	0	9	-	0	1	1	0	2	-	1	1	0	0	2	-	20
% Buses	0%	1.1%	0%	0%	0.9%	-	0%	1.6%	0%	0%	1.3%	-	0%	1.0%	0.8%	0%	0.6%	-	1.6%	1.5%	0%	0%	1.2%	-	1.0%
Bicycles on Road	0	1	0	0	1	-	0	0	1	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	2
% Bicycles on Road	0%	0.2%	0%	0%	0.1%	-	0%	0%	0.9%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Pedestrians	-	-	-	-	-	95	-	-	-	-	-	38	-	-	-	-	-	223	-	-	-	-	-	85	
% Pedestrians	-	-	-	-	-	99.0%	-	-	-	-	-	100%	-	-	-	-	-	96.1%	-	-	-	-	-	98.8%	-
Bicycles on Crosswalk	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	9	-	-	-	-	-	1	
% Bicycles on Crosswalk	-	-	-	-	-	1.0%	-	-	-	-	-	0%	-	-	-	-	-	3.9%	-	-	-	-	-	1.2%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

Midday Peak (12:15 PM - 1:15 PM)

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Phillip Street

Total: 366

In: 166 Out: 200

61 66 39

48

38

34

13

51

In: 710

553

106

Out: 793

Total: 1503

[E] Columbia Street

[W] Columbia Street

Total: 1529

Out: 741

In: 788

48

640

100

62

25

117

127

101

114

115

Out: 272 In: 342

Total: 614

[S] Phillip Street

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation
Solutions Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street Eastbound						Columbia Street Westbound						Phillip Street Northbound						Phillip Street Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-11-01 4:45PM	22	241	15	0	278	22	10	187	33	0	230	4	36	23	24	0	83	29	33	24	30	0	87	12	678
5:00PM	25	198	9	0	232	45	5	199	25	0	229	23	25	22	21	0	68	33	49	50	47	0	146	19	675
5:15PM	31	238	14	0	283	17	5	225	44	0	274	25	34	11	30	0	75	70	34	32	29	0	95	23	727
5:30PM	47	228	7	0	282	21	8	227	37	0	272	34	28	20	22	0	70	54	28	32	30	0	90	6	714
Total	125	905	45	0	1075	105	28	838	139	0	1005	86	123	76	97	0	296	186	144	138	136	0	418	60	2794
% Approach	11.6%	84.2%	4.2%	0%	-	-	2.8%	83.4%	13.8%	0%	-	-	41.6%	25.7%	32.8%	0%	-	-	34.4%	33.0%	32.5%	0%	-	-	-
% Total	4.5%	32.4%	1.6%	0%	38.5%	-	1.0%	30.0%	5.0%	0%	36.0%	-	4.4%	2.7%	3.5%	0%	10.6%	-	5.2%	4.9%	4.9%	0%	15.0%	-	-
PHF	0.665	0.942	0.750	-	0.949	-	0.700	0.923	0.790	-	0.917	-	0.854	0.826	0.808	-	0.892	-	0.730	0.690	0.723	-	0.714	-	0.960
Motorcycles	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	1
% Motorcycles	0%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	0%
Lights	125	884	45	0	1054	-	28	820	138	0	986	-	120	76	93	0	289	-	143	136	136	0	415	-	2744
% Lights	100%	97.7%	100%	0%	98.0%	-	100%	97.9%	99.3%	0%	98.1%	-	97.6%	100%	95.9%	0%	97.6%	-	99.3%	98.6%	100%	0%	99.3%	-	98.2%
Single-Unit Trucks	0	2	0	0	2	-	0	3	1	0	4	-	3	0	0	0	3	-	0	1	0	0	1	-	10
% Single-Unit Trucks	0%	0.2%	0%	0%	0.2%	-	0%	0.4%	0.7%	0%	0.4%	-	2.4%	0%	0%	0%	1.0%	-	0%	0.7%	0%	0%	0.2%	-	0.4%
Articulated Trucks	0	2	0	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	1	-	3
% Articulated Trucks	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.7%	0%	0%	0.2%	-	0.1%
Buses	0	15	0	0	15	-	0	15	0	0	15	-	0	0	4	0	4	-	0	0	0	0	0	-	34
% Buses	0%	1.7%	0%	0%	1.4%	-	0%	1.8%	0%	0%	1.5%	-	0%	0%	4.1%	0%	1.4%	-	0%	0%	0%	0%	0%	-	1.2%
Bicycles on Road	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	1	0	0	0	1	-	2
% Bicycles on Road	0%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.7%	0%	0%	0%	0.2%	-	0.1%
Pedestrians	-	-	-	-	-	105	-	-	-	-	-	86	-	-	-	-	-	184	-	-	-	-	-	60	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	98.9%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	1.1%	-	-	-	-	-	0%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Columbia Street W & Phillip Street - TMC

Thu Nov 1, 2018

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

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

All Movements

ID: 582385, Location: 43.476984, -80.539978



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Phillip Street

Total: 567

In: 418 Out: 149

144

138

136

18

42

[W] Columbia Street

Total: 2154

In: 1075

Out: 1079

35

45

905

125

70

22

28

838

139

In: 1005

Total: 2169

Out: 1164

[E] Columbia Street

67

97

76

123

119

Out: 402 In: 296

Total: 698

[S] Phillip Street

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

Full Length (7:30 AM-10 AM, 11 AM-1 PM, 3 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions Limited
5A-150 Pinebush Road, Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street West Eastbound							Columbia Street West Westbound							Lester Street Northbound							Driveway Southbound							
Time	R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		R	T	L	U	App	Ped*		Int
2018-07-12																													
7:30AM	2	128	0	0	130	1		1	117	1	0	119	1		2	0	0	0	2	2		4	3	5	0	12	5		263
7:45AM	1	162	3	0	166	0		2	122	2	0	126	1		4	0	1	0	5	13		0	0	2	0	2	14		299
Hourly Total	3	290	3	0	296	1		3	239	3	0	245	2		6	0	1	0	7	15		4	3	7	0	14	19		562
8:00AM	6	150	2	0	158	0		0	189	3	0	192	1		1	0	1	0	2	23		1	0	6	0	7	22		359
8:15AM	2	192	1	0	195	0		4	229	3	0	236	1		5	0	5	0	10	49		4	1	1	0	6	33		447
8:30AM	5	207	2	0	214	0		2	236	1	0	239	7		4	0	0	0	4	14		3	1	3	0	7	8		464
8:45AM	3	210	0	0	213	0		2	238	4	0	244	0		2	1	1	0	4	23		2	2	2	0	6	7		467
Hourly Total	16	759	5	0	780	0		8	892	11	0	911	9		12	1	7	0	20	109		10	4	12	0	26	70		1737
9:00AM	1	189	0	0	190	0		3	209	0	0	212	6		3	1	1	0	5	20		1	0	2	0	3	7		410
9:15AM	7	156	0	0	163	0		1	205	1	0	207	1		6	0	3	0	9	13		6	0	4	0	10	16		389
9:30AM	7	141	0	0	148	0		1	168	4	0	173	1		2	0	1	0	3	25		3	0	6	0	9	24		333
9:45AM	8	120	1	0	129	1		1	153	0	0	154	4		3	1	2	0	6	29		5	0	3	0	8	39		297
Hourly Total	23	606	1	0	630	1		6	735	5	0	746	12		14	2	7	0	23	87		15	0	15	0	30	86		1429
11:00AM	4	128	3	0	135	0		2	123	2	0	127	0		2	0	4	0	6	18		1	0	2	0	3	12		271
11:15AM	5	141	1	0	147	2		3	140	3	0	146	1		4	0	2	0	6	14		3	0	0	0	3	22		302
11:30AM	6	172	1	0	179	1		1	126	2	0	129	2		6	0	0	0	6	24		3	1	3	0	7	18		321
11:45AM	4	184	2	0	190	0		3	153	6	0	162	2		4	1	4	0	9	19		1	0	2	0	3	14		364
Hourly Total	19	625	7	0	651	3		9	542	13	0	564	5		16	1	10	0	27	75		8	1	7	0	16	66		1258
12:00PM	10	212	2	0	224	2		3	166	4	0	173	3		8	0	2	0	10	17		5	2	0	0	7	17		414
12:15PM	6	152	3	0	161	1		6	172	5	0	183	6		6	1	0	0	7	18		3	0	1	0	4	23		355
12:30PM	9	182	1	0	192	3		5	162	8	0	175	2		13	0	0	0	13	23		2	2	3	0	7	24		387
12:45PM	8	184	1	0	193	0		6	185	5	0	196	3		9	0	2	0	11	18		3	2	5	0	10	18		410
Hourly Total	33	730	7	0	770	6		20	685	22	0	727	14		36	1	4	0	41	76		13	6	9	0	28	82		1566
3:00PM	6	211	0	0	217	1		3	156	4	0	163	0		4	0	2	0	6	9		1	0	0	0	1	12		387
3:15PM	4	148	4	0	156	5		4	163	5	1	173	3		8	0	2	0	10	9		5	1	5	0	11	12		350
3:30PM	8	193	1	0	202	2		4	166	7	0	177	2		4	1	1	0	6	16		3	1	3	0	7	18		392
3:45PM	10	181	7	0	198	3		1	217	4	0	222	5		10	0	3	0	13	9		6	0	3	0	9	16		442
Hourly Total	28	733	12	0	773	11		12	702	20	1	735	10		26	1	8	0	35	43		15	2	11	0	28	58		1571
4:00PM	13	243	2	1	259	3		9	206	8	0	223	1		9	2	3	1	15	21		2	0	3	0	5	20		502
4:15PM	6	269	3	0	278	1		4	221	7	0	232	1		0	1	1	0	2	9		8	2	1	0	11	12		523
4:30PM	5	300	2	0	307	2		5	210	2	0	217	0		5	0	1	0	6	38		4	0	2	0	6	15		536
4:45PM	2	286	3	0	291	0		4	247	4	0	255	0		5	2	3	0	10	20		2	0	1	0	3	12		559
Hourly Total	26	1098	10	1	1135	6		22	884	21	0	927	2		19	5	8	1	33	88		16	2	7	0	25	59		2120
5:00PM	20	279	2	0	301	1		9	217	4	0	230	3		5	0	3	0	8	26		2	1	1	0	4	23		543
5:15PM	8	282	2	0	292	4		3	242	7	0	252	1		7	0	3	0	10	27		3	0	3	0	6	40		560
5:30PM	6	235	5	0	246	0		9	167	7	0	183	1		7	1	3	0	11	14		4	1	3	0	8	29		448
5:45PM	11	233	4	0	248	0		11	204	3	0	218	3		7	0	8	0	15	15		2	0	3	0	5	23		486
Hourly Total	45	1029	13	0	1087	5		32	830	21	0	883	8		26	1	17	0	44	82		11	2	10	0	23	115		2037
Total	193	5870	58	1	6122	33		112	5509	116	1	5738	62		155	12	62	1	230	575		92	20	78	0	190	555		12280
% Approach	3.2%	95.9%	0.9%	0%	-	-		2.0%	96.0%	2.0%	0%	-	-		67.4%	5.2%	27.0%	0.4%	-	-		48.4%	10.5%	41.1%	0%	-	-		-
% Total	1.6%	47.8%	0.5%	0%	49.9%	-		0.9%	44.9%	0.9%	0%	46.7%	-		1.3%	0.1%	0.5%	0%	1.9%	-		0.7%	0.2%	0.6%	0%	1.5%	-		-
Lights	177	5731	58	1	5967	-		111	5378	111	1	5601	-		149	12	60	1	222	-		92	20	77	0	189	-		11979
% Lights	91.7%	97.6%	100%	100%	97.5%	-		99.1%	97.6%	95.7%	100%	97.6%	-		96.1%	100%	96.8%	100%	96.5%	-		100%	100%	98.7%	0%	99.5%	-		97.5%
Articulated Trucks	0	14	0	0	14	-		0	9	0	0	9	-		2	0	0	0	2	-		0	0	0	0	0	-		25
% Articulated Trucks	0%	0.2%	0%	0%	0.2%	-		0%	0.2%	0%	0%	0.2%	-		1.3%	0%	0%	0%	0.9%	-		0%	0%	0%	0%	0%	-		0.2%
Buses and Single-Unit Trucks	16	125	0	0	141	-		1	122	5	0	128	-		4	0	2	0	6	-		0	0	1	0	1	-		276
% Buses and Single-Unit Trucks	8.3%	2.1%	0%	0%	2.3%	-		0.9%	2.2%	4.3%	0%	2.2%	-		2.6%	0%	3.2%	0%	2.6%	-		0%	0%	1.3%	0%	0.5%	-		2.2%
Pedestrians	-	-	-	-	-	33		-	-	-	-	-	62		-	-	-	-	-	575		-	-	-	-	-	555		
% Pedestrians	-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	100%		-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

Full Length (7:30 AM-10 AM, 11 AM-1 PM, 3 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Driveway

Total: 372

In: 190 Out: 182

92 20 78

227

328

[W] Columbia Street West

Total: 11786
In: 6122 Out: 5664

24

58

5870

193

9

112

5509

116

In: 5738 Out: 6104

Total: 11842

[E] Columbia Street West

25

37

Out: 330 In: 230
Total: 560

[S] Lester Street

1 92 122 155

248

327

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

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

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions
Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street West Eastbound						Columbia Street West Westbound						Lester Street Northbound						Driveway Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-07-12 8:15AM	2	192	1	0	195	0	4	229	3	0	236	1	5	0	5	0	10	49	4	1	1	0	6	33	447
8:30AM	5	207	2	0	214	0	2	236	1	0	239	7	4	0	0	0	4	14	3	1	3	0	7	8	464
8:45AM	3	210	0	0	213	0	2	238	4	0	244	0	2	1	1	0	4	23	2	2	2	0	6	7	467
9:00AM	1	189	0	0	190	0	3	209	0	0	212	6	3	1	1	0	5	20	1	0	2	0	3	7	410
Total	11	798	3	0	812	0	11	912	8	0	931	14	14	2	7	0	23	106	10	4	8	0	22	55	1788
% Approach	1.4%	98.3%	0.4%	0%	-	-	1.2%	98.0%	0.9%	0%	-	-	60.9%	8.7%	30.4%	0%	-	-	45.5%	18.2%	36.4%	0%	-	-	-
% Total	0.6%	44.6%	0.2%	0%	45.4%	-	0.6%	51.0%	0.4%	0%	52.1%	-	0.8%	0.1%	0.4%	0%	1.3%	-	0.6%	0.2%	0.4%	0%	1.2%	-	-
PHF	0.550	0.950	0.375	-	0.949	-	0.688	0.958	0.500	-	0.954	-	0.700	0.500	0.350	-	0.575	-	0.625	0.500	0.667	-	0.786	-	0.957
Lights	9	782	3	0	794	-	11	895	8	0	914	-	14	2	7	0	23	-	10	4	8	0	22	-	1753
% Lights	81.8%	98.0%	100%	0%	97.8%	-	100%	98.1%	100%	0%	98.2%	-	100%	100%	100%	0%	100%	-	100%	100%	100%	0%	100%	-	98.0%
Articulated Trucks	0	2	0	0	2	-	0	2	0	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	4
% Articulated Trucks	0%	0.3%	0%	0%	0.2%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	2	14	0	0	16	-	0	15	0	0	15	-	0	0	0	0	0	-	0	0	0	0	0	-	31
% Buses and Single-Unit Trucks	18.2%	1.8%	0%	0%	2.0%	-	0%	1.6%	0%	0%	1.6%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	1.7%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	14	-	-	-	-	-	106	-	-	-	-	-	55	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

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

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Driveway

Total: 38

In: 22 Out: 16

10 4 8

50 5

[W] Columbia Street West

Total: 1741

In: 812 Out: 929

3

798

11

11

912

8

In: 931

Total: 1751

Out: 820

[E] Columbia Street West

97 7 2 14

Out: 23 In: 23

Total: 46

[S] Lester Street

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

Midday Peak (12 PM - 1 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions
Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street West Eastbound						Columbia Street West Westbound						Lester Street Northbound						Driveway Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-07-12 12:00PM	10	212	2	0	224	2	3	166	4	0	173	3	8	0	2	0	10	17	5	2	0	0	7	17	414
12:15PM	6	152	3	0	161	1	6	172	5	0	183	6	6	1	0	0	7	18	3	0	1	0	4	23	355
12:30PM	9	182	1	0	192	3	5	162	8	0	175	2	13	0	0	0	13	23	2	2	3	0	7	24	387
12:45PM	8	184	1	0	193	0	6	185	5	0	196	3	9	0	2	0	11	18	3	2	5	0	10	18	410
Total	33	730	7	0	770	6	20	685	22	0	727	14	36	1	4	0	41	76	13	6	9	0	28	82	1566
% Approach	4.3%	94.8%	0.9%	0%	-	-	2.8%	94.2%	3.0%	0%	-	-	87.8%	2.4%	9.8%	0%	-	-	46.4%	21.4%	32.1%	0%	-	-	-
% Total	2.1%	46.6%	0.4%	0%	49.2%	-	1.3%	43.7%	1.4%	0%	46.4%	-	2.3%	0.1%	0.3%	0%	2.6%	-	0.8%	0.4%	0.6%	0%	1.8%	-	-
PHF	0.825	0.861	0.583	-	0.859	-	0.833	0.926	0.688	-	0.927	-	0.692	0.250	0.500	-	0.788	-	0.650	0.750	0.450	-	0.700	-	0.946
Lights	30	712	7	0	749	-	20	670	19	0	709	-	33	1	3	0	37	-	13	6	9	0	28	-	1523
% Lights	90.9%	97.5%	100%	0%	97.3%	-	100%	97.8%	86.4%	0%	97.5%	-	91.7%	100%	75.0%	0%	90.2%	-	100%	100%	100%	0%	100%	-	97.3%
Articulated Trucks	0	0	0	0	0	-	0	1	0	0	1	-	1	0	0	0	1	-	0	0	0	0	0	-	2
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	2.8%	0%	0%	0%	2.4%	-	0%	0%	0%	0%	0%	-	0.1%
Buses and Single-Unit Trucks	3	18	0	0	21	-	0	14	3	0	17	-	2	0	1	0	3	-	0	0	0	0	0	-	41
% Buses and Single-Unit Trucks	9.1%	2.5%	0%	0%	2.7%	-	0%	2.0%	13.6%	0%	2.3%	-	5.6%	0%	25.0%	0%	7.3%	-	0%	0%	0%	0%	0%	-	2.6%
Pedestrians	-	-	-	-	-	6	-	-	-	-	-	14	-	-	-	-	-	76	-	-	-	-	-	82	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

Midday Peak (12 PM - 1 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Driveway

Total: 56

In: 28 Out: 28

13 9

48

34

6

6

20

685

22

In: 727

Total: 1502

Out: 775

[E] Columbia Street West

[W] Columbia Street West

Total: 1472

Out: 702

In: 770

7

730

33

47

4

1

36

29

Out: 61

In: 41

Total: 102

[S] Lester Street

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions
Limited
5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

Leg Direction	Columbia Street West Eastbound						Columbia Street West Westbound						Lester Street Northbound						Driveway Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2018-07-12 4:30PM	5	300	2	0	307	2	5	210	2	0	217	0	5	0	1	0	6	38	4	0	2	0	6	15	536
4:45PM	2	286	3	0	291	0	4	247	4	0	255	0	5	2	3	0	10	20	2	0	1	0	3	12	559
5:00PM	20	279	2	0	301	1	9	217	4	0	230	3	5	0	3	0	8	26	2	1	1	0	4	23	543
5:15PM	8	282	2	0	292	4	3	242	7	0	252	1	7	0	3	0	10	27	3	0	3	0	6	40	560
Total	35	1147	9	0	1191	7	21	916	17	0	954	4	22	2	10	0	34	111	11	1	7	0	19	90	2198
% Approach	2.9%	96.3%	0.8%	0%	-	-	2.2%	96.0%	1.8%	0%	-	-	64.7%	5.9%	29.4%	0%	-	-	57.9%	5.3%	36.8%	0%	-	-	-
% Total	1.6%	52.2%	0.4%	0%	54.2%	-	1.0%	41.7%	0.8%	0%	43.4%	-	1.0%	0.1%	0.5%	0%	1.5%	-	0.5%	0%	0.3%	0%	0.9%	-	-
PHF	0.438	0.956	0.750	-	0.970	-	0.583	0.927	0.607	-	0.935	-	0.786	0.250	0.833	-	0.850	-	0.688	0.250	0.583	-	0.792	-	0.981
Lights	35	1132	9	0	1176	-	21	902	17	0	940	-	22	2	10	0	34	-	11	1	7	0	19	-	2169
% Lights	100%	98.7%	100%	0%	98.7%	-	100%	98.5%	100%	0%	98.5%	-	100%	100%	100%	0%	100%	-	100%	100%	100%	0%	100%	-	98.7%
Articulated Trucks	0	1	0	0	1	-	0	2	0	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	3
% Articulated Trucks	0%	0.1%	0%	0%	0.1%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Buses and Single-Unit Trucks	0	14	0	0	14	-	0	12	0	0	12	-	0	0	0	0	0	-	0	0	0	0	0	-	26
% Buses and Single-Unit Trucks	0%	1.2%	0%	0%	1.2%	-	0%	1.3%	0%	0%	1.3%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	1.2%
Pedestrians	-	-	-	-	-	7	-	-	-	-	-	4	-	-	-	-	-	111	-	-	-	-	-	90	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Lester Street & Columbia Street West - TMC

Thu Jul 12, 2018

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 546083, Location: 43.477764, -80.537682



Provided by: Paradigm Transportation Solutions Limited

5A-150 Pinebush Road,
Cambridge, ON, N1R 8J8, CA

[N] Driveway

Total: 51

In: 19 Out: 32

11 7

27

63

[W] Columbia Street West

Total: 2128

Out: 937

In: 1191

9

1147

35

2

21

916

17

In: 954

Out: 1176

Total: 2130

[E] Columbia Street West

24

10 22

87

Out: 53

In: 34

Total: 87

[S] Lester Street

Appendix C

Existing Synchro Reports



Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

	↖	→	↗	↙	←	↖	↗	↙	↘	↖	↗	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖	↖		↖	↖		↖	↖		↖	↖		
Traffic Volume (vph)	122	750	80	102	890	74	99	98	61	23	72	33	
Future Volume (vph)	122	750	80	102	890	74	99	98	61	23	72	33	
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1650	1650	
Storage Length (m)	112.5		0.0	45.0		0.0	15.0		0.0	30.0		0.0	
Storage Lanes	1		0	1		0	1		0	1		0	
Taper Length (m)	15.0			60.0			22.5			67.5			
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	0.98	0.97		0.91	0.99		0.89	0.99		0.99	0.95		
Frt		0.986			0.988			0.942			0.953		
Flt Protected	0.950			0.950			0.950			0.950			
Satd. Flow (prot)	1670	3184	0	1653	3253	0	1670	1488	0	1547	1489	0	
Flt Permitted	0.140			0.245			0.591			0.656			
Satd. Flow (perm)	240	3184	0	389	3253	0	926	1488	0	1053	1489	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		14			10			36			23		
Link Speed (k/h)		50			50			50			50		
Link Distance (m)		155.9			207.7			105.2			137.5		
Travel Time (s)		11.2			15.0			7.6			9.9		
Confl. Peds. (#/hr)	102		249	249		102	115		15	15		115	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Heavy Vehicles (%)	1%	1%	1%	2%	1%	4%	1%	1%	7%	9%	1%	0%	
Adj. Flow (vph)	122	750	80	102	890	74	99	98	61	23	72	33	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	122	830	0	102	964	0	99	159	0	23	105	0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA		
Protected Phases	7	4		3	8		5	2			6		
Permitted Phases	4			8			2			6			
Detector Phase	7	4		3	8		5	2		6	6		
Switch Phase													
Minimum Initial (s)	5.0	38.0		5.0	38.0		5.0	25.0		25.0	25.0		
Minimum Split (s)	9.0	44.0		9.0	44.0		9.0	31.0		31.0	31.0		
Total Split (s)	14.0	47.0		11.0	44.0		11.0	42.0		31.0	31.0		
Total Split (%)	14.0%	47.0%		11.0%	44.0%		11.0%	42.0%		31.0%	31.0%		
Maximum Green (s)	10.0	41.0		7.0	38.0		7.0	36.0		25.0	25.0		
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		2.0	2.0		
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		-2.0	-2.0		
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Recall Mode	None	Max		None	Max		None	Max		Max	Max		
Walk Time (s)		25.0			25.0			12.0		12.0	12.0		
Flash Dont Walk (s)		13.0			13.0			13.0		13.0	13.0		
Pedestrian Calls (#/hr)		0			0			0		0	0		
Act Effect Green (s)	51.9	44.6		47.4	40.6		38.0	38.0		29.3	29.3		
Actuated g/C Ratio	0.52	0.45		0.48	0.41		0.38	0.38		0.30	0.30		
v/c Ratio	0.49	0.58		0.38	0.72		0.24	0.27		0.07	0.23		

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

	↖	→	↗	↙	←	↖	↗	↙	↘	↖	↗	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Control Delay	18.3	22.6		15.8	28.4		22.2	17.8		28.3	23.8		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay	18.3	22.6		15.8	28.4		22.2	17.8		28.3	23.8		
LOS	B	C		B	C		C	B		C	C		
Approach Delay		22.1			27.2			19.5			24.6		
Approach LOS		C			C			B			C		
Queue Length 50th (m)	11.7	65.7		9.7	84.1		13.1	16.7		3.5	12.9		
Queue Length 95th (m)	21.2	86.0		18.2	110.3		24.7	32.4		10.0	27.2		
Internal Link Dist (m)		131.9			183.7			81.2			113.5		
Turn Bay Length (m)	112.5			45.0			15.0			30.0			
Base Capacity (vph)	271	1437		275	1335		406	591		310	454		
Starvation Cap Reductn	0	0		0	0		0	0		0	0		
Spillback Cap Reductn	0	0		0	0		0	0		0	0		
Storage Cap Reductn	0	0		0	0		0	0		0	0		
Reduced v/c Ratio	0.45	0.58		0.37	0.72		0.24	0.27		0.07	0.23		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 99.3

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 24.2

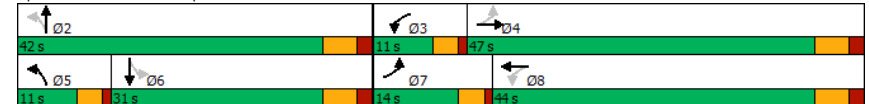
Intersection LOS: C

Intersection Capacity Utilization 69.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Philip Street & Columbia Street



HCM 6th Signalized Intersection Summary
1: Philip Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	122	750	80	102	890	74	99	98	61	23	72	33
Future Volume (veh/h)	122	750	80	102	890	74	99	98	61	23	72	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.70	0.93		0.70	0.92		0.91	0.90		0.87
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	1761	1761	1761	1747	1761	1720	1761	1637	1560	1650	1637	1650
Adj Flow Rate, veh/h	122	750	80	102	890	74	99	98	61	23	72	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	2	1	4	1	1	7	9	1	0
Cap, veh/h	264	1276	136	288	1293	108	407	350	218	356	292	134
Arrive On Green	0.06	0.44	0.42	0.05	0.43	0.41	0.06	0.39	0.37	0.29	0.29	0.27
Sat Flow, veh/h	1677	2913	310	1664	3010	250	1677	904	563	979	1010	463
Grp Volume(v), veh/h	122	430	400	102	495	469	99	0	159	23	0	105
Grp Sat Flow(s), veh/h/ln	1677	1673	1550	1664	1673	1587	1677	0	1467	979	0	1473
Q Serve(g_s), s	4.1	19.1	19.2	3.5	23.5	23.6	4.0	0.0	7.4	1.7	0.0	5.4
Cycle Q Clear(g_c), s	4.1	19.1	19.2	3.5	23.5	23.6	4.0	0.0	7.4	1.7	0.0	5.4
Prop In Lane	1.00		0.20	1.00		0.16	1.00		0.38	1.00		0.31
Lane Grp Cap(c), veh/h	264	733	679	288	719	682	407	0	568	356	0	426
V/C Ratio(X)	0.46	0.59	0.59	0.35	0.69	0.69	0.24	0.00	0.28	0.06	0.00	0.25
Avail Cap(c_a), veh/h	332	733	679	319	719	682	430	0	568	356	0	426
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.5	20.9	21.1	17.2	22.7	22.8	22.6	0.0	21.0	25.4	0.0	27.0
Incr Delay (d2), s/veh	1.3	3.4	3.7	0.7	5.3	5.6	0.3	0.0	1.2	0.3	0.0	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	0.6	3.4	3.3	0.5	4.6	4.4	0.8	0.0	1.3	0.2	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.8	24.3	24.8	18.0	28.0	28.4	22.9	0.0	22.2	25.8	0.0	28.4
LnGrp LOS	B	C	C	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h	952			1066			258			128		
Approach Delay, s/veh	23.9			27.2			22.5			27.9		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	2		3	4		5	6		7	8		
Phs Duration (G+Y+Rc), s	42.0		9.2	47.0		9.6	32.4		10.0	46.2		
Change Period (Y+Rc), s	6.0		4.0	6.0		4.0	6.0		4.0	6.0		
Max Green Setting (Gmax), s	36.0		7.0	41.0		7.0	25.0		10.0	38.0		
Max Q Clear Time (g_c+I1), s	9.4		5.5	21.2		6.0	7.4		6.1	25.6		
Green Ext Time (p_c), s	1.1		0.0	6.5		0.0	0.7		0.1	5.9		
Intersection Summary												
HCM 6th Ctrl Delay	25.4											
HCM 6th LOS	C											

Lanes, Volumes, Timings
2: Lester Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	 			 	 	
Traffic Volume (vph)	863	11	8	987	7	15
Future Volume (vph)	863	11	8	987	7	15
Ideal Flow (vphpl)	1775	1775	1775	1775	1765	1765
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt	0.998					0.908
Flt Protected					0.984	
Satd. Flow (prot)	3293	0	0	3307	1577	0
Flt Permitted	0.984					
Satd. Flow (perm)	3293	0	0	3307	1577	0
Link Speed (k/h)	50					50
Link Distance (m)	207.7					151.0
Travel Time (s)	15.0					10.9
Confl. Peds. (#/hr)	106		106	14		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	18%	0%	2%	0%	0%
Adj. Flow (vph)	863	11	8	987	7	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	874	0	0	995	22	0
Sign Control	Free				Free	Stop
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	48.9%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC
2: Lester Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	863	11	8	987	7	15
Future Vol, veh/h	863	11	8	987	7	15
Conflicting Peds, #/hr	0	106	106	0	0	14
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	18	0	2	0	0
Mvmt Flow	863	11	8	987	7	15

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	980
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	712
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	648
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	23.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	215	-	-	648	-
HCM Lane V/C Ratio	0.102	-	-	0.012	-
HCM Control Delay (s)	23.6	-	-	10.6	0.1
HCM Lane LOS	C	-	-	B	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑		↑	↑		↑	↑	↑
Traffic Volume (vph)	62	677	68	79	914	149	148	198	44	104	213	36
Future Volume (vph)	62	677	68	79	914	149	148	198	44	104	213	36
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1900	1750
Storage Length (m)	30.0		0.0	37.5		0.0	22.5		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	52.5			45.0			30.0			37.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99		0.97	0.99		0.97	0.99		0.97		0.94
Frt		0.986			0.979			0.973				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1653	3234	0	1686	3207	0	1686	1577	0	1686	1881	1444
Flt Permitted	0.133			0.222			0.504			0.528		
Satd. Flow (perm)	229	3234	0	384	3207	0	866	1577	0	912	1881	1360
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			23			13				133
Link Speed (k/h)		50			50			50				50
Link Distance (m)		212.0			107.7			120.9				88.2
Travel Time (s)		15.3			7.8			8.7				6.4
Confl. Peds. (#/hr)	73		59	59		73	46		41	41		46
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	0%	0%	2%	1%	0%	1%	0%	0%	1%	3%
Adj. Flow (vph)	62	677	68	79	914	149	148	198	44	104	213	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	62	745	0	79	1063	0	148	242	0	104	213	36
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	30.0		5.0	30.0		5.0	26.4		5.0	26.4	26.4
Minimum Split (s)	9.0	36.0		9.0	36.0		9.0	32.4		9.0	32.4	32.4
Total Split (s)	10.8	36.0		10.8	36.0		10.8	32.4		10.8	32.4	32.4
Total Split (%)	12.0%	40.0%		12.0%	40.0%		12.0%	36.0%		12.0%	36.0%	36.0%
Maximum Green (s)	6.8	30.0		6.8	30.0		6.8	26.4		6.8	26.4	26.4
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		17.0			17.0			12.4			12.4	12.4
Flash Dont Walk (s)		13.0			13.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	37.3	32.1		37.4	32.1		36.2	30.9		35.1	28.5	28.5
Actuated g/C Ratio	0.42	0.37		0.43	0.37		0.41	0.35		0.40	0.32	0.32
v/c Ratio	0.31	0.63		0.30	0.89		0.35	0.43		0.25	0.35	0.07

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	17.2	25.9		16.4	37.7		18.5	25.5		17.0	25.4	0.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	17.2	25.9		16.4	37.7		18.5	25.5		17.0	25.4	0.2
LOS	B	C		B	D		B	C		B	C	A
Approach Delay	25.2			36.3			22.8			20.4		
Approach LOS	C			D			C			C		
Queue Length 50th (m)	5.9	57.7		7.6	94.4		16.2	33.2		11.0	29.7	0.0
Queue Length 95th (m)	12.9	77.6		15.5	#136.7		29.0	56.2		21.2	49.3	0.0
Internal Link Dist (m)	188.0			83.7			96.9			64.2		
Turn Bay Length (m)	30.0			37.5			22.5			30.0		
Base Capacity (vph)	208	1189		264	1188		420	562		426	609	530
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.30	0.63		0.30	0.89		0.35	0.43		0.24	0.35	0.07

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 87.8

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 28.9

Intersection LOS: C

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Albert Street & Columbia Street

Ø1	Ø2	Ø3	Ø4
10.8 s	32.4 s	10.8 s	36 s
Ø5	Ø6	Ø7	Ø8
10.8 s	32.4 s	10.8 s	36 s

HCM 6th Signalized Intersection Summary
3: Albert Street & Columbia Street

(210573) 143 Columbia
Existing AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↱	↱	↰	↱	↱	↰	↱	↱
Traffic Volume (veh/h)	62	677	68	79	914	149	148	198	44	104	213	36
Future Volume (veh/h)	62	677	68	79	914	149	148	198	44	104	213	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.89	0.97		0.94	0.97		0.96	0.97		0.96
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	1747	1747	1775	1775	1747	1761	1775	1637	1650	1775	1885	1709
Adj Flow Rate, veh/h	62	677	68	79	914	149	148	198	44	104	213	36
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	0	0	2	1	0	1	0	0	1	3
Cap, veh/h	179	1101	110	269	1046	171	439	440	98	393	612	450
Arrive On Green	0.04	0.37	0.34	0.05	0.37	0.35	0.08	0.34	0.32	0.06	0.32	0.32
Sat Flow, veh/h	1664	3009	302	1690	2827	461	1690	1285	286	1690	1885	1387
Grp Volume(v), veh/h	62	373	372	79	537	526	148	0	242	104	213	36
Grp Sat Flow(s),veh/h/ln	1664	1660	1651	1690	1660	1628	1690	0	1571	1690	1885	1387
Q Serve(g_s), s	2.1	16.1	16.2	2.6	26.3	26.4	5.2	0.0	10.5	3.7	7.5	1.6
Cycle Q Clear(g_c), s	2.1	16.1	16.2	2.6	26.3	26.4	5.2	0.0	10.5	3.7	7.5	1.6
Prop In Lane	1.00		0.18	1.00		0.28	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	179	607	604	269	614	603	439	0	538	393	612	450
V/C Ratio(X)	0.35	0.61	0.62	0.29	0.87	0.87	0.34	0.00	0.45	0.26	0.35	0.08
Avail Cap(c_a), veh/h	234	607	604	318	614	603	439	0	538	423	612	450
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.5	22.7	22.9	18.7	25.6	25.9	18.8	0.0	22.5	19.5	22.5	20.5
Incr Delay (d2), s/veh	1.2	4.6	4.7	0.6	15.8	16.1	0.5	0.0	2.7	0.4	1.6	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	0.3	3.1	3.1	0.4	6.4	6.4	0.8	0.0	2.0	0.6	1.7	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.6	27.3	27.5	19.3	41.4	42.0	19.3	0.0	25.2	19.8	24.0	20.8
LnGrp LOS	C	C	C	B	D	D	B	A	C	B	C	C
Approach Vol, veh/h	807			1142			390			353		
Approach Delay, s/veh	27.0			40.2			23.0			22.5		
Approach LOS	C			D			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.2	34.0	8.3	36.0	10.8	32.4	7.9	36.4
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Max Green Setting (Gmax), s	6.8	26.4	6.8	30.0	6.8	26.4	6.8	30.0
Max Q Clear Time (g_c+I1), s	5.7	12.5	4.6	18.2	7.2	9.5	4.1	28.4
Green Ext Time (p_c), s	0.0	1.3	0.0	4.3	0.0	1.4	0.0	1.1

Intersection Summary

HCM 6th Ctrl Delay

31.4

HCM 6th LOS

C

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖		↖	↖		↖	↖		↖	↖	
Traffic Volume (vph)	48	979	135	150	907	30	104	82	133	147	149	155
Future Volume (vph)	48	979	135	150	907	30	104	82	133	147	149	155
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1650	1650
Storage Length (m)	112.5		0.0	45.0		0.0	15.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	15.0			60.0			22.5			67.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98	0.97		0.97		1.00	0.92	0.93		0.94	0.93	
Frt		0.982			0.995			0.907			0.924	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1686	3214	0	1670	3346	0	1686	1369	0	1686	1406	0
Flt Permitted	0.193			0.101			0.394			0.405		
Satd. Flow (perm)	337	3214	0	171	3346	0	647	1369	0	673	1406	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			4			71			48	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		155.9			207.7			105.2			137.5	
Travel Time (s)		11.2			15.0			7.6			9.9	
Confl. Peds. (#/hr)	60		186	186		60	105		86	86		105
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	48	979	135	150	907	30	104	82	133	147	149	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	1114	0	150	937	0	104	215	0	147	304	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	44.6		5.0	44.6		5.0	25.9		5.0	25.9	
Minimum Split (s)	9.0	50.6		9.0	50.6		9.0	31.9		9.0	31.9	
Total Split (s)	12.1	50.6		12.1	50.6		11.0	31.9		15.4	36.3	
Total Split (%)	11.0%	46.0%		11.0%	46.0%		10.0%	29.0%		14.0%	33.0%	
Maximum Green (s)	8.1	44.6		8.1	44.6		7.0	25.9		11.4	30.3	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		31.6			31.6			12.9			12.9	
Flash Dont Walk (s)		13.0			13.0			13.0			13.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	53.5	46.6		56.2	49.7		35.7	28.8		42.5	32.3	
Actuated g/C Ratio	0.49	0.42		0.51	0.45		0.32	0.26		0.39	0.29	
v/c Ratio	0.19	0.81		0.76	0.62		0.38	0.52		0.41	0.68	

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	14.4	33.2		43.4	25.8		26.5	28.5		26.1	37.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.4	33.2		43.4	25.8		26.5	28.5		26.1	37.6	
LOS	B	C		D	C		C	C		C	D	
Approach Delay		32.4			28.2			27.8			33.8	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	5.0	112.6		16.6	85.3		14.9	27.8		21.7	51.3	
Queue Length 95th (m)	11.0	141.7		#49.3	110.0		27.2	53.2		36.8	84.0	
Internal Link Dist (m)		131.9			183.7			81.2			113.5	
Turn Bay Length (m)	112.5			45.0			15.0			30.0		
Base Capacity (vph)	266	1372		198	1514		276	411		369	446	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.18	0.81		0.76	0.62		0.38	0.52		0.40	0.68	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 109.9

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 30.6

Intersection LOS: C

Intersection Capacity Utilization 89.7%

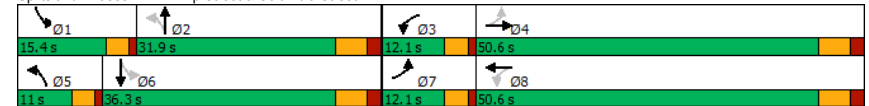
ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Philip Street & Columbia Street



HCM 6th Signalized Intersection Summary
1: Philip Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	979	135	150	907	30	104	82	133	147	149	155
Future Volume (veh/h)	48	979	135	150	907	30	104	82	133	147	149	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.77	0.97		0.79	0.96		0.88	0.94		0.89
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	1775	1775	1775	1761	1775	1775	1775	1650	1624	1775	1637	1650
Adj Flow Rate, veh/h	48	979	135	150	907	30	104	82	133	147	149	155
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	0	0	0	1	0	0	0	0	2	0	1	0
Cap, veh/h	254	1224	169	231	1520	50	249	143	232	329	204	212
Arrive On Green	0.04	0.43	0.41	0.07	0.46	0.44	0.06	0.28	0.26	0.08	0.30	0.28
Sat Flow, veh/h	1690	2860	394	1677	3298	109	1690	519	841	1690	687	714
Grp Volume(v), veh/h	48	577	537	150	464	473	104	0	215	147	0	304
Grp Sat Flow(s), veh/h/ln	1690	1686	1568	1677	1686	1721	1690	0	1360	1690	0	1401
Q Serve(g_s), s	1.8	32.4	32.6	5.4	22.3	22.3	4.9	0.0	14.9	6.8	0.0	21.3
Cycle Q Clear(g_c), s	1.8	32.4	32.6	5.4	22.3	22.3	4.9	0.0	14.9	6.8	0.0	21.3
Prop In Lane	1.00		0.25	1.00		0.06	1.00		0.62	1.00		0.51
Lane Grp Cap(c), veh/h	254	722	671	231	777	793	249	0	375	329	0	416
V/C Ratio(X)	0.19	0.80	0.80	0.65	0.60	0.60	0.42	0.00	0.57	0.45	0.00	0.73
Avail Cap(c_a), veh/h	320	722	671	242	777	793	256	0	375	369	0	416
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.0	27.1	27.3	23.2	21.8	21.9	28.9	0.0	34.5	27.1	0.0	34.9
Incr Delay (d2), s/veh	0.4	6.3	6.9	5.6	1.3	1.2	1.1	0.0	6.2	0.9	0.0	10.8
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	0.3	7.2	6.9	1.1	3.9	4.0	1.2	0.0	3.6	1.6	0.0	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.4	33.4	34.2	28.7	23.1	23.1	30.0	0.0	40.7	28.1	0.0	45.7
LnGrp LOS	B	C	C	C	C	C	C	A	D	C	A	D
Approach Vol, veh/h	1162			1087			319			451		
Approach Delay, s/veh	33.2			23.9			37.2			39.9		
Approach LOS	C			C			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.8	34.0	11.4	50.6	10.6	36.3	7.8	54.2				
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0				
Max Green Setting (Gmax), s	11.4	25.9	8.1	44.6	7.0	30.3	8.1	44.6				
Max Q Clear Time (g_c+I1), s	8.8	16.9	7.4	34.6	6.9	23.3	3.8	24.3				
Green Ext Time (p_c), s	0.1	1.0	0.0	5.9	0.0	1.2	0.0	7.4				
Intersection Summary												
HCM 6th Ctrl Delay	31.3											
HCM 6th LOS	C											

Lanes, Volumes, Timings
2: Lester Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	 			 	 	
Traffic Volume (vph)	1241	37	18	991	10	23
Future Volume (vph)	1241	37	18	991	10	23
Ideal Flow (vphpl)	1775	1775	1775	1775	1765	1765
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt	0.996					0.906
Flt Protected				0.999	0.985	
Satd. Flow (prot)	3327	0	0	3304	1575	0
Flt Permitted				0.999	0.985	
Satd. Flow (perm)	3327	0	0	3304	1575	0
Link Speed (k/h)	50					50
Link Distance (m)	207.7				212.0	151.0
Travel Time (s)	15.0				15.3	10.9
Confl. Peds. (#/hr)	111		111	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	0%	0%	2%	0%	0%
Adj. Flow (vph)	1241	37	18	991	10	23
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1278	0	0	1009	33	0
Sign Control	Free		Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	54.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC
2: Lester Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Vol, veh/h	1241	37	18	991	10	23
Future Vol, veh/h	1241	37	18	991	10	23
Conflicting Peds, #/hr	0	111	111	0	7	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	0	0	2	0	0
Mvmt Flow	1241	37	18	991	10	23

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1389
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	499
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	452
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	45.6
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	121	-	-	452	-
HCM Lane V/C Ratio	0.273	-	-	0.04	-
HCM Control Delay (s)	45.6	-	-	13.3	0.6
HCM Lane LOS	E	-	-	B	A
HCM 95th %tile Q(veh)	1	-	-	0.1	-

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	41	1012	162	104	898	81	122	182	69	214	358	99
Future Volume (vph)	41	1012	162	104	898	81	122	182	69	214	358	99
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1900	1750
Storage Length (m)	30.0		0.0	37.5		0.0	22.5		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	52.5			45.0			30.0			37.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99		0.99			0.97	0.99		0.98		0.93
Frt		0.979			0.988			0.959				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1637	3265	0	1670	3316	0	1670	1552	0	1670	1881	1488
Flt Permitted	0.129			0.124			0.362			0.449		
Satd. Flow (perm)	221	3265	0	216	3316	0	619	1552	0	770	1881	1389
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			12			22				133
Link Speed (k/h)		50			50			50				50
Link Distance (m)		212.0			107.7			120.9				88.2
Travel Time (s)		15.3			7.8			8.7				6.4
Confl. Peds. (#/hr)	51		41	41		51	54		38	38		54
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	1%	0%	0%	1%	0%	2%	1%	1%	0%
Adj. Flow (vph)	41	1012	162	104	898	81	122	182	69	214	358	99
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	1174	0	104	979	0	122	251	0	214	358	99
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases				8			2			6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	30.0		5.0	30.0		5.0	26.4		5.0	26.4	26.4
Minimum Split (s)	9.0	36.0		9.0	36.0		9.0	32.4		9.0	32.4	32.4
Total Split (s)	10.8	36.0		10.8	36.0		10.8	32.4		10.8	32.4	32.4
Total Split (%)	12.0%	40.0%		12.0%	40.0%		12.0%	36.0%		12.0%	36.0%	36.0%
Maximum Green (s)	6.8	30.0		6.8	30.0		6.8	26.4		6.8	26.4	26.4
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		17.0			17.0			12.4			12.4	12.4
Flash Dont Walk (s)		13.0			13.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	37.2	32.1		38.2	34.2		35.1	28.5		36.2	30.9	30.9
Actuated g/C Ratio	0.42	0.37		0.44	0.39		0.40	0.32		0.41	0.35	0.35
v/c Ratio	0.21	0.97		0.51	0.75		0.37	0.49		0.55	0.54	0.17

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	15.5	49.0		22.7	28.4		19.1	26.2		23.7	28.5	2.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	15.5	49.0		22.7	28.4		19.1	26.2		23.7	28.5	2.7
LOS	B	D		C	C		B	C		C	C	A
Approach Delay	47.9			27.9			23.8			23.2		
Approach LOS	D			C			C			C		
Queue Length 50th (m)	3.9	109.2		10.2	83.1		13.1	33.5		24.5	54.6	0.0
Queue Length 95th (m)	9.4	#158.3		19.5	109.4		24.4	57.0		40.8	84.2	6.4
Internal Link Dist (m)	188.0			83.7			96.9			64.2		
Turn Bay Length (m)	30.0			37.5			22.5			30.0		
Base Capacity (vph)	204	1206		206	1298		330	517		387	661	574
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.20	0.97		0.50	0.75		0.37	0.49		0.55	0.54	0.17

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 87.8

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 33.8

Intersection LOS: C

Intersection Capacity Utilization 90.1%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Albert Street & Columbia Street

Ø1	Ø2	Ø3	Ø4
10.8 s	32.4 s	10.8 s	36 s
Ø5	Ø6	Ø7	Ø8
10.8 s	32.4 s	10.8 s	36 s

HCM 6th Signalized Intersection Summary
3: Albert Street & Columbia Street

(210573) 143 Columbia
Existing PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (veh/h)	41	1012	162	104	898	81	122	182	69	214	358	99
Future Volume (veh/h)	41	1012	162	104	898	81	122	182	69	214	358	99
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.92	1.00		0.96	0.98		0.95	0.97		0.95
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	1733	1775	1775	1761	1775	1775	1761	1650	1624	1761	1885	1750
Adj Flow Rate, veh/h	41	1012	162	104	898	81	122	182	69	214	358	99
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	0	0	1	0	0	1	0	2	1	1	0
Cap, veh/h	200	1042	166	179	1197	108	326	360	137	382	622	465
Arrive On Green	0.04	0.36	0.34	0.06	0.38	0.36	0.07	0.32	0.30	0.08	0.33	0.33
Sat Flow, veh/h	1651	2875	459	1677	3115	281	1677	1120	425	1677	1885	1410
Grp Volume(v), veh/h	41	593	581	104	486	493	122	0	251	214	358	99
Grp Sat Flow(s), veh/h/ln	1651	1686	1648	1677	1686	1710	1677	0	1545	1677	1885	1410
Q Serve(g_s), s	1.4	30.5	30.7	3.5	22.0	22.1	4.4	0.0	11.7	6.8	13.9	4.5
Cycle Q Clear(g_c), s	1.4	30.5	30.7	3.5	22.0	22.1	4.4	0.0	11.7	6.8	13.9	4.5
Prop In Lane	1.00		0.28	1.00		0.16	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	200	611	597	179	648	657	326	0	497	382	622	465
V/C Ratio(X)	0.21	0.97	0.97	0.58	0.75	0.75	0.37	0.00	0.51	0.56	0.58	0.21
Avail Cap(c_a), veh/h	268	611	597	211	648	657	340	0	497	382	622	465
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.1	27.7	28.0	22.2	23.5	23.7	20.2	0.0	24.5	22.2	24.5	21.3
Incr Delay (d2), s/veh	0.5	29.8	30.8	3.0	7.8	7.7	0.7	0.0	3.6	1.8	3.9	1.0
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	0.2	9.7	9.7	0.6	4.5	4.6	0.7	0.0	2.3	1.3	3.3	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	20.6	57.5	58.8	25.2	31.3	31.4	20.9	0.0	28.2	24.0	28.3	22.4
LnGrp LOS	C	E	E	C	C	C	C	A	C	C	C	C
Approach Vol, veh/h	1215			1083			373			671		
Approach Delay, s/veh	56.9			30.7			25.8			26.1		
Approach LOS	E			C			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.8	32.4	9.1	36.0	10.1	33.1	7.2	37.9				
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0				
Max Green Setting (Gmax), s	6.8	26.4	6.8	30.0	6.8	26.4	6.8	30.0				
Max Q Clear Time (g_c+I1), s	8.8	13.7	5.5	32.7	6.4	15.9	3.4	24.1				
Green Ext Time (p_c), s	0.0	1.4	0.0	0.0	0.0	2.2	0.0	3.4				

Intersection Summary

HCM 6th Ctrl Delay

38.8

HCM 6th LOS

D

Appendix D

Internal Capture Calculations



NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	(210573) 143 Columbia			Organization:	Paradigm Transportation Solutions Limited
Project Location:	Waterloo			Performed By:	Adam Morrison
Scenario Description:				Date:	21-Dec-22
Analysis Year:	Site Generated Traffic			Checked By:	MB
Analysis Period:	AM Street Peak Hour			Date:	21-Dec-22

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	820	1	1000 Sq. ft	7	4	3
Restaurant				0		
Cinema/Entertainment				0		
Residential	222	591	Units	149	51	98
Hotel				0		
All Other Land Uses ²				0		
				156	55	101

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	156	55	101
Internal Capture Percentage	1%	2%	1%
External Vehicle-Trips ⁵	154	54	100
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	25%	0%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	1%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	(210573) 143 Columbia
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	4	4	1.00	3	3
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	51	51	1.00	98	98
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	1		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	1	20	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	0		0	3	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	3	4	3	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	51	51	51	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	3	3	3	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	97	98	97	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	(210573) 143 Columbia	Organization:	Paradigm Transportation Solutions Limited		
Project Location:	Waterloo	Performed By:	Adam Morrison		
Scenario Description:		Date:	21-Dec-22		
Analysis Year:	Site Generated Traffic	Checked By:	MB		
Analysis Period:	PM Street Peak Hour	Date:	21-Dec-22		

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail	820	1	1000 Sq. ft	18	9	9
Restaurant				0		
Cinema/Entertainment				0		
Residential	222	591	Units	177	99	78
Hotel				0		
All Other Land Uses ²				0		
				195	108	87

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	195	108	87
Internal Capture Percentage	3%	3%	3%
External Vehicle-Trips ⁵	189	105	84
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	11%	22%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
⁶ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	(210573) 143 Columbia
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	9	9	1.00	9	9
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	99	99	1.00	78	78
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		3	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	33	16	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	0	0	4	0
Retail	0		0	0	46	0
Restaurant	0	5		0	16	0
Cinema/Entertainment	0	0	0		4	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	8	9	8	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	2	97	99	97	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	2	7	9	7	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	77	78	77	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Appendix E

2027 Background Synchro Reports



Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	↖	→	↗	↙	←	↖	↗	↙	↘	↗	↘	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖		↖	↖		↖	↖		↖	↖	
Traffic Volume (vph)	135	828	88	113	983	82	109	108	68	26	80	37
Future Volume (vph)	135	828	88	113	983	82	109	108	68	26	80	37
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1650	1650
Storage Length (m)	112.5		0.0	45.0		0.0	15.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	15.0			60.0			22.5			67.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98	0.97		0.92		0.99	0.89	0.99		0.99	0.95	
Frt		0.986			0.988			0.942			0.953	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1670	3184	0	1653	3253	0	1670	1487	0	1547	1489	0
Flt Permitted	0.107			0.193			0.563			0.646		
Satd. Flow (perm)	184	3184	0	311	3253	0	885	1487	0	1037	1489	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			10			37			23	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		155.9			207.7			105.2			137.5	
Travel Time (s)		11.2			15.0			7.6			9.9	
Confl. Peds. (#/hr)	102		249	249		102	115		15	15		115
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	2%	1%	4%	1%	1%	7%	9%	1%	0%
Adj. Flow (vph)	135	828	88	113	983	82	109	108	68	26	80	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	135	916	0	113	1065	0	109	176	0	26	117	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	38.0		5.0	38.0		5.0	25.0		25.0	25.0	
Minimum Split (s)	9.0	44.0		9.0	44.0		9.0	31.0		31.0	31.0	
Total Split (s)	14.0	47.0		11.0	44.0		11.0	42.0		31.0	31.0	
Total Split (%)	14.0%	47.0%		11.0%	44.0%		11.0%	42.0%		31.0%	31.0%	
Maximum Green (s)	10.0	41.0		7.0	38.0		7.0	36.0		25.0	25.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Max		None	Max		None	Max		Max	Max	
Walk Time (s)		25.0			25.0			12.0		12.0	12.0	
Flash Dont Walk (s)		13.0			13.0			13.0		13.0	13.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effect Green (s)	51.9	43.0		47.8	41.0		38.0	38.0		27.1	27.1	
Actuated g/C Ratio	0.52	0.43		0.48	0.41		0.38	0.38		0.27	0.27	
v/c Ratio	0.59	0.66		0.47	0.80		0.28	0.30		0.09	0.28	

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	↖	→	↗	↙	←	↖	↗	↙	↘	↗	↘	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	24.8	25.2		18.5	31.2		22.7	18.6		28.5	25.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	24.8	25.2		18.5	31.2		22.7	18.6		28.5	25.1	
LOS	C	C		B	C		C	B		C	C	
Approach Delay		25.2			30.0			20.1			25.7	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	13.1	75.4		10.8	98.0		14.5	19.1		4.0	14.9	
Queue Length 95th (m)	28.2	98.0		19.8	126.7		26.9	36.0		10.8	30.5	
Internal Link Dist (m)		131.9			183.7			81.2			113.5	
Turn Bay Length (m)	112.5			45.0		15.0				30.0		
Base Capacity (vph)	246	1379		243	1339		392	589		281	420	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.55	0.66		0.47	0.80		0.28	0.30		0.09	0.28	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 99.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 26.8

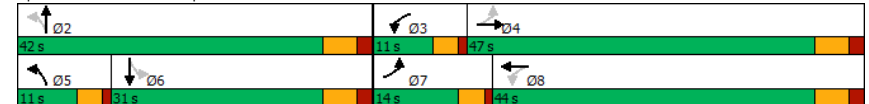
Intersection LOS: C

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Philip Street & Columbia Street



HCM 6th Signalized Intersection Summary
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	135	828	88	113	983	82	109	108	68	26	80	37
Future Volume (veh/h)	135	828	88	113	983	82	109	108	68	26	80	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.70	0.94		0.69	0.92		0.91	0.90		0.87
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	1761	1761	1761	1747	1761	1720	1761	1637	1560	1650	1637	1650
Adj Flow Rate, veh/h	135	828	88	113	983	82	109	108	68	26	80	37
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	2	1	4	1	1	7	9	1	0
Cap, veh/h	245	1270	135	270	1284	107	398	346	218	345	284	131
Arrive On Green	0.07	0.44	0.42	0.06	0.43	0.41	0.06	0.39	0.37	0.28	0.28	0.26
Sat Flow, veh/h	1677	2913	310	1664	3008	251	1677	899	566	964	1005	465
Grp Volume(v), veh/h	135	476	440	113	547	518	109	0	176	26	0	117
Grp Sat Flow(s), veh/h/ln	1677	1673	1549	1664	1673	1585	1677	0	1465	964	0	1470
Q Serve(g_s), s	4.6	22.1	22.2	3.9	27.4	27.5	4.5	0.0	8.4	2.0	0.0	6.2
Cycle Q Clear(g_c), s	4.6	22.1	22.2	3.9	27.4	27.5	4.5	0.0	8.4	2.0	0.0	6.2
Prop In Lane	1.00		0.20	1.00		0.16	1.00		0.39	1.00		0.32
Lane Grp Cap(c), veh/h	245	729	675	270	714	677	398	0	565	345	0	415
V/C Ratio(X)	0.55	0.65	0.65	0.42	0.77	0.77	0.27	0.00	0.31	0.08	0.00	0.28
Avail Cap(c_a), veh/h	304	729	675	294	714	677	412	0	565	345	0	415
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.3	21.9	22.1	18.1	24.1	24.2	23.0	0.0	21.5	26.1	0.0	27.9
Incr Delay (d2), s/veh	1.9	4.5	4.8	1.0	7.7	8.1	0.4	0.0	1.4	0.4	0.0	1.7
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	0.7	4.2	4.0	0.6	5.7	5.5	0.9	0.0	1.5	0.3	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.2	26.4	26.9	19.2	31.7	32.3	23.4	0.0	22.9	26.5	0.0	29.6
LnGrp LOS	C	C	C	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h		1051			1178			285			143	
Approach Delay, s/veh		26.1			30.8			23.1			29.0	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc), s	42.0	9.6	47.0	10.2	31.8	10.5	46.1					
Change Period (Y+Rc), s	6.0	4.0	6.0	4.0	6.0	4.0	6.0					
Max Green Setting (Gmax), s	36.0	7.0	41.0	7.0	25.0	10.0	38.0					
Max Q Clear Time (g_c+I1), s	10.4	5.9	24.2	6.5	8.2	6.6	29.5					
Green Ext Time (p_c), s	1.2	0.0	6.7	0.0	0.8	0.1	4.9					
Intersection Summary												
HCM 6th Ctrl Delay		28.0										
HCM 6th LOS		C										

Lanes, Volumes, Timings
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	953	13	9	1089	8	16
Future Volume (vph)	953	13	9	1089	8	16
Ideal Flow (vphpl)	1775	1775	1775	1775	1765	1765
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt	0.998				0.910	
Flt Protected					0.984	
Satd. Flow (prot)	3293	0	0	3307	1580	0
Flt Permitted					0.984	
Satd. Flow (perm)	3293	0	0	3307	1580	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	207.7			212.0	151.0	
Travel Time (s)	15.0			15.3	10.9	
Confl. Peds. (#/hr)		106	106			14
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	18%	0%	2%	0%	0%
Adj. Flow (vph)	953	13	9	1089	8	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	966	0	0	1098	24	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 52.7%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Vol, veh/h	953	13	9	1089	8	16
Future Vol, veh/h	953	13	9	1089	8	16
Conflicting Peds, #/hr	0	106	106	0	0	14
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	18	0	2	0	0
Mvmt Flow	953	13	9	1089	8	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1072
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	658
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	599
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	28.8
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	175	-	-	599	-
HCM Lane V/C Ratio	0.137	-	-	0.015	-
HCM Control Delay (s)	28.8	-	-	11.1	0.2
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	69	748	75	87	1009	164	163	218	48	115	235	40
Future Volume (vph)	69	748	75	87	1009	164	163	218	48	115	235	40
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1900	1750
Storage Length (m)	30.0		0.0	37.5		0.0	22.5		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	52.5			45.0			30.0			37.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.97	0.99		0.97	0.99		0.97		0.94
Frt		0.986			0.979			0.973				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1653	3225	0	1686	3196	0	1686	1575	0	1686	1881	1444
Flt Permitted	0.114			0.207			0.469			0.471		
Satd. Flow (perm)	198	3225	0	358	3196	0	804	1575	0	813	1881	1351
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			23			12				128
Link Speed (k/h)		50			50			50				50
Link Distance (m)		212.0			107.7			120.9				88.2
Travel Time (s)		15.3			7.8			8.7				6.4
Confl. Peds. (#/hr)	73		59	59		73	46		41	41		46
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	0%	0%	2%	1%	0%	1%	0%	0%	1%	3%
Adj. Flow (vph)	69	748	75	87	1009	164	163	218	48	115	235	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	823	0	87	1173	0	163	266	0	115	235	40
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases				8			2			6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	23.0		5.0	23.0		5.0	24.0		5.0	24.0	24.0
Minimum Split (s)	9.0	29.0		9.0	29.0		9.0	30.0		9.0	30.0	30.0
Total Split (s)	11.0	41.0		11.0	41.0		9.0	32.4		9.0	32.4	32.4
Total Split (%)	11.8%	43.9%		11.8%	43.9%		9.6%	34.7%		9.6%	34.7%	34.7%
Maximum Green (s)	7.0	35.0		7.0	35.0		5.0	26.4		5.0	26.4	26.4
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		10.0			10.0			10.0			10.0	10.0
Flash Dont Walk (s)		13.0			13.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	42.5	37.1		42.6	37.2		34.4	30.5		33.5	28.5	28.5
Actuated g/C Ratio	0.47	0.41		0.47	0.41		0.38	0.33		0.37	0.31	0.31
v/c Ratio	0.35	0.62		0.33	0.89		0.46	0.50		0.33	0.40	0.08

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	16.7	24.2		15.3	35.5		24.7	28.8		21.4	27.9	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	16.7	24.2		15.3	35.5		24.7	28.8		21.4	27.9	0.3
LOS	B	C		B	D		C	C		C	C	A
Approach Delay	23.7			34.1			27.3			23.2		
Approach LOS	C			C			C			C		
Queue Length 50th (m)	6.3	64.0		8.0	106.9		20.1	39.9		13.7	35.2	0.0
Queue Length 95th (m)	13.3	84.6		15.9	#151.8		34.8	65.7		25.6	57.0	0.0
Internal Link Dist (m)	188.0			83.7			96.9			64.2		
Turn Bay Length (m)	30.0			37.5			22.5			30.0		
Base Capacity (vph)	204	1319		269	1315		351	534		346	586	509
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.34	0.62		0.32	0.89		0.46	0.50		0.33	0.40	0.08

Intersection Summary

Area Type: Other

Cycle Length: 93.4

Actuated Cycle Length: 91.2

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 28.6

Intersection LOS: C

Intersection Capacity Utilization 83.3%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Albert Street & Columbia Street

Ø1	Ø2	Ø3	Ø4
9 s	32.4 s	11 s	41 s
Ø5	Ø6	Ø7	Ø8
9 s	32.4 s	11 s	41 s

HCM 6th Signalized Intersection Summary
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Background AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (veh/h)	69	748	75	87	1009	164	163	218	48	115	235	40
Future Volume (veh/h)	69	748	75	87	1009	164	163	218	48	115	235	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.91	0.99		0.94	0.97		0.95	0.98		0.96
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	1747	1747	1775	1775	1747	1761	1775	1637	1650	1775	1885	1709
Adj Flow Rate, veh/h	69	748	75	87	1009	164	163	218	48	115	235	40
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	0	0	2	1	0	1	0	0	1	3
Cap, veh/h	182	1227	123	280	1164	189	369	402	89	327	589	433
Arrive On Green	0.05	0.41	0.39	0.05	0.41	0.39	0.06	0.31	0.29	0.06	0.31	0.31
Sat Flow, veh/h	1664	3014	302	1690	2833	460	1690	1286	283	1690	1885	1384
Grp Volume(v), veh/h	69	412	411	87	591	582	163	0	266	115	235	40
Grp Sat Flow(s), veh/h/ln	1664	1660	1656	1690	1660	1632	1690	0	1569	1690	1885	1384
Q Serve(g_s), s	2.2	17.8	17.9	2.8	29.6	29.8	5.0	0.0	12.8	4.3	8.9	1.9
Cycle Q Clear(g_c), s	2.2	17.8	17.9	2.8	29.6	29.8	5.0	0.0	12.8	4.3	8.9	1.9
Prop In Lane	1.00		0.18	1.00		0.28	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	182	676	674	280	682	671	369	0	491	327	589	433
V/C Ratio(X)	0.38	0.61	0.61	0.31	0.87	0.87	0.44	0.00	0.54	0.35	0.40	0.09
Avail Cap(c_a), veh/h	235	676	674	328	682	671	369	0	491	327	589	433
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.0	21.2	21.4	17.4	24.5	24.8	23.6	0.0	26.0	21.9	24.5	22.1
Incr Delay (d2), s/veh	1.3	4.1	4.1	0.6	13.9	14.3	0.8	0.0	4.3	0.6	2.0	0.4
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	0.3	3.2	3.2	0.4	6.6	6.6	1.1	0.0	2.8	0.8	2.1	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	22.3	25.3	25.5	18.0	38.4	39.1	24.4	0.0	30.3	22.5	26.5	22.5
LnGrp LOS	C	C	C	B	D	D	C	A	C	C	C	C
Approach Vol, veh/h	892			1260			429			390		
Approach Delay, s/veh	25.1			37.3			28.0			24.9		
Approach LOS	C			D			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	32.4	8.4	41.0	9.0	32.4	8.1	41.3
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Max Green Setting (Gmax), s	5.0	26.4	7.0	35.0	5.0	26.4	7.0	35.0
Max Q Clear Time (g_c+I1), s	6.3	14.8	4.8	19.9	7.0	10.9	4.2	31.8
Green Ext Time (p_c), s	0.0	1.4	0.0	5.5	0.0	1.5	0.0	2.3

Intersection Summary

HCM 6th Ctrl Delay

30.7

HCM 6th LOS

C

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

	←	→	↙	↘	←	→	↙	↘	←	→	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	53	1081	149	166	1001	33	115	90	146	162	164	172
Future Volume (vph)	53	1081	149	166	1001	33	115	90	146	162	164	172
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1650	1650
Storage Length (m)	112.5		0.0	45.0		0.0	15.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	15.0			60.0			22.5			67.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.97		0.97		1.00	0.93	0.93		0.94	0.93	
Frt		0.982			0.995			0.907			0.923	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1686	3214	0	1670	3346	0	1686	1369	0	1686	1405	0
Flt Permitted	0.153			0.084			0.341			0.370		
Satd. Flow (perm)	268	3214	0	144	3346	0	564	1369	0	617	1405	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			4			71			49	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		155.9			207.7			105.2			137.5	
Travel Time (s)		11.2			15.0			7.6			9.9	
Confl. Peds. (#/hr)	60		186	186		60	105		86	86		105
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	53	1081	149	166	1001	33	115	90	146	162	164	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	1230	0	166	1034	0	115	236	0	162	336	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	44.6		5.0	44.6		5.0	25.9		5.0	25.9	
Minimum Split (s)	9.0	50.6		9.0	50.6		9.0	31.9		9.0	31.9	
Total Split (s)	12.1	50.6		12.1	50.6		11.0	31.9		15.4	36.3	
Total Split (%)	11.0%	46.0%		11.0%	46.0%		10.0%	29.0%		14.0%	33.0%	
Maximum Green (s)	8.1	44.6		8.1	44.6		7.0	25.9		11.4	30.3	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		31.6			31.6			12.9			12.9	
Flash Dont Walk (s)		13.0			13.0			13.0			13.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	53.6	46.6		56.1	49.6		35.7	28.7		42.7	32.3	
Actuated g/C Ratio	0.49	0.42		0.51	0.45		0.32	0.26		0.39	0.29	
v/c Ratio	0.24	0.90		0.90	0.68		0.45	0.58		0.47	0.75	

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

	←	→	↙	↘	←	→	↙	↘	←	→	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	15.2	39.2		68.5	27.5		28.8	31.1		27.4	41.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.2	39.2		68.5	27.5		28.8	31.1		27.4	41.9	
LOS	B	D		E	C		C	C		C	D	
Approach Delay		38.2			33.2			30.4			37.2	
Approach LOS		D			C			C			D	
Queue Length 50th (m)	5.5	131.7		22.3	98.3		16.6	32.6		24.2	59.2	
Queue Length 95th (m)	11.9	#177.1		#64.0	125.6		29.6	60.1		40.4	#102.1	
Internal Link Dist (m)		131.9			183.7			81.2			113.5	
Turn Bay Length (m)	112.5			45.0			15.0			30.0		
Base Capacity (vph)	237	1371		185	1511		254	409		353	447	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.90		0.90	0.68		0.45	0.58		0.46	0.75	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Natural Cycle: 105

Control Type: Semi Act-Uncooord

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 35.4

Intersection LOS: D

Intersection Capacity Utilization 93.2%

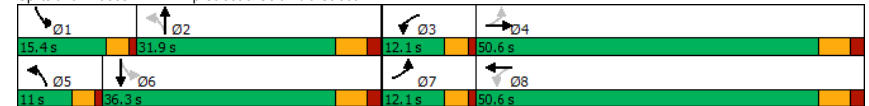
ICU Level of Service F

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Philip Street & Columbia Street



HCM 6th Signalized Intersection Summary
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 			 	
Traffic Volume (veh/h)	53	1081	149	166	1001	33	115	90	146	162	164	172
Future Volume (veh/h)	53	1081	149	166	1001	33	115	90	146	162	164	172
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.77	0.99		0.79	0.97		0.87	0.95		0.89
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	1775	1775	1775	1761	1775	1775	1775	1650	1624	1775	1637	1650
Adj Flow Rate, veh/h	53	1081	149	166	1001	33	115	90	146	162	164	172
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	0	0	0	1	0	0	0	0	2	0	1	0
Cap, veh/h	230	1213	166	210	1519	50	223	140	226	314	201	210
Arrive On Green	0.04	0.42	0.41	0.07	0.46	0.44	0.06	0.27	0.25	0.09	0.29	0.28
Sat Flow, veh/h	1690	2861	392	1677	3299	109	1690	518	840	1690	683	716
Grp Volume(v), veh/h	53	635	595	166	512	522	115	0	236	162	0	336
Grp Sat Flow(s), veh/h/ln	1690	1686	1567	1677	1686	1721	1690	0	1357	1690	0	1399
Q Serve(g_s), s	2.0	38.3	38.8	6.1	25.8	25.9	5.5	0.0	17.0	7.6	0.0	24.6
Cycle Q Clear(g_c), s	2.0	38.3	38.8	6.1	25.8	25.9	5.5	0.0	17.0	7.6	0.0	24.6
Prop In Lane	1.00		0.25	1.00		0.06	1.00		0.62	1.00		0.51
Lane Grp Cap(c), veh/h	230	715	664	210	776	793	223	0	366	314	0	411
V/C Ratio(X)	0.23	0.89	0.90	0.79	0.66	0.66	0.52	0.00	0.64	0.52	0.00	0.82
Avail Cap(c_a), veh/h	293	715	664	211	776	793	223	0	366	341	0	411
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.1	29.3	29.7	24.9	23.0	23.0	30.2	0.0	36.1	27.7	0.0	36.6
Incr Delay (d2), s/veh	0.5	13.1	14.8	18.0	2.1	2.0	2.1	0.0	8.5	1.3	0.0	16.3
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	0.4	9.8	9.6	1.9	4.8	4.9	1.4	0.0	4.3	1.8	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	42.4	44.5	42.9	25.0	25.0	32.2	0.0	44.6	29.1	0.0	52.9
LnGrp LOS	C	D	D	D	C	C	C	A	D	C	A	D
Approach Vol, veh/h	1283			1200			351			498		
Approach Delay, s/veh	42.4			27.5			40.5			45.1		
Approach LOS	D			C			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.7	33.6	12.0	50.6	11.0	36.3	8.0	54.6				
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0				
Max Green Setting (Gmax), s	11.4	25.9	8.1	44.6	7.0	30.3	8.1	44.6				
Max Q Clear Time (g_c+I1), s	9.6	19.0	8.1	40.8	7.5	26.6	4.0	27.9				
Green Ext Time (p_c), s	0.1	0.9	0.0	2.8	0.0	0.8	0.0	7.5				
Intersection Summary												
HCM 6th Ctrl Delay	37.3											
HCM 6th LOS	D											

Lanes, Volumes, Timings
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↱	↰	
Traffic Volume (vph)	1370	41	20	1094	11	26
Future Volume (vph)	1370	41	20	1094	11	26
Ideal Flow (vphpl)	1775	1775	1775	1775	1765	1765
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt	0.996				0.905	
Flt Protected				0.999	0.985	
Satd. Flow (prot)	3327	0	0	3304	1573	0
Flt Permitted				0.999	0.985	
Satd. Flow (perm)	3327	0	0	3304	1573	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	207.7			212.0	151.0	
Travel Time (s)	15.0			15.3	10.9	
Confl. Peds. (#/hr)		111	111		7	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	0%	0%	2%	0%	0%
Adj. Flow (vph)	1370	41	20	1094	11	26
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1411	0	0	1114	37	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 58.8%	ICU Level of Service B					
Analysis Period (min) 15						

HCM 6th TWSC
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

Intersection						
Int Delay, s/veh	1.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Vol, veh/h	1370	41	20	1094	11	26
Future Vol, veh/h	1370	41	20	1094	11	26
Conflicting Peds, #/hr	0	111	111	0	7	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	0	0	2	0	0
Mvmt Flow	1370	41	20	1094	11	26

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1522
Stage 1	-	-	1502
Stage 2	-	-	594
Critical Hdwy	-	4.1	6.8
Critical Hdwy Stg 1	-	-	5.8
Critical Hdwy Stg 2	-	-	5.8
Follow-up Hdwy	-	2.2	3.5
Pot Cap-1 Maneuver	-	444	46
Stage 1	-	-	174
Stage 2	-	-	520
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	402	36
Mov Cap-2 Maneuver	-	-	36
Stage 1	-	-	158
Stage 2	-	-	451

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	66.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	94	-	-	402	-
HCM Lane V/C Ratio	0.394	-	-	0.05	-
HCM Control Delay (s)	66.2	-	-	14.4	0.9
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	1.6	-	-	0.2	-

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	45	1117	179	115	991	89	135	201	76	236	395	109
Future Volume (vph)	45	1117	179	115	991	89	135	201	76	236	395	109
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1900	1750
Storage Length (m)	30.0		0.0	37.5		0.0	22.5		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	52.5			45.0			30.0			37.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99			0.99		0.97	0.98		0.97		0.93
Frt		0.979			0.988			0.959				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1637	3255	0	1670	3312	0	1670	1550	0	1670	1881	1488
Flt Permitted	0.135			0.102			0.235			0.409		
Satd. Flow (perm)	231	3255	0	179	3312	0	402	1550	0	701	1881	1378
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			12			21				128
Link Speed (k/h)		50			50			50				50
Link Distance (m)		212.0			173.7			120.9				88.2
Travel Time (s)		15.3			12.5			8.7				6.4
Confl. Peds. (#/hr)	51		41	41		51	54		38	38		54
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	1%	0%	0%	1%	0%	2%	1%	1%	0%
Adj. Flow (vph)	45	1117	179	115	991	89	135	201	76	236	395	109
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	1296	0	115	1080	0	135	277	0	236	395	109
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	23.0		5.0	23.0		5.0	24.0		5.0	24.0	24.0
Minimum Split (s)	9.0	29.0		9.0	29.0		9.0	30.0		9.0	30.0	30.0
Total Split (s)	11.0	41.0		11.0	41.0		9.0	32.4		9.0	32.4	32.4
Total Split (%)	11.8%	43.9%		11.8%	43.9%		9.6%	34.7%		9.6%	34.7%	34.7%
Maximum Green (s)	7.0	35.0		7.0	35.0		5.0	26.4		5.0	26.4	26.4
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		10.0			10.0			10.0			10.0	10.0
Flash Dont Walk (s)		13.0			13.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	43.5	37.0		45.5	41.3		33.4	28.4		33.4	28.4	28.4
Actuated g/C Ratio	0.47	0.40		0.49	0.44		0.36	0.30		0.36	0.30	0.30
v/c Ratio	0.22	0.99		0.58	0.73		0.64	0.57		0.78	0.69	0.21

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	14.1	52.0		26.8	26.0		35.3	30.6		43.1	36.0	4.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	14.1	52.0		26.8	26.0		35.3	30.6		43.1	36.0	4.4
LOS	B	D		C	C		D	C		D	D	A
Approach Delay	50.7			26.1			32.1			33.6		
Approach LOS	D			C			C			C		
Queue Length 50th (m)	4.1	124.5		10.8	92.7		16.3	40.5		30.5	65.5	0.0
Queue Length 95th (m)	9.6	#176.4		#27.1	120.8		#33.3	67.1		#62.1	98.8	9.1
Internal Link Dist (m)	188.0			149.7			96.9			64.2		
Turn Bay Length (m)	30.0			37.5			22.5			30.0		
Base Capacity (vph)	214	1305		199	1474		211	486		302	572	508
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.21	0.99		0.58	0.73		0.64	0.57		0.78	0.69	0.21

Intersection Summary

Area Type: Other

Cycle Length: 93.4

Actuated Cycle Length: 93.3

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 37.2

Intersection LOS: D

Intersection Capacity Utilization 93.8%

ICU Level of Service F

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Albert Street & Columbia Street

Ø1	Ø2	Ø3	Ø4
9 s	32.4 s	11 s	41 s
Ø5	Ø6	Ø7	Ø8
9 s	32.4 s	11 s	41 s

HCM 6th Signalized Intersection Summary
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Background PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	45	1117	179	115	991	89	135	201	76	236	395	109
Future Volume (veh/h)	45	1117	179	115	991	89	135	201	76	236	395	109
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.96	0.99		0.94	0.98		0.95
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	1733	1775	1775	1761	1775	1775	1761	1650	1624	1761	1885	1750
Adj Flow Rate, veh/h	45	1117	179	115	991	89	135	201	76	236	395	109
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	0	0	1	0	0	1	0	2	1	1	0
Cap, veh/h	205	1159	185	179	1326	119	256	346	131	307	583	434
Arrive On Green	0.04	0.40	0.38	0.06	0.43	0.40	0.05	0.31	0.29	0.05	0.31	0.31
Sat Flow, veh/h	1651	2880	460	1677	3118	280	1677	1120	424	1677	1885	1405
Grp Volume(v), veh/h	45	652	644	115	536	544	135	0	277	236	395	109
Grp Sat Flow(s), veh/h/ln	1651	1686	1653	1677	1686	1712	1677	0	1544	1677	1885	1405
Q Serve(g_s), s	1.5	34.6	35.1	3.8	24.6	24.7	5.0	0.0	13.9	5.0	16.8	5.3
Cycle Q Clear(g_c), s	1.5	34.6	35.1	3.8	24.6	24.7	5.0	0.0	13.9	5.0	16.8	5.3
Prop In Lane	1.00		0.28	1.00		0.16	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	205	679	666	179	717	728	256	0	477	307	583	434
V/C Ratio(X)	0.22	0.96	0.97	0.64	0.75	0.75	0.53	0.00	0.58	0.77	0.68	0.25
Avail Cap(c_a), veh/h	269	679	666	206	717	728	256	0	477	307	583	434
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	26.7	27.1	22.1	22.2	22.4	24.3	0.0	27.0	31.2	27.8	23.8
Incr Delay (d2), s/veh	0.5	26.1	27.8	5.4	7.0	6.9	2.0	0.0	5.1	11.3	6.2	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	0.2	9.9	10.2	0.7	4.6	4.7	1.1	0.0	3.1	2.7	4.5	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	19.6	52.8	55.0	27.5	29.2	29.3	26.3	0.0	32.1	42.4	34.0	25.2
LnGrp LOS	B	D	D	C	C	C	C	A	C	D	C	C
Approach Vol, veh/h	1341			1195			412			740		
Approach Delay, s/veh	52.7			29.1			30.2			35.4		
Approach LOS	D			C			C			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.0	32.4	9.5	41.0	9.0	32.4	7.4	43.1				
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0				
Max Green Setting (Gmax), s	5.0	26.4	7.0	35.0	5.0	26.4	7.0	35.0				
Max Q Clear Time (g_c+I1), s	7.0	15.9	5.8	37.1	7.0	18.8	3.5	26.7				
Green Ext Time (p_c), s	0.0	1.4	0.0	0.0	0.0	2.0	0.0	4.9				

Intersection Summary

HCM 6th Ctrl Delay

39.1

HCM 6th LOS

D

Notes

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

Appendix F

2027 Total Synchro Reports



Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

	↖	→	↗	↖	←	↖	↗	↖	↗	↖	↗	↖	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖	↖		↖	↖		↖	↖		↖	↖		
Traffic Volume (vph)	135	832	88	113	991	109	109	108	68	40	80	37	
Future Volume (vph)	135	832	88	113	991	109	109	108	68	40	80	37	
Ideal Flow (vphpl)	1775	1775		1775	1775		1775	1650	1650	1775	1650	1650	
Storage Length (m)	112.5		0.0	45.0		0.0	15.0		0.0	30.0		0.0	
Storage Lanes	1		0	1		0	1		0	1		0	
Taper Length (m)	15.0			60.0			22.5			67.5			
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	0.98	0.97		0.93		0.98	0.89	0.99		0.99	0.95		
Frt		0.986			0.985			0.942			0.953		
Flt Protected	0.950			0.950			0.950			0.950			
Satd. Flow (prot)	1670	3185	0	1653	3230	0	1670	1487	0	1547	1489	0	
Flt Permitted	0.098			0.191			0.563			0.646			
Satd. Flow (perm)	169	3185	0	308	3230	0	885	1487	0	1037	1489	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		14			14			37			23		
Link Speed (k/h)		50			50			50			50		
Link Distance (m)		155.9			125.0			105.2			137.5		
Travel Time (s)		11.2			9.0			7.6			9.9		
Confl. Peds. (#/hr)	102		249	249		102	115		15	15		115	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Heavy Vehicles (%)	1%	1%	1%	2%	1%	4%	1%	1%	7%	9%	1%	0%	
Adj. Flow (vph)	135	832	88	113	991	109	109	108	68	40	80	37	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	135	920	0	113	1100	0	109	176	0	40	117	0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA		
Protected Phases	7	4		3	8		5	2			6		
Permitted Phases	4			8			2			6			
Detector Phase	7	4		3	8		5	2		6	6		
Switch Phase													
Minimum Initial (s)	5.0	38.0		5.0	38.0		5.0	25.0		25.0	25.0		
Minimum Split (s)	9.0	44.0		9.0	44.0		9.0	31.0		31.0	31.0		
Total Split (s)	14.0	47.0		11.0	44.0		11.0	42.0		31.0	31.0		
Total Split (%)	14.0%	47.0%		11.0%	44.0%		11.0%	42.0%		31.0%	31.0%		
Maximum Green (s)	10.0	41.0		7.0	38.0		7.0	36.0		25.0	25.0		
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		4.0	4.0		
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		2.0	2.0		
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		-2.0	-2.0		
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		
Recall Mode	None	Max		None	Max		None	Max		Max	Max		
Walk Time (s)		25.0			25.0			12.0		12.0	12.0		
Flash Dont Walk (s)		13.0			13.0			13.0		13.0	13.0		
Pedestrian Calls (#/hr)		0			0			0		0	0		
Act Effect Green (s)	51.9	43.0		47.8	41.0		38.0	38.0		27.1	27.1		
Actuated g/C Ratio	0.52	0.43		0.48	0.41		0.38	0.38		0.27	0.27		
v/c Ratio	0.61	0.67		0.47	0.83		0.28	0.30		0.14	0.28		

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

	↖	→	↗	↖	←	↖	↗	↖	↗	↖	↗	↖	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Control Delay	27.0	25.3		18.6	32.7		22.7	18.6		29.5	25.1		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay	27.0	25.3		18.6	32.7		22.7	18.6		29.5	25.1		
LOS	C	C		B	C		C	B		C	C		
Approach Delay		25.5			31.4			20.1			26.2		
Approach LOS		C			C			C			C		
Queue Length 50th (m)	13.1	75.9		10.8	103.0		14.5	19.1		6.2	14.9		
Queue Length 95th (m)	29.9	98.4		19.8	133.0		26.9	36.0		15.0	30.5		
Internal Link Dist (m)		131.9			101.0			81.2			113.5		
Turn Bay Length (m)	112.5			45.0		15.0				30.0			
Base Capacity (vph)	239	1379		242	1332		392	589		281	420		
Starvation Cap Reductn	0	0		0	0		0	0		0	0		
Spillback Cap Reductn	0	0		0	0		0	0		0	0		
Storage Cap Reductn	0	0		0	0		0	0		0	0		
Reduced v/c Ratio	0.56	0.67		0.47	0.83		0.28	0.30		0.14	0.28		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 99.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 27.6

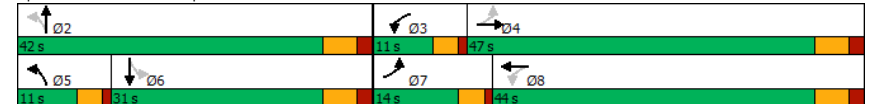
Intersection LOS: C

Intersection Capacity Utilization 87.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Philip Street & Columbia Street



HCM 6th Signalized Intersection Summary
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 			 	
Traffic Volume (veh/h)	135	832	88	113	991	109	109	108	68	40	80	37
Future Volume (veh/h)	135	832	88	113	991	109	109	108	68	40	80	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.70	0.94		0.69	0.92		0.91	0.90		0.87
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	1761	1761	1761	1747	1761	1720	1761	1637	1560	1650	1637	1650
Adj Flow Rate, veh/h	135	832	88	113	991	109	109	108	68	40	80	37
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	2	1	4	1	1	7	9	1	0
Cap, veh/h	234	1271	134	269	1235	136	398	346	218	345	284	131
Arrive On Green	0.07	0.44	0.42	0.06	0.43	0.41	0.06	0.39	0.37	0.28	0.28	0.26
Sat Flow, veh/h	1677	2915	308	1664	2894	318	1677	899	566	964	1005	465
Grp Volume(v), veh/h	135	477	443	113	572	528	109	0	176	40	0	117
Grp Sat Flow(s), veh/h/ln	1677	1673	1550	1664	1673	1538	1677	0	1465	964	0	1470
Q Serve(g_s), s	4.6	22.2	22.3	3.9	29.4	29.6	4.5	0.0	8.4	3.1	0.0	6.2
Cycle Q Clear(g_c), s	4.6	22.2	22.3	3.9	29.4	29.6	4.5	0.0	8.4	3.1	0.0	6.2
Prop In Lane	1.00		0.20	1.00		0.21	1.00		0.39	1.00		0.32
Lane Grp Cap(c), veh/h	234	729	676	269	714	657	398	0	565	345	0	415
V/C Ratio(X)	0.58	0.65	0.65	0.42	0.80	0.80	0.27	0.00	0.31	0.12	0.00	0.28
Avail Cap(c_a), veh/h	293	729	676	293	714	657	412	0	565	345	0	415
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.1	22.0	22.1	18.2	24.6	24.8	23.0	0.0	21.5	26.5	0.0	27.9
Incr Delay (d2), s/veh	2.2	4.5	4.9	1.0	9.2	10.1	0.4	0.0	1.4	0.7	0.0	1.7
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	0.7	4.2	4.0	0.6	6.3	6.0	0.9	0.0	1.5	0.4	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.4	26.5	27.0	19.2	33.9	34.9	23.4	0.0	22.9	27.2	0.0	29.6
LnGrp LOS	C	C	C	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h	1055			1213			285			157		
Approach Delay, s/veh	26.3			32.9			23.1			29.0		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	2		3	4		5	6		7	8		
Phs Duration (G+Y+Rc), s	42.0		9.6	47.0		10.2	31.8		10.5	46.1		
Change Period (Y+Rc), s	6.0		4.0	6.0		4.0	6.0		4.0	6.0		
Max Green Setting (Gmax), s	36.0		7.0	41.0		7.0	25.0		10.0	38.0		
Max Q Clear Time (g_c+I1), s	10.4		5.9	24.3		6.5	8.2		6.6	31.6		
Green Ext Time (p_c), s	1.2		0.0	6.7		0.0	0.9		0.1	4.1		
Intersection Summary												
HCM 6th Ctrl Delay	29.1											
HCM 6th LOS	C											

Lanes, Volumes, Timings
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	 			 	 	
Traffic Volume (vph)	997	13	9	1113	8	16
Future Volume (vph)	997	13	9	1113	8	16
Ideal Flow (vphpl)	1775	1775	1775	1775	1765	1765
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt	0.998					0.910
Flt Protected					0.984	
Satd. Flow (prot)	3293	0	0	3307	1580	0
Flt Permitted	0.984					
Satd. Flow (perm)	3293	0	0	3307	1580	0
Link Speed (k/h)	50					50
Link Distance (m)	82.7				212.0	151.0
Travel Time (s)	6.0				15.3	10.9
Confl. Peds. (#/hr)	106		106	14		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	18%	0%	2%	0%	0%
Adj. Flow (vph)	997	13	9	1113	8	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1010	0	0	1122	24	0
Sign Control	Free				Free	Stop
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	53.4%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑	↑
Traffic Vol, veh/h	997	13	9	1113	8	16
Future Vol, veh/h	997	13	9	1113	8	16
Conflicting Peds, #/hr	0	106	106	0	0	14
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	18	0	2	0	0
Mvmt Flow	997	13	9	1113	8	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1116
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	633
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	576
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	30.7
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	164	-	-	576	-
HCM Lane V/C Ratio	0.146	-	-	0.016	-
HCM Control Delay (s)	30.7	-	-	11.3	0.2
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑	↑↑		↑	↑↑		↑	↑↑	↑
Traffic Volume (vph)	92	768	75	87	1021	164	163	218	48	115	235	53
Future Volume (vph)	92	768	75	87	1021	164	163	218	48	115	235	53
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1900	1750
Storage Length (m)	30.0		0.0	37.5		0.0	22.5		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	52.5			45.0			30.0			37.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.97	0.99		0.97	0.99		0.97		0.94
Frt		0.987			0.979			0.973				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1653	3229	0	1686	3197	0	1686	1575	0	1686	1881	1444
Flt Permitted	0.114			0.199			0.469			0.471		
Satd. Flow (perm)	198	3229	0	344	3197	0	804	1575	0	813	1881	1351
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			23			12				128
Link Speed (k/h)		50			50			50				50
Link Distance (m)		212.0			107.7			120.9				88.2
Travel Time (s)		15.3			7.8			8.7				6.4
Confl. Peds. (#/hr)	73		59	59		73	46		41	41		46
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	0%	0%	2%	1%	0%	1%	0%	0%	1%	3%
Adj. Flow (vph)	92	768	75	87	1021	164	163	218	48	115	235	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	843	0	87	1185	0	163	266	0	115	235	53
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	23.0		5.0	23.0		5.0	24.0		5.0	24.0	24.0
Minimum Split (s)	9.0	29.0		9.0	29.0		9.0	30.0		9.0	30.0	30.0
Total Split (s)	11.0	41.0		11.0	41.0		9.0	32.4		9.0	32.4	32.4
Total Split (%)	11.8%	43.9%		11.8%	43.9%		9.6%	34.7%		9.6%	34.7%	34.7%
Maximum Green (s)	7.0	35.0		7.0	35.0		5.0	26.4		5.0	26.4	26.4
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		10.0			10.0			10.0			10.0	10.0
Flash Dont Walk (s)		13.0			13.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	42.6	37.1		42.6	37.1		34.4	30.5		33.5	28.5	28.5
Actuated g/C Ratio	0.47	0.41		0.47	0.41		0.38	0.33		0.37	0.31	0.31
v/c Ratio	0.46	0.64		0.34	0.90		0.46	0.50		0.33	0.40	0.10

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	19.7	24.6		15.5	36.6		24.7	28.8		21.4	27.9	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	19.7	24.6		15.5	36.6		24.7	28.8		21.4	27.9	0.4
LOS	B	C		B	D		C	C		C	C	A
Approach Delay	24.1			35.1			27.3			22.5		
Approach LOS	C			D			C			C		
Queue Length 50th (m)	8.5	66.1		8.0	108.6		20.1	39.9		13.7	35.2	0.0
Queue Length 95th (m)	16.7	87.4		15.9	#154.3		34.8	65.7		25.6	57.0	0.0
Internal Link Dist (m)	188.0			83.7			96.9			64.2		
Turn Bay Length (m)	30.0			37.5			22.5			30.0		
Base Capacity (vph)	204	1321		263	1314		351	534		346	586	509
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.45	0.64		0.33	0.90		0.46	0.50		0.33	0.40	0.10

Intersection Summary

Area Type: Other

Cycle Length: 93.4

Actuated Cycle Length: 91.2

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 28.9

Intersection LOS: C

Intersection Capacity Utilization 85.0%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Albert Street & Columbia Street

Ø1	Ø2	Ø3	Ø4
9 s	32.4 s	11 s	41 s
Ø5	Ø6	Ø7	Ø8
9 s	32.4 s	11 s	41 s

HCM 6th Signalized Intersection Summary
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Total AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (veh/h)	92	768	75	87	1021	164	163	218	48	115	235	53
Future Volume (veh/h)	92	768	75	87	1021	164	163	218	48	115	235	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.91	0.99		0.94	0.98		0.95	0.98		0.96
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	1747	1747	1775	1775	1747	1761	1775	1637	1650	1775	1885	1709
Adj Flow Rate, veh/h	92	768	75	87	1021	164	163	218	48	115	235	53
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	0	0	2	1	0	1	0	0	1	3
Cap, veh/h	185	1233	120	275	1154	185	366	402	88	327	589	432
Arrive On Green	0.05	0.41	0.39	0.05	0.41	0.38	0.05	0.31	0.29	0.05	0.31	0.31
Sat Flow, veh/h	1664	3023	295	1690	2838	455	1690	1286	283	1690	1885	1384
Grp Volume(v), veh/h	92	422	421	87	596	589	163	0	266	115	235	53
Grp Sat Flow(s), veh/h/ln	1664	1660	1658	1690	1660	1633	1690	0	1569	1690	1885	1384
Q Serve(g_s), s	3.0	18.3	18.4	2.8	30.3	30.5	5.0	0.0	12.8	4.3	8.9	2.5
Cycle Q Clear(g_c), s	3.0	18.3	18.4	2.8	30.3	30.5	5.0	0.0	12.8	4.3	8.9	2.5
Prop In Lane	1.00		0.18	1.00		0.28	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	185	677	676	275	675	664	366	0	490	327	589	432
V/C Ratio(X)	0.50	0.62	0.62	0.32	0.88	0.89	0.44	0.00	0.54	0.35	0.40	0.12
Avail Cap(c_a), veh/h	229	677	676	322	675	664	366	0	490	327	589	432
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.6	21.4	21.5	17.5	25.0	25.3	23.7	0.0	26.1	21.9	24.6	22.4
Incr Delay (d2), s/veh	2.1	4.3	4.3	0.7	15.6	16.0	0.8	0.0	4.3	0.6	2.0	0.6
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	0.5	3.3	3.3	0.4	7.0	7.1	1.2	0.0	2.8	0.8	2.2	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	23.6	25.6	25.8	18.2	40.5	41.3	24.5	0.0	30.3	22.6	26.6	23.0
LnGrp LOS	C	C	C	B	D	D	C	A	C	C	C	C
Approach Vol, veh/h	935			1272			429			403		
Approach Delay, s/veh	25.5			39.4			28.1			25.0		
Approach LOS	C			D			C			C		

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	32.4	8.4	41.1	9.0	32.4	8.6	41.0
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0
Max Green Setting (Gmax), s	5.0	26.4	7.0	35.0	5.0	26.4	7.0	35.0
Max Q Clear Time (g_c+I1), s	6.3	14.8	4.8	20.4	7.0	10.9	5.0	32.5
Green Ext Time (p_c), s	0.0	1.4	0.0	5.5	0.0	1.6	0.0	1.9

Intersection Summary

HCM 6th Ctrl Delay

31.6

HCM 6th LOS

C

Lanes, Volumes, Timings

4: Site Driveway & Columbia Street

(210573) 143 Columbia

2027 Total AM Peak Hour

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕↕			↕↕	↕↕	
Traffic Volume (vph)	946	19	23	1144	35	44
Future Volume (vph)	946	19	23	1144	35	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt	0.997				0.925	
Flt Protected				0.999	0.978	
Satd. Flow (prot)	3529	0	0	3536	1685	0
Flt Permitted				0.999	0.978	
Satd. Flow (perm)	3529	0	0	3536	1685	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	125.0			82.7	79.2	
Travel Time (s)	9.0			6.0	5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1028	21	25	1243	38	48
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1049	0	0	1268	86	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 59.3%

ICU Level of Service B

Analysis Period (min) 15

HCM 6th TWSC

4: Site Driveway & Columbia Street

(210573) 143 Columbia

2027 Total AM Peak Hour

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕↕			↕↕	↕↕	
Traffic Vol, veh/h	946	19	23	1144	35	44
Future Vol, veh/h	946	19	23	1144	35	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
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	1028	21	25	1243	38	48

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1049
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.22
Pot Cap-1 Maneuver	-	-	659
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	659
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	67.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	137	-	-	659	-
HCM Lane V/C Ratio	0.627	-	-	0.038	-
HCM Control Delay (s)	67.6	-	-	10.7	0.6
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	3.3	-	-	0.1	-

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖		↖	↖		↖	↖		↖	↖	
Traffic Volume (vph)	53	1090	149	166	1008	55	115	90	146	189	164	172
Future Volume (vph)	53	1090	149	166	1008	55	115	90	146	189	164	172
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1650	1650
Storage Length (m)	112.5		0.0	45.0		0.0	15.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	15.0			60.0			22.5			67.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.97		0.97		1.00	0.93	0.93		0.94	0.93	
Frt		0.982			0.992			0.907			0.923	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1686	3214	0	1670	3330	0	1686	1369	0	1686	1405	0
Flt Permitted	0.142			0.084			0.344			0.363		
Satd. Flow (perm)	249	3214	0	144	3330	0	569	1369	0	606	1405	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			6			71			49	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		155.9			126.8			105.2			137.5	
Travel Time (s)		11.2			9.1			7.6			9.9	
Confl. Peds. (#/hr)	60		186	186		60	105		86	86		105
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	53	1090	149	166	1008	55	115	90	146	189	164	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	1239	0	166	1063	0	115	236	0	189	336	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	44.6		5.0	44.6		5.0	25.9		5.0	25.9	
Minimum Split (s)	9.0	50.6		9.0	50.6		9.0	31.9		9.0	31.9	
Total Split (s)	12.1	50.6		12.1	50.6		11.0	31.9		15.4	36.3	
Total Split (%)	11.0%	46.0%		11.0%	46.0%		10.0%	29.0%		14.0%	33.0%	
Maximum Green (s)	8.1	44.6		8.1	44.6		7.0	25.9		11.4	30.3	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Max		None	Max	
Walk Time (s)		31.6			31.6			12.9			12.9	
Flash Dont Walk (s)		13.0			13.0			13.0			13.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	53.6	46.6		56.1	49.6		35.4	28.4		42.9	32.3	
Actuated g/C Ratio	0.49	0.42		0.51	0.45		0.32	0.26		0.39	0.29	
v/c Ratio	0.25	0.90		0.90	0.71		0.45	0.58		0.55	0.75	

Lanes, Volumes, Timings
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	15.5	39.8		68.5	28.1		28.9	31.3		29.6	41.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.5	39.8		68.5	28.1		28.9	31.3		29.6	41.9	
LOS	B	D		E	C		C	C		C	D	
Approach Delay		38.8			33.6			30.5			37.5	
Approach LOS		D			C			C			D	
Queue Length 50th (m)	5.5	133.4		22.3	102.3		16.6	32.6		28.8	59.2	
Queue Length 95th (m)	11.9	#179.3		#64.0	130.7		29.6	60.1		46.5	#102.1	
Internal Link Dist (m)		131.9			102.8			81.2			113.5	
Turn Bay Length (m)	112.5			45.0			15.0			30.0		
Base Capacity (vph)	229	1371		185	1505		253	405		350	447	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.90		0.90	0.71		0.45	0.58		0.54	0.75	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 35.9

Intersection LOS: D

Intersection Capacity Utilization 94.2%

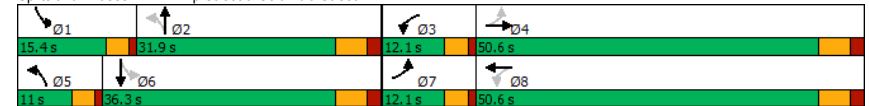
ICU Level of Service F

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Philip Street & Columbia Street



HCM 6th Signalized Intersection Summary
1: Philip Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 			 	
Traffic Volume (veh/h)	53	1090	149	166	1008	55	115	90	146	189	164	172
Future Volume (veh/h)	53	1090	149	166	1008	55	115	90	146	189	164	172
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.77	0.99		0.79	0.95		0.87	0.96		0.89
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	1775	1775	1775	1761	1775	1775	1775	1650	1624	1775	1637	1650
Adj Flow Rate, veh/h	53	1090	149	166	1008	55	115	90	146	189	164	172
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	0	0	0	1	0	0	0	0	2	0	1	0
Cap, veh/h	221	1214	165	208	1474	80	222	133	216	318	201	210
Arrive On Green	0.04	0.42	0.41	0.07	0.46	0.44	0.06	0.26	0.24	0.10	0.29	0.28
Sat Flow, veh/h	1690	2865	390	1677	3200	175	1690	515	836	1690	683	716
Grp Volume(v), veh/h	53	639	600	166	531	532	115	0	236	189	0	336
Grp Sat Flow(s), veh/h/ln	1690	1686	1568	1677	1686	1689	1690	0	1351	1690	0	1399
Q Serve(g_s), s	2.0	38.7	39.3	6.1	27.3	27.3	5.6	0.0	17.4	8.9	0.0	24.6
Cycle Q Clear(g_c), s	2.0	38.7	39.3	6.1	27.3	27.3	5.6	0.0	17.4	8.9	0.0	24.6
Prop In Lane	1.00		0.25	1.00		0.10	1.00		0.62	1.00		0.51
Lane Grp Cap(c), veh/h	221	715	665	208	776	778	222	0	349	318	0	411
V/C Ratio(X)	0.24	0.89	0.90	0.80	0.68	0.68	0.52	0.00	0.68	0.59	0.00	0.82
Avail Cap(c_a), veh/h	284	715	665	209	776	778	222	0	349	326	0	411
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.4	29.4	29.8	25.0	23.4	23.5	30.8	0.0	37.2	27.7	0.0	36.6
Incr Delay (d2), s/veh	0.6	13.8	15.6	19.0	2.5	2.5	2.1	0.0	10.1	2.8	0.0	16.3
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	0.4	10.0	9.8	2.0	5.1	5.1	1.4	0.0	4.5	2.2	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.0	43.2	45.4	44.0	25.8	25.9	32.9	0.0	47.3	30.4	0.0	52.9
LnGrp LOS	C	D	D	D	C	C	C	A	D	C	A	D
Approach Vol, veh/h	1292			1229			351			525		
Approach Delay, s/veh	43.3			28.3			42.6			44.8		
Approach LOS	D			C			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.9	32.4	12.0	50.6	11.0	36.3	8.0	54.6				
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0				
Max Green Setting (Gmax), s	11.4	25.9	8.1	44.6	7.0	30.3	8.1	44.6				
Max Q Clear Time (g_c+I1), s	10.9	19.4	8.1	41.3	7.6	26.6	4.0	29.3				
Green Ext Time (p_c), s	0.0	0.9	0.0	2.5	0.0	0.8	0.0	7.3				
Intersection Summary												
HCM 6th Ctrl Delay	38.0											
HCM 6th LOS	D											

Lanes, Volumes, Timings
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	 			 	 	
Traffic Volume (vph)	1407	41	20	1140	11	26
Future Volume (vph)	1407	41	20	1140	11	26
Ideal Flow (vphpl)	1775	1775	1775	1775	1765	1765
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt	0.996				0.905	
Flt Protected				0.999	0.985	
Satd. Flow (prot)	3327	0	0	3304	1573	0
Flt Permitted				0.999	0.985	
Satd. Flow (perm)	3327	0	0	3304	1573	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	80.9			212.0	151.0	
Travel Time (s)	5.8			15.3	10.9	
Confl. Peds. (#/hr)	111		111	7		4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	0%	0%	2%	0%	0%
Adj. Flow (vph)	1407	41	20	1140	11	26
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1448	0	0	1160	37	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 60.2%				ICU Level of Service B		
Analysis Period (min) 15						

HCM 6th TWSC
2: Lester Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

Intersection						
Int Delay, s/veh	1.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Vol, veh/h	1407	41	20	1140	11	26
Future Vol, veh/h	1407	41	20	1140	11	26
Conflicting Peds, #/hr	0	111	111	0	7	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	0	0	2	0	0
Mvmt Flow	1407	41	20	1140	11	26

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1559
Stage 1	-	-	1539
Stage 2	-	-	617
Critical Hdwy	-	4.1	6.8
Critical Hdwy Stg 1	-	-	5.8
Critical Hdwy Stg 2	-	-	5.8
Follow-up Hdwy	-	2.2	3.5
Pot Cap-1 Maneuver	-	430	42
Stage 1	-	-	166
Stage 2	-	-	506
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	390	33
Mov Cap-2 Maneuver	-	-	33
Stage 1	-	-	150
Stage 2	-	-	433

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	74
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	87	-	-	390	-
HCM Lane V/C Ratio	0.425	-	-	0.051	-
HCM Control Delay (s)	74	-	-	14.7	1
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	1.7	-	-	0.2	-

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	64	1134	179	115	1013	89	135	201	76	236	395	133
Future Volume (vph)	64	1134	179	115	1013	89	135	201	76	236	395	133
Ideal Flow (vphpl)	1775	1775	1775	1775	1775	1775	1775	1650	1650	1775	1900	1750
Storage Length (m)	30.0		0.0	37.5		0.0	22.5		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	52.5			45.0			30.0			37.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99			0.99		0.97	0.98		0.97		0.93
Frt		0.980			0.988			0.959				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1637	3259	0	1670	3312	0	1670	1550	0	1670	1881	1488
Flt Permitted	0.116			0.106			0.217			0.398		
Satd. Flow (perm)	199	3259	0	186	3312	0	372	1550	0	682	1881	1378
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			12			20				133
Link Speed (k/h)		50			50			50				50
Link Distance (m)		212.0			107.7			120.9				88.2
Travel Time (s)		15.3			7.8			8.7				6.4
Confl. Peds. (#/hr)	51		41	41		51	54		38	38		54
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	1%	0%	0%	1%	0%	2%	1%	1%	0%
Adj. Flow (vph)	64	1134	179	115	1013	89	135	201	76	236	395	133
Shared Lane Traffic (%)												
Lane Group Flow (vph)	64	1313	0	115	1102	0	135	277	0	236	395	133
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	23.0		5.0	23.0		5.0	24.0		5.0	24.0	24.0
Minimum Split (s)	9.0	29.0		9.0	29.0		9.0	30.0		9.0	30.0	30.0
Total Split (s)	12.4	41.0		12.4	41.0		9.0	31.0		9.0	31.0	31.0
Total Split (%)	13.3%	43.9%		13.3%	43.9%		9.6%	33.2%		9.6%	33.2%	33.2%
Maximum Green (s)	8.4	35.0		8.4	35.0		5.0	25.0		5.0	25.0	25.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	-2.0		0.0	-2.0		0.0	-2.0		0.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		10.0			10.0			10.0			10.0	10.0
Flash Dont Walk (s)		13.0			13.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	44.1	37.0		46.2	39.6		32.0	27.0		32.0	27.0	27.0
Actuated g/C Ratio	0.48	0.40		0.50	0.43		0.34	0.29		0.34	0.29	0.29
v/c Ratio	0.31	1.00		0.53	0.78		0.69	0.60		0.82	0.72	0.27

Lanes, Volumes, Timings
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	15.2	53.8		22.4	28.1		40.5	32.5		48.9	38.6	6.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	15.2	53.8		22.4	28.1		40.5	32.5		48.9	38.6	6.2
LOS	B	D		C	C		D	C		D	D	A
Approach Delay	52.0			27.6			35.1			36.1		
Approach LOS	D			C			D			D		
Queue Length 50th (m)	5.6	~128.8		10.4	93.8		16.8	41.7		31.5	67.1	0.0
Queue Length 95th (m)	12.0	#180.0		23.2	124.4		#37.2	68.8		#67.3	101.1	13.4
Internal Link Dist (m)	188.0			83.7			96.9			64.2		
Turn Bay Length (m)	30.0			37.5			22.5			30.0		
Base Capacity (vph)	227	1312		226	1421		197	465		288	546	494
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.28	1.00		0.51	0.78		0.69	0.60		0.82	0.72	0.27

Intersection Summary

Area Type:	Other
Cycle Length: 93.4	
Actuated Cycle Length: 92.8	
Natural Cycle: 90	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 39.0	Intersection LOS: D
Intersection Capacity Utilization 94.3%	ICU Level of Service F
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3: Albert Street & Columbia Street

Ø1	Ø2	Ø3	Ø4
8 s	31 s	12.4 s	41 s
Ø5	Ø6	Ø7	Ø8
8 s	31 s	12.4 s	41 s

HCM 6th Signalized Intersection Summary
3: Albert Street & Columbia Street

(210573) 143 Columbia
2027 Total PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↱	↱	↰	↱	↱	↰	↱	↱
Traffic Volume (veh/h)	64	1134	179	115	1013	89	135	201	76	236	395	133
Future Volume (veh/h)	64	1134	179	115	1013	89	135	201	76	236	395	133
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.96	0.98		0.94	0.97		0.95
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	1733	1775	1775	1761	1775	1775	1761	1650	1624	1761	1885	1750
Adj Flow Rate, veh/h	64	1134	179	115	1013	89	135	201	76	236	395	133
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	0	0	1	0	0	1	0	2	1	1	0
Cap, veh/h	213	1181	186	181	1328	117	246	334	126	296	563	419
Arrive On Green	0.04	0.41	0.39	0.06	0.43	0.40	0.06	0.30	0.28	0.06	0.30	0.30
Sat Flow, veh/h	1651	2888	454	1677	3125	274	1677	1119	423	1677	1885	1403
Grp Volume(v), veh/h	64	660	653	115	547	555	135	0	277	236	395	133
Grp Sat Flow(s), veh/h/ln	1651	1686	1656	1677	1686	1713	1677	0	1543	1677	1885	1403
Q Serve(g_s), s	2.1	34.4	34.8	3.7	24.9	25.0	5.0	0.0	13.9	5.0	16.8	6.6
Cycle Q Clear(g_c), s	2.1	34.4	34.8	3.7	24.9	25.0	5.0	0.0	13.9	5.0	16.8	6.6
Prop In Lane	1.00		0.27	1.00		0.16	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	213	690	677	181	717	728	246	0	461	296	563	419
V/C Ratio(X)	0.30	0.96	0.96	0.63	0.76	0.76	0.55	0.00	0.60	0.80	0.70	0.32
Avail Cap(c_a), veh/h	293	690	677	236	717	728	246	0	461	296	563	419
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.8	25.9	26.4	21.6	22.1	22.3	24.6	0.0	27.4	31.5	28.2	24.6
Incr Delay (d2), s/veh	0.8	25.1	26.9	3.6	7.5	7.4	2.6	0.0	5.7	14.2	7.2	2.0
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	0.3	9.5	9.8	0.6	4.6	4.7	1.1	0.0	3.1	2.9	4.6	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	19.6	51.1	53.3	25.2	29.6	29.7	27.2	0.0	33.1	45.7	35.3	26.6
LnGrp LOS	B	D	D	C	C	C	C	A	C	D	D	C
Approach Vol, veh/h	1377			1217			412			764		
Approach Delay, s/veh	50.6			29.3			31.2			37.0		
Approach LOS	D			C			C			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.0	31.0	9.4	41.0	9.0	31.0	8.0	42.4				
Change Period (Y+Rc), s	4.0	6.0	4.0	6.0	4.0	6.0	4.0	6.0				
Max Green Setting (Gmax), s	5.0	25.0	8.4	35.0	5.0	25.0	8.4	35.0				
Max Q Clear Time (g_c+I1), s	7.0	15.9	5.7	36.8	7.0	18.8	4.1	27.0				
Green Ext Time (p_c), s	0.0	1.2	0.1	0.0	0.0	1.8	0.1	4.8				

Intersection Summary

HCM 6th Ctrl Delay	38.8
HCM 6th LOS	D

Lanes, Volumes, Timings

4: Site Driveway & Columbia Street

(210573) 143 Columbia

2027 Total PM Peak Hour

	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔↔			↔↔	↔↔	
Traffic Volume (vph)	1407	36	45	1160	28	36
Future Volume (vph)	1407	36	45	1160	28	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt	0.996			0.924		
Flt Protected				0.998	0.979	
Satd. Flow (prot)	3525	0	0	3532	1685	0
Flt Permitted				0.998	0.979	
Satd. Flow (perm)	3525	0	0	3532	1685	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	126.8			80.9	66.6	
Travel Time (s)	9.1			5.8	4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1529	39	49	1261	30	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1568	0	0	1310	69	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 75.4%

ICU Level of Service D

Analysis Period (min) 15

HCM 6th TWSC

4: Site Driveway & Columbia Street

(210573) 143 Columbia

2027 Total PM Peak Hour

Intersection						
Int Delay, s/veh	13					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔↔			↔↔	↔↔	
Traffic Vol, veh/h	1407	36	45	1160	28	36
Future Vol, veh/h	1407	36	45	1160	28	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
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	1529	39	49	1261	30	39

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1568
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.22
Pot Cap-1 Maneuver	-	-	417
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	417
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.2	\$ 492
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	44	-	-	417	-
HCM Lane V/C Ratio	1.581	-	-	0.117	-
HCM Control Delay (s)	\$ 492	-	-	14.8	2.7
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	6.9	-	-	0.4	-

Notes

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

Appendix G

OTM Book 12, Justification 7, Signal Warrant



Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: 2027 Total
Region/City/Township: City of Waterloo

Major Street: Columbia Street W
Minor Street: Lester Street

North/South?: N

Number of Approach Lanes: 2 or more
Tee Intersection?: N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

Time Period	Major Street						Minor Street						Peds Crossing
	Columbia Street W						Lester Street						
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	4	998	13	10	1114	13	8	2	17	10	5	12	0
PM Peak Hour	11	1407	42	20	1140	25	12	2	26	8	1	13	0
Average Hourly Volume	4	601	14	7	563	10	5	1	11	4	1	6	0

Warrant	AHV
1A - All	1228
1B - Minor	29
2A - Major	1199
2B - Cross	11

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	All Approaches	480	720	600	900	
% Fulfilled						136.5%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Minor Street Approaches	120	170	120	170	
% Fulfilled						17.2%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Major Street Approaches	480	720	600	900	
% Fulfilled						133.2%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						14.7%

Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: 2027 Total
Region/City/Township: City of Waterloo

Major Street: Columbia Street W
Minor Street: Site Driveway

North/South?: N

Number of Approach Lanes: 2 or more
Tee Intersection?: Y
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

Time Period	Major Street						Minor Street						Peds Crossing
	Columbia Street W						Site Driveway						
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	0	947	19	24	1145	0	36	0	44	0	0	0	0
PM Peak Hour	0	1407	37	47	1159	0	30	0	37	0	0	0	0
Average Hourly Volume	0	588	14	18	576	0	16	0	20	0	0	0	0

Warrant	AHV
1A - All	1233
1B - Minor	37
2A - Major	1196
2B - Cross	16

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	All Approaches	480	720	600	900	1233
% Fulfilled						136.9%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Minor Street Approaches	180	255	180	255	37
% Fulfilled						14.4%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Major Street Approaches	480	720	600	900	1196
% Fulfilled						132.9%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
	Traffic Crossing Major Street	50	75	50	75	16
% Fulfilled						21.9%