

Halifax Regional Municipality

Spring Garden Road Area Transportation Study – Interim Report

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This Statement of Qualifications and Limitations is attached to and forms part of the Report.

March 15, 2010

Mr. Roddy MacIntyre, P.Eng.
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Traffic and Right-of-Way Services
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PO Box 1749
Halifax, NS B3J 3A5

Dear Mr. R. MacIntyre

Project No: 60144708

Regarding: Spring Garden Road Area Transportation Study – Interim Report

AECOM Canada Ltd. is pleased to submit to the Halifax Regional Municipality 4 copies of the final version of the Interim Study Report for the Spring Garden Road Area Transportation Study along with a pdf copy on CD.

Sincerely,
AECOM Canada Ltd.

Ray Rice, P.Eng.
Department Manager
Ray.Rice@aecom.com

Encl.

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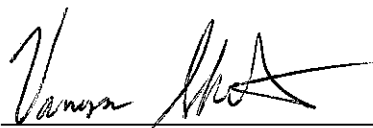
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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	VS	March 9, 2010	Update to section 4, additional appendices added

AECOM Signatures

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1. Introduction

1.1 Background

AECOM Canada Ltd. was retained by the Halifax Regional Municipality (HRM) to undertake a transportation study for the Spring Garden Road area in Halifax. The purpose of this study was to identify and assess the potential impacts to the area transportation network due to new development and a proposed one-way street system. The study will be completed in two phases, with this report summarizing the findings and analyses of Phase I.

The first phase of the study examined operational impacts in the study area based on several road network modification scenarios and existing traffic volumes. Phase II of the study will examine the impacts on the roadway network within the study area based on future traffic projected to 2020 and will consider both background traffic growth and development traffic growth from proposed the developments in the area. The background traffic growth is traffic growth in the study area based on the increase in development in the entire Halifax Regional Municipality. The development traffic is related to the several anticipated development projects directly in the study area, including a new central library projected to open by 2013. An operational assessment of the study area road network, both modified and unmodified, will be completed in order to determine the impacts resulting from proposed development traffic.

1.2 Project Need & Objectives

The proposed developments in the Spring Garden Road area (central library, residential and commercial) will have an impact on traffic operations. This transportation study will determine whether roadway modifications are necessary in order to provide adequate traffic flow through the area due to the anticipated developments.

The objective of this study is to provide traffic operational analysis based on four roadway configuration scenarios. The scenarios are:

- Scenario A - The existing road layout and traffic control system is considered Scenario A. This is the base scenario which will be used as a comparison against which all other scenarios will be measured.
- Scenario B - Scenario B encompasses the streetscape design for Spring Garden Road. Sidewalks are widened at the intersections of Brenton Street, Dresden Row and Birmingham Street thereby narrowing the roadway at these intersections, which has the effect of eliminating the de facto left turn lane in the eastbound and westbound directions. For this reason, left turns will be prohibited at Dresden Row. In addition, a dedicated left turn lane will be added in the eastbound direction at the intersection of Queen Street and Spring Garden Road.
- Scenario C - One-way street configuration Scenario C consists of the proposed one-way cross street system. In this scenario, Dresden Row and Birmingham Street will become one-way streets from Sackville Street to Clyde Street for southbound and northbound traffic respectively. A traffic signal will be added at the intersection of Sackville Street and Queen. Doyle Street will become a westbound one-way street, while Artillery Place will become a one-way street in the eastbound direction. Brenton Place and Clyde Street will change from a one-way street to a two-way street between South Park and Dresden Row, therefore allowing two-way traffic between South Park Street and Queen Street.
- Scenario D - Scenario D combines the modifications described in Scenarios B and C. This option will encompass the streetscape design for Spring Garden Road and the proposed one-way street system.

Phase I of the transportation study involved the assessment of present day traffic on Scenarios A through D. Examining the scenarios with existing traffic conditions was the first step in determining if the scenarios are viable options. In Phase II of the study, an operational assessment of the study area network for unmodified and modified conditions will be carried out to assess the impacts of traffic expected to be generated from proposed study area developments. Two traffic volume scenarios will be prepared for analysis based on different estimates of traffic growth. The first scenario will include traffic growth based only on overall growth in the area (background growth) and the second scenario will contain traffic volumes based on background growth and development generated traffic.

The completion of this study is critical in the timeline of many related projects in the area. The impacts of each of the modification scenarios discussed in this study will be used to move forward with local development projects and road modification projects.

2. Site Characteristics

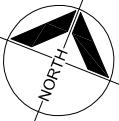
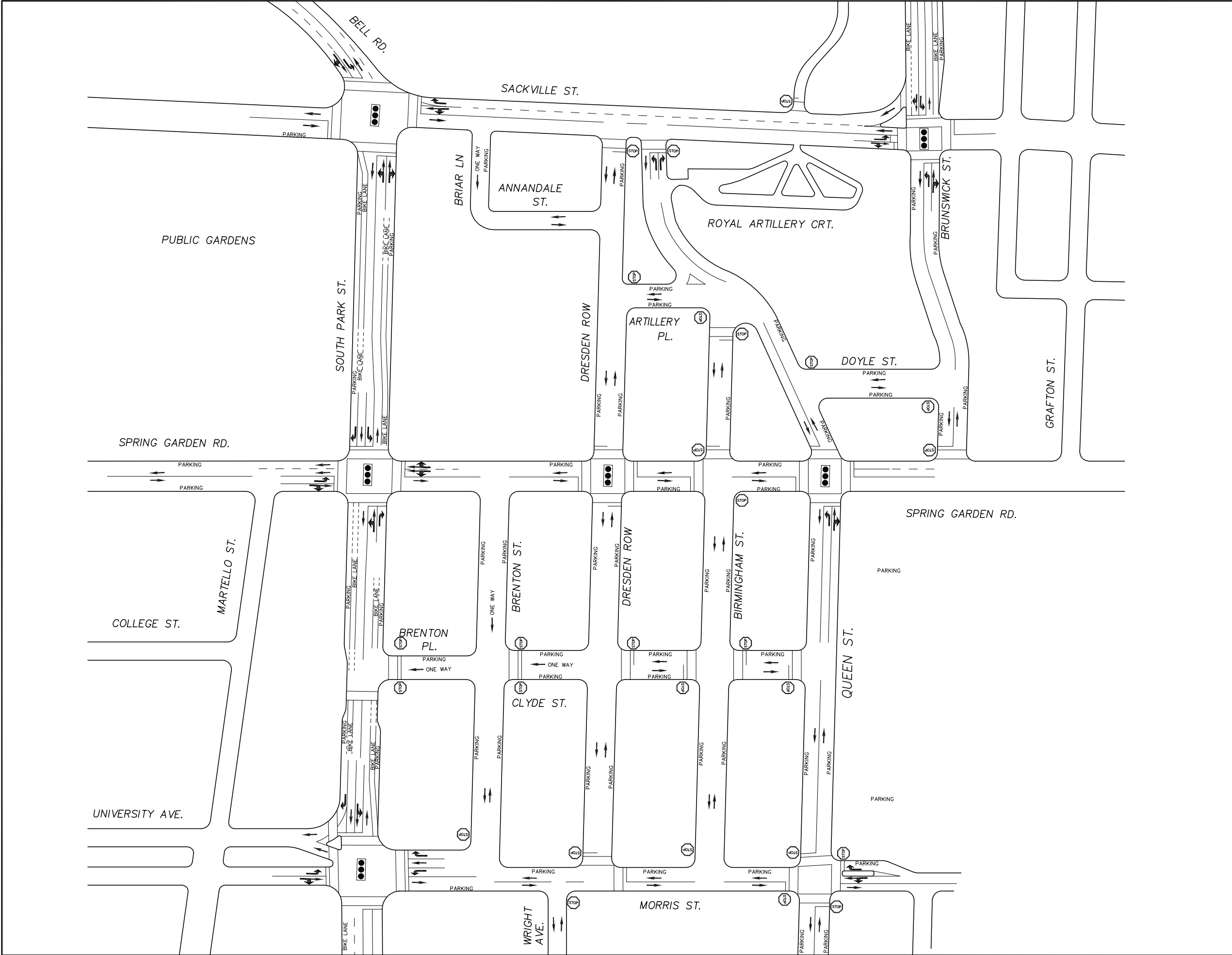
The study area is bounded by Sackville Street to the north, Morris Street to the south, South Park Street to the west and Queen Street to the east as shown in **Figure 1**. This area of Halifax is a busy section of the downtown area. Primary tourist attractions in the vicinity include the Public Gardens, the Citadel and Dalhousie University. The north section of the study area is primarily a commercial district with a large number of shops and restaurants. Many unique stores line the streets which provide an exceptional shopping experience. The south part of the study area is dominated by residential buildings, including several heritage structures, and also contains a primary school. The commercial nature of the study area results in a high demand for parking. On-street parking is generally permitted along many of the streets in the study area. There are also several large surface parking lots as well as underground parking available for patrons. Entrances to surface parking lots are located on Dresden Row and on Birmingham Street just north of the Clyde Street intersections. Another surface parking lot entrance is located at the Queen Street/ Clyde Street intersection. Underground parking is available at Birmingham Street just south of the Queen Street/Artillery Street intersection and at Annandale Street.

The majority of streets in the study area are two-lane, bi-directional roads, with a few exceptions. Brenton Place, Briar Lane, Brenton Street, (between Spring Garden Road and Clyde Street), and Clyde Street, (between Brenton Street and Dresden Row) are one-ways roads. South Park Street is the only road in the study area that incorporates bicycle lanes, which are located between Sackville Street and Morris Street. There are six signalized intersections in the study area, located at:

- South Park Street/ Sackville Street
- South Park Street/ Spring Garden Road
- South Park Street/ Morris Street
- Spring Garden Road/ Dresden Row
- Spring Garden Road/ Queen Street
- Sackville Street/ Brunswick Street

The remaining intersections are controlled with stop signs on the minor road except at the Queen Street/ Morris Street intersection which is a four-way stop controlled intersection.

Spring Garden Road is a main transit link served by twenty-one routes and South Park Street also has several transit routes. The many shops and boutiques in the area also contribute to large pedestrian volumes. Along Spring Garden Road and at some of the intersections along Clyde Street, there is more pedestrian traffic than vehicular traffic as shown in **Figure 2**. These pedestrians have an impact on intersection operations since they can often cause delays to the vehicles waiting at stop signs.



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Halifax Regional Municipality
Transportation Study
Spring Garden Road Area

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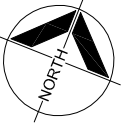
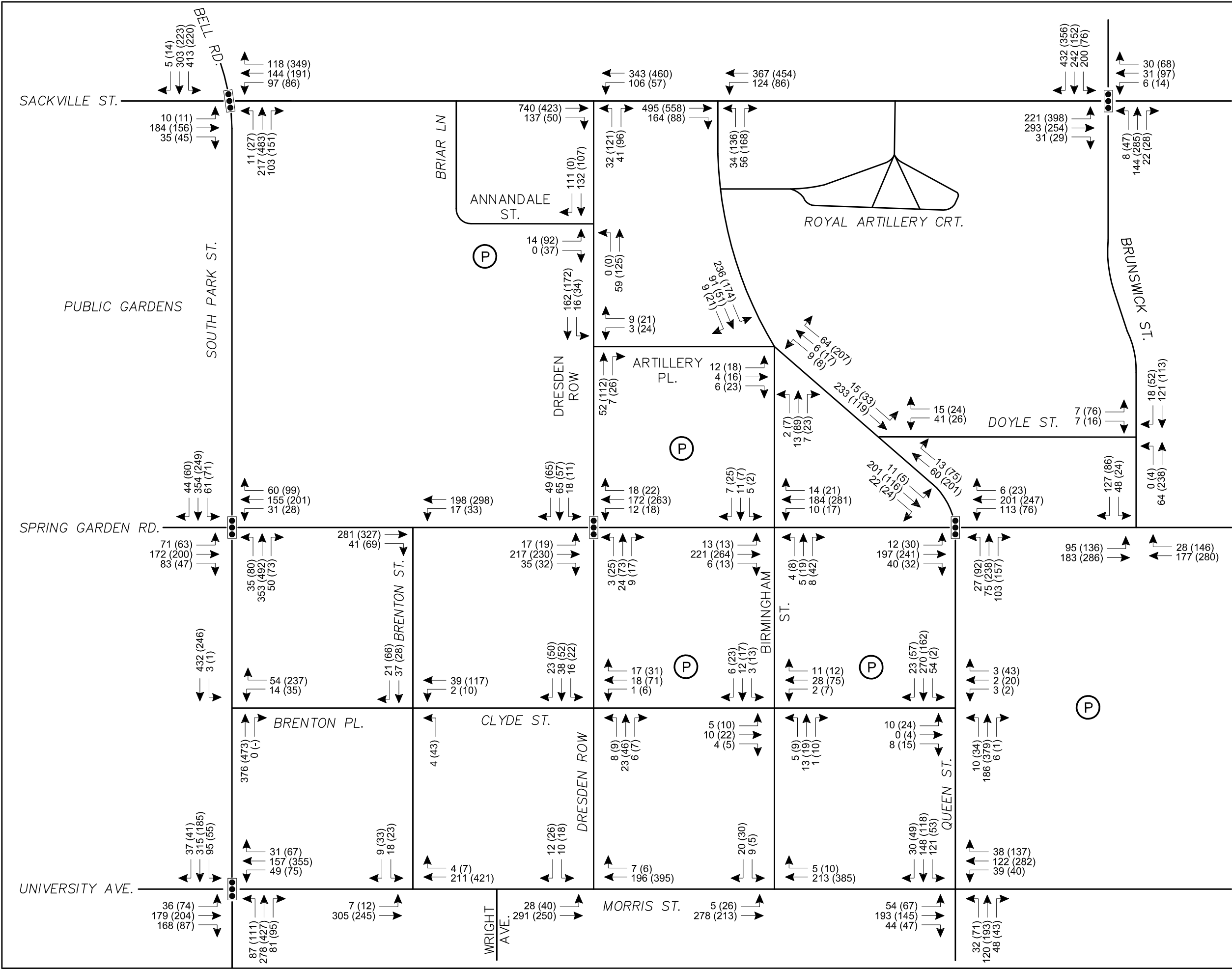
3. Methodology

Traffic counts were undertaken in January 2010 in order to supplement volume data available from the existing HRM traffic model. The HRM traffic model was developed in 2008 using Synchro 6.0 intersection capacity analysis software and was based on a previous model from 2004. The 2008 version updated the traffic volumes and increased the number of intersections in the traffic model. For this study, vehicle and pedestrian volumes were collected during the a.m. and p.m. peak hours that aligned with the peak hours indicated in the existing Synchro model. These volumes were at minor intersections with lower volumes and were rationalized with the existing volumes in the Synchro model. Jamar handheld traffic data collectors were used for the majority of the fourteen intersection counts and Miovision cameras and software were used to collect data at the remaining four intersections. The existing traffic volumes were tabulated and are shown in **Figure 3**.

The 2008 Downtown Halifax Synchro model was used to evaluate the Level of Service (LOS) at each intersection in the study area, which is determined based on the average delay per vehicle. The model was reduced in size to include only the intersections in the study area and the immediately surrounding area. All other aspects of the model were retained including lane arrangement, intersection control, heavy vehicle percentages, peak hour factors, and saturation flow rates for the scenario analyses. The existing conditions scenario, described as Scenario A, contained twenty-six intersections of which six were controlled by traffic signals. The model was used to perform the traffic analyses for both the a.m. and p.m. peak hour traffic flows. The peak hour traffic flows were entered for each intersection individually rather than selecting a peak hour for the overall area. This method is consistent with that used to input peak hour traffic volumes for the 2008 traffic model. The performance of each intersection was described in terms of delay using the Highway Capacity Manual (HCM) 2000 standards.

Once the existing situation was analysed, the traffic was redistributed as per the modified scenarios described previously as Scenarios B through D. Traffic assignment patterns were developed for each scenario recognizing the available capacities and network restrictions. The figures describing the redistribution of the traffic are presented in Appendix A and the resulting traffic volumes are presented in **Figures 4, 5 and 6**. The redistributed traffic volumes were input into the traffic model and the results of the intersection operations analyses for the Scenarios B through D for both the a.m. and p.m. peak hours were tabulated. The cost of the proposed modifications for the one-way street scenario was evaluated

A comparative table indicating the delays at each intersection for the four scenarios was prepared and the results were reviewed to determine where improvements were required. Several alternative solutions were investigated to address the traffic issues at each intersection. These modifications to the scenarios were then assessed in order to evaluate the potential for improved traffic flow.



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Right Turn
Through
Left Turn

50 AM Traffic Volumes
(75) PM Traffic Volumes

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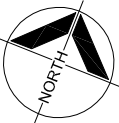
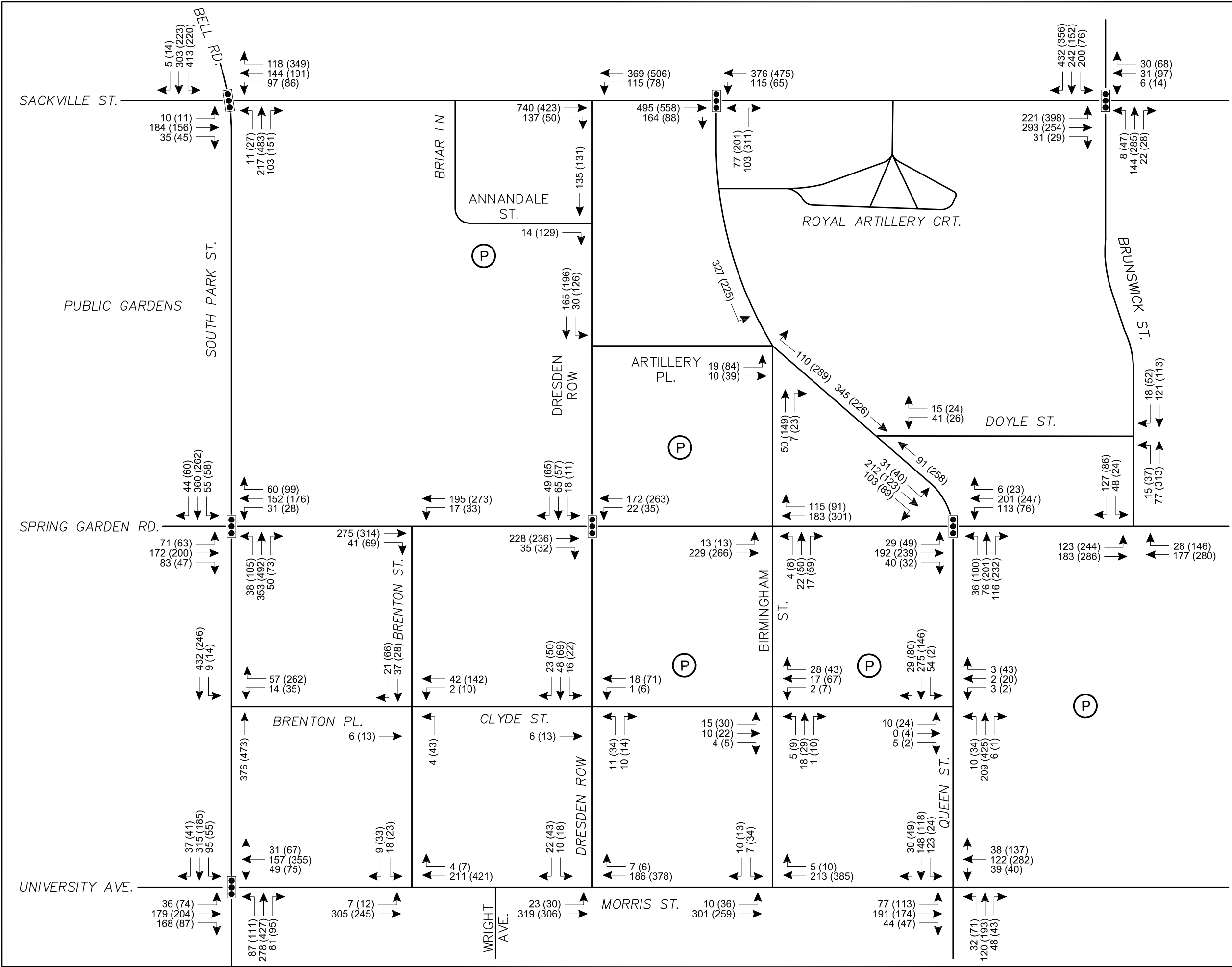
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Fig. 3



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LEGEND

Right Turn
Through
Left Turn

50 AM Traffic Volumes
(75) PM Traffic Volumes

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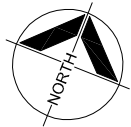
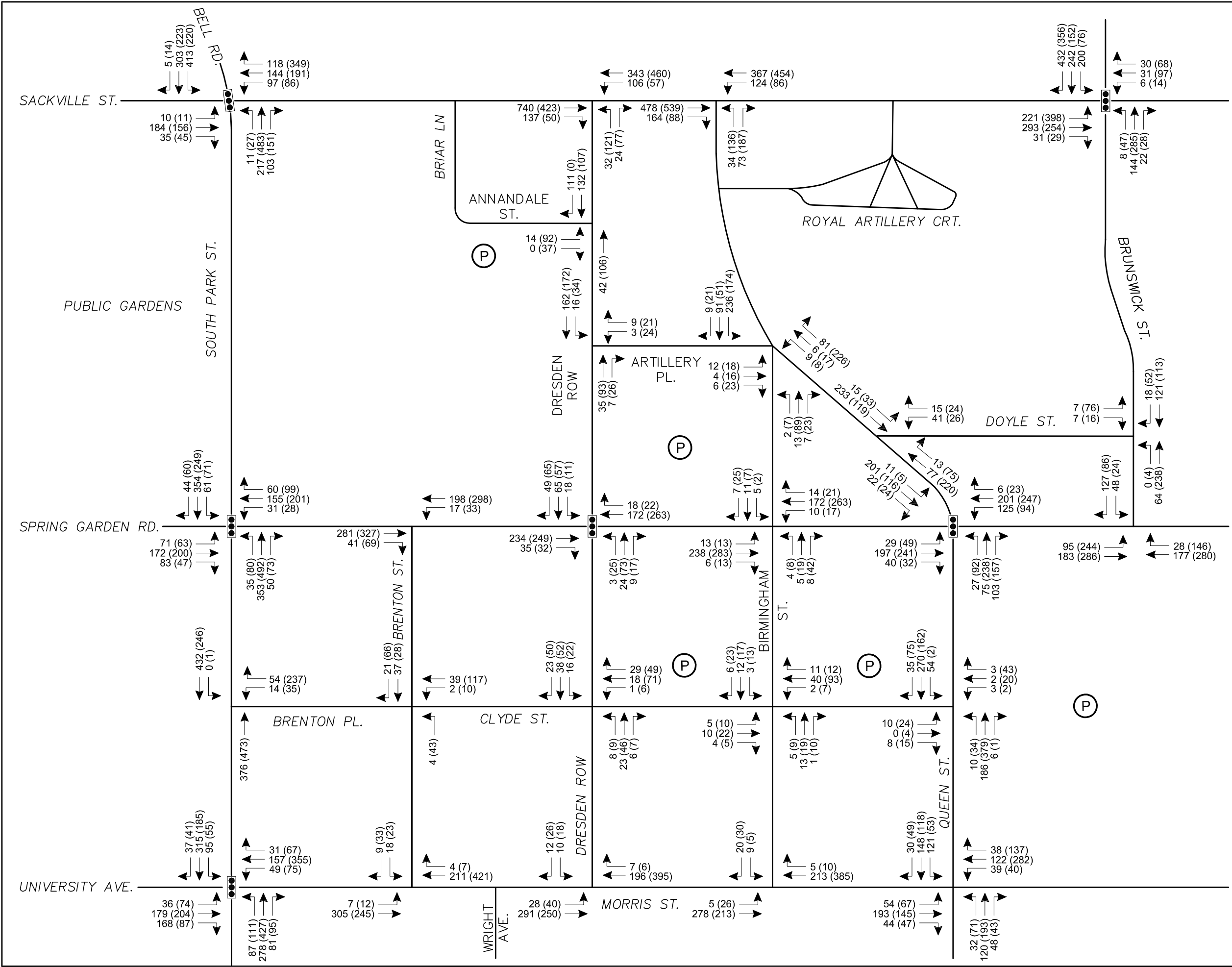
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Fig. 5



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- LEGEND
- Right Turn
 - Through
 - Left Turn
- 50 AM Traffic Volumes
(75) PM Traffic Volumes



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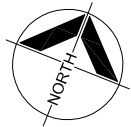
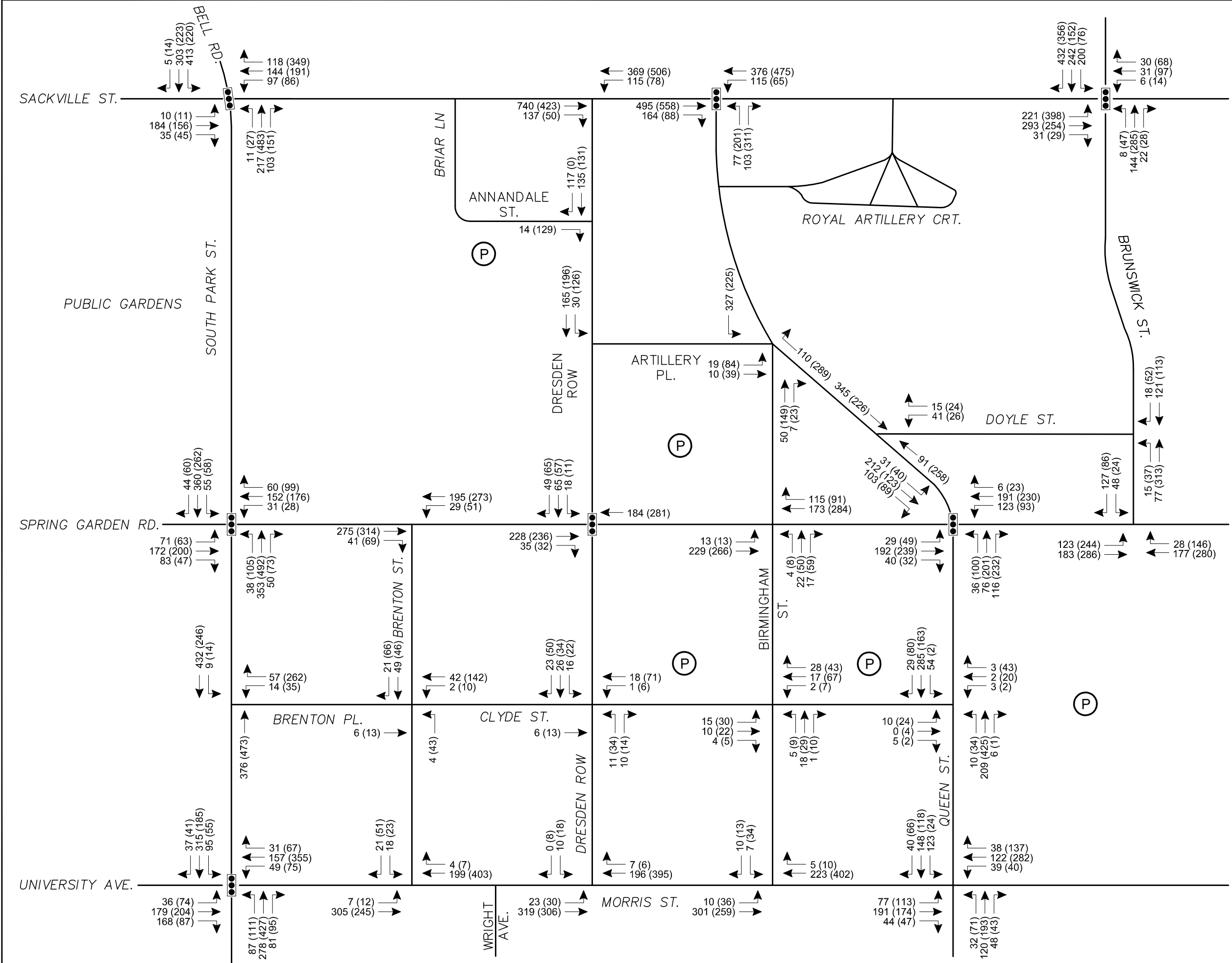
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LEGEND

Right Turn
Through
Left Turn

50 AM Traffic Volumes
(75) PM Traffic Volumes

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**SCENARIO D
TRAFFIC VOLUMES**

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4. Network Operations

The capacity of a road network is often described in terms of a level of service for both intersections and roadways. A level of service is determined based on the average delay that a vehicle experiences in passing through an intersection or along a section of road. LOS “A” designates an excellent level of service with little delay, while LOS “F” indicates a poor level of service and significant delay.

The acceptable length of delay at a stop-controlled intersection is less than the acceptable length of delay at an intersection controlled by traffic signals. The delay time per vehicles and the corresponding level of service is shown in **Table 1**.

Table 1 Level of Service Criteria

Control Delay Per Vehicle (seconds)		
LOS	Signalised Intersections	Stop Controlled Intersections
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

The intersections in the Spring Garden area were analysed using both the Synchro and SimTraffic modelling software. The results from both SimTraffic and Synchro were then compared. The Synchro results were used, as they seemed to better reflect the actual situation. The delays are reported as per HCM (Highway Capacity Manual) calculations except for the intersection of Artillery/Queen/Birmingham where the unusual configuration could not be analysed using Synchro. For this intersection, the SimTraffic delay results were included in the analysis.

The approaches with poor levels of service (“E”, “F”) were flagged but since a high delay for a low volume should not be equally compared to a high delay for a high volume, it was decided that vehicle-hours of delay would be used to compare the intersections for all scenarios.

Each intersection was reviewed for changes in overall delay based on the different scenarios. Many intersections had relatively stable results. However, at the intersections where there were changes in delay, modifications were proposed and then analysed in more detail.

4.1 Scenario A

The existing road layout and traffic control system is considered Scenario A. This is the base scenario which will be used as a comparison against which all other scenarios will be measured.

The detailed results of the intersection analysis for Scenario A are presented in Appendix B. Intersections exhibiting a poor level of service are summarised in **Table 2**.

Table 2 Scenario A Intersections with Poor LOS

AM period	PM period
Sackville St. - Dresden Row	Sackville St. - Dresden Row
Sackville St. - Brunswick St.	Sackville St. - Queen St.
Spring Garden Rd. - Birmingham St.	Spring Garden Rd. - Birmingham St.
Spring Garden Rd. - Brunswick St.	Spring Garden Rd. - Brunswick St.
	Brenton Pl. - South Park St.
	Morris St. - Queen St.

Intersection	Problematic movements	Delay (seconds)	LOS
Sackville St. - Dresden Row	Northbound	78.9 (AM), 93.7 (PM)	F (AM), F (PM)
Sackville St. - Queen St.	Northbound	127.6 (PM)	F (PM)
Sackville St. - Brunswick St.	Southbound	142.8 (AM)	F (AM)
Spring Garden Rd. - Birmingham St.	Northbound, Southbound	AM: NB: 51.6, SB: 54.3 PM: NB: 107.3, SB: 134.7	AM: F (NB), F (SB) PM: F (AM), F (SB)
Spring Garden Rd. - Brunswick St.	Southbound	59.0 (AM), 163.7 (PM)	F (AM), F (PM)
Brenton Pl. - South Park St.	Westbound	96.4 (PM)	F (PM)
Morris St. - Queen St.	Northbound	41.4 (PM)	E (PM)

The high delays at the intersections along Spring Garden Road are mainly due to pedestrian conflicts and the actual delay may be less than that predicted in the traffic model due to the driver behaviour of inching forward with a vehicle until pedestrians yield the right of way. The delays in the p.m. period at the intersections along Sackville Street are due to the large volume of traffic on Sackville Street which causes the vehicles on the side streets to wait for long periods of time for an acceptable gap in the traffic. This situation also occurs at the intersection of Brenton Place and South Park Street although the delays are not as significant. The total volume of traffic entering the intersection of Morris Street and Queen Street is approaching the capacity of this four-way stop controlled intersection thereby engendering increased delays for all movements. The delay at the intersection of Sackville Street and Brunswick Street is a result of the high volume of southbound traffic. This delay can be reduced through the review of the signal timing.

4.2 Scenario B

Scenario B encompasses the streetscape design for Spring Garden Road. Sidewalks are widened at the intersections of Brenton Street, Dresden Row and Birmingham Street. This reduces the distance that pedestrians are required to cross by narrowing the roadway at these intersections, which has the effect of eliminating the de facto left turn lane in the eastbound and westbound directions. For this reason, left turns will be prohibited at Dresden Row. In addition, a dedicated left turn lane will be added in the eastbound direction at the intersection of Queen Street and Spring Garden Road.

The detailed results of the intersection analysis for Scenario B are presented in Appendix B. Intersections exhibiting a poor level of service are summarised in **Table 3**.

Table 3 Scenario B Intersections with Poor LOS

AM period	PM period
Sackville St. - Dresden Row	Sackville St. - Dresden Row
Sackville St. - Brunswick St.	Sackville St. - Queen St.
Spring Garden Rd. - Birmingham St.	Spring Garden Rd. - Birmingham St.
Spring Garden Rd. - Brunswick St.	Spring Garden Rd. - Brunswick St.

	Brenton Pl. - South Park St.
	Morris St. - Queen St.

Intersection	Problematic movements	Delay (seconds)	LOS
Sackville St. - Dresden Row	Northbound	75.7 (AM), 83.4 (PM)	F (AM), F (PM)
Sackville St. - Queen St.	Northbound	80.3 (PM)	F (PM)
Sackville St. - Brunswick St.	Southbound	142.8 (AM)	F (AM)
Spring Garden Rd. - Birmingham St.	Northbound, Southbound	AM: NB: 35.9, SB: 44.8 PM: NB: 74.2, SB: 94.1	AM: E (NB), E (SB) PM: F (AM), F (SB)
Spring Garden Rd. - Brunswick St.	Southbound	59.0 (AM), 151.9 (PM)	F (AM), F (PM)
Brenton Pl. - South Park St.	Westbound	96.4 (PM)	F (PM)
Morris St. - Queen St.	Westbound, Northbound	PM: WB: 41.0 NB: 41.4	PM: WB: E, NB: E

The same intersections that exhibited a poor level of service in Scenario A also have a poor level of service in Scenario B, although there has been an improvement at the intersection of Spring Garden Road and Birmingham Street. The delay at this intersection has decreased due to the narrowing of the roadway. The vehicles waiting on Birmingham Street are more easily able to find gaps in traffic since there is only one lane to cross in both the eastbound and westbound directions.

4.3 Scenario C

Scenario C consists of the proposed one-way cross street system as shown in **Figure 7**. In this scenario, Dresden Row and Birmingham Street will become one-way streets from Sackville Street to Clyde Street for southbound and northbound traffic respectively. A traffic signal will be added at the intersection of Sackville Street and Queen Street to compensate for the larger volume from redistributed traffic on Queen Street. Doyle Street will become a westbound one-way street, while Artillery Place will become a one-way street in the eastbound direction. Brenton Place and Clyde Street will change from a one-way street to a two-way street between South Park and Dresden Row, therefore allowing two-way traffic between South Park Street and Queen Street. By changing formerly bi-directional streets to one-way streets, more space will become available for on-street parking in the Spring Garden area. Due to the new roadway configuration, numerous turns from the former two lane roads will become prohibited resulting in a new traffic circulation pattern. The figures describing the redistribution of the traffic are presented in Appendix A.

The volume distribution for this scenario was presented in **Figure 5** and an increase in volume was observed at the following intersections:

- Queen/Sackville
- Artillery/Birmingham/Queen
- Queen/Spring Garden
- Spring Garden/ Brunswick
- Queen/Morris

Due to the redistribution patterns, Queen Street is likely to experience an increase in traffic volume. Also, the conversion of Doyle Street to a one-way street will likely increase the traffic volumes at the Spring Garden Road/ Brunswick Street intersection as traffic is redistributed along Spring Garden Road in order to reach Brunswick Street. The conversion of Brenton Place from a one-way street to a two-way street is unlikely to attract much traffic volume. Southbound vehicles would need to make a left turn at the unsignalised intersection of Brenton Place and South Park Street. This movement requires a gap in traffic flow which may be difficult to find due to the high northbound traffic volumes. Northbound vehicles would be more likely to use the newly created two-way street; however, there is currently not a strong reason for traffic to be redirected along Clyde Street. Since it is not a through street, vehicles probably have Clyde Street as a destination or are searching for parking. Redevelopment of the parking

lots on Clyde Street may have an effect on the attractiveness of this street as a destination. Currently, Clyde Street is easily accessible from any of the intersections along Morris Street and there is no obvious need for the redistribution of traffic flow.

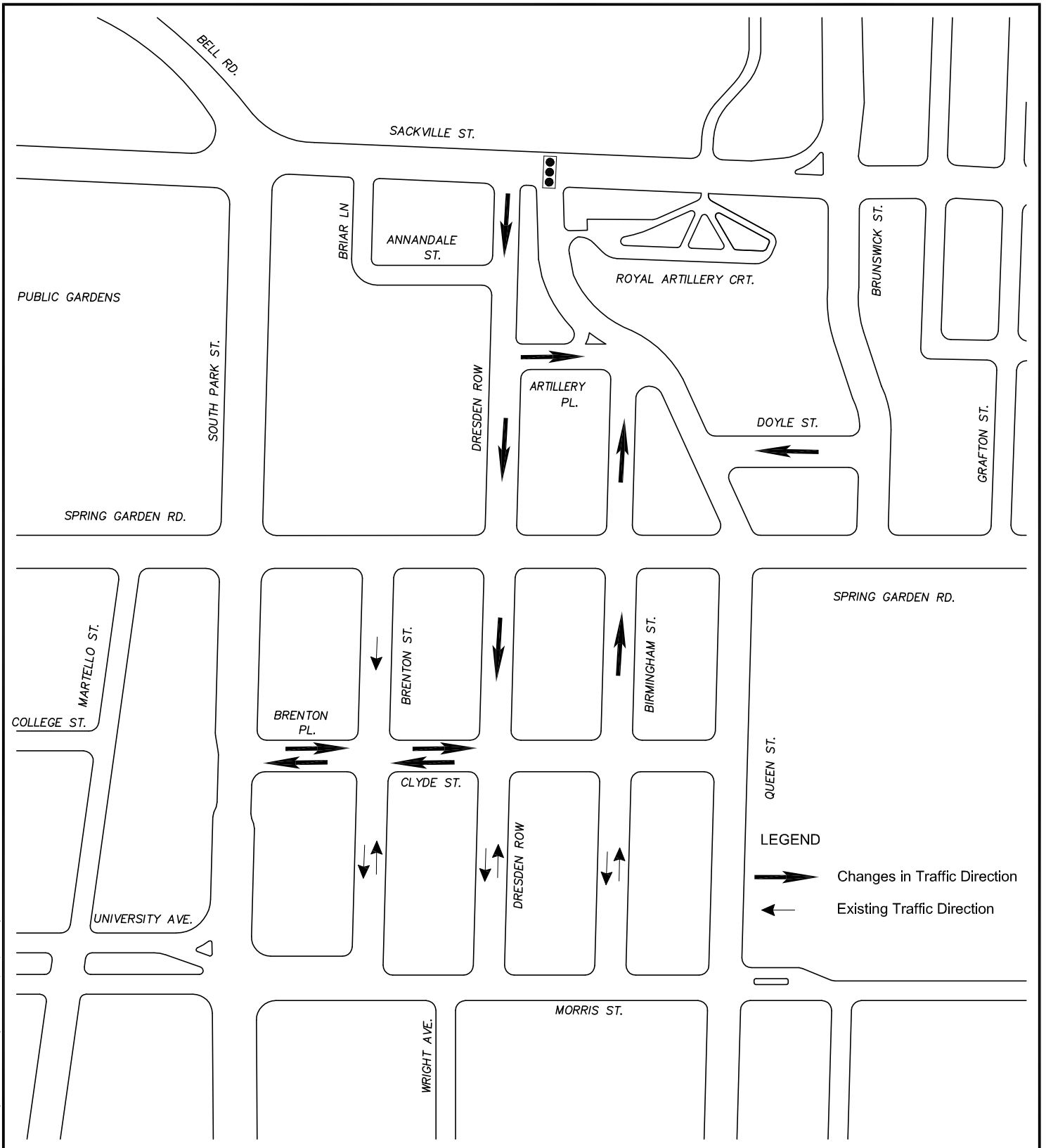
The detailed results of the intersection analysis for Scenario C are presented in Appendix B. Intersections exhibiting a poor level of service are summarised in **Table 4**.

Table 4 Scenario C Intersections with Poor LOS

AM period	PM period
Sackville St. - Brunswick St.	Spring Garden Rd. - Birmingham St.
Spring Garden Rd. - Birmingham St.	Spring Garden Rd. - Brunswick St.
Spring Garden Rd. - Brunswick St.	Brenton Pl. - South Park St.
	Clyde St. - Queen St.
	Morris St. - Queen St.

Intersection	Problematic movements	Delay (seconds)	LOS
Sackville St. - Brunswick St.	Southbound	142.8 (AM)	F (AM)
Spring Garden Rd. - Birmingham St.	Northbound	35.6 (AM), 95.8 (PM)	E (AM), F (PM)
Spring Garden Rd. - Brunswick St.	Southbound	71.7 (AM), 574.6 (PM)	F (AM), F (PM)
Brenton Pl. - South Park St.	Westbound	125.0 (PM)	F (PM)
Clyde St. - Queen St.	Eastbound	37.6 (PM)	E (PM)
Morris St. - Queen St.	Eastbound, Westbound, Northbound	PM: EB: 71.8 WB: 37.3 NB: 49.7	PM: EB: F, WB: E, NB: E

In Scenario C, the intersections at Sackville Street no longer experience poor levels of service related to delay due to the one-way configuration of Dresden Row and the installation of traffic signals at Queen Street. Although more traffic has been redirected to Queen Street, the addition of a traffic signal manages the increase in traffic volumes. However, the increase in traffic on Queen Street does have a negative impact at the intersections with Clyde Street and with Morris Street. The intersections of Spring Garden Road with Birmingham Street and Brunswick Street continue to be problematic, as does the intersection of Brenton Place and South Park Street.



PROJECT:		Halifax Regional Municipality Transportation Study Spring Garden Road Area			
 		DRAWING:		SCENARIO C	
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		No.	DATE	BY	ISSUES / REVISIONS
		DRAWN BY:		CHECKED BY:	PROJECT No. :
		S.A.E.			60144708
		DESIGNED BY:		APPROVED BY:	DRAWING No.
					Fig. 7
		SCALE:		DATE:	
		N.T.S.		Jan. 2010	

4.4 Scenario D

Scenario D combines the modifications described in Scenarios B and C. This option will encompass the streetscape design for Spring Garden Road and the proposed one-way street system.

The detailed results of the intersection analysis for Scenario D are presented in Appendix B. Intersections exhibiting a poor level of service are summarised in **Table 5**.

Table 5 Scenario D Intersections with Poor LOS

AM period	PM period
Sackville St. - Brunswick St.	Spring Garden Rd. - Birmingham St.
Spring Garden Rd. - Brunswick St.	Spring Garden Rd. - Brunswick St.
	Brenton Pl. - South Park St.
	Clyde St. - Queen St.
	Morris St. - Queen St.

Intersection	Problematic movements	Delay (seconds)	LOS
Sackville St. - Brunswick St.	Southbound	142.8 (AM)	F (AM)
Spring Garden Rd. - Birmingham St.	Northbound	72.2 (PM)	F (PM)
Spring Garden Rd. - Brunswick St.	Southbound	71.7 (AM), 574.6 (PM)	F (AM), F (PM)
Brenton Pl. - South Park St.	Westbound	121.6 (PM)	F (PM)
Clyde St. - Queen St.	Eastbound	38.9 (PM)	E (PM)
Morris St. - Queen St.	Eastbound, Westbound, Northbound	PM: EB: 75.8 WB: 36.3 NB: 48.1	PM: EB: F, WB: E, NB: E

The intersections with poor levels of service in Scenario D are the same intersections as in Scenario C since the traffic flow patterns are very similar.

4.5 Summary of Impacts

The three roadway layout Scenarios B through D generate impacts related to intersection operations as well as impacts to access and traffic flow. The impacts to intersection operations can be measured through quantitative methods and the differences between the scenarios can be easily compared. Impacts related to access and traffic flow are mostly qualitative and should be considered separately for each scenario.

4.5.1 Intersection operations

In order to compare the intersection operations of the four roadway scenarios, a table was prepared (**Table 6**) that presents the delay for each intersection using vehicle-hours of delay. This measure of delay takes into account the volumes at each approach to the intersection and the delay experienced at each approach.

Table 6 Comparative Intersection Analysis in Vehicle-Hours of Delay

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Sackville St. - South Park St.	8.31	8.31	8.13	8.33	10.30	10.32	10.19	10.64
Sackville St. - Dresden Row	2.07	1.65	0.52	0.52	5.89	4.83	0.34	0.34
Sackville St. - Queen St.	1.14	1.21	4.40	4.72	11.09	7.50	9.21	9.05
Sackville St. - Brunswick St.	37.90	37.90	37.90	37.90	15.51	15.51	15.51	15.51
Artillery Pl. - Dresden Row	0.07	0.07	0.07	0.07	0.27	0.25	0.31	0.31
Artillery Pl. - Birmingham St.	0.18	0.29	0.20	0.16	0.49	0.67	1.04	1.35
Doyle St. - Queen St.	0.21	0.21	0.19	0.19	0.28	0.29	0.18	0.18
Doyle St. - Brunswick St.	0.04	0.04	0.03	0.03	0.38	0.38	0.11	0.11
Spring Garden Rd. - South Park St.	6.39	6.39	6.39	6.45	8.18	8.18	7.99	8.80
Spring Garden Rd. - Brenton St.	0.05	0.05	0.05	0.08	0.17	0.17	0.10	0.26
Spring Garden Rd. - Dresden Row	2.00	2.02	1.82	1.67	3.45	3.48	2.69	2.33
Spring Garden Rd. - Birmingham St.	0.67	0.57	0.47	0.43	3.44	2.52	3.16	2.41
Spring Garden Rd. - Queen St.	4.42	4.62	6.05	5.93	6.42	6.71	8.63	8.41
Spring Garden Rd. - Brunswick St.	3.16	3.16	3.88	3.88	5.75	5.39	18.50	19.75
Brenton Pl. - South Park St.	0.32	0.32	0.38	0.38	7.28	7.28	10.36	10.08
Clyde St. - Brenton St.	0.13	0.13	0.16	0.16	0.54	0.54	0.70	0.72
Clyde St. - Dresden Row	0.15	0.19	0.14	0.13	0.44	0.50	0.46	0.45
Clyde St. - Birmingham St.	0.18	0.22	0.22	0.22	0.50	0.57	0.59	0.59
Clyde St. - Queen St.	0.31	0.31	0.31	0.31	0.46	0.46	0.45	0.46
Morris St. - South Park St.	5.72	5.72	5.69	5.81	7.99	8.00	8.01	7.83
Morris St. - Brenton St.	0.12	0.12	0.12	0.15	0.29	0.29	0.29	0.35
Morris St. - Dresden Row	0.16	0.16	0.18	0.11	0.32	0.32	0.37	0.23
Morris St. - Birmingham St.	0.12	0.12	0.09	0.09	0.23	0.23	0.38	0.39
Morris St. - Queen St.	3.88	3.88	4.41	4.27	11.68	12.79	20.72	21.10
Total Vehicle Hours of Delay	77.71	77.66	81.79	82.03	101.34	97.19	120.27	121.63

Legend

Signalized Intersection
Stop-Controlled Intersection
A and B - Stop-Controlled Intersection C and D - Signalized Intersection

Many of the intersections exhibited relatively stable results with little change in delay between the existing situation, Scenario A, and the other three scenarios. These consistent results are mainly along Clyde Street and Morris Street with the exception of the intersection of Morris Street and Queen Street where a deterioration of conditions was observed in both the a.m. and p.m. peak periods but with a more pronounced change in the p.m. peak hour. This intersection is approaching capacity and signals may need to be considered in the future. Other intersections with fairly stable delays are Sackville Street/ South Park Street, Spring Garden Road/ South Park Street and Artillery Place/ Dresden Row.

At the intersection of Sackville Street and Dresden Row there were improved results in Scenarios C and D due to the removal of the northbound traffic flows. In the one-way street Scenarios of C and D, traffic on Dresden Row is southbound only, thereby reducing overall delays at the intersection.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Sackville St. - Dresden Row	2.07	1.65	0.52	0.52	5.89	4.83	0.34	0.34

At the intersection of Sackville Street and Queen Street there is an increase in delay in the a.m. period in Scenarios C and D due to the installation of a traffic signal, but in p.m. period for the same scenarios there is a reduction in delay due to better overall flow of traffic. The best scenario for this intersection is Scenario B, since there is less eastbound traffic at the intersection due to fewer vehicles from Dresden Row.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Sackville St. - Queen St.	1.14	1.21	4.40	4.72	11.09	7.50	9.21	9.05

The intersection of Artillery Place and Birmingham Street experiences greater delay for northbound vehicles in Scenarios C and D in the p.m. period due to the increase in traffic volumes from redistributed traffic.

Intersection	PM Scenarios			
	A	B	C	D
Artillery Pl. - Birmingham St.	0.49	0.67	1.04	1.35

There is an improvement in delay at the intersection of Doyle Street and Queen Street due to the elimination of the southbound left turn movements.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Doyle St. - Queen St.	0.21	0.21	0.19	0.19	0.28	0.29	0.18	0.18

At the intersection of Doyle Street and Brunswick Street there is reduced delay in Scenarios C and D due to the change in roadway configuration and the elimination of traffic volumes eastbound on Doyle Street.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Doyle St. - Brunswick St.	0.04	0.04	0.03	0.03	0.38	0.38	0.11	0.11

At the intersection of Spring Garden Road and Brenton Street there is more westbound left turning traffic in Scenario D due to the prohibition of left turns at Dresden Row and the inability to turn left at Birmingham because of the one-way street designation. This results in an increase in average delay for this approach from 1.9 seconds per vehicle to 2.9 seconds per vehicle during the p.m. peak period.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Spring Garden Rd. - Brenton St..	0.05	0.05	0.05	0.08	0.17	0.17	0.10	0.26

At the intersection of Spring Garden Road and Dresden Row the results improved in Scenarios C and D due to the elimination of northbound traffic.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Spring Garden Rd. - Dresden Row	2.00	2.02	1.82	1.67	3.45	3.48	2.69	2.33

At the intersection of Spring Garden Road and Birmingham Street each scenario had different results. In Scenario A, it was observed that the de facto left turn lane reduces gap time for traffic travelling in the northbound and southbound directions. When this lane is removed in Scenario B, the delay for the northbound and southbound traffic is reduced since there is only one lane for the traffic to cross. In Scenario C the delay was higher in the p.m. period since there were again two lanes to cross on Spring Garden Road for the northbound traffic. Also, the total intersection traffic volumes were higher than in Scenario B or Scenario D. In Scenario D there was less traffic at this intersection due to more westbound traffic turning left at Queen Street.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Spring Garden Rd. - Birmingham St.	0.67	0.57	0.47	0.43	3.44	2.52	3.16	2.41

At the intersection of Spring Garden Road and Queen Street the delays are similar in all scenarios but traffic volumes are higher in Scenarios C and D which increases the overall vehicle-hours of delay.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Spring Garden Rd. - Queen St.	4.42	4.62	6.05	5.93	6.42	6.71	8.63	8.41

At the intersection of Spring Garden Road and Brunswick Street there is a significant increase in the delay for southbound traffic due to large amount of additional eastbound traffic turning left that has been detoured from the intersection of Queen Street and Doyle Street. There are also a large number of pedestrians which impede the southbound traffic flow.

Intersection	AM Scenarios				PM Scenarios			
	A	B	C	D	A	B	C	D
Spring Garden Rd. - Brunswick St.	3.16	3.16	3.88	3.88	5.75	5.39	18.50	19.75

The intersection of Brenton Place and South Park Street is at capacity in the p.m. peak period and any additional vehicles westbound on Brenton Place increase the delay significantly.

Intersection	PM Scenarios			
	A	B	C	D
Brenton Pl. - South Park St.	7.28	7.28	10.36	10.08

The total overall delay for each scenario is shown at the bottom of Table 6 and from this table, we can see that the scenarios in the a.m. period have very similar amounts of delay with Scenario A and B virtually identical but in the p.m. period, Scenario B clearly has the least amount of delay while Scenario D has the greatest amount of delay.

4.5.2 Access and Traffic Flow

In addition to the operational impacts observed at the intersections, each of the scenarios produced impacts related to access and the flow of traffic.

Scenario B

Due to the prohibition of left turns at Dresden Row and Spring Garden Road, there are fewer turning movement conflicts at this intersection. Also, the traffic volumes are likely to detour to Queen Street, which allows the main traffic flow to remain on the major roads. However, a more circuitous route is required to reach the parking lots on Dresden Row and Birmingham Street and there is a reduction in pass-by traffic on Dresden Row with a reduction of 12 to 19 vehicles in the a.m. peak hour and a reduction of 12 to 18 vehicles in the p.m. peak hour.

At Queen Street, where a dedicated eastbound left turn lane is to be added, there is a possibility of implementing a left turn phase in the signal timing. There is also an opportunity for allowing opposing left turn movements if the east side of the intersection is rehabilitated at the same time.

The narrowing of Spring Garden Road at Birmingham and at Dresden Row allows one lane for all movements in the eastbound and westbound directions. There is therefore less distance for pedestrians to cross and less potential conflict for the northbound and southbound traffic. The crossing decision for these vehicles is made easier since there are fewer lanes to observe.

Scenario C

The one-way southbound designation for Dresden Row will improve the flow of traffic at the Sackville Street and Dresden Row intersection and reduce the number of conflicting turning movements at this intersection. Southbound traffic will continue to have easy access to the Annandale Street parking garage entrance but traffic coming from Spring Garden Road requires a circuitous route to this parking garage. The pass-by traffic on Dresden Row is reduced by 60 vehicles in the a.m. peak hour and by 130 vehicles in the p.m. peak hour. The extra road width achieved by the reduction of Dresden Row to a single lane road could be used for approximately 20 additional on-street parking spaces between Spring Garden Road and Sackville Street. The access to the HRM parking lot on Dresden Row is maintained for southbound traffic, but there is a detour required for access to this parking lot for northbound traffic from the intersection of Dresden Row and Clyde Street.

The one-way northbound designation of Birmingham Street will impact vehicles attempting to access the parking garage entrance on Birmingham Street. Good access to this parking garage is maintained for vehicles coming from Spring Garden Road, but vehicles coming from Sackville Street must detour onto Spring Garden Road in order to gain access to parking garage. The Queen Street/ Artillery Place/ Birmingham Street intersection could experience increased northbound traffic at Birmingham Street. Vehicles departing from the parking garage will only have the northbound option and additional vehicles could be redistributed from Dresden Row. Five additional on-street parking spaces would become available on Birmingham Street between Spring Garden Road and Artillery Place due to the increase in available pavement width.

With Doyle Street as one-way westbound, there will be a reduction in conflicts at Queen Street and Doyle Street due to the elimination of southbound left turning traffic crossing Queen Street. This traffic of 15 vehicles in the a.m. peak hour and 33 vehicles in the p.m. peak hour will be rerouted through the intersection of Brunswick Street and Spring Garden Road.

Due to Artillery Place becoming a one-way eastbound roadway, the Queen Street/ Artillery Place/ Birmingham Street intersection could experience additional traffic volumes entering the intersection from Artillery Place since this road is a viable routing option for vehicles exiting the parking garage on Annandale Street and intending to access Sackville Street. The narrow roadway is appropriate width for one-way traffic.

With Brenton Place and Clyde Street becoming a two-way street between South Park Street and Dresden Row, traffic from South Park Street can use this roadway to travel in an eastbound direction, however the roadway is somewhat narrow for two-way traffic. Also, westbound vehicles at the intersection of South Park Street and Brenton Place will no longer be able to use full width of the pavement as both a left turning lane and a right turning lane if bi-directional traffic is introduced. Signalisation of this intersection may eventually be required if the southbound left turn volumes increase significantly.

The signalization of the Queen Street and Sackville Street intersection will improve the traffic flow at this busy intersection especially as traffic increases due to the redistribution of traffic from Dresden Row.

Scenario D

Scenario D is expected to experience a combination of effects from both Scenario B and Scenario C. The same access issues and traffic flow issues as described for Scenario B and C will also occur in Scenario D.

4.5.3 Cost estimate

A cost estimate for the modifications anticipated for each scenario was prepared. In Scenario B, other than the costs associated with the streetscape plan which have been estimated by others, the prohibition of left turns is expected to cost approximately \$1000 for the purchase and installation of “No Left Turn” signs on Spring Garden Road.

For Scenario C, **Table 7** outlines the elements required for the operation of the one-way street scenario and the cost estimate for the purchase and installation of the items.

Table 7 Scenario C Cost Estimate

Scenario element	Item	Cost
Dresden Row one-way southbound	Purchase and installation of signs and construction of a curb extension at the northeast corner of Dresden Row and Clyde Street	\$30,000
Birmingham Street one-way northbound	Purchase and installation of signs	\$2,000
Doyle Street one-way westbound	Purchase and installation of signs	\$1,000
Artillery Place one-way eastbound	Purchase and installation of signs	\$1,000
Brenton Place/ Clyde Street two-way	Purchase and installation of signs, painting of pavement markings	\$1,500
Queen Street/ Sackville Street	Purchase and installation of traffic signals	\$130,000
TOTAL		\$165,500

Since Scenario D is a combination of Scenario C and Scenario B, the elements of each of the scenarios can be combined for a total cost of approximately \$166,500.

4.6 Modifications

Several modifications to the proposed Scenarios C and D were considered in order to improve the intersection operations in the study area. Modifications that were carried forward were incorporated into the Synchro model. The intersection operations were evaluated and then compared to the original scenarios.

The concept of a roundabout at the intersection of Queen/Artillery/Birmingham was considered. A single-lane roundabout could successfully operate at this junction based on the existing traffic volumes, however, the installation of a roundabout is not recommended at this intersection based on the existing geometry. A centre circle that could accommodate all of the approaches would be large due to the acute and oblique angles of the Queen Street approaches. Further complicating the design is the offset between Birmingham Street and Queen Street. Construction of a large roundabout at this location would require significant property acquisition and/or purchase of adjacent buildings. The delays encountered at this intersection in the existing configuration are manageable and modifications to the intersection are not necessary to improve the traffic flow.

Other modifications that were considered were:

- the removal of the traffic signal at Dresden Row and Spring Garden Road
- the prohibition of left turns from Spring Garden Road onto Birmingham Street
- improved signal timing at the Queen Street and Spring Garden Road intersection
- return to one-way operation of Brenton Place and the subsequent utilization of the entire width of the roadway for two westbound turn lanes at the Brenton Place/ South Park Street intersection
- return to two-way operation on Doyle Street
- return to one-way operation of Clyde Street between Brenton Street and Dresden Row

The prohibition of the left turn movement from Spring Garden Road onto Birmingham Street was investigated for Scenario B and the intersection operations did not change significantly so this improvement was not carried forward to the other scenarios. All other modifications were incorporated into the Synchro model for the analysis of Scenarios C and D. The high volume of pedestrians at the Dresden Row/ Spring Garden Road intersection negatively affected the results of the Synchro analysis for this intersection. Therefore, the SimTraffic results for this intersection were included in the comparative analysis shown in **Table 8**.

Table 8 Scenario Analysis with Modifications

AM Scenarios						
Intersection	A	B	C	C with modifications	D	D with modifications
Sackville St. - South Park St.	8.31	8.31	8.13	8.13	8.33	8.33
Sackville St. - Dresden Row	2.07	1.65	0.52	0.52	0.52	0.52
Sackville St. - Queen St.	1.14	1.21	4.40	4.40	4.72	4.72
Sackville St. - Brunswick St.	37.90	37.90	37.90	10.67	37.90	10.67
Artillery Pl. - Dresden Row	0.07	0.07	0.07	0.07	0.07	0.07
Artillery Pl. - Birmingham St.	0.18	0.29	0.20	0.20	0.16	0.16
Doyle St. - Queen St.	0.21	0.21	0.19	0.23	0.19	0.23
Doyle St. - Brunswick St.	0.04	0.04	0.03	0.04	0.03	0.04
Spring Garden Rd. - South Park St.	6.39	6.39	6.39	6.57	6.45	6.53
Spring Garden Rd. - Brenton St.	0.05	0.05	0.05	0.05	0.08	0.08
Spring Garden Rd. - Dresden Row	2.00	2.02	1.82	0.79	1.67	0.55
Spring Garden Rd. - Birmingham St.	0.67	0.57	0.47	0.48	0.43	0.48
Spring Garden Rd. - Queen St.	4.42	4.62	6.05	5.68	5.93	5.58
Spring Garden Rd. - Brunswick St.	3.16	3.16	3.88	3.16	3.88	3.16
Brenton Pl. - South Park St.	0.32	0.32	0.38	0.35	0.38	0.32
Clyde St. - Brenton St.	0.13	0.13	0.16	0.13	0.16	0.14
Clyde St. - Dresden Row	0.15	0.19	0.14	0.15	0.13	0.12
Clyde St. - Birmingham St.	0.18	0.22	0.22	0.20	0.22	0.20
Clyde St. - Queen St.	0.31	0.31	0.31	0.31	0.31	0.31
Morris St. - South Park St.	5.72	5.72	5.69	5.69	5.81	5.81
Morris St. - Brenton St.	0.12	0.12	0.12	0.12	0.15	0.15
Morris St. - Dresden Row	0.16	0.16	0.18	0.17	0.11	0.10
Morris St. - Birmingham St.	0.12	0.12	0.09	0.11	0.09	0.11
Morris St. - Queen St.	3.88	3.88	4.41	4.41	4.27	4.27
Total Vehicle Hours of Delay	77.71	77.66	81.79	52.62	82.03	52.66

PM Scenarios						
Intersection	A	B	C	C with modifications	D	D with modifications
Sackville St. - South Park St.	10.30	10.32	10.19	10.19	10.64	10.64
Sackville St. - Dresden Row	5.89	4.83	0.34	0.34	0.34	0.34
Sackville St. - Queen St.	11.09	7.50	9.21	9.21	9.05	9.05
Sackville St. - South Park St.	15.51	15.51	15.51	13.83	15.51	13.83
Artillery Pl. - Dresden Row	0.27	0.25	0.31	0.31	0.31	0.00
Artillery Pl. - Birmingham St.	0.49	0.67	1.04	1.04	1.35	1.35
Doyle St. - Queen St.	0.28	0.29	0.18	0.28	0.18	0.28
Doyle St. - Brunswick St.	0.38	0.38	0.11	0.37	0.11	0.37
Spring Garden Rd. - South Park St.	8.18	8.18	7.99	8.02	8.80	8.38
Spring Garden Rd. - Brenton St.	0.17	0.17	0.10	0.10	0.26	0.27
Spring Garden Rd. - Dresden Row	3.45	3.48	2.69	3.21	2.33	3.43
Spring Garden Rd. - Birmingham St.	3.44	2.52	3.16	3.17	2.41	2.86
Spring Garden Rd. - Queen St.	6.42	6.71	8.63	8.04	8.41	8.27
Spring Garden Rd. - Brunswick St.	5.75	5.39	18.50	5.72	19.75	5.39
Brenton Pl. - South Park St.	7.28	7.28	10.36	5.20	10.08	5.20
Clyde St. - Brenton St.	0.54	0.54	0.70	0.57	0.72	0.72
Clyde St. - Dresden Row	0.44	0.50	0.46	0.42	0.45	0.40
Clyde St. - Birmingham St.	0.50	0.57	0.59	0.59	0.59	0.53
Clyde St. - Queen St.	0.46	0.46	0.45	0.45	0.46	0.46
Morris St. - South Park St.	7.99	8.00	8.01	8.01	7.83	7.83
Morris St. - Brenton St.	0.29	0.29	0.29	0.29	0.35	0.35
Morris St. - Dresden Row	0.32	0.32	0.37	0.35	0.23	0.28
Morris St. - Birmingham St.	0.23	0.23	0.38	0.41	0.39	0.42
Morris St. - Queen St.	11.68	12.79	20.72	20.72	21.10	21.10
Total Vehicle Hours of Delay	101.34	97.19	120.27	100.82	121.63	101.73

Legend

Signalized Intersection

Stop-Controlled Intersection

The modifications included in Scenarios C and D contributed to the reduction of the total delay for the intersections in the study area. In some instances there were minor increases in delay at a particular intersection but overall the modifications improved the traffic operations. In the p.m. peak period the modifications succeeded in reducing delay to less than that experienced in the existing situation. In the a.m. peak period, although the total delay was higher than the existing situation, the delay for the four scenarios was fairly uniform.

5. Recommendations

Based on the results of the operational analyses and taking into account the impacts on access and traffic flow through the road network, the following recommendations are made for the Spring Garden Road Area.

Scenario D which includes the one-way street layout and the Spring Garden Road streetscape design can be implemented and will produce acceptable traffic operations results. The narrowing of Spring Garden Road at Birmingham and at Dresden Row allows one lane for all movements in the eastbound and westbound directions. There is therefore less distance for pedestrians to cross and less potential conflict for the northbound and southbound traffic. The crossing decision for these vehicles is made easier since there are fewer lanes to observe. Several modifications to Scenario are proposed as outlined below.

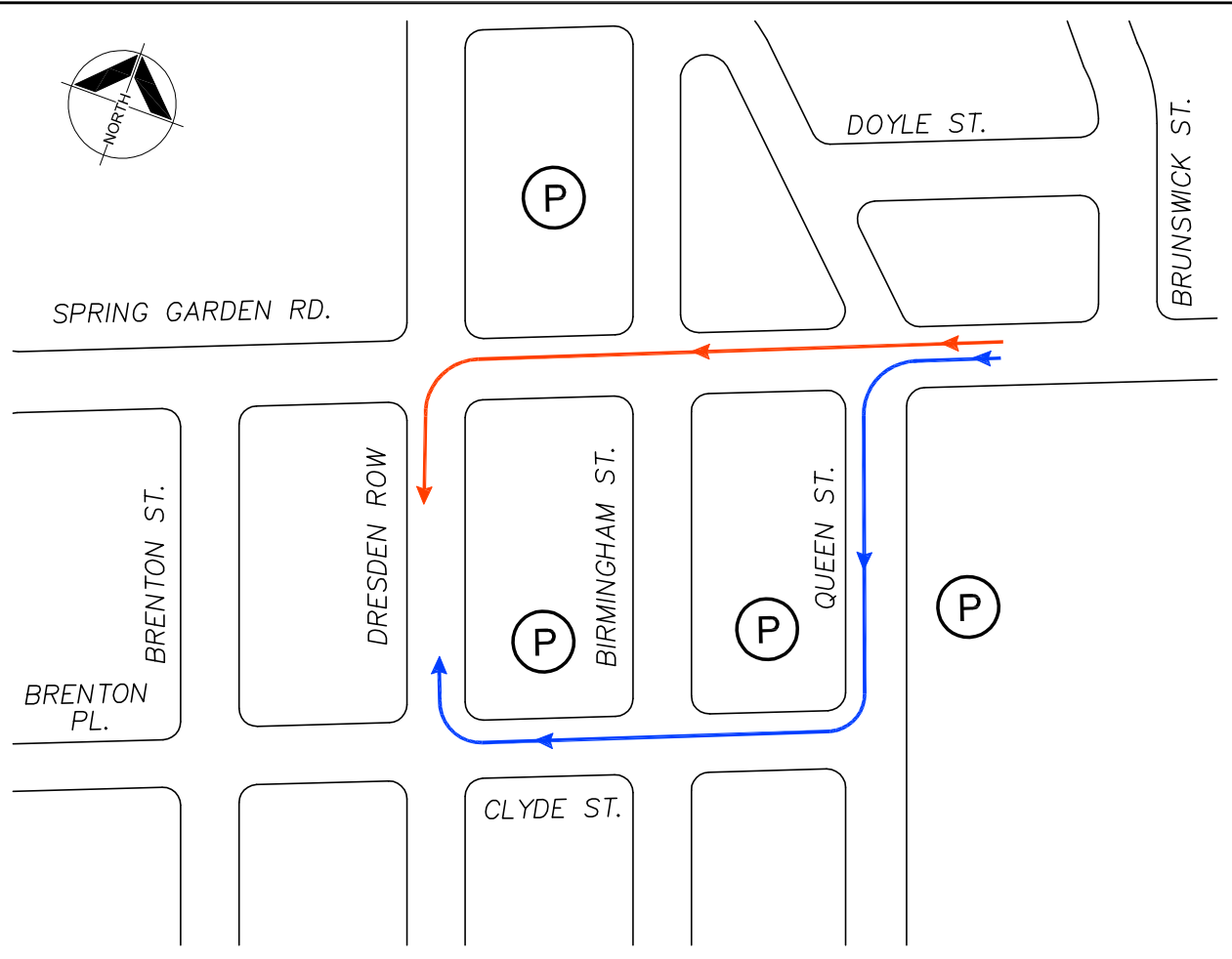
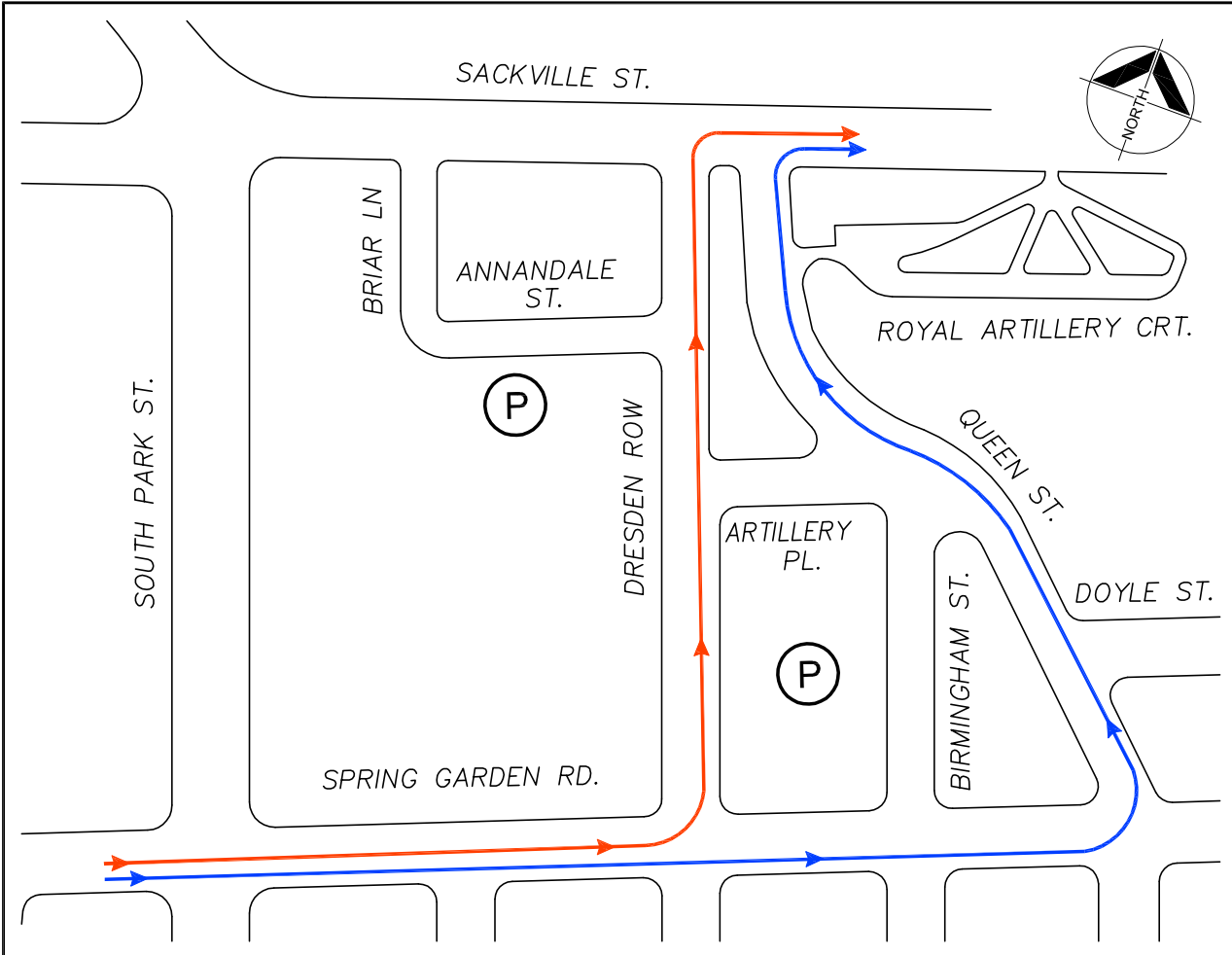
- Doyle Street should remain a two-way street
- Brenton Place should remain a one-way street
- Clyde Street should remain a one-way street between Brenton Street and Dresden Row

Traffic operations were assessed with the removal of the traffic signal at Dresden Row and Spring Garden Road. The removal of the traffic signal did not improve intersection operations during the more critical p.m. peak period. The signals provide a means to control pedestrian crossings and they also produce a platoon effect that facilitates intersection operations and pedestrian crossings at the adjacent intersections. The traffic signals cause the traffic along Spring Garden Road to travel in groups due to the fact that vehicles will gather at red lights. This grouping effect produces gaps in between each group of vehicles, which allows northbound and southbound traffic and pedestrians to cross Spring Garden Road more easily. At an approximate cost of \$30,000- \$40,000 for the removal and decommissioning of the traffic signals, this modification to Scenario D is not recommended.

In addition to the recommendations associated with Scenario D, it is suggested that the intersection of Queen Street and Morris Street be regularly monitored as traffic volumes increase over time. This stop-controlled intersection is approaching its capacity and traffic signals may be warranted in the near future.

Appendix A

Redistribution Traffic Patterns



1			
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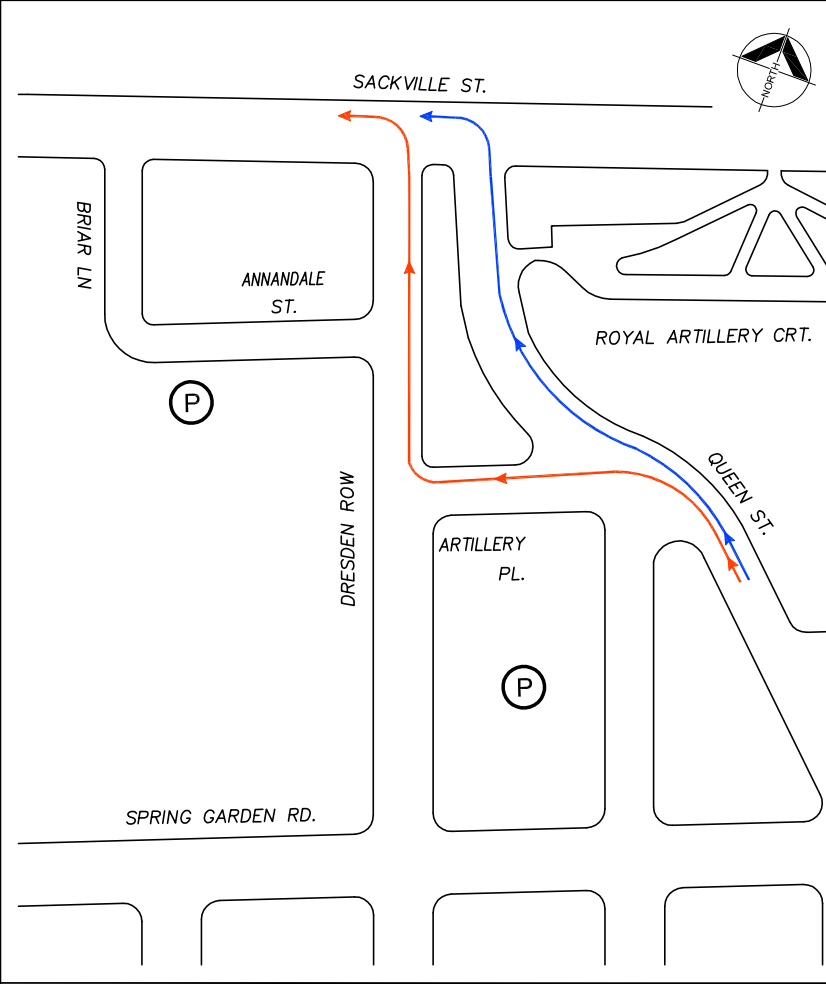
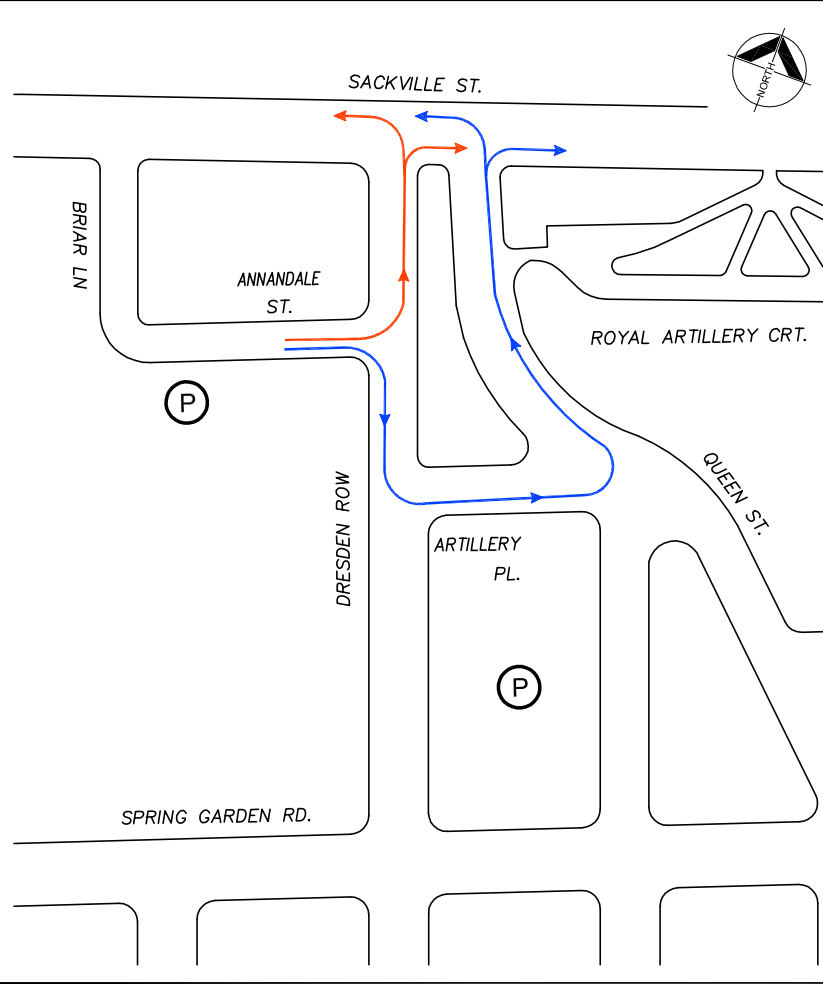
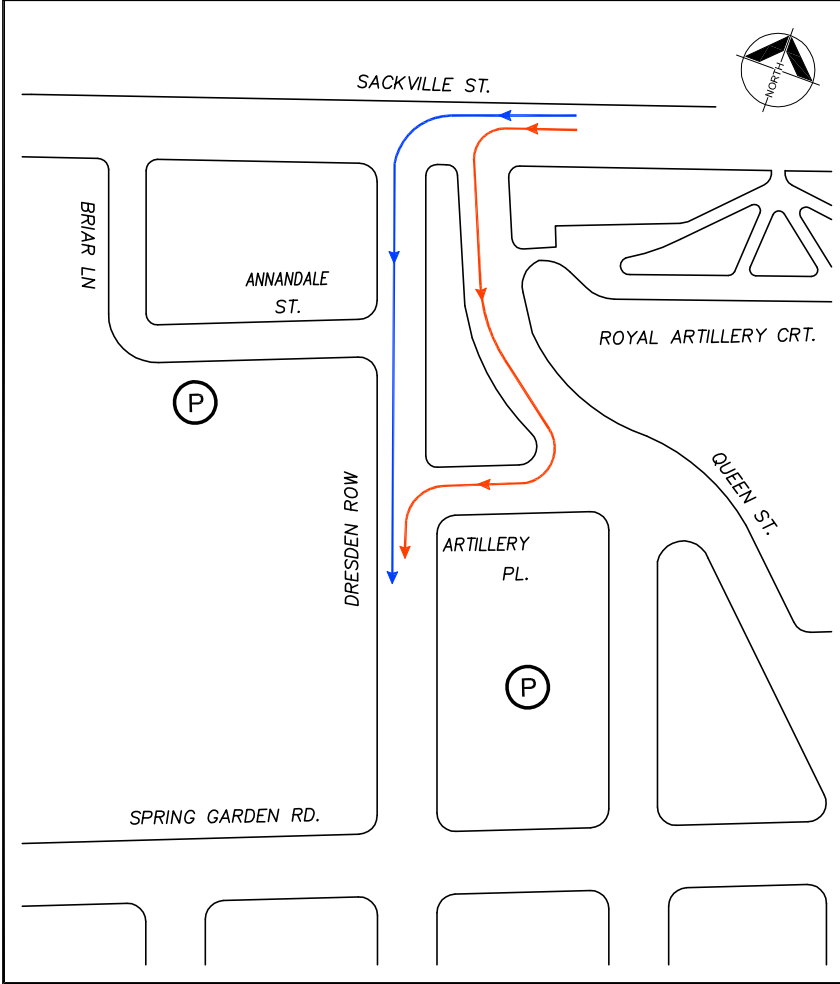
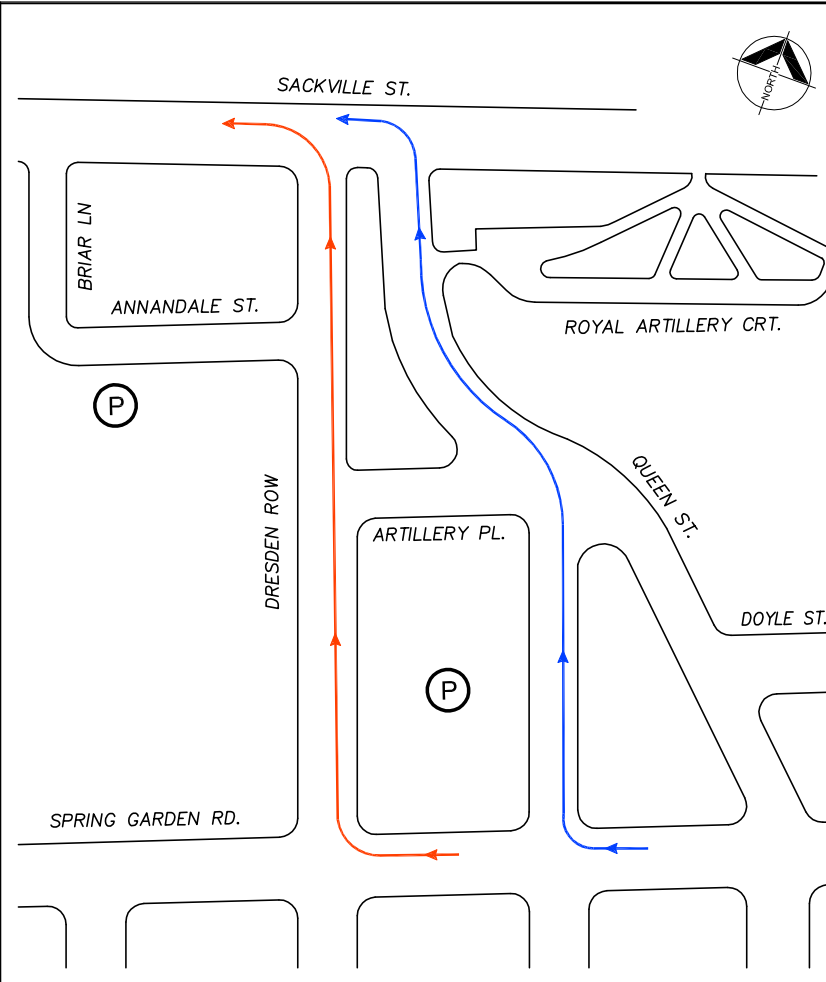
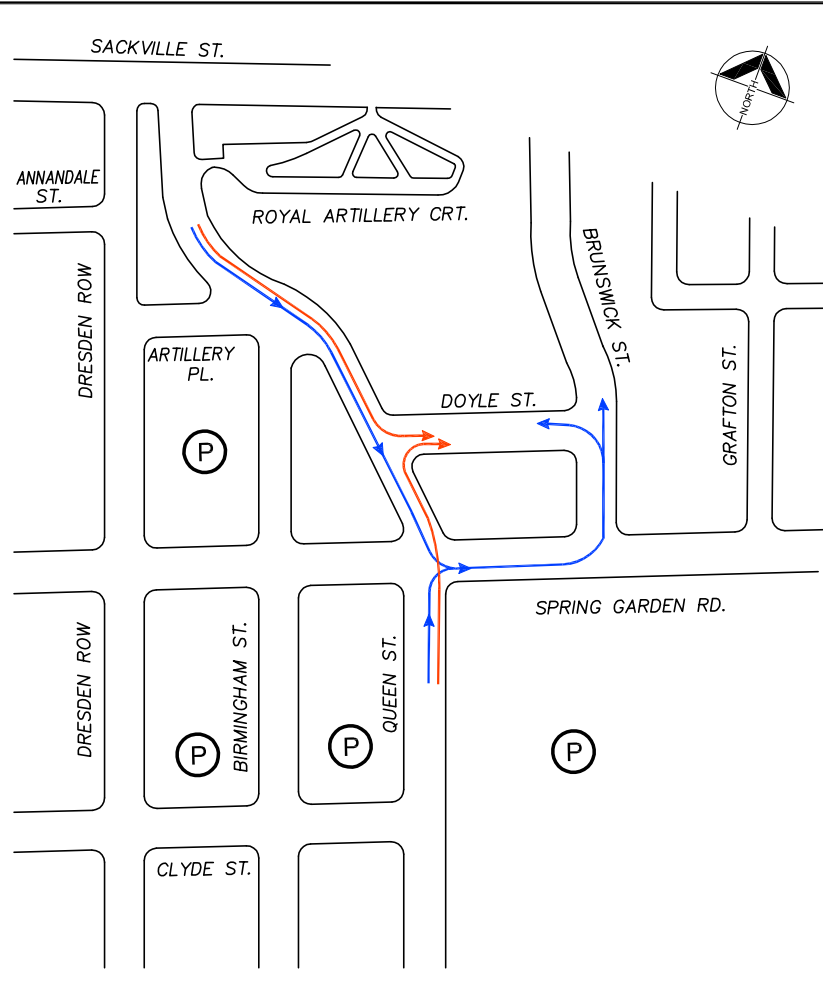
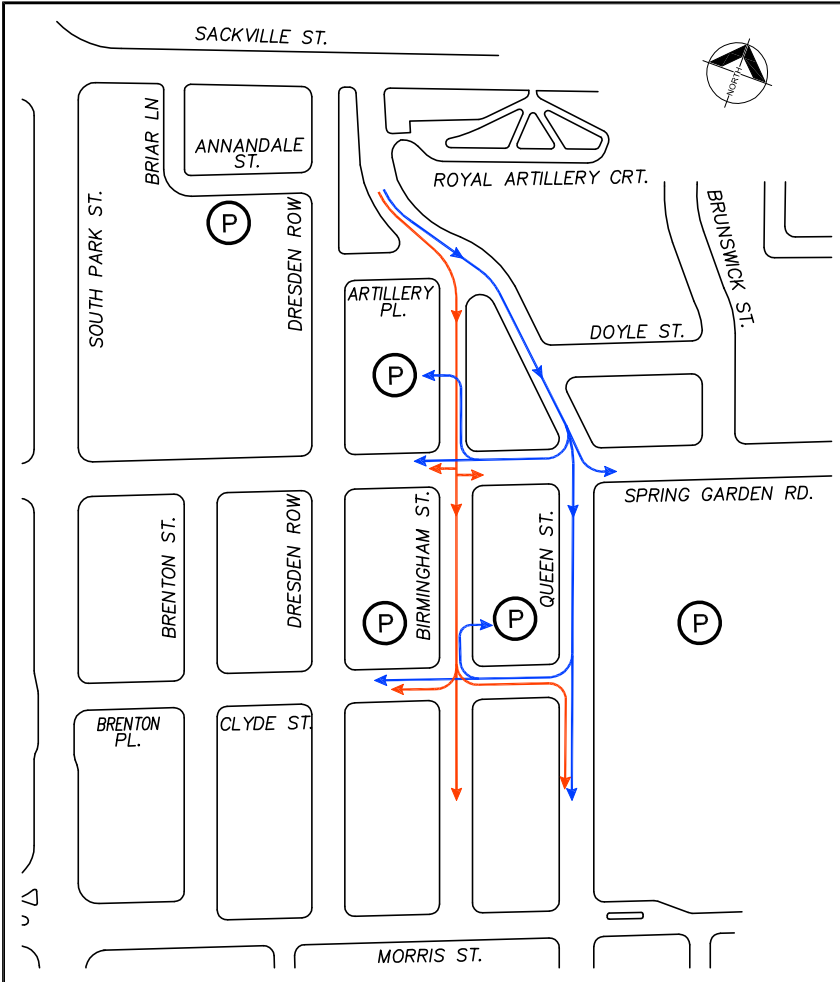
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Transportation Study
Spring Garden Road Area

DRAWING:

SCENARIO B
Redistributed Traffic

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		A-1
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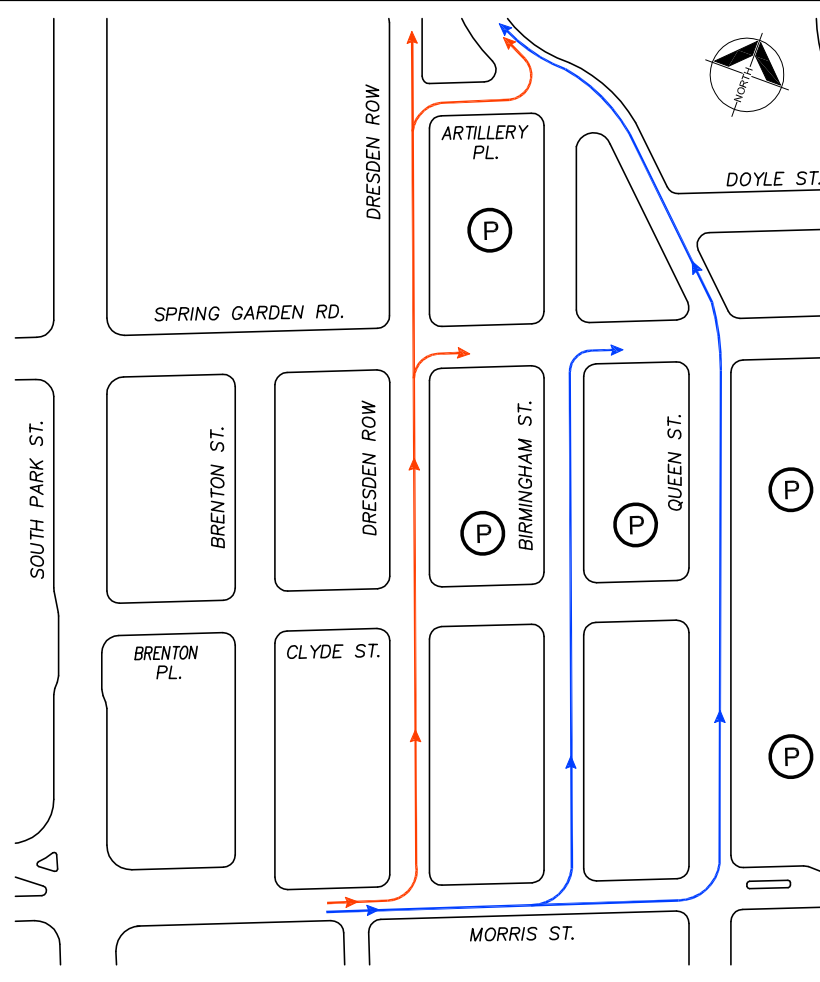
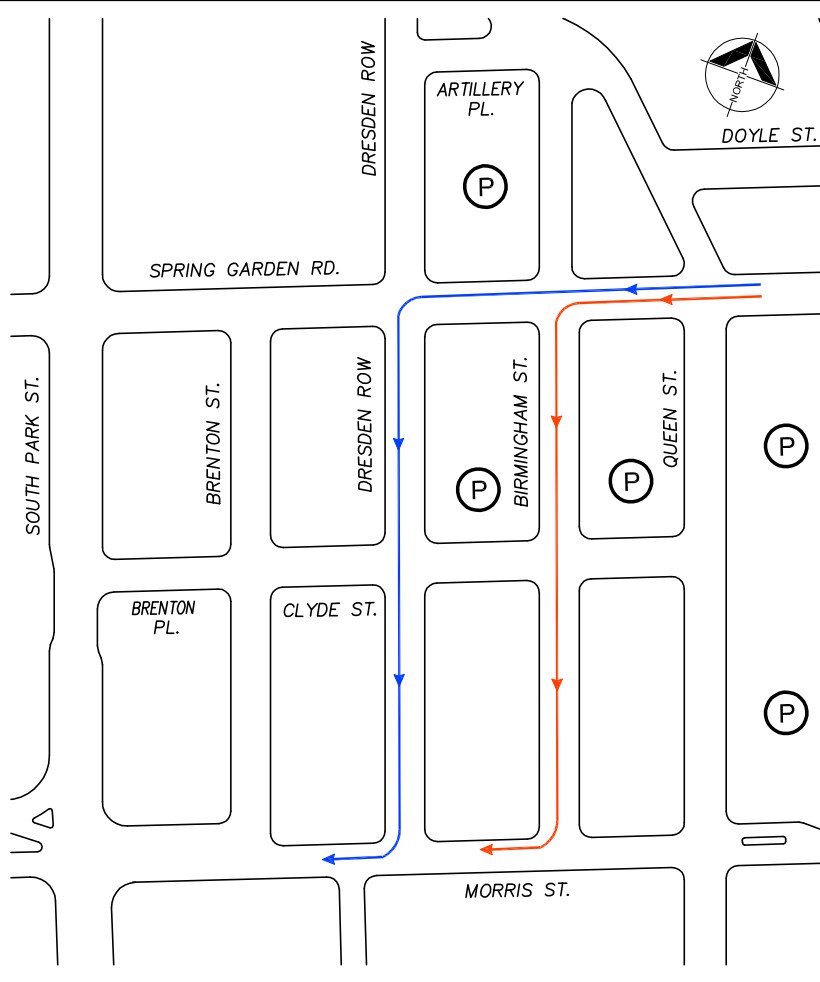
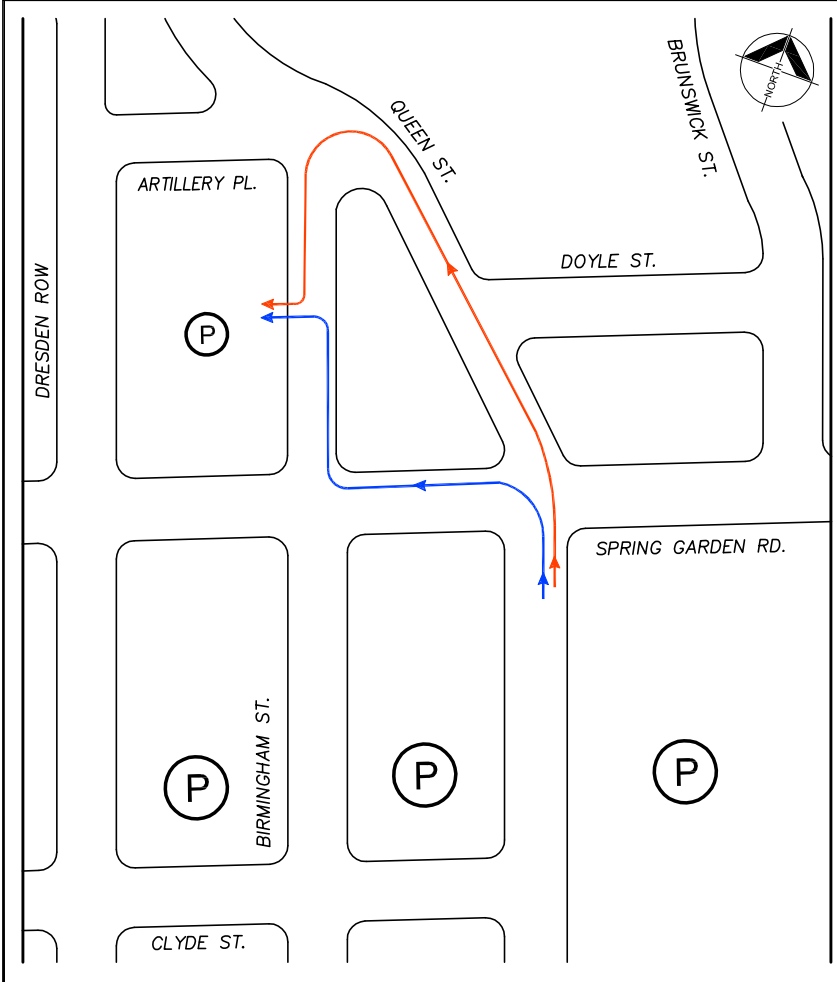
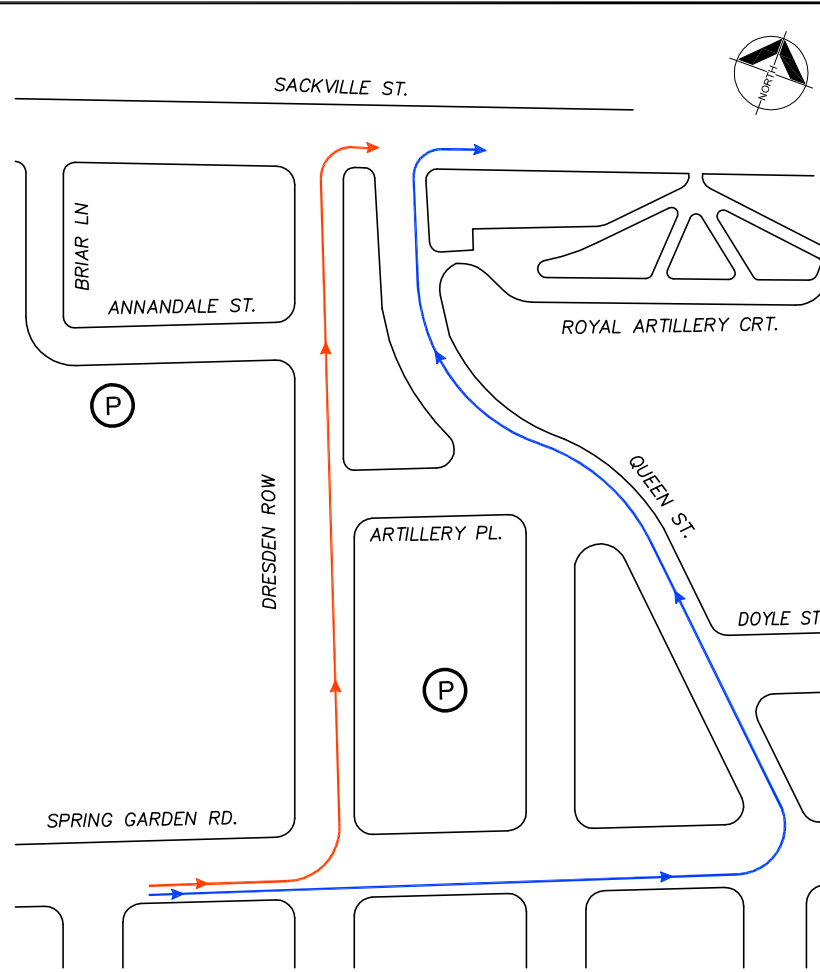
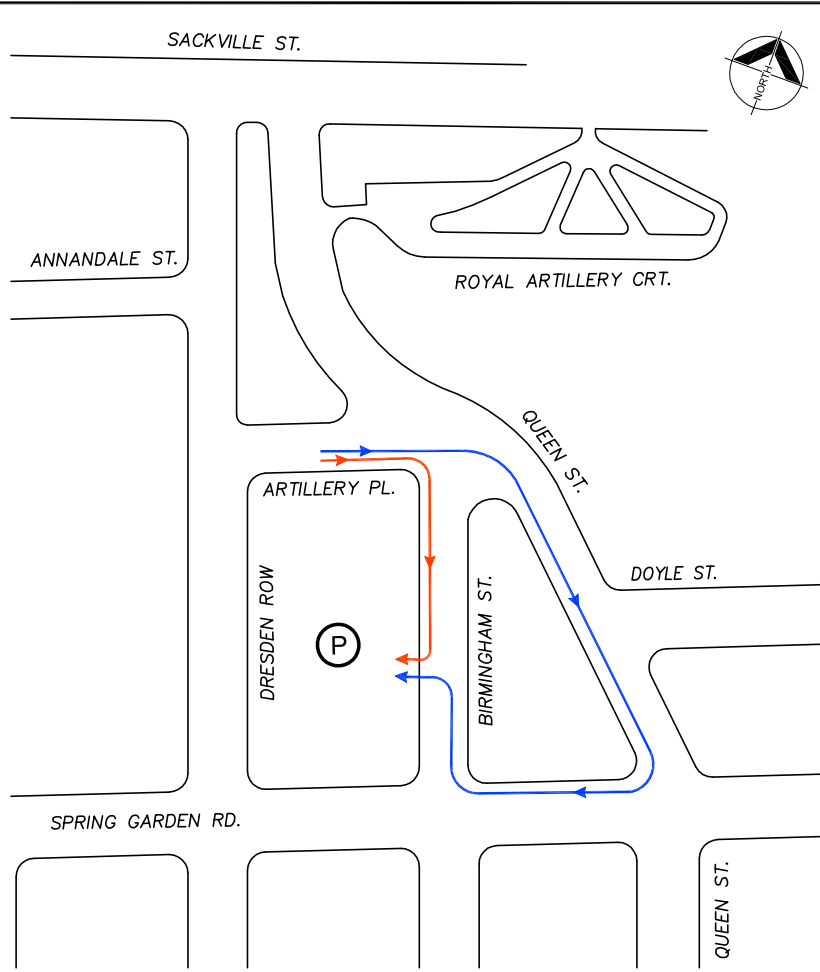
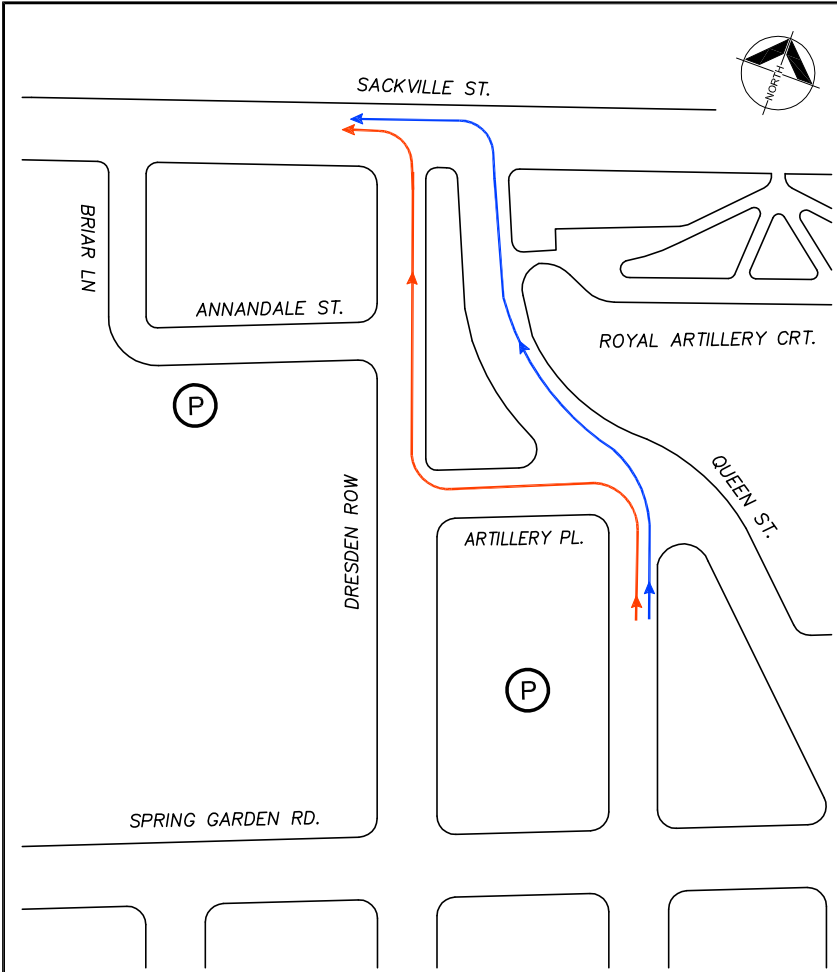
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Spring Garden Road Area

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SCENARIO C
Redistributed Traffic

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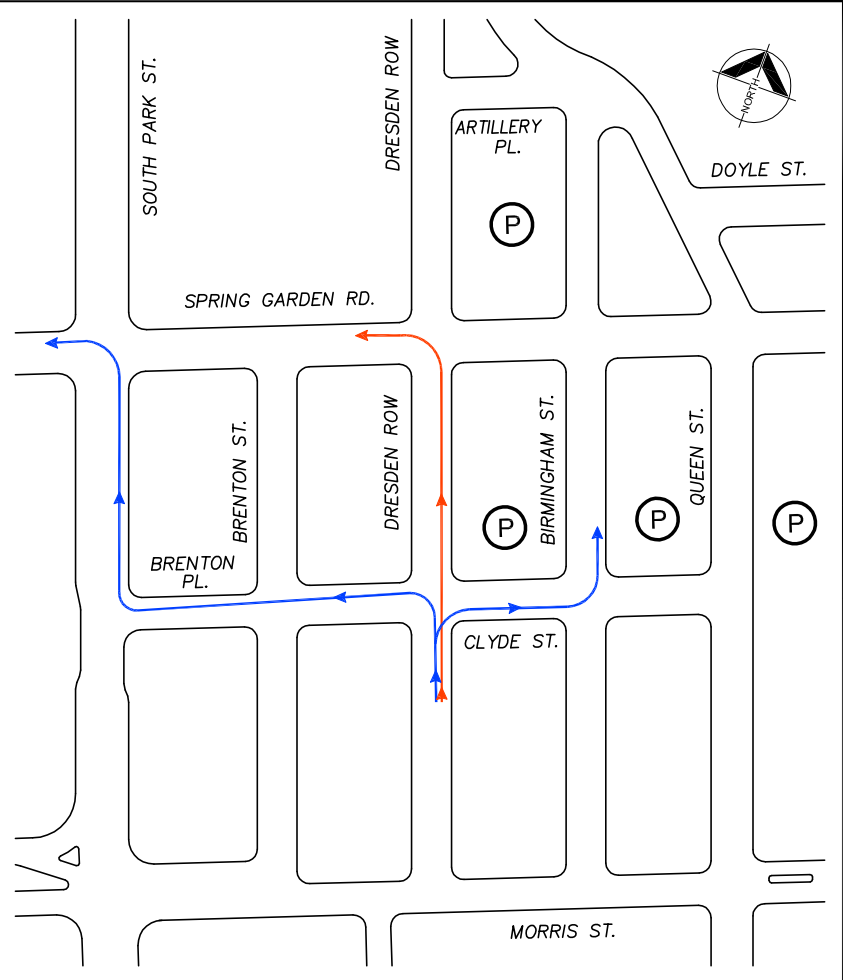
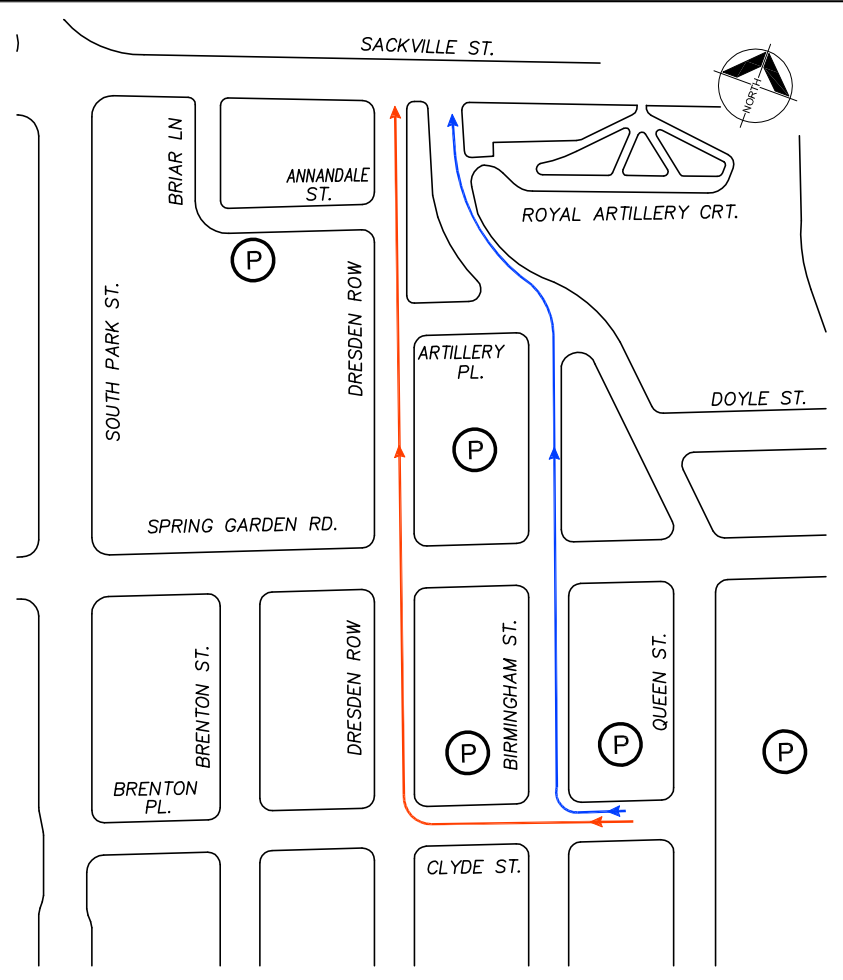
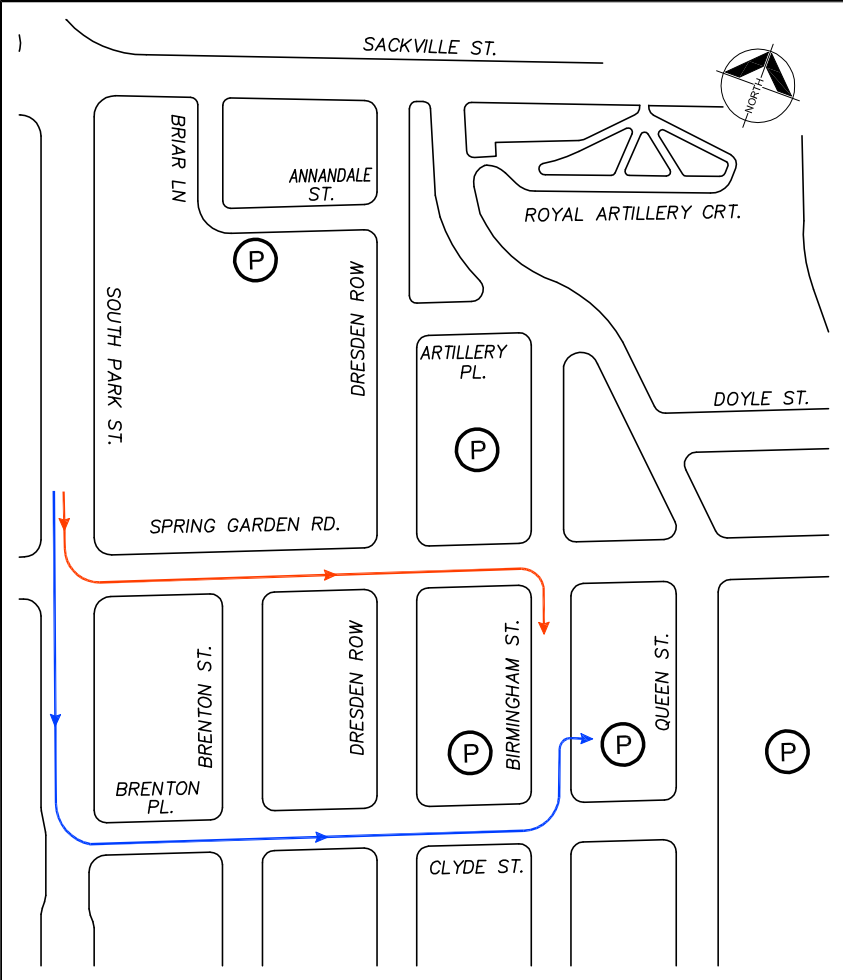
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Spring Garden Road Area

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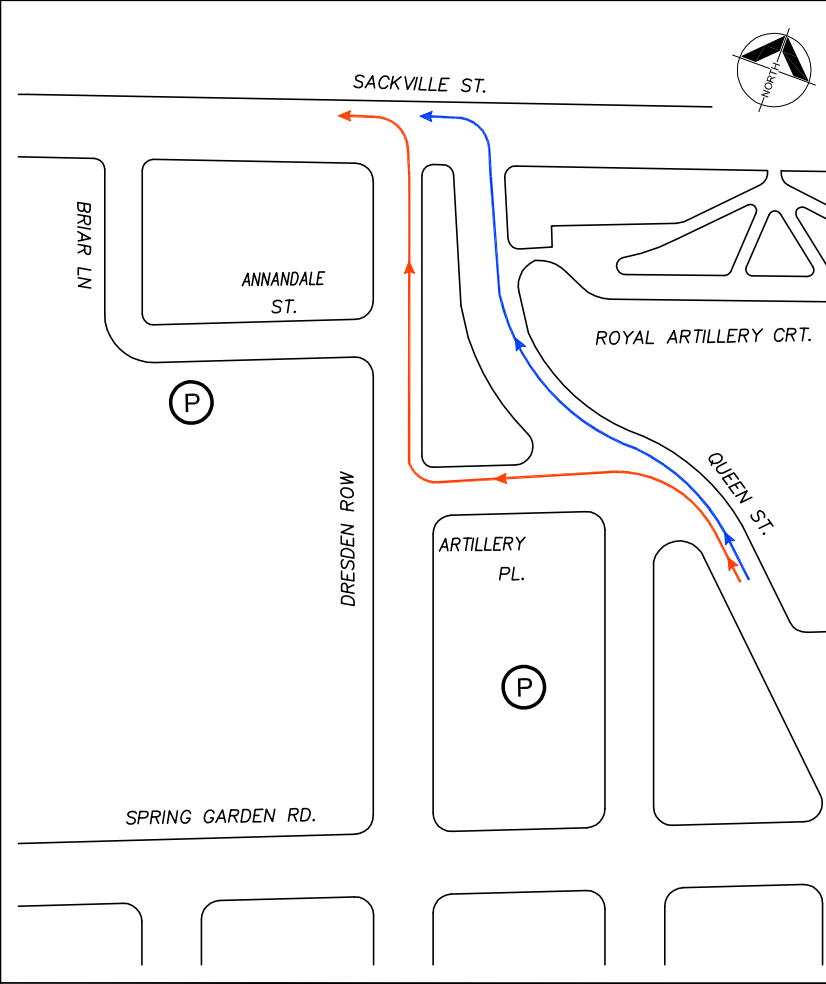
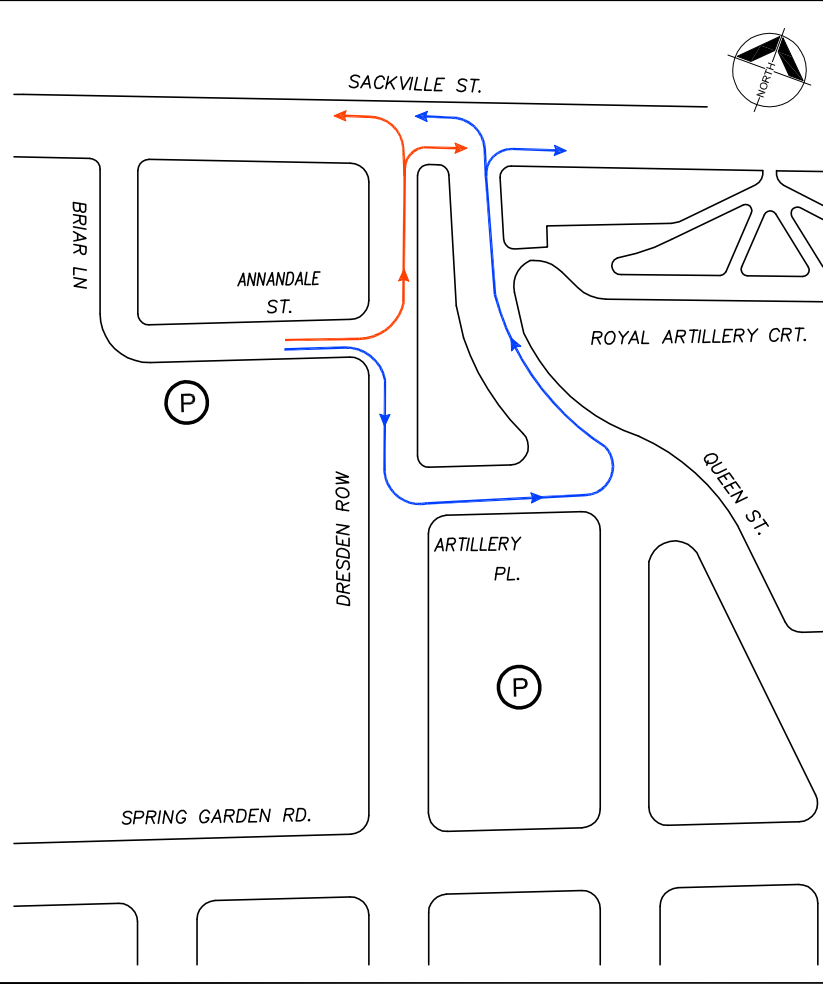
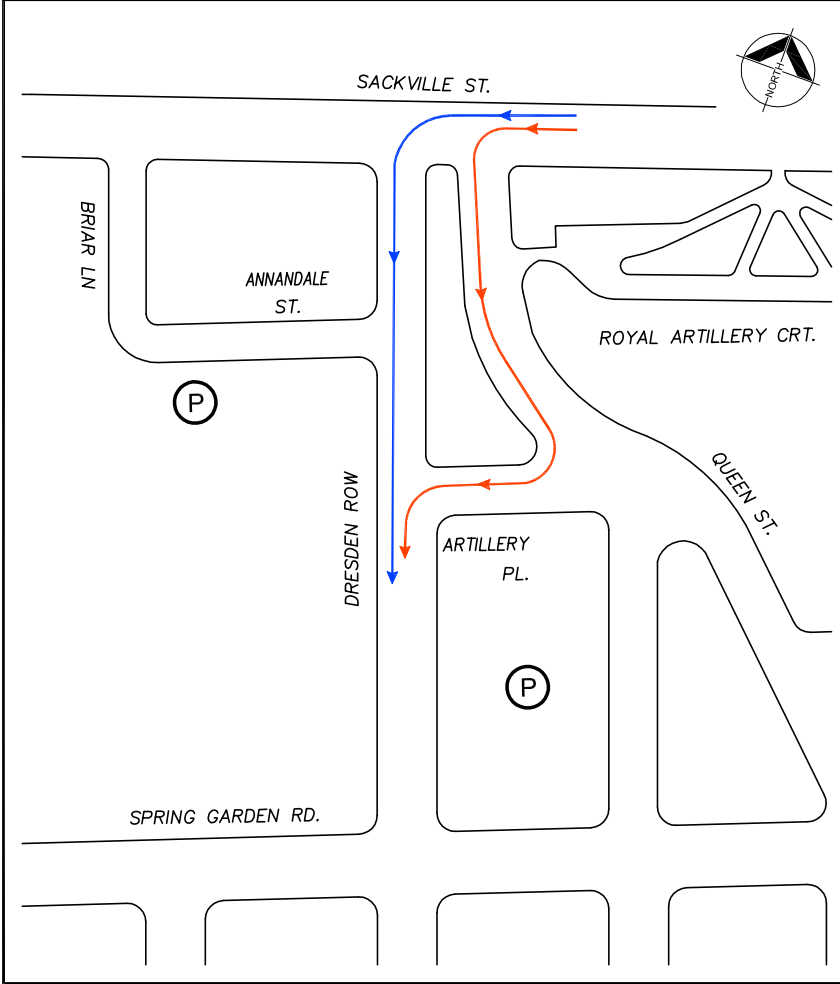
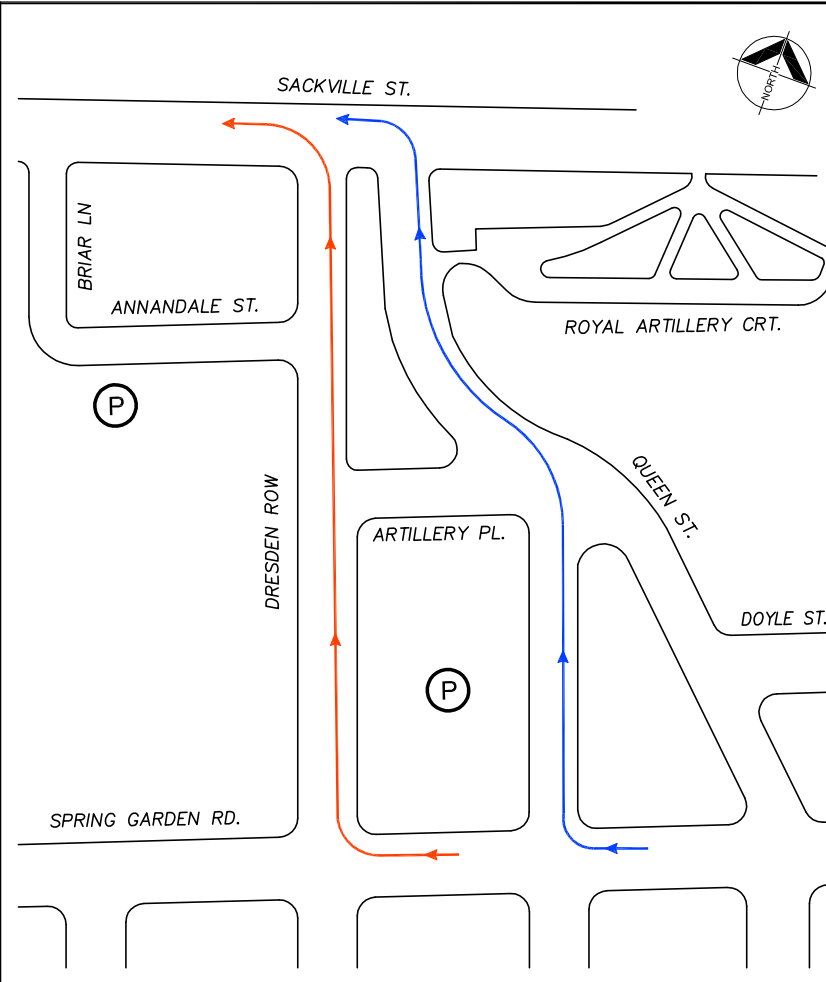
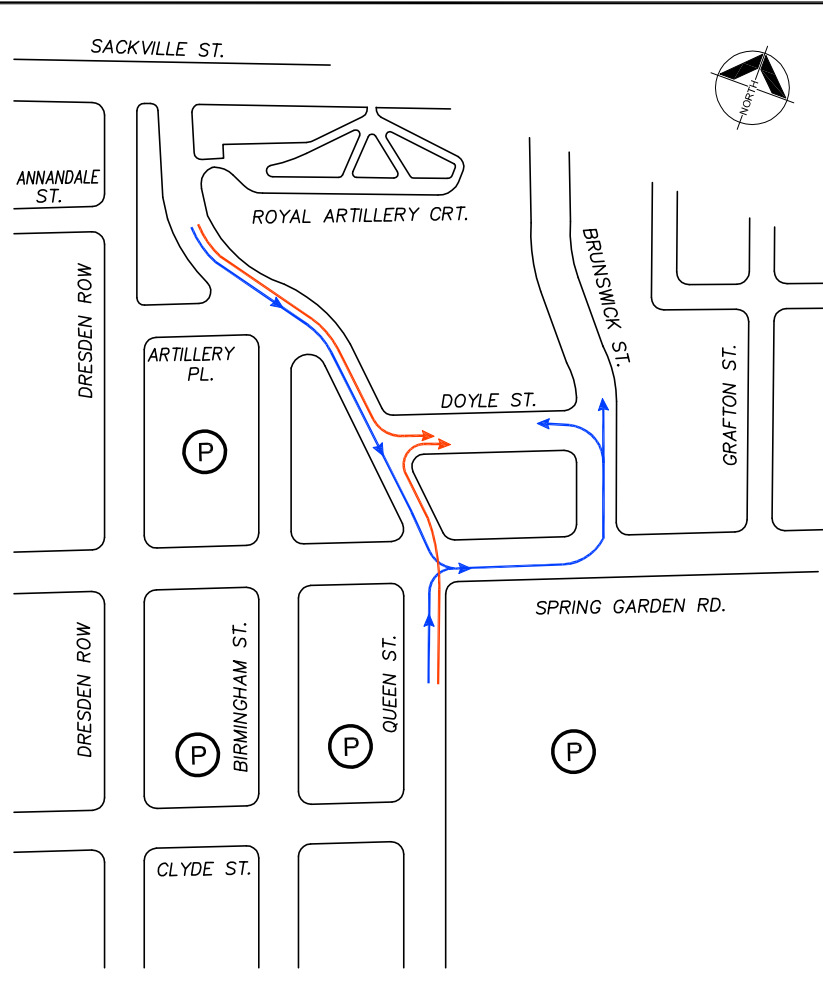
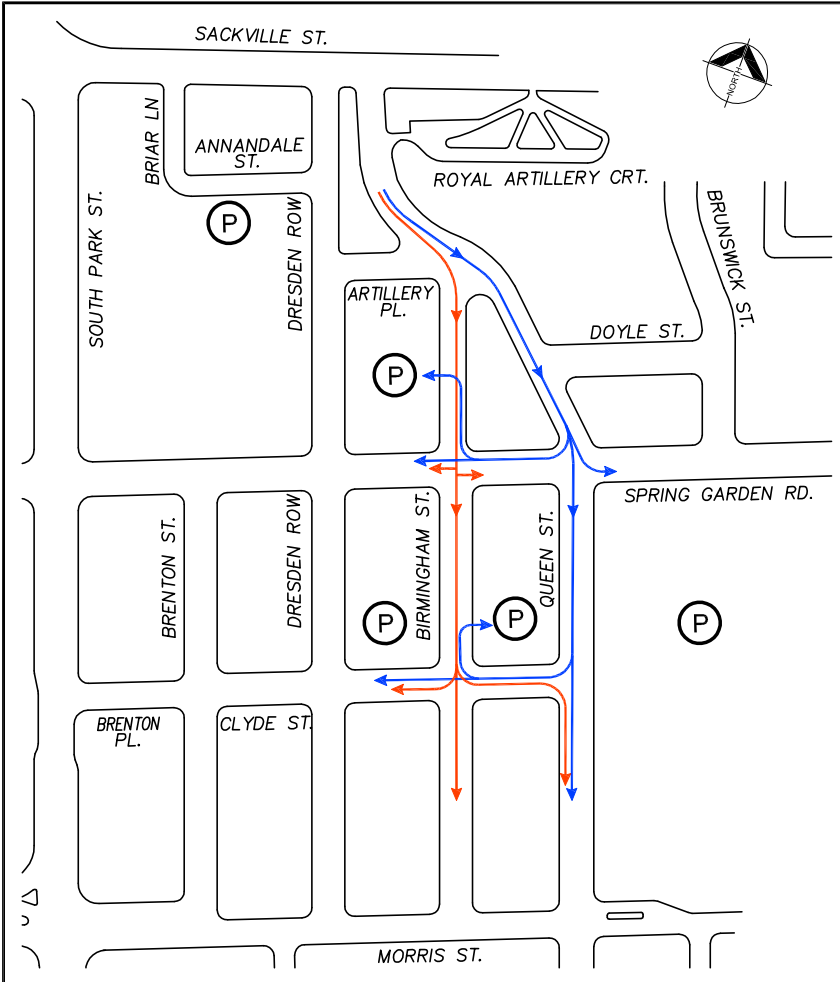
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Transportation Study
Spring Garden Road Area

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SCENARIO C
Redistributed Traffic

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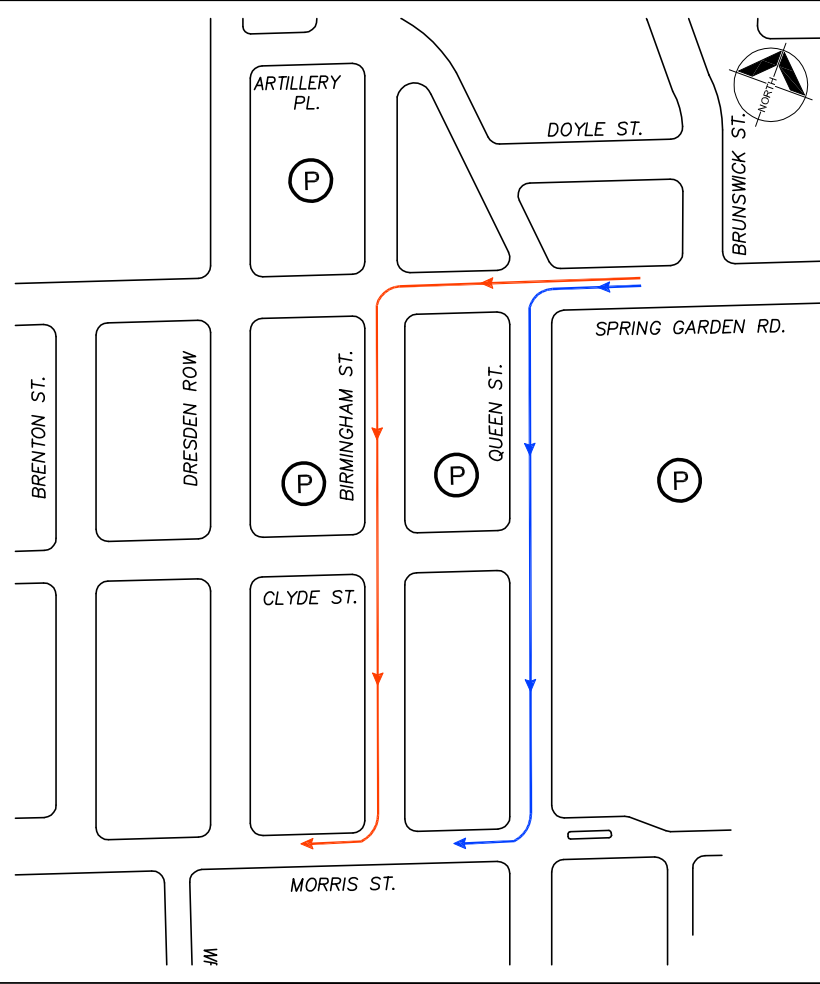
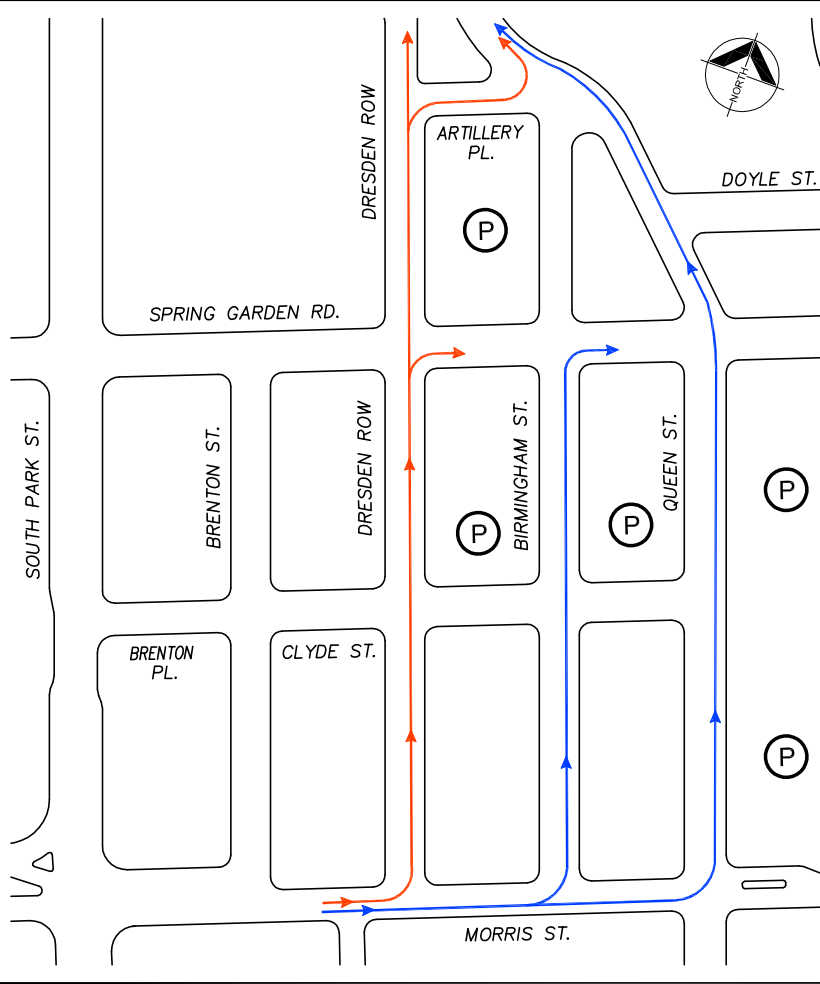
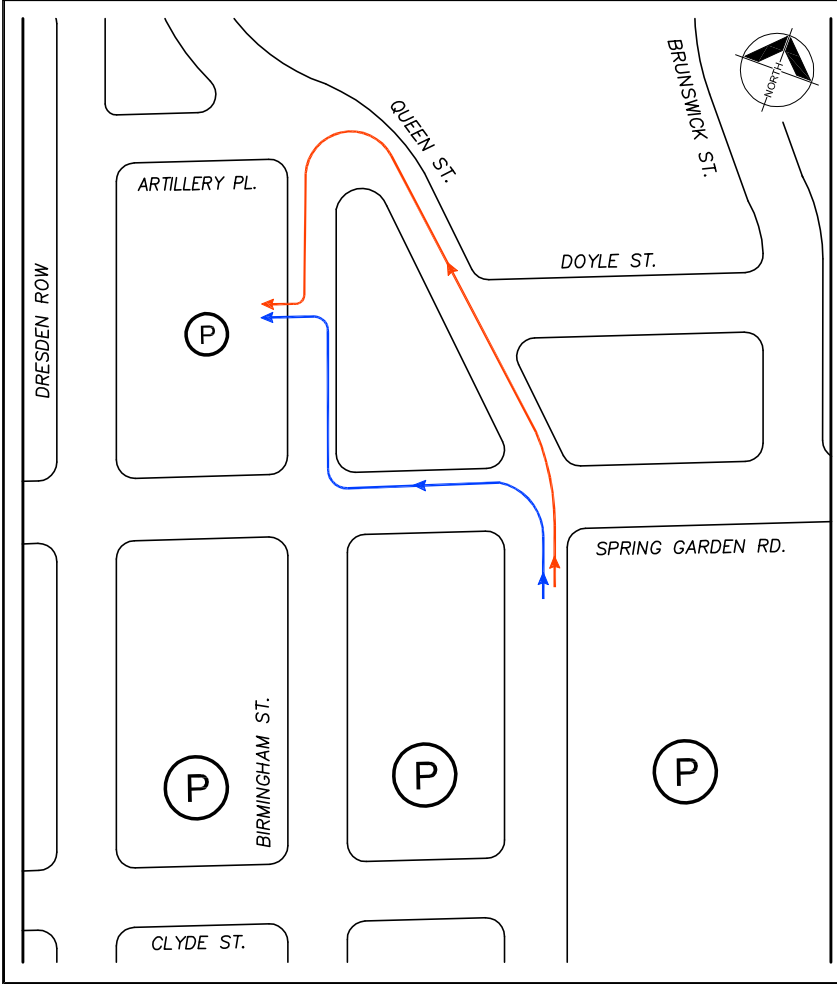
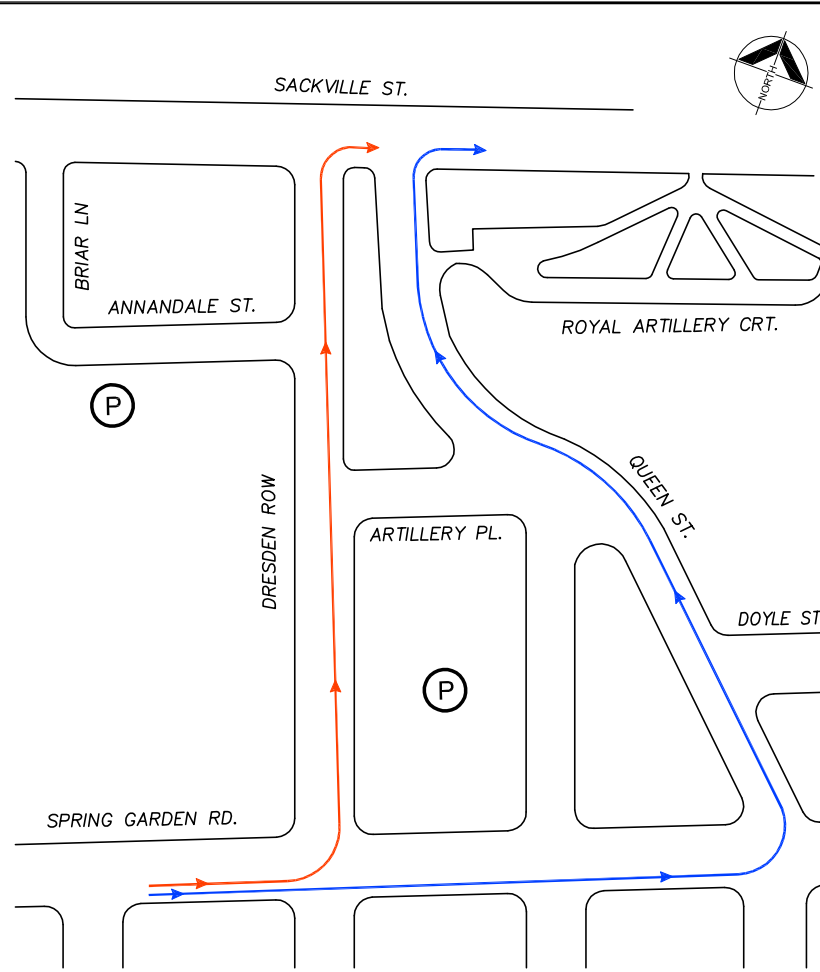
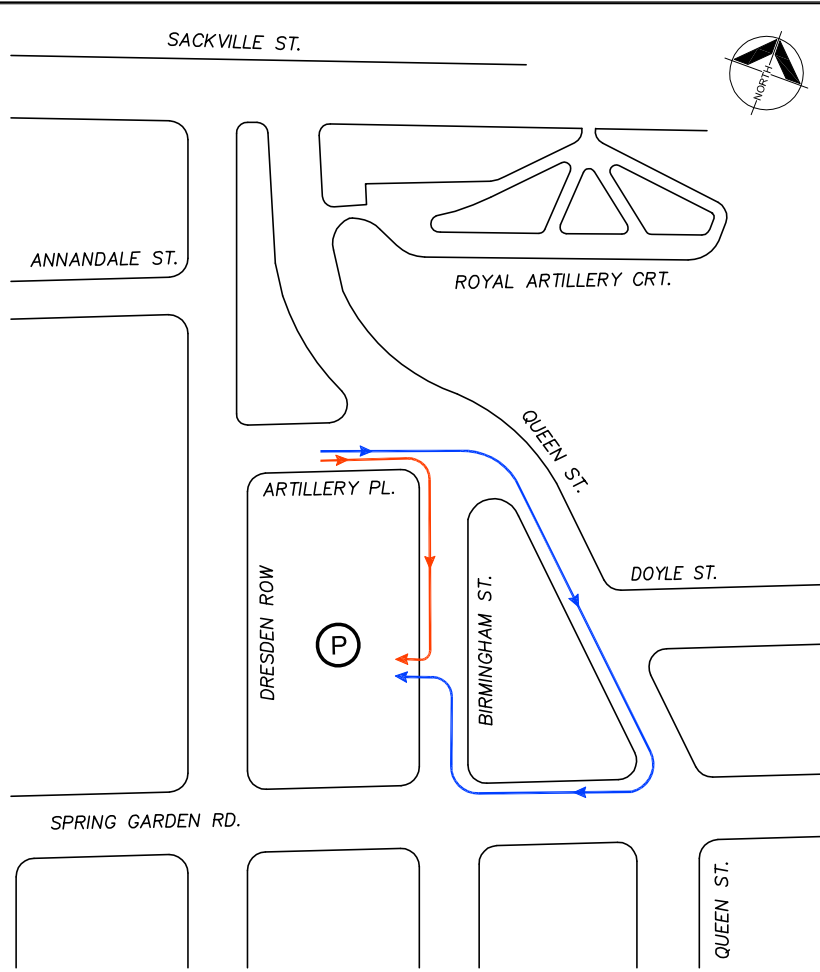
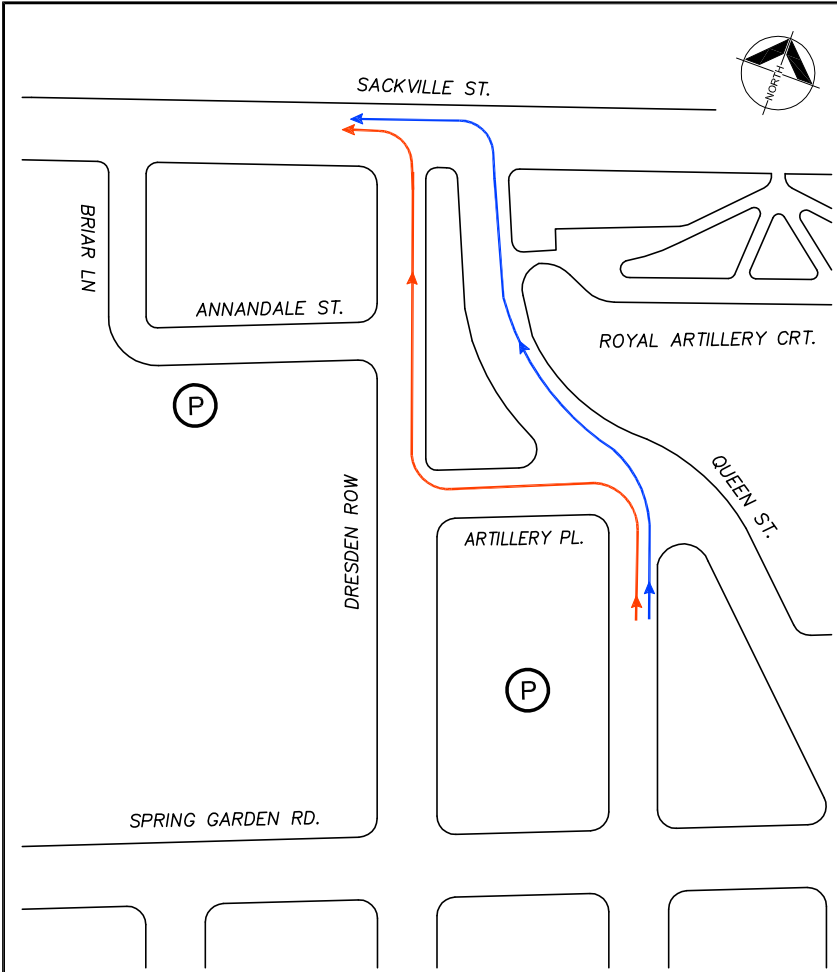
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Spring Garden Road Area

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SCENARIO D
Redistributed Traffic

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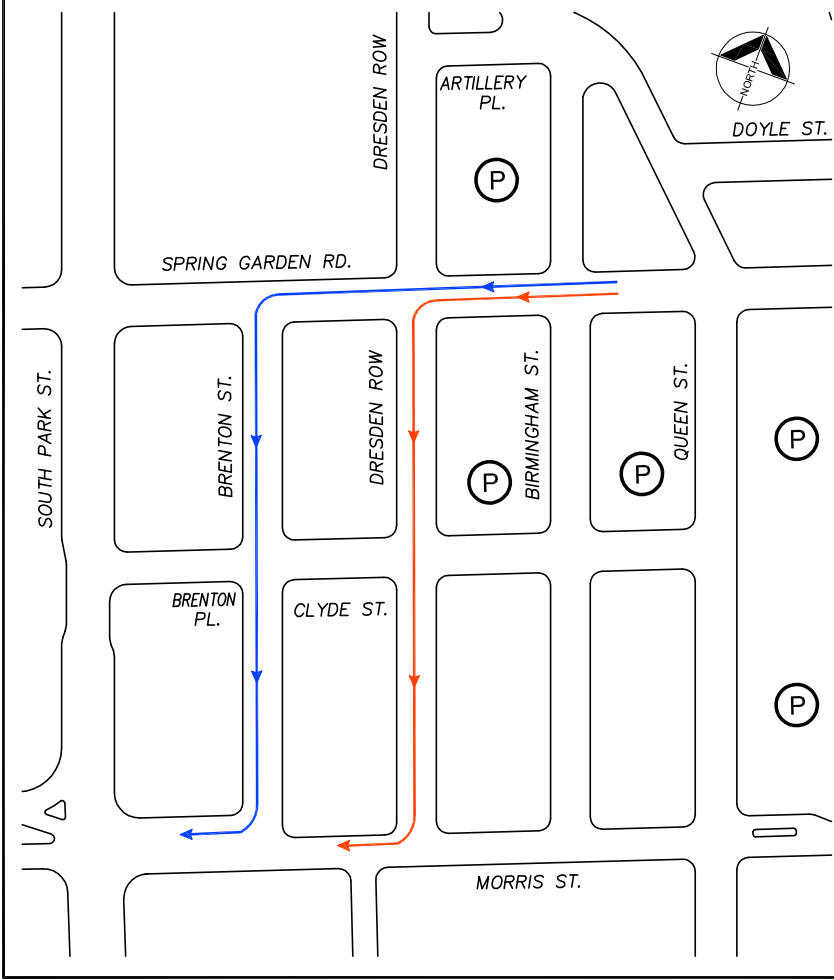
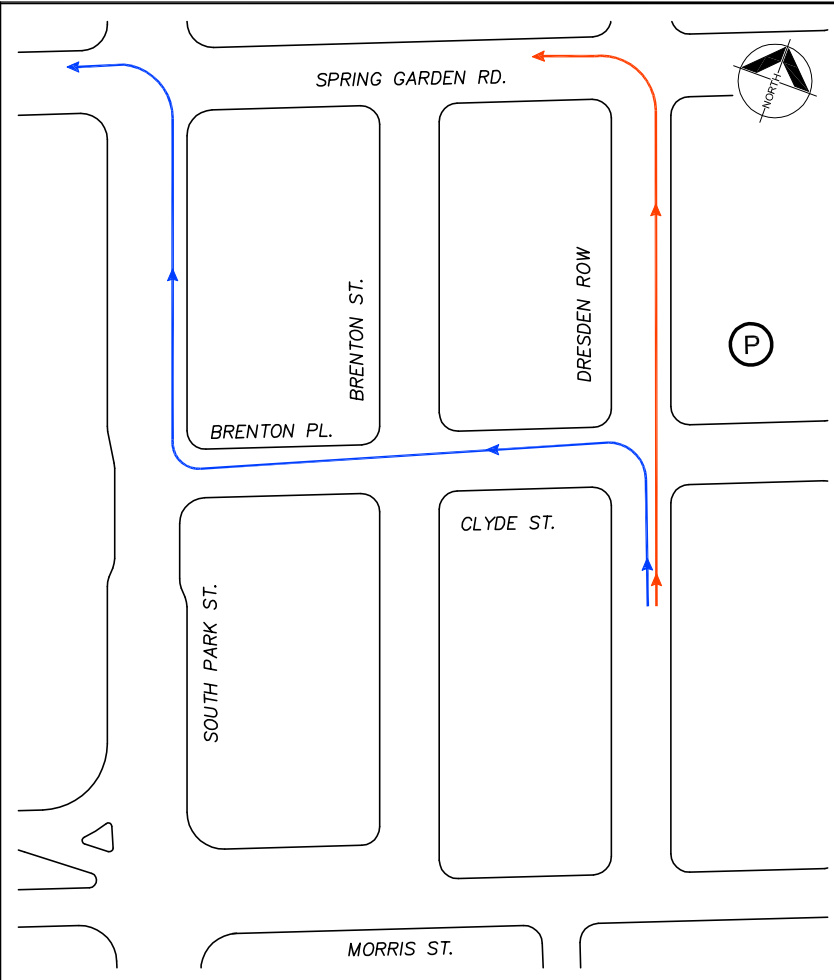
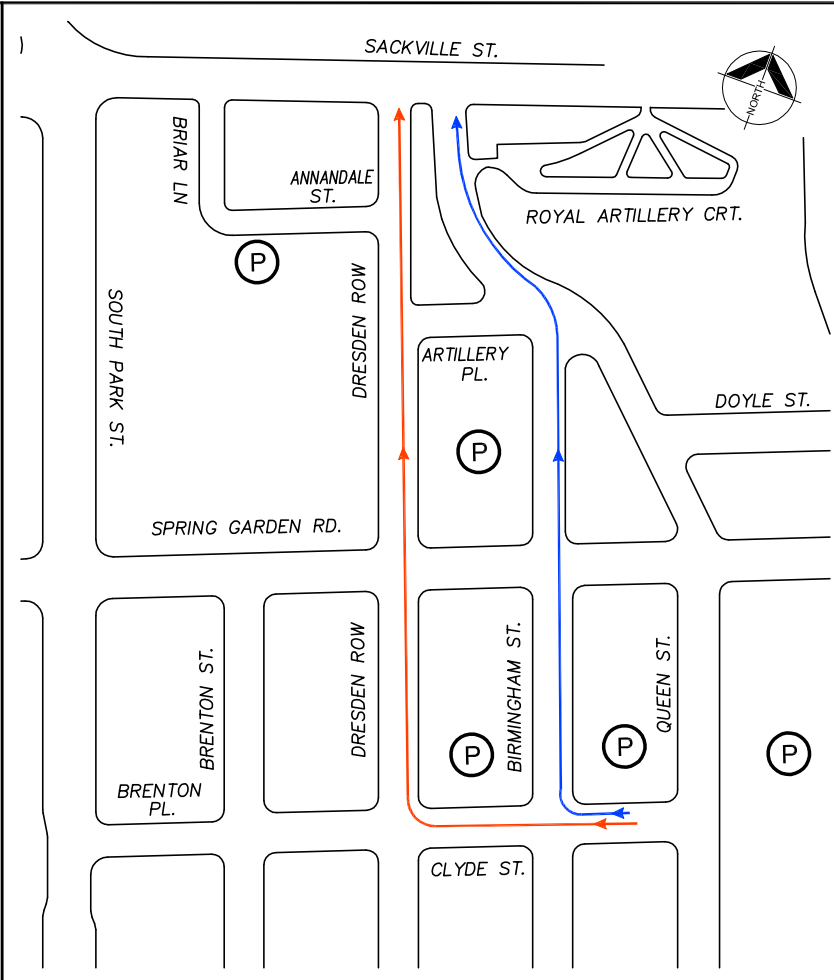
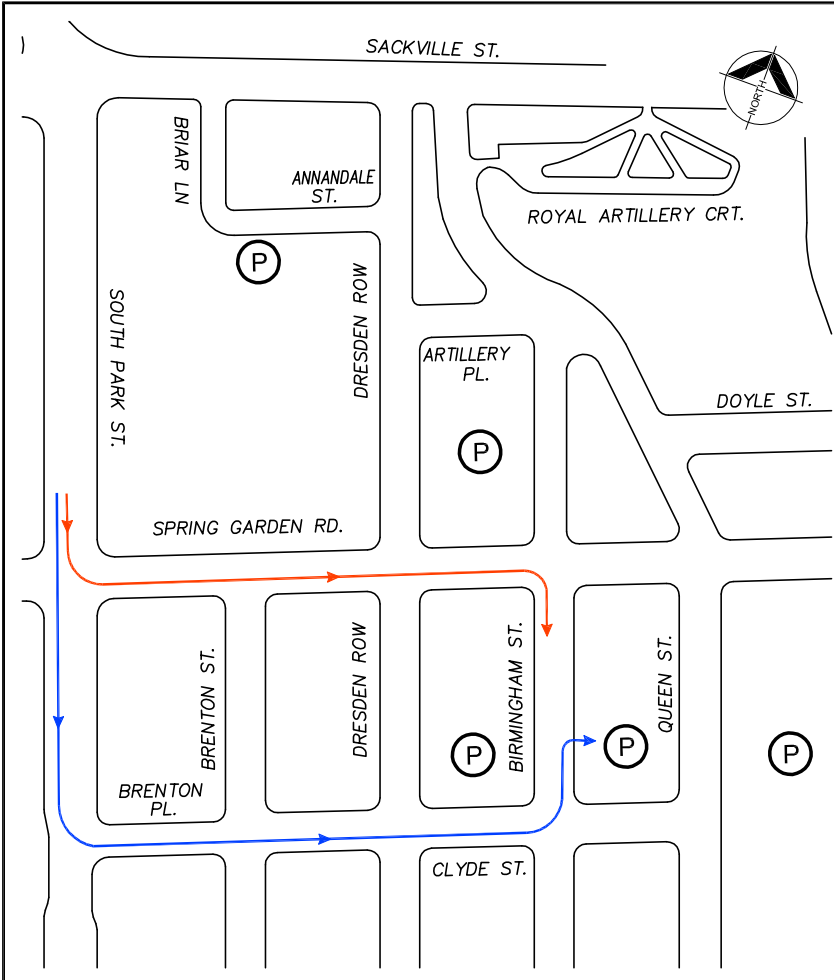
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Spring Garden Road Area

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Appendix B

Intersection Analysis Results

Scenario A with Existing Traffic

2010 AM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay (s)	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	23.4	229	19.9	359	23.0	331	13.6	721
Sackville St. - Dresden Row	0.0	877	3.8	449	78.9	73	-	
Sackville St. - Queen St.	0.0	659	3.2	491	28.1	90	-	
Artillery Pl. - Dresden Row	-		9.4	12	0.0	59	0.8	178
Artillery Pl. - Birmingham St.	2.3	18	0.6	70	5.1	41	1.1	318
Doyle St. - Queen St.	-		11.3	56	0.0	73	0.5	248
Doyle St. - Brunswick St.	9.7	14	-		0.0	64	0.0	139
Spring Garden Rd. - South Park St.	19.7	326	14.1	246	18.5	438	10.9	459
Spring Garden Rd. - Brenton St..	0.0	322	0.9	215	-		-	
Spring Garden Rd. - Dresden Row	10.6	269	8.9	202	15.2	36	15.2	132
Spring Garden Rd. - Birmingham St.	0.8	240	0.4	208	51.6	17	54.3	23
Spring Garden Rd. - Queen St.	7.0	249	11.5	320	21.3	205	26.2	234
Spring Garden Rd. - Brunswick St.	3.8	278	0.0	205	-		59.0	175
Brenton Pl. - South Park St.	-		17.2	68	0.0	376	0.0	432
Clyde St. - Brenton St.	-		10.5	41	7.5	4	0.0	58
Clyde St. - Dresden Row	-		10.2	36	1.7	37	1.6	77
Clyde St. - Birmingham St.	10.0	19	10.1	41	2.0	19	1.1	21
Clyde St. - Queen St.	19.3	18	-		0.5	202	1.9	347
Morris St. - South Park St.	18.7	383	15.9	237	10.2	446	11.4	447
Morris St. - Brenton St.	0.2	312	0.0	215	-		13.5	27
Morris St. - Dresden Row	0.9	319	0.0	203	-		13.1	22
Morris St. - Birmingham St.	0.2	283	0.0	218	-		12.9	29
Morris St. - Queen St.	15.4	291	11.4	199	12.8	200	15.6	299

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	B	C	B
Sackville St. - Dresden Row	A	A	F	-
Sackville St. - Queen St.	A	A	D	-
Artillery Pl. - Dresden Row	-	A	A	A
Artillery Pl. - Birmingham St.	A	A	A	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	A	-	A	A
Spring Garden Rd. - South Park St.	B	B	B	B
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	A	B	B
Spring Garden Rd. - Birmingham St.	A	A	F	F
Spring Garden Rd. - Queen St.	A	B	C	C
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	C	A	A
Clyde St. - Brenton St.	-	B	A	A
Clyde St. - Dresden Row	-	B	A	A
Clyde St. - Birmingham St.	B	B	A	A
Clyde St. - Queen St.	C	-	A	A
Morris St. - South Park St.	B	B	B	B
Morris St. - Brenton St.	A	A	-	B
Morris St. - Dresden Row	A	A	-	B
Morris St. - Birmingham St.	A	A	-	B
Morris St. - Queen St.	C	B	B	C

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.49	1.98	2.11	2.72	8.31
Sackville St. - Dresden Row	0.00	0.47	1.60	-	2.07
Sackville St. - Queen St.	0.00	0.44	0.70	-	1.14
Artillery Pl. - Dresden Row	-	0.03	0.00	0.04	0.07
Artillery Pl. - Birmingham St.	0.01	0.01	0.06	0.10	0.18
Doyle St. - Queen St.	-	0.18	0.00	0.03	0.21
Doyle St. - Brunswick St.	0.04	-	0.00	0.00	0.04
Spring Garden Rd. - South Park St.	1.78	0.96	2.25	1.39	6.39
Spring Garden Rd. - Brenton St..	0.00	0.05	-	-	0.05
Spring Garden Rd. - Dresden Row	0.79	0.50	0.15	0.56	2.00
Spring Garden Rd. - Birmingham St.	0.05	0.02	0.24	0.35	0.67
Spring Garden Rd. - Queen St.	0.48	1.02	1.21	1.70	4.42
Spring Garden Rd. - Brunswick St.	0.29	0.00	-	2.87	3.16
Brenton Pl. - South Park St.	-	0.32	0.00	0.00	0.32
Clyde St. - Brenton St.	-	0.12	0.01	0.00	0.13
Clyde St. - Dresden Row	-	0.10	0.02	0.03	0.15
Clyde St. - Birmingham St.	0.05	0.12	0.01	0.01	0.18
Clyde St. - Queen St.	0.10	-	0.03	0.18	0.31
Morris St. - South Park St.	1.99	1.05	1.26	1.42	5.72
Morris St. - Brenton St.	0.02	0.00	-	0.10	0.12
Morris St. - Dresden Row	0.08	0.00	-	0.08	0.16
Morris St. - Birmingham St.	0.02	0.00	-	0.10	0.12
Morris St. - Queen St.	1.24	0.63	0.71	1.30	3.88

Scenario A - Total Vehicle Hours of Delay (AM)39.81

Legend

Signalized Intersection

Stop-Controlled Intersection

Poor Level of Service

2010 PM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	23.9	212	27.9	626	13.7	661	12.0	457
Sackville St. - Dresden Row	0.0	473	1.7	517	93.7	217	-	
Sackville St. - Queen St.	0.0	646	2.1	540	127.6	304	-	
Artillery Pl. - Dresden Row	-		13.2	48	0.0	138	1.6	224
Artillery Pl. - Birmingham St.	4.3	56	1.1	219	8.9	109	1.3	229
Doyle St. - Queen St.	-		14.0	50	0.0	276	2.0	152
Doyle St. - Brunswick St.	14.4	92	-		0.2	242	0.0	165
Spring Garden Rd. - South Park St.	23.0	310	19.9	328	19.5	645	8.5	380
Spring Garden Rd. - Brenton St..	0.0	396	1.9	331	0.0		-	
Spring Garden Rd. - Dresden Row	15.9	281	11.1	303	17.3	115	19.5	133
Spring Garden Rd. - Birmingham St.	0.7	290	0.6	319	107.3	69	134.7	34
Spring Garden Rd. - Queen St.	10.3	303	16.1	346	24.2	487	18.2	145
Spring Garden Rd. - Brunswick St.	6.4	422	0.0	426	-		163.7	110
Brenton Pl. - South Park St.	-		96.4	272	0.0	473	0.0	246
Clyde St. - Brenton St.	0.0	0	12.6	127	7.6	43	0.0	94
Clyde St. - Dresden Row	0.0	0	12.4	108	1.1	62	1.5	124
Clyde St. - Birmingham St.	12.0	37	12.4	94	1.9	38	1.9	53
Clyde St. - Queen St.	28.2	43	-		1.0	414	0.1	221
Morris St. - South Park St.	21.0	365	19.2	497	13.6	633	10.5	281
Morris St. - Brenton St.	0.6	257	0.0	428	-		15.7	56
Morris St. - Dresden Row	1.5	290	0.0	401	-		16.4	44
Morris St. - Birmingham St.	1.2	239	0.0	395	-		15.1	35
Morris St. - Queen St.	34.0	333	32.3	520	41.4	376	25.9	277

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	C	B	B
Sackville St. - Dresden Row	A	A	F	-
Sackville St. - Queen St.	A	A	F	-
Artillery Pl. - Dresden Row	-	B	A	A
Artillery Pl. - Birmingham St.	A	A	A	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	B	-	A	A
Spring Garden Rd. - South Park St.	C	B	B	A
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	B	B	B
Spring Garden Rd. - Birmingham St.	A	A	F	F
Spring Garden Rd. - Queen St.	B	B	C	B
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	F	A	A
Clyde St. - Brenton St.	-	B	A	A
Clyde St. - Dresden Row	-	B	A	A
Clyde St. - Birmingham St.	B	B	A	A
Clyde St. - Queen St.	D	-	A	A
Morris St. - South Park St.	C	B	B	B
Morris St. - Brenton St.	A	A	-	C
Morris St. - Dresden Row	A	A	-	C
Morris St. - Birmingham St.	A	A	-	C
Morris St. - Queen St.	D	D	E	D

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.41	4.85	2.52	1.52	10.30
Sackville St. - Dresden Row	0.00	0.24	5.65	-	5.89
Sackville St. - Queen St.	0.00	0.32	10.78	-	11.09
Artillery Pl. - Dresden Row	-	0.18	0.00	0.10	0.28
Artillery Pl. - Birmingham St.	0.07	0.07	0.27	0.08	0.49
Doyle St. - Queen St.	-	0.19	0.00	0.08	0.28
Doyle St. - Brunswick St.	0.37	-	0.01	0.00	0.38
Spring Garden Rd. - South Park St.	1.98	1.81	3.49	0.90	8.18
Spring Garden Rd. - Brenton St.	0.00	0.17	-	-	0.17
Spring Garden Rd. - Dresden Row	1.24	0.93	0.55	0.72	3.45
Spring Garden Rd. - Birmingham St.	0.06	0.05	2.06	1.27	3.44
Spring Garden Rd. - Queen St.	0.87	1.55	3.27	0.73	6.42
Spring Garden Rd. - Brunswick St.	0.75	0.00	-	5.00	5.75
Brenton Pl. - South Park St.	-	7.28	0.00	0.00	7.28
Clyde St. - Brenton St.	-	0.44	0.09	0.00	0.54
Clyde St. - Dresden Row	-	0.37	0.02	0.05	0.44
Clyde St. - Birmingham St.	0.12	0.32	0.02	0.03	0.50
Clyde St. - Queen St.	0.34	-	0.12	0.01	0.46
Morris St. - South Park St.	2.13	2.65	2.39	0.82	7.99
Morris St. - Brenton St.	0.04	0.00	-	0.24	0.29
Morris St. - Dresden Row	0.12	0.00	-	0.20	0.32
Morris St. - Birmingham St.	0.08	0.00	-	0.15	0.23
Morris St. - Queen St.	3.15	4.67	4.32	1.99	14.13

Scenario A - Total Vehicle Hours of Delay (PM)88.29

Scenario B with Existing Traffic

2010 AM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	23.4	229	19.9	359	23.0	331	13.6	721
Sackville St. - Dresden Row	0.0	877	3.8	449	75.7	56	-	
Sackville St. - Queen St.	0.0	642	3.2	491	26.0	107	-	
Artillery Pl. - Dresden Row	-		9.3	12	0.0	42	0.8	178
Artillery Pl. - Birmingham St.	6.0	21	1.3	94	7.5	49	1.3	333
Doyle St. - Queen St.	-		11.4	56	0.0	90	0.5	248
Doyle St. - Brunswick St.	9.7	14	-		0.0	64	0.0	139
Spring Garden Rd. - South Park St.	19.7	326	14.1	246	18.5	438	10.9	459
Spring Garden Rd. - Brenton St..	0.0	322	0.9	215	-		-	
Spring Garden Rd. - Dresden Row	11.1	269	9.1	190	15.4	36	15.2	132
Spring Garden Rd. - Birmingham St.	1.1	257	0.6	196	35.9	17	44.8	23
Spring Garden Rd. - Queen St.	8.4	266	11.7	332	21.3	205	26.3	234
Spring Garden Rd. - Brunswick St.	3.8	278	0.0	205	-		59.0	175
Brenton Pl. - South Park St.	-		17.2	68	0.0	376	0.0	432
Clyde St. - Brenton St.	-		10.5	41	7.5	4	0.0	58
Clyde St. - Dresden Row	-		10.0	48	1.7	37	1.6	77
Clyde St. - Birmingham St.	10.1	19	10.1	41	2.0	19	0.7	33
Clyde St. - Queen St.	19.3	18	-	-	0.5	202	1.9	347
Morris St. - South Park St.	18.7	383	15.9	237	10.2	446	11.4	447
Morris St. - Brenton St.	0.2	312	0.0	215	-		13.5	27
Morris St. - Dresden Row	0.9	319	0.0	203	-		13.1	22
Morris St. - Birmingham St.	0.2	283	0.0	218	-		12.9	29
Morris St. - Queen St.	15.4	300	11.4	211	12.8	225	15.6	315

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	B	C	B
Sackville St. - Dresden Row	A	A	F	-
Sackville St. - Queen St.	A	A	D	-
Artillery Pl. - Dresden Row	-	A	A	A
Artillery Pl. - Birmingham St.	A	A	A	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	A	-	A	A
Spring Garden Rd. - South Park St.	B	B	B	B
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	A	B	B
Spring Garden Rd. - Birmingham St.	A	A	E	E
Spring Garden Rd. - Queen St.	A	B	C	C
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	C	A	A
Clyde St. - Brenton St.	-	B	A	A
Clyde St. - Dresden Row	-	B	A	A
Clyde St. - Birmingham St.	B	B	A	A
Clyde St. - Queen St.	C	-	A	A
Morris St. - South Park St.	B	B	B	B
Morris St. - Brenton St.	A	A	-	B
Morris St. - Dresden Row	A	A	-	B
Morris St. - Birmingham St.	A	A	-	B
Morris St. - Queen St.	C	B	B	C

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.49	1.98	2.11	2.72	8.31
Sackville St. - Dresden Row	0.00	0.47	1.18	-	1.65
Sackville St. - Queen St.	0.00	0.44	0.77	-	1.21
Artillery Pl. - Dresden Row	-	0.03	0.00	0.04	0.07
Artillery Pl. - Birmingham St.	0.04	0.03	0.10	0.12	0.29
Doyle St. - Queen St.	-	0.18	0.00	0.03	0.21
Doyle St. - Brunswick St.	0.04	-	0.00	0.00	0.04
Spring Garden Rd. - South Park St.	1.78	0.96	2.25	1.39	6.39
Spring Garden Rd. - Brenton St..	0.00	0.05	-	-	0.05
Spring Garden Rd. - Dresden Row	0.83	0.48	0.15	0.56	2.02
Spring Garden Rd. - Birmingham St.	0.08	0.03	0.17	0.29	0.57
Spring Garden Rd. - Queen St.	0.62	1.08	1.21	1.71	4.62
Spring Garden Rd. - Brunswick St.	0.29	0.00	-	2.87	3.16
Brenton Pl. - South Park St.	-	0.32	0.00	0.00	0.32
Clyde St. - Brenton St.	-	0.12	0.01	0.00	0.13
Clyde St. - Dresden Row	-	0.13	0.02	0.03	0.19
Clyde St. - Birmingham St.	0.05	0.12	0.01	0.01	0.19
Clyde St. - Queen St.	0.10	-	0.03	0.18	0.31
Morris St. - South Park St.	1.99	1.05	1.26	1.42	5.72
Morris St. - Brenton St.	0.02	0.00	-	0.10	0.12
Morris St. - Dresden Row	0.08	0.00	-	0.08	0.16
Morris St. - Birmingham St.	0.02	0.00	-	0.10	0.12
Morris St. - Queen St.	1.28	0.67	0.80	1.37	4.12

Scenario B - Total Vehicle Hours of Delay (AM)	39.96
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Legend

Signalized Intersection	Stop-Controlled Intersection	Poor Level of Service
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2010 PM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	23.9	212	27.9	626	13.8	661	12.0	457
Sackville St. - Dresden Row	0.0	473	1.7	517	83.4	198	-	
Sackville St. - Queen St.	0.0	627	2.0	540	80.3	323	-	
Artillery Pl. - Dresden Row	-		12.9	45	0.0	119	1.6	206
Artillery Pl. - Birmingham St.	4.7	63	1.6	244	11.7	119	1.4	231
Doyle St. - Queen St.	-		14.3	50	0.0	295	2.1	152
Doyle St. - Brunswick St.	14.4	92	-		0.2	242	0.0	165
Spring Garden Rd. - South Park St.	23.0	310	19.9	328	19.5	645	8.5	380
Spring Garden Rd. - Brenton St..	0.0	396	1.9	331	-		-	
Spring Garden Rd. - Dresden Row	16.8	281	11.3	285	17.4	115	19.5	133
Spring Garden Rd. - Birmingham St.	1.4	309	1.1	301	74.2	69	94.1	34
Spring Garden Rd. - Queen St.	11.9	322	16.3	364	24.2	487	17.9	145
Spring Garden Rd. - Brunswick St.	6.4	422	0.0	426	-		151.9	110
Brenton Pl. - South Park St.	-		96.4	272	0.0	473	0.0	246
Clyde St. - Brenton St.	-		12.6	127	7.6	43	0.0	94
Clyde St. - Dresden Row	-		12.4	126	1.1	62	1.5	124
Clyde St. - Birmingham St.	12.1	37	12.7	112	1.9	38	1.9	53
Clyde St. - Queen St.	28.7	43	-		1.0	414	0.1	239
Morris St. - South Park St.	20.9	365	19.2	497	13.7	633	10.5	281
Morris St. - Brenton St.	0.6	257	0.0	428	-		15.7	56
Morris St. - Dresden Row	1.5	290	0.0	401	-		16.4	44
Morris St. - Birmingham St.	1.2	239	0.0	395	-		15.1	35
Morris St. - Queen St.	34.0	333	32.3	520	41.4	376	25.9	277

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	C	B	B
Sackville St. - Dresden Row	A	A	F	-
Sackville St. - Queen St.	A	A	F	-
Artillery Pl. - Dresden Row	-	B	A	A
Artillery Pl. - Birmingham St.	A	A	B	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	B	-	A	A
Spring Garden Rd. - South Park St.	C	B	B	A
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	B	B	B
Spring Garden Rd. - Birmingham St.	A	A	F	F
Spring Garden Rd. - Queen St.	B	B	C	B
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	F	A	A
Clyde St. - Brenton St.	-	B	A	A
Clyde St. - Dresden Row	F	B	A	A
Clyde St. - Birmingham St.	B	B	A	A
Clyde St. - Queen St.	D	-	A	A
Morris St. - South Park St.	C	B	B	B
Morris St. - Brenton St.	A	A	-	C
Morris St. - Dresden Row	A	A	-	C
Morris St. - Birmingham St.	A	A	-	C
Morris St. - Queen St.	D	D	E	D

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.41	4.85	2.53	1.52	10.32
Sackville St. - Dresden Row	0.00	0.24	4.59	-	4.83
Sackville St. - Queen St.	0.00	0.30	7.20	-	7.50
Artillery Pl. - Dresden Row	-	0.16	0.00	0.09	0.25
Artillery Pl. - Birmingham St.	0.08	0.11	0.39	0.09	0.67
Doyle St. - Queen St.	-	0.20	0.00	0.09	0.29
Doyle St. - Brunswick St.	0.37	-	0.01	0.00	0.38
Spring Garden Rd. - South Park St.	1.98	1.81	3.49	0.90	8.18
Spring Garden Rd. - Brenton St..	0.00	0.17	-	-	0.17
Spring Garden Rd. - Dresden Row	1.31	0.89	0.56	0.72	3.48
Spring Garden Rd. - Birmingham St.	0.12	0.09	1.42	0.89	2.52
Spring Garden Rd. - Queen St.	1.06	1.65	3.27	0.72	6.71
Spring Garden Rd. - Brunswick St.	0.75	0.00	-	4.64	5.39
Brenton Pl. - South Park St.	-	7.28	0.00	0.00	7.28
Clyde St. - Brenton St.	-	0.44	0.09	0.00	0.54
Clyde St. - Dresden Row	-	0.43	0.02	0.05	0.50
Clyde St. - Birmingham St.	0.12	0.40	0.02	0.03	0.57
Clyde St. - Queen St.	0.34	-	0.12	0.01	0.46
Morris St. - South Park St.	2.12	2.65	2.41	0.82	8.00
Morris St. - Brenton St.	0.04	0.00	-	0.24	0.29
Morris St. - Dresden Row	0.12	0.00	-	0.20	0.32
Morris St. - Birmingham St.	0.08	0.00	-	0.15	0.23
Morris St. - Queen St.	3.15	4.67	4.32	1.99	14.13

Scenario B - Total Vehicle Hours of Delay (PM)	83.02
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Scenario C with Existing Traffic

2010 AM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	23.4	229	18.1	359	23.0	331	13.6	721
Sackville St. - Dresden Row	0.0	877	3.9	484	-		-	
Sackville St. - Queen St.	13.2	659	4.1	491	28.4	180	-	
Artillery Pl. - Dresden Row	-		-		-		1.3	195
Artillery Pl. - Birmingham St.	2.6	31	0.4	110	3.4	120	0.7	247
Doyle St. - Queen St.	-		12.2	56	0.0	91	0.0	345
Doyle St. - Brunswick St.	-		-	-	1.3	92	0.0	139
Spring Garden Rd. - South Park St.	19.7	326	14.1	246	18.5	438	10.9	459
Spring Garden Rd. - Brenton St..	0.0	316	0.8	212	-		-	
Spring Garden Rd. - Dresden Row	10.2	263	9.3	194	-		15.6	132
Spring Garden Rd. - Birmingham St.	0.7	242	0.0	298	35.6	43	-	
Spring Garden Rd. - Queen St.	7.1	261	11.5	320	21.9	228	32.5	346
Spring Garden Rd. - Brunswick St.	4.7	306	0.0	205	-		71.7	175
Brenton Pl. - South Park St.	-		17.4	71	0.0	376	0.3	441
Clyde St. - Brenton St.	10.5	6	11.0	44	7.7	4	0.0	58
Clyde St. - Dresden Row	11.4	6	11.5	19	1.8	49	1.4	87
Clyde St. - Birmingham St.	10.0	25	9.5	47	1.3	28	-	
Clyde St. - Queen St.	20.9	15	-		0.5	225	1.9	358
Morris St. - South Park St.	18.7	383	15.9	237	10.2	446	11.2	447
Morris St. - Brenton St.	0.2	312	0.0	215	-		13.4	27
Morris St. - Dresden Row	0.6	342	0.0	193	-		12.6	32
Morris St. - Birmingham St.	0.5	315	0.0	218	-		13.8	17
Morris St. - Queen St.	16.7	322	11.6	211	13.1	225	16.1	317

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	B	C	B
Sackville St. - Dresden Row	A	A	-	-
Sackville St. - Queen St.	B	A	C	-
Artillery Pl. - Dresden Row	-	-	-	A
Artillery Pl. - Birmingham St.	A	A	A	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	-	-	A	A
Spring Garden Rd. - South Park St.	B	B	B	B
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	A	-	B
Spring Garden Rd. - Birmingham St.	A	A	E	-
Spring Garden Rd. - Queen St.	A	B	C	C
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	C	A	A
Clyde St. - Brenton St.	B	B	A	A
Clyde St. - Dresden Row	B	B	A	A
Clyde St. - Birmingham St.	B	A	A	-
Clyde St. - Queen St.	C	-	A	A
Morris St. - South Park St.	B	B	B	B
Morris St. - Brenton St.	A	A	-	B
Morris St. - Dresden Row	A	A	-	B
Morris St. - Birmingham St.	A	A	-	B
Morris St. - Queen St.	C	B	B	C

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.49	1.80	2.11	2.72	8.13
Sackville St. - Dresden Row	0.00	0.52	-	-	0.52
Sackville St. - Queen St.	2.42	0.56	1.42	-	4.40
Artillery Pl. - Dresden Row	-	-	-	0.07	0.07
Artillery Pl. - Birmingham St.	0.02	0.01	0.11	0.05	0.20
Doyle St. - Queen St.	-	0.19	0.00	0.00	0.19
Doyle St. - Brunswick St.	-	-	0.03	0.00	0.03
Spring Garden Rd. - South Park St.	1.78	0.96	2.25	1.39	6.39
Spring Garden Rd. - Brenton St..	0.00	0.05	-	-	0.05
Spring Garden Rd. - Dresden Row	0.75	0.50	-	0.57	1.82
Spring Garden Rd. - Birmingham St.	0.05	0.00	0.43	-	0.47
Spring Garden Rd. - Queen St.	0.51	1.02	1.39	3.12	6.05
Spring Garden Rd. - Brunswick St.	0.40	0.00	-	3.49	3.88
Brenton Pl. - South Park St.	-	0.34	0.00	0.04	0.38
Clyde St. - Brenton St.	0.02	0.13	0.01	0.00	0.16
Clyde St. - Dresden Row	0.02	0.06	0.02	0.03	0.14
Clyde St. - Birmingham St.	0.07	0.12	0.01	-	0.20
Clyde St. - Queen St.	0.09	-	0.03	0.19	0.31
Morris St. - South Park St.	1.99	1.05	1.26	1.39	5.69
Morris St. - Brenton St.	0.02	0.00	-	0.10	0.12
Morris St. - Dresden Row	0.06	0.00	-	0.11	0.17
Morris St. - Birmingham St.	0.04	0.00	-	0.07	0.11
Morris St. - Queen St.	1.49	0.68	0.82	1.42	4.41

Scenario C - Total Vehicle Hours of Delay (AM)	43.89
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Legend

Signalized Intersection	Stop-Controlled Intersection	Poor Level of Service
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2010 PM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	23.9	212	27.2	626	13.8	661	12.0	457
Sackville St. - Dresden Row	0.0	473	2.1	584	-		-	
Sackville St. - Queen St.	14.1	646	11.7	540	34.6	512	-	
Artillery Pl. - Dresden Row	-		-		-		3.5	322
Artillery Pl. - Birmingham St.	5.8	219	0.5	230	12.7	178	0.9	105
Doyle St. - Queen St.	-		12.9	50	0.0	258	0.0	226
Doyle St. - Brunswick St.	-		-		1.1	350	0.0	165
Spring Garden Rd. - South Park St.	24.7	310	18.6	303	18.6	670	7.9	380
Spring Garden Rd. - Brenton St..	0.0	383	1.2	306	-		-	
Spring Garden Rd. - Dresden Row	14.2	268	11.0	298	-		19.5	133
Spring Garden Rd. - Birmingham St.	0.6	279	0.0	392	95.8	117	-	
Spring Garden Rd. - Queen St.	12.1	320	16.1	346	29.9	533	22.6	252
Spring Garden Rd. - Brunswick St.	6.4	422	0.0	426	-		574.6	110
Brenton Pl. - South Park St.	-		125.0	297	0.0	473	0.6	260
Clyde St. - Brenton St.	10.9	13	13.4	152	7.6	43	0.0	94
Clyde St. - Dresden Row	12.1	13	13.5	77	6.5	41	1.3	141
Clyde St. - Birmingham St.	12.1	50	11.5	117	1.3	55	-	
Clyde St. - Queen St.	37.6	30	-		1.0	460	0.1	228
Morris St. - South Park St.	21.0	365	19.2	497	13.8	633	10.3	281
Morris St. - Brenton St.	0.6	257	0.0	428	-		15.7	56
Morris St. - Dresden Row	0.8	336	0.0	384	-		16.1	61
Morris St. - Birmingham St.	1.6	302	0.0	395	-		21.1	47
Morris St. - Queen St.	71.8	428	37.3	520	49.7	376	24.7	234

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	C	B	B
Sackville St. - Dresden Row	A	A	-	-
Sackville St. - Queen St.	B	B	C	-
Artillery Pl. - Dresden Row	-	-	-	A
Artillery Pl. - Birmingham St.	A	A	B	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	-	-	A	A
Spring Garden Rd. - South Park St.	C	B	B	A
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	B	-	B
Spring Garden Rd. - Birmingham St.	A	A	F	-
Spring Garden Rd. - Queen St.	B	B	C	C
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	F	A	A
Clyde St. - Brenton St.	B	B	A	A
Clyde St. - Dresden Row	B	B	A	A
Clyde St. - Birmingham St.	B	B	A	-
Clyde St. - Queen St.	E	-	A	A
Morris St. - South Park St.	C	B	B	B
Morris St. - Brenton St.	A	A	-	C
Morris St. - Dresden Row	A	A	-	C
Morris St. - Birmingham St.	A	A	-	C
Morris St. - Queen St.	F	E	E	C

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.41	4.73	2.53	1.52	10.19
Sackville St. - Dresden Row	0.00	0.34	-	-	0.34
Sackville St. - Queen St.	2.53	1.76	4.92	-	9.21
Artillery Pl. - Dresden Row	-	-	-	0.31	0.31
Artillery Pl. - Birmingham St.	0.35	0.03	0.63	0.03	1.04
Doyle St. - Queen St.	-	0.18	0.00	0.00	0.18
Doyle St. - Brunswick St.	-	-	0.11	0.00	0.11
Spring Garden Rd. - South Park St.	2.13	1.57	3.46	0.83	7.99
Spring Garden Rd. - Brenton St..	0.00	0.10	-	-	0.10
Spring Garden Rd. - Dresden Row	1.06	0.91	-	0.72	2.69
Spring Garden Rd. - Birmingham St.	0.05	0.00	3.11	-	3.16
Spring Garden Rd. - Queen St.	1.08	1.55	4.43	1.58	8.63
Spring Garden Rd. - Brunswick St.	0.75	0.00	-	17.56	18.31
Brenton Pl. - South Park St.	-	10.31	0.00	0.04	10.36
Clyde St. - Brenton St.	0.04	0.57	0.09	0.00	0.70
Clyde St. - Dresden Row	0.04	0.29	0.07	0.05	0.46
Clyde St. - Birmingham St.	0.17	0.37	0.02	-	0.56
Clyde St. - Queen St.	0.31	-	0.13	0.01	0.45
Morris St. - South Park St.	2.13	2.65	2.43	0.80	8.01
Morris St. - Brenton St.	0.04	0.00	-	0.24	0.29
Morris St. - Dresden Row	0.07	0.00	-	0.27	0.35
Morris St. - Birmingham St.	0.13	0.00	-	0.28	0.41
Morris St. - Queen St.	8.54	5.39	5.19	1.61	20.72

Scenario C - Total Vehicle Hours of Delay (PM)	104.55
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Scenario D with Existing Traffic

2010 AM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	22.5	229	20.4	359	20.2	331	15.0	721
Sackville St. - Dresden Row	0.0	753	3.9	484	0.0	0	-	
Sackville St. - Queen St.	12.2	659	6.9	491	31.0	180	-	
Artillery Pl. - Dresden Row	-		-		-		1.3	195
Artillery Pl. - Birmingham St.	3.1	22	0.3	112	2.6	127	0.7	216
Doyle St. - Queen St.	-		12.2	56	0.0	91	0.0	345
Doyle St. - Brunswick St.	-		-		1.3	92	0.0	139
Spring Garden Rd. - South Park St.	18.0	326	13.5	243	19.5	441	11.9	459
Spring Garden Rd. - Brenton St.	0.0	316	1.3	224	-		-	
Spring Garden Rd. - Dresden Row	6.5	263	6.4	184	-		23.8	132
Spring Garden Rd. - Birmingham St.	0.9	242	0.0	288	31.3	43	-	
Spring Garden Rd. - Queen St.	7.0	261	11.6	320	21.9	228	31.3	346
Spring Garden Rd. - Brunswick St.	4.7	306	0.0	205	-		71.7	175
Brenton Pl. - South Park St.	-		17.5	71	0.0	376	0.3	441
Clyde St. - Brenton St.	10.6	6	11.1	44	7.8	4	0.0	70
Clyde St. - Dresden Row	10.9	6	11.1	19	5.0	17	1.9	65
Clyde St. - Birmingham St.	10.0	25	9.5	47	1.3	28	-	
Clyde St. - Queen St.	21.1	15	-		0.5	225	1.9	368
Morris St. - South Park St.	20.3	383	15.9	237	10.2	446	10.8	447
Morris St. - Brenton St.	0.2	312	0.0	203	-		12.6	39
Morris St. - Dresden Row	0.6	342	0.0	203	-		15.1	10
Morris St. - Birmingham St.	0.5	315	0.0	228	-		13.9	17
Morris St. - Queen St.	16.9	312	11.6	199	13.2	200	16.6	311

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	C	C	C	B
Sackville St. - Dresden Row	A	A	A	-
Sackville St. - Queen St.	B	A	C	-
Artillery Pl. - Dresden Row	-	-	-	A
Artillery Pl. - Birmingham St.	A	A	A	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	-	-	A	A
Spring Garden Rd. - South Park St.	B	B	B	B
Spring Garden Rd. - Brenton St.	A	A	-	-
Spring Garden Rd. - Dresden Row	A	A	-	C
Spring Garden Rd. - Birmingham St.	A	A	D	-
Spring Garden Rd. - Queen St.	A	B	C	C
Spring Garden Rd. - Brunswick St.	A	A	-	F
Brenton Pl. - South Park St.	-	C	A	A
Clyde St. - Brenton St.	B	B	A	A
Clyde St. - Dresden Row	B	B	A	A
Clyde St. - Birmingham St.	B	A	A	-
Clyde St. - Queen St.	C	-	A	A
Morris St. - South Park St.	C	B	B	B
Morris St. - Brenton St.	A	A	-	B
Morris St. - Dresden Row	A	A	-	C
Morris St. - Birmingham St.	A	A	-	B
Morris St. - Queen St.	C	B	B	C

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.43	2.03	1.86	3.00	8.33
Sackville St. - Dresden Row	0.00	0.52	0.00	-	0.52
Sackville St. - Queen St.	2.23	0.94	1.55	-	4.72
Artillery Pl. - Dresden Row	-	-	-	0.07	0.07
Artillery Pl. - Birmingham St.	0.02	0.01	0.09	0.04	0.16
Doyle St. - Queen St.	-	0.19	0.00	0.00	0.19
Doyle St. - Brunswick St.	-	-	0.03	0.00	0.03
Spring Garden Rd. - South Park St.	1.63	0.91	2.39	1.52	6.45
Spring Garden Rd. - Brenton St.	0.00	0.08	-	-	0.08
Spring Garden Rd. - Dresden Row	0.47	0.33	-	0.87	1.67
Spring Garden Rd. - Birmingham St.	0.06	0.00	0.37	-	0.43
Spring Garden Rd. - Queen St.	0.51	1.03	1.39	3.01	5.93
Spring Garden Rd. - Brunswick St.	0.40	0.00	-	3.49	3.88
Brenton Pl. - South Park St.	-	0.35	0.00	0.04	0.38
Clyde St. - Brenton St.	0.02	0.14	0.01	0.00	0.16
Clyde St. - Dresden Row	0.02	0.06	0.02	0.03	0.13
Clyde St. - Birmingham St.	0.07	0.12	0.01	-	0.20
Clyde St. - Queen St.	0.09	-	0.03	0.19	0.31
Morris St. - South Park St.	2.16	1.05	1.26	1.34	5.81
Morris St. - Brenton St.	0.02	0.00	-	0.14	0.15
Morris St. - Dresden Row	0.06	0.00	-	0.04	0.10
Morris St. - Birmingham St.	0.04	0.00	-	0.07	0.11
Morris St. - Queen St.	1.46	0.64	0.73	1.43	4.27

Scenario D - Total Vehicle Hours of Delay (AM)	44.13
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Legend

Signalized Intersection

Stop-Controlled Intersection

Poor Level of Service

2010 PM

Intersection	Approach							
	EB		WB		NB		SB	
	Delay	Volume	Delay	Volume	Delay	Volume	Delay	Volume
Sackville St. - South Park St.	19.5	212	18.1	626	22.3	661	17.7	457
Sackville St. - Dresden Row	0.0	473	2.1	584	-		-	
Sackville St. - Queen St.	14.5	646	9.7	540	35.1	512	-	
Artillery Pl. - Dresden Row	-		-		-		3.5	322
Artillery Pl. - Birmingham St.	8.0	114	0.9	246	21.9	158	1.2	209
Doyle St. - Queen St.	-		12.9	50	0.0	258	0.0	226
Doyle St. - Brunswick St.	-		-		1.1	350	0.0	165
Spring Garden Rd. - South Park St.	18.5	310	14.0	303	25.6	670	12.0	380
Spring Garden Rd. - Brenton St..	0.0	383	2.9	324	-		-	
Spring Garden Rd. - Dresden Row	10.3	268	7.0	281	-		27.5	133
Spring Garden Rd. - Birmingham St.	0.8	279	0.0	375	72.2	117	-	
Spring Garden Rd. - Queen St.	8.8	320	16.4	346	29.9	533	23.2	252
Spring Garden Rd. - Brunswick St.	14.9	530	0.0	426	-		574.6	110
Brenton Pl. - South Park St.	-		121.6	297	0.0	473	0.7	260
Clyde St. - Brenton St.	11.8	13	13.0	152	6.4	43	1.7	112
Clyde St. - Dresden Row	11.8	13	13.0	77	6.4	41	1.7	106
Clyde St. - Birmingham St.	12.0	50	11.4	117	1.5	48	-	
Clyde St. - Queen St.	38.9	30	-		1.0	460	0.1	245
Morris St. - South Park St.	19.9	365	18.3	497	14.4	633	9.6	281
Morris St. - Brenton St.	0.5	257	0.0	410	-		15.3	74
Morris St. - Dresden Row	0.8	336	0.0	401	-		16.6	44
Morris St. - Birmingham St.	1.6	302	0.0	412	-		21.6	47
Morris St. - Queen St.	75.8	428	36.3	520	48.1	376	25.8	254

Intersection	Level of Service by Approach			
	EB	WB	NB	SB
Sackville St. - South Park St.	B	B	C	B
Sackville St. - Dresden Row	A	A	-	-
Sackville St. - Queen St.	B	A	D	-
Artillery Pl. - Dresden Row	-	-	-	A
Artillery Pl. - Birmingham St.	A	A	C	A
Doyle St. - Queen St.	-	B	A	A
Doyle St. - Brunswick St.	-	-	A	A
Spring Garden Rd. - South Park St.	B	B	C	B
Spring Garden Rd. - Brenton St..	A	A	-	-
Spring Garden Rd. - Dresden Row	B	A	-	C
Spring Garden Rd. - Birmingham St.	A	A	F	-
Spring Garden Rd. - Queen St.	A	B	C	C
Spring Garden Rd. - Brunswick St.	B	A	-	F
Brenton Pl. - South Park St.	-	F	A	A
Clyde St. - Brenton St.	B	B	A	A
Clyde St. - Dresden Row	B	B	A	A
Clyde St. - Birmingham St.	B	B	A	-
Clyde St. - Queen St.	E	-	A	A
Morris St. - South Park St.	B	B	B	A
Morris St. - Brenton St.	A	A	-	C
Morris St. - Dresden Row	A	A	-	C
Morris St. - Birmingham St.	A	A	-	C
Morris St. - Queen St.	F	E	E	D

Intersection	Vehicle-hours of delay				Total Delay
	EB	WB	NB	SB	
Sackville St. - South Park St.	1.15	3.15	4.09	2.25	10.64
Sackville St. - Dresden Row	0.00	0.34	-	-	0.34
Sackville St. - Queen St.	2.60	1.46	4.99	-	9.05
Artillery Pl. - Dresden Row	-	-	-	0.31	0.31
Artillery Pl. - Birmingham St.	0.25	0.06	0.96	0.07	1.35
Doyle St. - Queen St.	-	0.18	0.00	0.00	0.18
Doyle St. - Brunswick St.	-	-	0.11	0.00	0.11
Spring Garden Rd. - South Park St.	1.59	1.18	4.76	1.27	8.80
Spring Garden Rd. - Brenton St..	0.00	0.26	-	-	0.26
Spring Garden Rd. - Dresden Row	0.77	0.55	-	1.02	2.33
Spring Garden Rd. - Birmingham St.	0.06	0.00	2.35	-	2.41
Spring Garden Rd. - Queen St.	0.78	1.58	4.43	1.62	8.41
Spring Garden Rd. - Brunswick St.	2.19	0.00	-	17.56	19.75
Brenton Pl. - South Park St.	-	10.03	0.00	0.05	10.08
Clyde St. - Brenton St.	0.04	0.55	0.08	0.05	0.72
Clyde St. - Dresden Row	0.04	0.28	0.07	0.05	0.44
Clyde St. - Birmingham St.	0.17	0.37	0.02	-	0.56
Clyde St. - Queen St.	0.32	-	0.13	0.01	0.46
Morris St. - South Park St.	2.02	2.53	2.53	0.75	7.83
Morris St. - Brenton St.	0.04	0.00	-	0.31	0.35
Morris St. - Dresden Row	0.07	0.00	-	0.20	0.28
Morris St. - Birmingham St.	0.13	0.00	-	0.28	0.42
Morris St. - Queen St.	9.01	5.24	5.02	1.82	21.10

Scenario D - Total Vehicle Hours of Delay (PM)	106.16
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Appendix C

Traffic Data Collected

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 7, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Dresden Row

SOUTH: Dresden Row

EAST: Artillery

15 MINUTE TOTALS

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:30 to 7:45	0	44	6	0	11	1	0	0	3	0	1	0	0	0	0	0	0	0	4	3	4	2
7:45 to 8:00	0	42	4	0	11	1	1	0	1	0	1	0	0	1	0	0	0	0	3	12	5	0
8:00 to 8:15	0	33	3	0	11	1	1	0	2	0	0	0	0	0	0	1	0	0	5	11	6	0
8:15 to 8:30	0	41	3	0	8	4	0	0	3	0	0	0	0	2	0	0	0	0	6	6	5	0
8:30 to 8:45	0	34	4	0	12	5	1	0	2	0	1	0	0	0	0	0	0	0	7	9	10	0
8:45 to 9:00	0	20	0	0	4	0	1	0	3	0	0	0	0	0	0	0	0	0	2	6	6	0

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 16:15	0	25	11	0	24	6	1	0	4	0	0	0	0	0	0	0	0	0	8	13	19	0
16:15 to 16:30	0	29	3	0	21	8	5	0	5	0	0	0	0	1	0	0	0	0	8	10	15	0
16:30 to 16:45	0	37	5	0	25	4	5	0	1	0	0	0	0	0	0	0	0	0	12	8	28	0
16:45 to 17:00	0	53	8	0	36	10	10	0	3	0	0	0	0	0	0	0	0	0	9	18	33	0
17:00 to 17:15	0	38	8	0	26	5	4	0	8	0	0	0	0	0	0	0	0	0	12	27	17	0
17:15 to 17:30	0	44	13	0	25	7	5	0	1	0	0	0	0	0	0	0	0	0	13	21	24	0

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:30 to 8:30	0	160	16	0	41	7	2	0	9	0	2	0	0	3	0	1	0	0	18	32	20	2
7:45 to 8:45	0	150	14	0	42	11	3	0	8	0	2	0	0	3	0	1	0	0	21	38	26	0
8:00 to 9:00	0	128	10	0	35	10	3	0	10	0	1	0	0	2	0	1	0	0	20	32	27	0
Peak period at the intersection	0	160	16	0	41	7	2	0	9	0	2	0	0	3	0	1	0	0	18	32	20	2

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 17:00	0	144	27	0	106	28	21	0	13	0	0	0	0	1	0	0	0	0	37	49	95	0
16:15 to 17:15	0	157	24	0	108	27	24	0	17	0	0	0	0	1	0	0	0	0	41	63	93	0
16:30 to 17:30	0	172	34	0	112	26	24	0	13	0	0	0	0	0	0	0	0	0	46	74	102	0
Peak period at the intersection	0	172	34	0	112	26	24	0	13	0	0	0	0	0	0	0	0	0	46	74	102	0

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 7, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Queen

SOUTH: Birmingham

EAST: Queen

WEST: Artillery

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE		
																														
AM																														
7:30 to 7:45	0	10	43	0	6	0	1	6	8	2	2	0	0	1	1	0	0	0	0	0	1	0	0	3	0	1	1			
7:45 to 8:00	3	20	56	1	2	0	0	0	10	5	1	0	1	0	0	0	0	0	0	0	0	0	4	4	4	3				
8:00 to 8:15	1	17	44	1	1	1	1	1	12	3	1	0	0	1	0	0	0	1	0	0	0	0	6	2	1	4				
8:15 to 8:30	1	25	69	0	2	2	4	1	17	4	3	2	0	1	1	0	0	0	0	0	0	0	7	3	1	6				
8:30 to 8:45	2	22	64	0	4	3	2	2	17	4	0	3	0	0	0	0	0	0	0	0	0	0	5	2	6	9				
8:45 to 9:00	5	24	58	1	6	0	2	3	18	1	0	1	0	1	0	0	0	0	0	0	0	0	2	0	7	3				

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	←	↓	↘	←	↑	↗	←	←	↗	↗	→	↘	←	↓	↘	←	↑	↗	←	←	↗	↗	→	↘	↔	↔	↕	↕
16:00 to 16:15	7	6	32	1	15	10	1	2	45	3	4	6	0	0	0	0	0	0	0	0	0	0	0	0	2	3	17	17
16:15 to 16:30	5	14	25	3	8	6	2	3	63	2	4	6	0	0	0	0	0	0	0	0	0	0	0	0	5	1	6	10
16:30 to 16:45	6	13	28	0	24	5	1	5	53	7	6	4	0	0	0	0	0	0	0	0	0	0	0	0	5	11	12	8
16:45 to 17:00	5	15	27	3	25	7	2	4	43	5	4	5	0	0	0	0	0	0	0	0	1	0	0	0	7	6	9	17
17:00 to 17:15	5	9	22	1	32	5	3	5	47	4	2	8	0	0	0	0	0	0	0	0	0	0	0	0	6	3	8	8
17:15 to 17:30	6	11	16	2	24	5	2	2	42	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	7	14	0

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	←	↓	↘	←	↑	↗	←	←	↗	↗	→	↘	←	↓	↘	←	↑	↗	←	←	↗	↗	→	↘	↔	↔	↕	↕
7:30 to 8:30	5	72	212	2	11	3	6	7	47	14	7	2	1	3	2	0	0	1	0	1	0	0	0	0	20	9	7	14
7:45 to 8:45	7	84	233	2	9	6	7	3	56	16	5	5	1	2	1	0	0	1	0	0	0	0	0	0	22	11	12	22
8:00 to 9:00	9	88	235	2	13	6	9	6	64	12	4	6	0	3	1	0	0	1	0	0	0	0	0	0	20	7	15	22
8:15 to 9:15	8	71	191	1	12	5	8	6	52	9	3	6	0	2	1	0	0	0	0	0	0	0	0	0	14	5	14	18
8:30 to 9:30	7	46	122	1	10	3	4	5	35	5	0	4	0	1	0	0	0	0	0	0	0	0	0	0	7	2	13	12
Peak period at the intersection	9	88	235	2	13	6	9	6	64	12	4	6	0	3	1	0	0	1	0	0	0	0	0	0	20	7	15	22

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	←	↓	↘	←	↑	↗	←	←	↗	↗	→	↘	←	↓	↘	←	↑	↗	←	←	↗	↗	→	↘	↔	↔	↕	↕
16:00 to 17:00	23	48	112	7	72	28	6	14	204	17	18	21	0	0	0	0	0	0	0	0	1	0	0	0	19	21	44	52
16:15 to 17:15	21	51	102	7	89	23	8	17	206	18	16	23	0	0	0	0	0	0	0	0	1	0	0	0	23	21	35	43
16:30 to 17:30	22	48	93	6	105	22	8	16	185	16	12	17	0	0	0	0	0	0	0	0	2	0	0	0	21	27	43	33
Peak period at the intersection	21	51	102	7	89	23	8	17	206	18	16	23	0	0	0	0	0	0	0	0	1	0	0	0	23	21	35	43

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 7, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Queen

SOUTH: Queen

EAST: Doyle

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:30 to 7:45	0	34	1	0	7	2	1	0	0	0	0	0	0	0	0	0	0	0	2	1	2	3
7:45 to 8:00	0	49	3	0	10	4	9	0	2	0	0	0	0	1	0	0	0	0	1	3	2	4
8:00 to 8:15	0	55	4	0	10	7	12	0	3	0	0	0	0	0	0	0	0	0	3	5	4	4
8:15 to 8:30	0	51	5	0	12	2	9	0	2	0	0	0	0	0	0	0	0	0	5	1	4	2
8:30 to 8:45	0	81	2	0	18	1	13	0	6	0	0	0	0	0	0	1	0	0	11	7	3	0
8:45 to 9:00	0	46	4	0	20	3	7	0	4	0	0	0	0	0	0	0	0	0	6	11	10	0

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 16:15	0	39	9	0	40	26	5	0	9	0	0	0	0	0	0	0	0	0	34	15	18	1
16:15 to 16:30	0	26	6	0	63	14	7	0	7	0	0	0	0	0	0	0	0	0	15	28	23	12
16:30 to 16:45	0	27	9	0	48	14	5	0	6	0	0	0	0	0	0	0	0	0	25	25	24	7
16:45 to 17:00	0	27	9	0	50	21	9	0	2	0	0	0	0	0	0	0	0	0	7	7	10	0
17:00 to 17:15	0	25	5	0	46	15	14	0	6	0	0	0	0	0	0	0	0	0	29	24	27	0
17:15 to 17:30	0	24	5	0	41	14	8	0	8	0	0	0	0	0	0	0	0	1	27	17	23	0

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:30 to 8:30	0	189	13	0	39	15	31	0	7	0	0	0	0	1	0	0	0	0	11	10	12	13
7:45 to 8:45	0	236	14	0	50	14	43	0	13	0	0	0	0	1	0	1	0	0	20	16	13	10
8:00 to 9:00	0	233	15	0	60	13	41	0	15	0	0	0	0	0	0	1	0	0	25	24	21	6
Peak period at the intersection	0	233	15	0	60	13	41	0	15	0	0	0	0	0	0	1	0	0	25	24	21	6

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 17:00	0	119	33	0	201	75	26	0	24	0	0	0	0	0	0	0	0	0	81	75	75	20
16:15 to 17:15	0	105	29	0	207	64	35	0	21	0	0	0	0	0	0	0	0	0	76	84	84	19
16:30 to 17:30	0	103	28	0	185	64	36	0	22	0	0	0	0	0	0	0	0	1	88	73	84	7
Peak period at the intersection	0	119	33	0	201	75	26	0	24	0	0	0	0	0	0	0	0	0	81	75	75	20

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 7, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:00-8:00 and 16:00-17:30

NORTH APPROACH: Brunswick

SOUTH: Brunswick

WEST: Doyle

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE	
																							
7:00 to 7:15	1	20	0	0	13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	1
7:15 to 7:30	1	20	0	0	11	0	3	0	2	0	0	0	0	1	0	0	0	0	1	0	0	5	1
7:30 to 7:45	3	33	0	0	18	0	0	0	1	0	1	0	0	0	0	0	0	0	3	0	0	5	10
7:45 to 8:00	13	47	0	0	21	0	3	0	3	0	0	0	0	0	0	0	0	0	3	3	5	12	

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 16:15	11	21	0	0	64	0	15	0	5	0	0	0	0	1	0	0	0	0	0	0	0	31
16:15 to 16:30	10	25	0	2	52	0	18	0	5	0	0	0	0	1	0	0	0	0	5	0	0	22
16:30 to 16:45	11	25	0	0	72	0	22	0	5	0	0	0	1	0	0	0	0	0	6	8	0	23
16:45 to 17:00	6	32	0	1	55	0	16	0	1	0	0	0	0	0	0	0	0	0	6	3	0	26
17:00 to 17:15	24	31	0	0	58	0	20	0	5	1	0	0	0	0	0	0	0	0	9	3	0	24
17:15 to 17:30	9	28	0	3	50	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0	0

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:00 to 8:00	18	120	0	0	63	0	7	0	7	0	1	0	0	1	0	0	0	0	7	5	16	24

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 17:00	38	103	0	3	243	0	71	0	16	0	0	0	1	2	0	0	0	0	17	11	0	102
16:15 to 17:15	51	113	0	3	237	0	76	0	16	1	0	0	1	1	0	0	0	0	26	14	0	95
16:30 to 17:30	50	116	0	4	235	0	58	0	11	1	0	0	1	0	0	0	0	0	24	20	0	73

Peak period at the intersection	51	113	0	3	237	0	76	0	16	1	0	0	1	1	0	0	0	0	26	14	0	95
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Client: HRM

COUNT DURATION 7:45-9:15 and 16:00-17:30

WEST: Spring Garden

PEDESTRIANS

PEAK PERIOD	NORTHBOUND			WESTBOUND			EASTBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:45 to 8:00	0	0	0	5	44	0	0	35	13	0	0	0	0	13	0	0	9	0	83	36	0	52
8:00 to 8:15	0	0	0	4	39	0	0	54	6	0	0	0	0	13	0	0	3	0	113	45	0	54
8:15 to 8:30	0	0	0	3	30	0	0	65	15	0	0	0	0	12	0	0	4	0	121	63	0	66
8:30 to 8:45	0	0	0	5	38	0	0	68	10	0	0	0	0	16	0	0	14	0	113	47	0	53
8:45 to 9:00	0	0	0	5	39	0	0	62	10	0	0	0	0	11	0	0	11	0	135	40	0	60
9:00 to 9:15	0	0	0	2	10	0	0	28	7	0	0	0	0	9	0	0	5	0	71	17	0	27

PEAK PERIOD	NORTHBOUND			WESTBOUND			EASTBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE				
																										
16:00 to 16:15	0	0	0	8	68	0	0	57	11	0	0	0	0	6	0	0	17	0	0	115	3	122				
16:15 to 16:30	0	0	0	5	61	0	0	68	14	0	0	0	0	6	0	0	16	0	0	137	1	155				
16:30 to 16:45	0	0	0	5	69	0	0	64	17	0	0	0	0	6	0	0	10	0	0	150	1	216				
16:45 to 17:00	0	0	0	12	72	0	0	67	21	0	0	0	0	7	0	0	12	0	0	181	1	115				
17:00 to 17:15	0	0	0	11	73	0	0	78	17	0	0	0	0	4	0	0	12	0	0	162	0	105				
17:15 to 17:30	0	0	0	15	91	0	0	0	0	0	0	0	0	9	0	0	0	0	0	152	0	0				

PEAK PERIOD	NORTHBOUND			WESTBOUND			EASTBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
AM																						
7:45 to 8:45	0	0	0	17	151	0	0	222	44	0	0	0	0	54	0	0	30	0	430	191	0	225
8:00 to 9:00	0	0	0	17	146	0	0	249	41	0	0	0	0	52	0	0	32	0	482	195	0	233
8:15 to 9:15	0	0	0	15	117	0	0	223	42	0	0	0	0	48	0	0	34	0	440	167	0	206

Peak period at the intersection	0	0	0	17	146	0	0	249	41	0	0	0	0	52	0	0	32	0	482	195	0	233
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PEAK PERIOD	NORTHBOUND			WESTBOUND			EASTBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	←	↑	→	←	←	↖	↗	→	↘	←	↑	→	↖	←	↖	↗	→	↘				
16:00 to 17:00	0	0	0	30	270	0	0	256	63	0	0	0	0	25	0	0	55	0	0	583	6	608
16:15 to 17:15	0	0	0	33	275	0	0	277	69	0	0	0	0	23	0	0	50	0	0	630	3	591
16:30 to 17:30	0	0	0	43	305	0	0	209	55	0	0	0	0	26	0	0	34	0	0	645	2	436

Peak period at the intersection	0	0	0	33	275	0	0	277	69	0	0	0	0	23	0	0	50	0	0	630	3	591
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Project Number: 60144708

Client: HRM

DATE OF COUNT: January 14, 2010

COUNT LOCATION: Halifax

COUNT DURATION 8:00-9:00 and 16:00-17:30

NORTH APPROACH: South Park

SOUTH: South Park

EAST: Clyde

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
8:00 to 8:15	0	108	2	0	61	0	5	2	10	0	4	0	0	1	0	0	0	1	19	25	13	18
8:15 to 8:30	1	97	1	0	68	0	1	2	13	0	1	0	0	4	0	0	0	1	27	41	24	32
8:30 to 8:45	0	87	0	0	74	0	5	0	10	0	6	0	0	3	0	0	0	1	28	28	16	22
8:45 to 9:00	0	77	0	0	61	0	3	1	10	0	2	0	0	4	0	0	0	3	11	40	19	15

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 16:15	1	58	1	0	146	0	2	0	44	0	3	0	0	6	0	0	0	0	26	42	12	42
16:15 to 16:30	0	55	0	0	125	0	7	0	40	0	1	0	0	2	0	0	0	0	25	37	13	28
16:30 to 16:45	0	44	0	1	107	6	3	0	49	0	1	0	0	2	0	0	0	0	61	41	6	42
16:45 to 17:00	0	54	0	0	113	0	10	4	42	0	0	0	0	3	0	0	0	1	28	32	19	28
17:00 to 17:15	0	62	0	0	96	0	6	1	72	0	4	0	0	3	0	0	0	2	26	36	10	35
17:15 to 17:30	0	61	1	0	128	15	9	2	71	0	0	0	0	0	0	0	0	0	54	54	17	56

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
8:00 to 9:00	1	369	3	0	264	0	14	5	43	0	13	0	0	12	0	0	0	6	85	134	72	87

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 17:00	1	211	1	1	491	6	22	4	175	0	5	0	0	13	0	0	0	1	140	152	50	140
16:15 to 17:15	0	215	0	1	441	6	26	5	203	0	6	0	0	10	0	0	0	3	140	146	48	133
16:30 to 17:30	0	221	1	1	444	21	28	7	234	0	5	0	0	8	0	0	0	3	169	163	52	161

Peak period at the intersection	0	221	1	1	444	21	28	7	234	0	5	0	0	8	0	0	0	3	169	163	52	161
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Project Number: 60144708

Client: HRM

DATE OF COUNT: January 12, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Brenton

SOUTH: Brenton

EAST: Clyde

WEST: Clyde

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	AM																											
																												
7:30 to 7:45	4	2	1	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	17	2	6
7:45 to 8:00	3	4	0	0	0	0	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	15	4	21	
8:00 to 8:15	9	10	0	0	0	0	1	6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6	12	2	13	
8:15 to 8:30	2	10	0	0	0	0	1	7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	18	11	8	33	
8:30 to 8:45	5	8	0	1	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	14	2	25	
8:45 to 9:00	5	9	0	1	2	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	11	6	19	

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
PM																												
16:00 to 16:15	10	6	0	2	4	0	2	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	11	8	24	
16:15 to 16:30	20	5	0	4	0	1	3	22	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	26	22	14	23	
16:30 to 16:45	16	7	0	13	0	0	3	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	13	5	11		
16:45 to 17:00	14	8	0	4	0	0	2	24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	25	17	11	6		
17:00 to 17:15	10	5	0	6	8	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	16	7	11		
17:15 to 17:30	25	8	0	7	4	1	5	30	0	0	0	0	1	0	0	0	0	0	0	0	0	0	19	14	9	0		

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
7:30 to 8:30	18	26	1	1	0	0	4	26	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	48	55	16	73	
7:45 to 8:45	19	32	0	1	0	0	4	31	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	43	52	16	92	
8:00 to 9:00	21	37	0	2	2	0	2	37	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	50	48	18	90	
Peak period at the intersection	21	37	0	2	2	0	2	37	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	50	48	18	90	

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
16:00 to 17:00	60	26	0	23	4	1	10	104	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	101	63	38	64	
16:15 to 17:15	60	25	0	27	8	1	8	108	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	91	68	37	51	
16:30 to 17:30	65	28	0	30	12	1	10	116	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	84	60	32	28	
Peak period at the intersection	65	28	0	30	12	1	10	116	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	84	60	32	28	

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 12, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 15:45-17:15

NORTH APPROACH: Dresden Row

SOUTH: Dresden Row

EAST: Clyde

WEST: Clyde

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
7:30 to 7:45	2	7	2	1	5	2	0	3	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	9	7	12
7:45 to 8:00	7	8	2	1	3	0	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	7	5	16	
8:00 to 8:15	4	13	3	1	4	2	1	5	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6	11	8	12
8:15 to 8:30	3	9	9	4	10	2	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	7	12	28
8:30 to 8:45	4	11	2	1	6	2	0	7	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7	6	5	14
8:45 to 9:00	9	4	2	2	3	0	0	3	6	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	7	7	6	21

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
PM																												
15:45 to 16:00	12	16	5	2	12	1	0	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	7	13	14	
16:00 to 16:15	5	10	4	3	12	3	4	18	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	10	12	15	
16:15 to 16:30	15	5	8	2	16	2	2	16	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	13	11	11	
16:30 to 16:45	9	16	4	0	12	3	2	21	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	7	10	6	
16:45 to 17:00	11	10	7	5	9	1	1	12	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	18	3	18	9	
17:00 to 17:15	15	21	3	2	9	1	1	22	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	13	12	19	

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
7:30 to 8:30	16	37	16	7	22	6	2	11	10	1	0	0	1	0	0	0	0	0	0	2	0	0	0	22	34	32	68	
7:45 to 8:45	18	41	16	7	23	6	2	15	15	0	0	0	1	0	0	0	0	0	0	1	1	0	0	27	31	30	70	
8:00 to 9:00	20	37	16	8	23	6	1	17	16	0	0	0	3	1	0	0	0	0	0	1	1	0	0	28	31	31	75	
Peak period at the intersection	20	37	16	8	23	6	1	17	16	0	0	0	3	1	0	0	0	0	0	1	1	0	0	28	31	31	75	

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
15:45 to 16:45	41	47	21	7	52	9	8	67	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	37	46	46
16:00 to 17:00	40	41	23	10	49	9	9	67	28	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	64	33	51	41
16:15 to 17:15	50	52	22	9	46	7	6	71	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	74	36	51	45
Peak period at the intersection	50	52	22	9	46	7	6	71	31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	74	36	51	45

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 13, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Birmingham

SOUTH: Birmingham

EAST: Clyde

WEST: Clyde

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
AM																												
7:30 to 7:45	2	0	0	0	1	2	0	7	1	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	9	8	3	
7:45 to 8:00	0	5	0	1	3	1	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	9	5		
8:00 to 8:15	0	2	0	2	4	0	1	5	1	2	3	2	0	0	0	0	0	0	0	0	0	0	3	13	8	7		
8:15 to 8:30	3	4	1	0	2	1	0	6	1	0	4	0	0	0	0	0	0	0	0	0	0	0	5	8	12	16		
8:30 to 8:45	1	5	2	2	6	0	1	3	2	2	3	2	0	0	0	0	0	0	0	0	0	0	0	9	6	15		
8:45 to 9:00	2	1	0	1	1	0	0	14	6	1	0	0	0	0	0	0	0	0	0	0	0	0	1	11	9	11		

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	PM																											
16:00 to 16:15	7	2	3	2	7	5	1	17	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	20	16	9	14	
16:15 to 16:30	4	4	5	2	3	2	3	20	2	3	9	4	0	0	0	0	0	0	0	0	0	0	0	19	14	14	28	
16:30 to 16:45	5	4	2	5	3	2	1	18	3	0	6	1	0	0	0	0	0	0	0	0	0	0	0	21	12	22	16	
16:45 to 17:00	7	7	3	0	6	1	2	20	3	6	5	0	0	0	0	0	0	0	0	0	0	0	0	8	6	14	17	
17:00 to 17:15	5	4	2	1	5	3	1	16	2	5	6	0	0	0	0	0	0	0	0	0	0	0	0	17	9	14	18	
17:15 to 17:30	7	2	2	1	5	1	4	18	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	8	3	0	

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
7:30 to 8:30	5	11	1	3	10	4	1	19	5	2	12	4	0	0	0	0	0	0	0	0	0	0	0	0	8	32	37	31
7:45 to 8:45	4	16	3	5	15	2	2	15	6	4	10	5	0	0	0	0	0	0	0	0	0	0	0	0	8	32	35	43
8:00 to 9:00	6	12	3	5	13	1	2	28	10	5	10	4	0	0	0	0	0	0	0	0	0	0	0	0	9	41	35	49
Peak period at the intersection	6	12	3	5	13	1	2	28	10	5	10	4	0	0	0	0	0	0	0	0	0	0	0	0	9	41	35	49

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE	
																													
	16:00 to 17:00	16:15 to 17:15	16:30 to 17:30	23	17	13	9	19	10	7	75	12	10	22	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak period at the intersection	23	17	13	9	19	10	7	75	12	10	22	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 12, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Queen

SOUTH: Queen

WEST: Clyde

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
AM																						
7:30 to 7:45	2	79	0	1	27	0	1	0	0	1	0	0	0	0	0	0	0	0	14	28	14	3
7:45 to 8:00	2	82	0	0	36	0	0	0	0	3	0	0	0	0	1	0	0	0	5	35	16	10
8:00 to 8:15	6	96	0	0	39	0	3	0	1	0	0	0	0	0	0	0	0	0	10	42	10	9
8:15 to 8:30	4	97	0	4	56	0	3	0	5	1	0	0	0	0	2	0	0	0	7	40	13	14
8:30 to 8:45	6	82	0	5	38	0	3	0	1	0	0	0	0	1	0	0	0	0	12	45	24	18
8:45 to 9:00	5	69	0	7	59	0	1	0	1	1	0	0	0	0	0	0	0	0	14	50	19	10

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
PM																						
16:00 to 16:15	11	48	0	7	112	0	6	0	2	0	0	0	0	0	0	0	0	0	51	36	16	20
16:15 to 16:30	14	40	0	10	93	0	2	0	6	0	0	0	0	0	0	0	0	0	40	20	7	14
16:30 to 16:45	9	51	0	14	99	0	2	0	3	0	0	0	0	0	0	0	0	0	46	36	7	12
16:45 to 17:00	8	42	2	10	83	0	5	0	4	1	0	0	0	0	0	0	0	0	46	23	9	25
17:00 to 17:15	12	50	0	7	85	0	3	0	0	0	0	0	0	0	1	0	0	0	64	35	15	21
17:15 to 17:30	12	45	0	9	69	0	0	0	0	0	0	0	0	0	0	0	0	0	51	25	12	0

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:30 to 8:30	14	354	0	5	158	0	7	0	9	2	0	0	0	0	3	0	0	0	36	145	53	36
7:45 to 8:45	18	357	0	9	169	0	9	0	10	1	0	0	0	1	3	0	0	0	34	162	63	51
8:00 to 9:00	21	344	0	16	192	0	10	0	8	2	0	0	0	1	2	0	0	0	43	177	66	51
Peak period at the intersection	21	344	0	16	192	0	10	0	8	2	0	0	0	1	2	0	0	0	43	177	66	51

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 17:00	42	181	2	41	387	0	15	0	15	1	0	0	0	0	0	0	0	0	183	115	39	71
16:15 to 17:15	43	183	2	41	360	0	12	0	13	1	0	0	0	0	1	0	0	0	196	114	38	72
16:30 to 17:30	41	188	2	40	336	0	10	0	7	1	0	0	0	0	1	0	0	0	207	119	43	58
Peak period at the intersection	42	181	2	41	387	0	15	0	15	1	0	0	0	0	0	0	0	0	183	115	39	71

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 21, 2010

COUNT LOCATION: Halifax

COUNT DURATION 8:15-9:15 and 16:00-17:00

NORTH APPROACH: Queen

SOUTH: Queen

WEST: Clyde

EAST: Parking Lot Entrance

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
8:15 to 8:30	23	70	5	2	48	3	0	1	1	3	0	1	0	0	0	1	0	0	0	0	0	0	0	0	20	8	40	18
8:30 to 8:45	13	46	5	1	19	2	0	0	0	0	0	3	0	5	0	1	0	0	0	0	0	1	0	0	21	4	34	25
8:45 to 9:00	13	50	5	1	35	0	0	0	2	4	0	0	0	1	1	2	0	0	0	0	0	1	0	0	20	2	47	21
9:00 to 9:15	5	46	6	2	34	1	3	1	0	3	0	6	0	2	1	0	0	0	0	0	0	0	0	0	22	3	44	21

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
PM																												
16:00 to 16:15	1	33	11	3	95	1	1	3	7	3	1	1	0	0	1	0	0	0	0	0	0	0	0	0	11	5	51	24
16:15 to 16:30	1	40	17	7	72	0	0	5	13	1	0	1	0	0	0	1	0	0	0	0	0	0	0	22	1	37	21	
16:30 to 16:45	0	33	19	4	75	0	0	10	15	1	3	2	0	0	0	0	0	0	0	0	0	0	0	33	5	26	14	
16:45 to 17:00	0	36	9	19	55	0	1	2	8	3	0	1	0	0	0	1	1	0	0	0	0	0	0	12	8	43	35	

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST Aerial
																												
	8:15 to 9:15	54	212	21	6	136	6	3	2	3	10	0	10	0	8	2	4	0	0	0	0	0	2	0	0	83	17	165

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	PM																											
																												
16:00 to 17:00	2	142	56	33	297	1	2	20	43	8	4	5	0	0	1	1	2	0	0	0	0	0	0	78	19	157	94	

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 6, 2010

COUNT LOCATION: Halifax

COUNT DURATION: 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Brenton

EAST: Morris

WEST: Morris

15 MINUTE TOTALS

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

PEAK PERIOD	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
AM																						
7:30 to 7:45	2	0	2	0	44	0	3	56	0	0	0	0	0	1	0	0	3	0	5	0	1	1
7:45 to 8:00	0	0	0	0	46	1	4	54	0	0	0	0	0	0	0	0	1	0	17	0	1	0
8:00 to 8:15	5	0	5	0	46	0	0	65	0	0	0	0	0	0	0	0	1	0	16	0	1	1
8:15 to 8:30	2	0	10	0	64	0	0	78	0	0	0	0	2	0	0	1	0	37	0	0	0	
8:30 to 8:45	2	0	2	0	53	1	3	95	0	0	0	0	1	0	0	1	0	14	0	1	0	
8:45 to 9:00	0	0	1	0	42	3	4	64	0	0	0	0	3	0	0	0	0	13	0	1	0	

PEAK PERIOD	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
PM																						
16:00 to 16:15	6	0	2	0	90	1	4	50	0	0	0	0	2	0	0	0	1	0	18	0	1	1
16:15 to 16:30	9	0	6	0	93	1	0	61	0	0	0	0	0	0	0	0	0	16	0	1	0	
16:30 to 16:45	8	0	7	0	108	3	3	54	0	0	0	0	0	0	0	0	0	37	0	0	0	
16:45 to 17:00	7	0	6	0	111	2	4	60	0	0	0	0	1	0	0	0	0	15	0	1	0	
17:00 to 17:15	9	0	4	0	108	1	5	66	0	0	0	0	0	0	0	4	0	16	0	1	0	
17:15 to 17:30	12	0	3	0	103	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

HOURLY TOTALS

PEAK PERIOD	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
AM																						
7:30 to 8:30	9	0	17	0	200	1	7	253	0										75	0	3	2
7:45 to 8:45	9	0	17	0	209	2	7	292	0										84	0	3	1
8:00 to 9:00	9	0	18	0	205	4	7	302	0										80	0	3	1

Peak period at the intersection	9	0	18	0	205	4	7	302	0	0	0	0	6	0	0	3	0	80	0	3	1
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PEAK PERIOD	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
	PM																					
16:00 to 17:00	30	0	21	0	402	7	11	225	0	0	0	0	3	0	0	1	0	86	0	3	1	
16:15 to 17:15	33	0	23	0	420	7	12	241	0	0	0	0	1	0	0	4	0	84	0	3	0	
16:30 to 17:30	36	0	20	0	430	7	12	180	0	0	0	0	1	0	0	4	0	68	0	2	0	

Peak period at the intersection	33	0	23	0	420	7	12	241	0	0	0	0	1	0	0	4	0	84	0	3	0
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Project Number: 60144708

Client: HRM

DATE OF COUNT: January 6, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 16:00-17:30

NORTH APPROACH: Dresden Row

EAST: Morris

WEST: Morris

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD AM	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE	
																							
7:30 to 7:45	6	0	3	0	35	1	3	53	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0
7:45 to 8:00	3	0	0	0	45	2	3	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 to 8:15	3	0	1	0	45	2	4	61	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
8:15 to 8:30	3	0	4	0	64	1	11	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 to 8:45	3	0	2	0	47	1	8	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 to 9:00	3	0	3	0	39	3	5	61	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

PEAK PERIOD PM	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 16:15	4	0	4	0	76	2	10	54	0	0	0	0	1	0	0	0	0	0	9	4	12	14
16:15 to 16:30	6	0	3	0	85	0	8	66	0	0	0	0	0	0	0	0	0	0	3	2	4	17
16:30 to 16:45	3	0	2	0	104	3	11	52	0	0	0	0	0	0	0	0	0	0	4	0	15	39
16:45 to 17:00	9	0	4	0	102	2	11	63	0	0	0	0	0	0	0	0	0	0	9	12	24	28
17:00 to 17:15	8	0	9	0	104	1	10	69	0	0	0	0	0	0	0	0	0	0	15	3	17	29
17:15 to 17:30	8	0	5	0	84	5	0	0	0	0	0	0	0	0	0	0	0	0	14	3	10	0

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
7:30 to 8:30	15	0	8	0	189	6	21	247	0	0	0	0	0	0	1	2	0	0	0	0	1	0
7:45 to 8:45	12	0	7	0	201	6	26	280	0	0	0	0	0	0	0	1	0	0	0	0	0	0
8:00 to 9:00	12	0	10	0	195	7	28	290	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Peak period at the intersection	12	0	10	0	195	7	28	290	0	0	0	0	1	0	0	1	0	0	0	0	0	0

PEAK PERIOD PM	SOUTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																						
16:00 to 17:00	22	0	13	0	367	7	40	235	0	0	0	0	1	0	0	0	0	0	25	18	55	98
16:15 to 17:15	26	0	18	0	395	6	40	250	0	0	0	0	0	0	0	0	0	0	31	17	60	113
16:30 to 17:30	28	0	20	0	394	11	32	184	0	0	0	0	0	0	0	0	0	0	42	18	66	96
Peak period at the intersection	26	0	18	0	395	6	40	250	0	0	0	0	0	0	0	0	0	0	31	17	60	113

Project Number: 60144708

Client: HRM

DATE OF COUNT: January 6, 2010

COUNT LOCATION: Halifax

COUNT DURATION 7:30-9:00 and 15:45-17:30

NORTH APPROACH: Birmingham

EAST: Morris

WEST: Morris

PASSENGER VEHICLES

HEAVY VEHICLES

PEDESTRIANS

15 MINUTE TOTALS

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
7:30 to 7:45	0	4	0	0	0	0	0	37	0	0	55	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		
7:45 to 8:00	1	3	0	0	0	0	0	50	1	0	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:00 to 8:15	2	7	2	0	0	0	0	51	4	2	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:15 to 8:30	4	1	2	0	0	0	0	61	0	2	77	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
8:30 to 8:45	1	0	5	0	0	0	0	49	0	1	79	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0		
8:45 to 9:00	0	0	0	0	0	0	0	38	0	6	60	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0		

PEAK PERIOD	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
PM																												
15:45 to 16:00	3	4	1	0	1	0	0	76	3	2	47	0	0	1	0	0	0	0	0	0	0	0	0	3	1	8	25	
16:00 to 16:15	5	0	2	0	0	0	0	79	2	4	41	3	0	0	0	0	0	0	1	0	0	0	0	1	2	21	21	
16:15 to 16:30	3	0	2	0	0	0	0	86	1	3	49	0	0	0	0	0	0	0	0	0	0	0	13	0	19	19		
16:30 to 16:45	6	0	2	0	0	0	0	97	3	9	61	1	0	0	0	0	0	0	0	0	0	0	8	0	36	40		
16:45 to 17:00	3	0	2	0	0	0	0	88	3	5	44	0	0	0	0	0	0	0	0	0	0	0	8	0	26	29		
17:00 to 17:15	10	0	1	0	0	0	0	112	2	8	55	0	0	0	0	0	0	0	0	0	0	0	20	0	22	34		
17:15 to 17:30	11	0	0	0	0	0	0	88	2	4	53	0	0	0	0	0	0	0	0	0	0	0	13	0	15	30		

HOURLY TOTALS

PEAK PERIOD AM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE
																												
7:30 to 8:30	7	15	4	0	0	0	0	199	5	4	253	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7:45 to 8:45	8	11	9	0	0	0	0	211	5	5	277	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0
8:00 to 9:00	7	8	9	0	0	0	0	199	4	11	285	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0
Peak period at the intersection	8	11	9	0	0	0	0	211	5	5	277	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0

PEAK PERIOD PM	SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND			WESTBOUND			EASTBOUND			NORTH SIDE	SOUTH SIDE	EAST SIDE	WEST SIDE	
																													
	←	↓	↘	←	↑	↗	←	←	↘	↗	→	→	↘	←	↓	↘	←	↑	↗	←	←	↘	↗	→	→	↘	↗	↕	↕
15:45 to 16:45	17	4	7	0	1	0	0	338	9	18	198	4	0	1	0	0	0	0	0	1	0	0	0	0	0	25	3	84	105
16:00 to 17:00	17	0	8	0	0	0	0	350	9	21	195	4	0	0	0	0	0	0	0	1	0	0	0	0	30	2	102	109	
16:15 to 17:15	22	0	7	0	0	0	0	383	9	25	209	1	0	0	0	0	0	0	0	0	0	0	0	0	49	0	103	122	
16:30 to 17:30	30	0	5	0	0	0	0	385	10	26	213	1	0	0	0	0	0	0	0	0	0	0	0	0	49	0	99	133	
Peak period at the intersection	30	0	5	0	0	0	0	385	10	26	213	1	0	0	0	0	0	0	0	0	0	0	0	0	49	0	99	133	

Appendix D

Modelling Results

- Scenario A 2010 AM
- Scenario A 2010 PM
- Scenario B 2010 AM
- Scenario B 2010 PM
- Scenario C 2010 AM
- Scenario C 2010 PM
- Scenario D 2010 AM
- Scenario D 2010 PM
- Scenario C 2010 AM with modifications
- Scenario C 2010 PM with modifications
- Scenario D 2010 AM with modifications
- Scenario D 2010PM with modifications

Scenario A 2010 AM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99			0.94		1.00	0.99		1.00	0.96	
Flpb, ped/bikes	0.94	1.00			0.99		1.00	1.00		0.96	1.00	
Frt	1.00	0.98			0.94		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1450	1609			1513		1626	1624		1470	1495	
Flt Permitted	0.65	1.00			0.92		0.15	1.00		0.57	1.00	
Satd. Flow (perm)	993	1609			1398		263	1624		888	1495	
Volume (vph)	221	293	31	6	31	30	8	144	22	200	242	432
Peak-hour factor, PHF	0.91	0.94	0.70	0.40	0.86	0.83	0.50	0.80	0.69	0.94	0.83	0.86
Adj. Flow (vph)	243	312	44	15	36	36	16	180	32	213	292	502
RTOR Reduction (vph)	0	7	0	0	25	0	0	9	0	0	86	0
Lane Group Flow (vph)	243	349	0	0	62	0	16	203	0	213	708	0
Confl. Peds. (#/hr)	49		52	52		49	27		25	25		27
Confl. Bikes (#/hr)			16						4			25
Heavy Vehicles (%)	2%	0%	6%	0%	0%	0%	0%	0%	5%	1%	3%	2%
Turn Type	pm+pt		Perm			Perm			Perm			
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	600	849			427		95	586		321	540	
v/s Ratio Prot	0.07	c0.22						0.13			c0.47	
v/s Ratio Perm	0.15				0.04		0.06			0.24		
v/c Ratio	0.41	0.41			0.15		0.17	0.35		0.66	1.31	
Uniform Delay, d1	9.9	10.3			18.2		15.6	16.8		19.3	23.0	
Progression Factor	1.00	1.00			1.55		1.01	1.02		1.15	1.07	
Incremental Delay, d2	2.0	1.5			0.7		3.8	1.6		7.0	148.6	
Delay (s)	11.9	11.7			28.9		19.6	18.7		29.3	173.2	
Level of Service	B	B			C		B	B		C	F	
Approach Delay (s)		11.8			28.9			18.8			142.8	
Approach LOS		B			C			B			F	
Intersection Summary												
HCM Average Control Delay			82.1				HCM Level of Service			F		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			78.8%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

30: Sackville St & Queen St

10/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	4%			-4%	4%	
Volume (veh/h)	495	164	124	367	34	56
Peak Hour Factor	0.91	0.82	0.87	0.82	0.85	0.88
Hourly flow rate (vph)	544	200	143	448	40	64
Pedestrians	4			5	44	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	4	
Right turn flare (veh)						7
Median type	None					
Median storage veh						
Upstream signal (m)	192			195		
pX, platoon unblocked				0.93	0.93	0.93
vC, conflicting volume				788	1201	693
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				773	1215	671
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				81	69	82
cM capacity (veh/h)				752	128	360
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	744	292	298	104		
Volume Left	0	143	0	40		
Volume Right	200	0	0	64		
cSH	1700	752	1700	330		
Volume to Capacity	0.44	0.19	0.18	0.31		
Queue Length 95th (m)	0.0	5.3	0.0	10.0		
Control Delay (s)	0.0	6.5	0.0	28.1		
Lane LOS	A		D			
Approach Delay (s)	0.0	3.2	28.1			
Approach LOS	D					
Intersection Summary						
Average Delay	3.3					
Intersection Capacity Utilization	65.5%			ICU Level of Service	C	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

10/03/2010

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations				 		 		
Sign Control	Free			Free	Stop			
Grade	4%			-4%	6%			
Volume (veh/h)	740	137	106	343	32	41		
Peak Hour Factor	0.97	0.97	0.88	0.88	0.83	0.83		
Hourly flow rate (vph)	763	141	120	390	39	49		
Pedestrians	2			8	35			
Lane Width (m)	3.7			3.7	3.7			
Walking Speed (m/s)	1.2			1.2	1.2			
Percent Blockage	0			1	3			
Right turn flare (veh)								
Median type	None							
Median storage veh								
Upstream signal (m)	158			229				
pX, platoon unblocked			0.80		0.80	0.80		
vC, conflicting volume			939		1306	877		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol			924		1385	845		
tC, single (s)			4.1		6.9	6.9		
tC, 2 stage (s)								
tF (s)			2.2		3.5	3.3		
p0 queue free %			79		53	79		
cM capacity (veh/h)			568		81	235		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1				
Volume Total	904	250	260	88				
Volume Left	0	120	0	39				
Volume Right	141	0	0	49				
cSH	1700	568	1700	129				
Volume to Capacity	0.53	0.21	0.15	0.68				
Queue Length 95th (m)	0.0	6.0	0.0	28.4				
Control Delay (s)	0.0	7.8	0.0	78.9				
Lane LOS			A	F				
Approach Delay (s)	0.0	3.8		78.9				
Approach LOS				F				
Intersection Summary								
Average Delay			5.9					
Intersection Capacity Utilization			77.1%	ICU Level of Service	D			
Analysis Period (min)			15					

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	193	44	39	122	38	32	120	48	121	148	30
Peak Hour Factor	0.97	0.97	0.97	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95
Hourly flow rate (vph)	56	199	45	41	130	40	36	135	54	127	156	32
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	300	171	40	225	315							
Volume Left (vph)	56	41	0	36	127							
Volume Right (vph)	45	0	40	54	32							
Hadj (s)	-0.02	0.16	-0.67	-0.08	0.05							
Departure Headway (s)	6.1	6.9	6.1	6.1	6.0							
Degree Utilization, x	0.51	0.33	0.07	0.38	0.53							
Capacity (veh/h)	535	471	527	529	555							
Control Delay (s)	15.4	12.1	8.3	12.8	15.6							
Approach Delay (s)	15.4	11.4		12.8	15.6							
Approach LOS	C	B		B	C							
Intersection Summary												
Delay			14.1									
HCM Level of Service			B									
Intersection Capacity Utilization			73.4%			ICU Level of Service				D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↗		↕	↗	↗	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.97	1.00		1.00	1.00	0.98	1.00	
Frt		0.98			1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1996			1709	1502		1859	1349	1628	1813	
Flt Permitted		0.98			0.70	1.00		0.98	1.00	0.39	1.00	
Satd. Flow (perm)		1963			1227	1502		1817	1349	676	1813	
Volume (vph)	10	184	35	97	144	118	11	217	103	413	303	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	11	200	38	102	152	124	12	241	114	449	329	5
RTOR Reduction (vph)	0	8	0	0	0	85	0	0	81	0	1	0
Lane Group Flow (vph)	0	241	0	0	254	39	0	253	33	449	333	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			4			2			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		22.0			22.0	22.0		20.0	20.0	44.0	44.0	
Effective Green, g (s)		25.0			25.0	25.0		23.0	23.0	47.0	47.0	
Actuated g/C Ratio		0.31			0.31	0.31		0.29	0.29	0.59	0.59	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		613			383	469		522	388	635	1065	
v/s Ratio Prot										c0.18	0.18	
v/s Ratio Perm		0.12			c0.21	0.03		0.14	0.02	c0.24		
v/c Ratio		0.39			0.66	0.08		0.48	0.08	0.71	0.31	
Uniform Delay, d1		21.6			23.8	19.4		23.6	20.8	10.4	8.3	
Progression Factor		1.00			1.00	1.00		0.84	1.13	1.00	1.00	
Incremental Delay, d2		1.9			8.7	0.3		2.8	0.4	6.5	0.8	
Delay (s)		23.4			32.6	19.8		22.5	23.9	16.9	9.1	
Level of Service		C			C	B		C	C	B	A	
Approach Delay (s)		23.4			28.4			23.0			13.6	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay		20.0			HCM Level of Service					C		
HCM Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)					8.0		
Intersection Capacity Utilization		79.5%			ICU Level of Service					D		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.88		0.96			1.00	0.93
Flpb, ped/bikes	0.92	1.00		0.94	1.00	1.00		0.99			0.98	1.00
Frt	1.00	0.93		1.00	1.00	0.85		0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99	1.00
Satd. Flow (prot)	1582	1652		1665	1874	1369		3233			3472	1527
Flt Permitted	0.61	1.00		0.37	1.00	1.00		0.70			0.70	1.00
Satd. Flow (perm)	1019	1652		645	1874	1369		2304			2472	1527
Volume (vph)	36	179	168	49	157	31	87	278	81	95	315	37
Peak-hour factor, PHF	0.82	0.84	0.86	0.88	0.84	0.71	0.62	0.80	0.92	0.82	0.82	0.54
Adj. Flow (vph)	44	213	195	56	187	44	140	348	88	116	384	69
RTOR Reduction (vph)	0	41	0	0	0	26	0	18	0	0	0	35
Lane Group Flow (vph)	44	367	0	56	187	18	0	558	0	0	500	34
Confl. Peds. (#/hr)	104		118	118		104	74		164	164		74
Confl. Bikes (#/hr)			4			11			14			3
Heavy Vehicles (%)	6%	1%	1%	2%	1%	3%	1%	4%	1%	0%	3%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	31.0	31.0		31.0	31.0	31.0		37.0			37.0	37.0
Effective Green, g (s)	33.0	33.0		33.0	33.0	33.0		39.0			39.0	39.0
Actuated g/C Ratio	0.41	0.41		0.41	0.41	0.41		0.49			0.49	0.49
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	420	681		266	773	565		1123			1205	744
v/s Ratio Prot		c0.22			0.10							
v/s Ratio Perm	0.04			0.09		0.01		c0.24			0.20	0.02
v/c Ratio	0.10	0.54		0.21	0.24	0.03		0.50			0.41	0.05
Uniform Delay, d1	14.4	17.8		15.1	15.3	14.0		13.9			13.2	10.7
Progression Factor	0.97	0.92		1.00	1.00	1.00		0.64			0.83	0.68
Incremental Delay, d2	0.5	2.9		1.8	0.7	0.1		1.4			1.0	0.1
Delay (s)	14.5	19.1		16.9	16.1	14.1		10.2			12.0	7.4
Level of Service	B	B		B	B	B		B			B	A
Approach Delay (s)		18.7			15.9			10.2			11.4	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay		13.5						HCM Level of Service		B		
HCM Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		80.0						Sum of lost time (s)		8.0		
Intersection Capacity Utilization		91.1%						ICU Level of Service		F		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.39		1.00	0.57	1.00	0.91		1.00	1.00	0.68
Flpb, ped/bikes	0.73	1.00	1.00		0.93	1.00	0.90	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1163	1564	545		1302	802	1499	1616		1790	1773	1021
Flt Permitted	0.58	1.00	1.00		0.92	1.00	0.42	1.00		0.37	1.00	1.00
Satd. Flow (perm)	709	1564	545		1213	802	658	1616		696	1773	1021
Volume (vph)	71	172	83	31	155	60	35	353	50	61	354	44
Peak-hour factor, PHF	0.61	0.84	0.83	0.86	0.90	0.83	0.73	0.87	0.69	0.67	0.84	0.92
Adj. Flow (vph)	116	205	100	36	172	72	48	406	72	91	421	48
RTOR Reduction (vph)	0	0	61	0	0	44	0	8	0	0	0	21
Lane Group Flow (vph)	116	205	39	0	208	28	48	470	0	91	421	27
Confl. Peds. (#/hr)	340		225	225		340	125		214	214		125
Confl. Bikes (#/hr)						2			2			15
Heavy Vehicles (%)	4%	12%	11%	20%	27%	8%	9%	3%	14%	3%	1%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	28.0	28.0	28.0		28.0	28.0	38.0	38.0		38.0	38.0	38.0
Effective Green, g (s)	31.0	31.0	31.0		31.0	31.0	41.0	41.0		41.0	41.0	41.0
Actuated g/C Ratio	0.39	0.39	0.39		0.39	0.39	0.51	0.51		0.51	0.51	0.51
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	275	606	211		470	311	337	828		357	909	523
v/s Ratio Prot		0.13						c0.29			0.24	
v/s Ratio Perm	0.16		0.07		c0.17	0.03	0.07			0.13		0.03
v/c Ratio	0.42	0.34	0.18		0.44	0.09	0.14	0.57		0.25	0.46	0.05
Uniform Delay, d1	17.9	17.3	16.2		18.1	15.5	10.3	13.4		10.9	12.5	9.8
Progression Factor	1.00	1.00	1.00		0.74	0.47	1.06	1.23		0.78	0.80	0.62
Incremental Delay, d2	4.7	1.5	1.9		3.0	0.6	0.9	2.7		1.6	1.6	0.2
Delay (s)	22.6	18.8	18.1		16.3	7.8	11.7	19.2		10.2	11.6	6.2
Level of Service	C	B	B		B	A	B	B		B	B	A
Approach Delay (s)		19.7			14.1			18.5			10.9	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay			15.7				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			58.2%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

76: Clyde Street & South Park Street

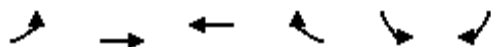
10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	14	54	376	0	0	432
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	59	409	0	0	470
Pedestrians	72		134			85
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	6		11			7
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			142			142
pX, platoon unblocked	0.93	0.90			0.90	
vC, conflicting volume	1084	566			481	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	924	516			421	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	87			100	
cM capacity (veh/h)	232	436			958	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	74	409	470			
Volume Left	15	0	0			
Volume Right	59	0	0			
cSH	369	1700	1700			
Volume to Capacity	0.20	0.24	0.28			
Queue Length 95th (m)	5.6	0.0	0.0			
Control Delay (s)	17.2	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	17.2	0.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		42.5%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	7	305	211	4	18	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	332	229	4	20	10
Pedestrians			3		84	
Lane Width (m)			3.7		3.7	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	318				665	316
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	318				665	316
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	99
cM capacity (veh/h)	1153				391	673
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	339	234	29			
Volume Left	8	0	20			
Volume Right	0	4	10			
cSH	1153	1700	454			
Volume to Capacity	0.01	0.14	0.06			
Queue Length 95th (m)	0.2	0.0	1.6			
Control Delay (s)	0.2	0.0	13.5			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	13.5			
Approach LOS			B			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		31.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.90		1.00	0.92			0.87			0.79	
Flpb, ped/bikes	0.53	1.00		0.68	1.00			0.95			0.94	
Frt	1.00	0.98		1.00	0.98			0.97			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	840	1415		1147	1272			1669			1499	
Flt Permitted	0.60	1.00		0.52	1.00			0.96			0.96	
Satd. Flow (perm)	529	1415		632	1272			1611			1456	
Volume (vph)	17	217	35	12	172	18	3	24	9	18	65	49
Peak-hour factor, PHF	0.53	0.84	0.74	0.60	0.86	0.75	0.38	0.86	0.75	0.75	0.77	0.72
Adj. Flow (vph)	32	258	47	20	200	24	8	28	12	24	84	68
RTOR Reduction (vph)	0	8	0	0	5	0	0	8	0	0	28	0
Lane Group Flow (vph)	32	297	0	20	219	0	0	41	0	0	148	0
Confl. Peds. (#/hr)	335		243	243		335	141		122	122		141
Confl. Bikes (#/hr)			11			4			2			2
Heavy Vehicles (%)	6%	12%	3%	0%	30%	0%	0%	0%	0%	0%	0%	6%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	40.0	40.0		40.0	40.0			28.0			28.0	
Effective Green, g (s)	42.0	42.0		42.0	42.0			30.0			30.0	
Actuated g/C Ratio	0.52	0.52		0.52	0.52			0.38			0.38	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	278	743		332	668			604			546	
v/s Ratio Prot		c0.21			0.17							
v/s Ratio Perm	0.06			0.03				0.03			c0.10	
v/c Ratio	0.12	0.40		0.06	0.33			0.07			0.27	
Uniform Delay, d1	9.6	11.4		9.3	10.9			16.0			17.4	
Progression Factor	0.81	0.82		0.77	0.71			0.94			0.97	
Incremental Delay, d2	0.8	1.5		0.3	1.3			0.2			1.2	
Delay (s)	8.6	10.9		7.5	9.0			15.2			18.2	
Level of Service	A	B		A	A			B			B	
Approach Delay (s)		10.6			8.9			15.2			18.2	
Approach LOS		B			A			B			B	
Intersection Summary												
HCM Average Control Delay			12.0			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			35.3%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free		Free		Stop		Stop		Stop		Stop	
Grade	0%		1%		2%		-4%					
Volume (veh/h)	13	221	6	10	184	14	4	5	8	5	11	7
Peak Hour Factor	0.65	0.92	0.38	0.83	0.75	0.88	0.33	0.50	0.67	0.42	0.92	0.58
Hourly flow rate (vph)	20	240	16	12	245	16	12	10	12	12	12	12
Pedestrians	96		2		324		324					
Lane Width (m)	3.0		3.0		3.9		4.8					
Walking Speed (m/s)	1.2		1.2		1.2		1.2					
Percent Blockage	7		0		29		36					
Right turn flare (veh)					4							
Median type					None		None					
Median storage veh												
Upstream signal (m)	80		81									
pX, platoon unblocked	0.96			0.97			0.97	0.97	0.97	0.97	0.97	0.96
vC, conflicting volume	585			580			996	1221	574	895	1221	673
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	568			568			953	1185	562	850	1185	660
tC, single (s)	4.1			4.2			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	97			98			83	87	96	86	85	95
cM capacity (veh/h)	624			674			73	80	333	85	80	268
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	20	256	12	261	34	36						
Volume Left	20	0	12	0	12	12						
Volume Right	0	16	0	16	12	12						
cSH	624	1700	674	1700	117	108						
Volume to Capacity	0.03	0.15	0.02	0.15	0.29	0.33						
Queue Length 95th (m)	0.8	0.0	0.4	0.0	8.5	10.0						
Control Delay (s)	11.0	0.0	10.4	0.0	51.6	54.3						
Lane LOS	B		B		F	F						
Approach Delay (s)	0.8		0.5		51.6	54.3						
Approach LOS					F	F						
Intersection Summary												
Average Delay			6.5									
Intersection Capacity Utilization			40.2%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

174: Doyle Street & Queen Street

10/03/2010

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	41	15	60	13	15	233			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	45	16	65	14	16	253			
Pedestrians	21		24			25			
Lane Width (m)	3.7		3.7			3.7			
Walking Speed (m/s)	1.2		1.2			1.2			
Percent Blockage	2		2			2			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (m)	61								
pX, platoon unblocked									
vC, conflicting volume	403	118			100				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	403	118			100				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	92	98			99				
cM capacity (veh/h)	574	897			1465				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	61	79	270						
Volume Left	45	0	16						
Volume Right	16	14	0						
cSH	635	1700	1465						
Volume to Capacity	0.10	0.05	0.01						
Queue Length 95th (m)	2.4	0.0	0.3						
Control Delay (s)	11.3	0.0	0.5						
Lane LOS	B		A						
Approach Delay (s)	11.3	0.0	0.5						
Approach LOS	B								
Intersection Summary									
Average Delay	2.0								
Intersection Capacity Utilization	35.6%		ICU Level of Service		A				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

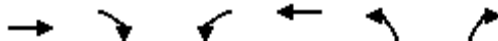
10/03/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕		↕	↕		↕	↕			↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0	4.6	3.0
Grade (%)		-2%			0%			2%			-5%	
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor		0.95		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes		0.90		1.00	0.98		1.00	0.80			0.96	
Flpb, ped/bikes		0.97		0.63	1.00		0.86	1.00			0.99	
Frt		0.98		1.00	0.99		1.00	0.91			0.99	
Flt Protected		1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		2594		1039	1400		1298	1367			1986	
Flt Permitted		0.93		0.56	1.00		0.48	1.00			0.97	
Satd. Flow (perm)		2425		611	1400		660	1367			1933	
Volume (vph)	12	197	40	113	201	6	27	75	103	11	201	22
Peak-hour factor, PHF	0.60	0.80	0.77	0.79	0.90	0.75	0.84	0.89	0.76	0.55	0.88	0.80
Adj. Flow (vph)	20	246	52	143	223	8	32	84	136	20	228	28
RTOR Reduction (vph)	0	21	0	0	2	0	0	73	0	0	5	0
Lane Group Flow (vph)	0	297	0	143	229	0	32	147	0	0	271	0
Confl. Peds. (#/hr)	282		199	199		282	87		144	144		87
Confl. Bikes (#/hr)			8			4			3			3
Heavy Vehicles (%)	0%	15%	3%	2%	24%	0%	11%	1%	1%	0%	1%	5%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		43.0		43.0	43.0		25.0	25.0			25.0	
Effective Green, g (s)		45.0		45.0	45.0		27.0	27.0			27.0	
Actuated g/C Ratio		0.56		0.56	0.56		0.34	0.34			0.34	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)		1364		344	788		223	461			652	
v/s Ratio Prot					0.16			0.11				
v/s Ratio Perm		0.12		0.23			0.05				0.14	
v/c Ratio		0.22		0.42	0.29		0.14	0.32			0.42	
Uniform Delay, d1		8.7		10.0	9.2		18.4	19.7			20.4	
Progression Factor		0.76		1.00	1.00		1.00	1.00			1.13	
Incremental Delay, d2		0.4		3.7	0.9		1.3	1.8			1.9	
Delay (s)		7.0		13.7	10.1		19.8	21.5			25.1	
Level of Service		A		B	B		B	C			C	
Approach Delay (s)		7.0			11.5			21.3			25.1	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM Average Control Delay			15.4			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			51.0%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

10/03/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EBT			WBT		
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	281	41	17	198	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	305	45	18	215	0	0
Pedestrians	300				200	
Lane Width (m)	3.0				0.0	
Walking Speed (m/s)	1.2				1.2	
Percent Blockage	21				0	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			550		1080	528
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			518		1086	494
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		100	100
cM capacity (veh/h)			978		174	537
Direction, Lane #	EB 1	WB 1				
Volume Total	350	234				
Volume Left	0	18				
Volume Right	45	0				
cSH	1700	978				
Volume to Capacity	0.21	0.02				
Queue Length 95th (m)	0.0	0.4				
Control Delay (s)	0.0	0.9				
Lane LOS		A				
Approach Delay (s)	0.0	0.9				
Approach LOS						
Intersection Summary						
Average Delay		0.3				
Intersection Capacity Utilization		27.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Doyle Street & Brunswick Street

10/03/2010

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	  					
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	7	7	0	64	121	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	8	0	70	132	20
Pedestrians	24			5	7	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	2			0	1	
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)	187					
pX, platoon unblocked						
vC, conflicting volume	242	170	175			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242	170	175			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	727	852	1372			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	15	70	151			
Volume Left	8	0	0			
Volume Right	8	0	20			
cSH	784	1372	1700			
Volume to Capacity	0.02	0.00	0.09			
Queue Length 95th (m)	0.5	0.0	0.0			
Control Delay (s)	9.7	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.7	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay	0.6					
Intersection Capacity Utilization	22.4%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

225: Clyde Street & Dresden Row

10/03/2010

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Sign Control	Stop			Stop			Free			Free				
Grade	0%			0%			4%			0%				
Volume (veh/h)	0	0	0	1	18	17	8	23	6	16	38	23		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	0	0	0	1	20	18	9	25	7	17	41	25		
Pedestrians	75			31			31			28				
Lane Width (m)	0.0			3.7			3.7			3.7				
Walking Speed (m/s)	1.2			1.2			1.2			1.2				
Percent Blockage	0			3			3			2				
Right turn flare (veh)														
Median type	None			None										
Median storage veh														
Upstream signal (m)												141		
pX, platoon unblocked														
vC, conflicting volume	266	244	160	196	253	87	141				63			
vC1, stage 1 conf vol														
vC2, stage 2 conf vol														
vCu, unblocked vol	266	244	160	196	253	87	141				63			
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1			
tC, 2 stage (s)														
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2			
p0 queue free %	100	100	100	100	97	98	99				99			
cM capacity (veh/h)	620	630	862	699	622	923	1442				1499			
Direction, Lane #	WB 1	NB 1	SB 1											
Volume Total	39	40	84											
Volume Left	1	9	17											
Volume Right	18	7	25											
cSH	738	1442	1499											
Volume to Capacity	0.05	0.01	0.01											
Queue Length 95th (m)	1.3	0.1	0.3											
Control Delay (s)	10.2	1.7	1.6											
Lane LOS	B	A	A											
Approach Delay (s)	10.2	1.7	1.6											
Approach LOS	B													
Intersection Summary														
Average Delay	3.7													
Intersection Capacity Utilization	28.9%			ICU Level of Service			A							
Analysis Period (min)	15													

HCM Unsignalized Intersection Capacity Analysis

226: Clyde Street & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			2%			0%	
Volume (veh/h)	5	10	4	2	28	11	5	13	1	3	12	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	11	4	2	30	12	5	14	1	3	13	7
Pedestrians		49			35			41			9	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			3			4			1	
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	134	133	106	134	136	59	69				50	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	134	133	106	134	136	59	69				50	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	99	98	100	100	96	99	100				100	
cM capacity (veh/h)	717	700	876	726	698	969	1468				1510	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	21	45	21	23								
Volume Left	5	2	5	3								
Volume Right	4	12	1	7								
cSH	736	756	1468	1510								
Volume to Capacity	0.03	0.06	0.00	0.00								
Queue Length 95th (m)	0.7	1.4	0.1	0.0								
Control Delay (s)	10.0	10.1	2.0	1.1								
Lane LOS	B	B	A	A								
Approach Delay (s)	10.0	10.1	2.0	1.1								
Approach LOS	B	B										
Intersection Summary												
Average Delay			6.6									
Intersection Capacity Utilization			28.9%	ICU Level of Service			A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

227: Clyde Street & Brenton Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	2	39	0	4	0	0	0	37	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	2	42	0	4	0	0	0	40	23
Pedestrians	90			18			48			50		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			2			4			4		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	222	168	190	126	180	68	153				18	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	222	168	190	126	180	68	153				18	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	100	94	100	100				100	
cM capacity (veh/h)	661	711	817	789	701	938	1428				1574	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	45	4	63									
Volume Left	2	4	0									
Volume Right	0	0	23									
cSH	705	1428	1700									
Volume to Capacity	0.06	0.00	0.04									
Queue Length 95th (m)	1.5	0.1	0.0									
Control Delay (s)	10.5	7.5	0.0									
Lane LOS	B	A										
Approach Delay (s)	10.5	7.5	0.0									
Approach LOS	B											
Intersection Summary												
Average Delay	4.5											
Intersection Capacity Utilization	31.0%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

228: Clyde Street & Queen St

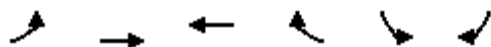
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			3%	
Volume (veh/h)	10	0	8	3	2	3	10	186	6	54	270	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	9	3	2	3	11	202	7	59	293	25
Pedestrians		85			165			17			83	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		7			14			1			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	823	904	408	841	913	453	403			374		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	811	897	369	831	907	453	364			374		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	99	98	99	99	99			94		
cM capacity (veh/h)	190	194	580	181	192	484	1039			1017		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	20	9	220	377								
Volume Left	11	3	11	59								
Volume Right	9	3	7	25								
cSH	271	241	1039	1017								
Volume to Capacity	0.07	0.04	0.01	0.06								
Queue Length 95th (m)	1.8	0.9	0.2	1.4								
Control Delay (s)	19.3	20.5	0.5	1.9								
Lane LOS	C	C	A	A								
Approach Delay (s)	19.3	20.5	0.5	1.9								
Approach LOS	C	C										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			55.0%	ICU Level of Service						A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

230: Morris Street & Dresden Row

10/03/2010

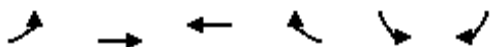


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	28	291	196	7	10	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	316	213	8	11	13
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		166				
pX, platoon unblocked						
vC, conflicting volume	252				685	361
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	252				685	361
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	98
cM capacity (veh/h)	1279				373	601
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	347	221	24			
Volume Left	30	0	11			
Volume Right	0	8	13			
cSH	1279	1700	470			
Volume to Capacity	0.02	0.13	0.05			
Queue Length 95th (m)	0.6	0.0	1.2			
Control Delay (s)	0.9	0.0	13.1			
Lane LOS	A		B			
Approach Delay (s)	0.9	0.0	13.1			
Approach LOS			B			
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		52.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

231: Morris Street & Birmingham Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	5	278	213	5	9	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	302	232	5	10	22
Pedestrians		100	100		50	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		9	9		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	287				697	384
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	287				697	384
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	96
cM capacity (veh/h)	1220				355	581
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	308	237	32			
Volume Left	5	0	10			
Volume Right	0	5	22			
cSH	1220	1700	485			
Volume to Capacity	0.00	0.14	0.07			
Queue Length 95th (m)	0.1	0.0	1.6			
Control Delay (s)	0.2	0.0	12.9			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		38.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

232: Artillery & Dresden Row

10/03/2010

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		6%			-4%			
Volume (veh/h)	3	9	52	7	16	162			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	3	10	57	8	17	176			
Pedestrians	20		32			18			
Lane Width (m)	3.7		3.7			3.7			
Walking Speed (m/s)	1.2		1.2			1.2			
Percent Blockage	2		3			2			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (m)	130								
pX, platoon unblocked									
vC, conflicting volume	323	98			84				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	323	98			84				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	99	99			99				
cM capacity (veh/h)	634	927			1487				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	13	64	193						
Volume Left	3	0	17						
Volume Right	10	8	0						
cSH	831	1700	1487						
Volume to Capacity	0.02	0.04	0.01						
Queue Length 95th (m)	0.4	0.0	0.3						
Control Delay (s)	9.4	0.0	0.8						
Lane LOS	A		A						
Approach Delay (s)	9.4	0.0	0.8						
Approach LOS	A								
Intersection Summary									
Average Delay		1.0							
Intersection Capacity Utilization		30.6%	ICU Level of Service	A					
Analysis Period (min)		15							

63: Queen St & Artillery Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.0	0.0	0.1	0.2
Delay / Veh (s)	1.2	1.2	6.6	6.1	1.9
Total Stops	19	4	20	16	59
Travel Dist (km)	35.5	7.9	2.9	2.4	48.7
Travel Time (hr)	1.2	0.2	0.1	0.1	1.7
Avg Speed (kph)	31	34	21	16	29
Vehicles Entered	311	81	27	34	453
Vehicles Exited	308	81	27	34	450
Hourly Exit Rate	308	81	27	34	450

73: Spring Garden Road & South Park Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.9	1.5	2.0	1.5	6.9
Delay / Veh (s)	18.5	24.9	16.0	11.8	16.6
Total Stops	244	156	304	200	904
Travel Dist (km)	21.3	15.6	59.8	21.1	117.7
Travel Time (hr)	2.4	1.9	3.4	2.0	9.8
Avg Speed (kph)	9	8	18	11	12
Vehicles Entered	367	220	452	454	1493
Vehicles Exited	365	221	447	454	1487
Hourly Exit Rate	365	221	447	454	1487

75: Sackville St & Summer Street Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.3	0.8	6.0	7.1
Delay / Veh (s)	7.3	10.9	23.1	19.0
Total Stops	83	238	908	1229
Travel Dist (km)	41.1	37.1	99.2	177.5
Travel Time (hr)	1.3	1.6	8.6	11.5
Avg Speed (kph)	32	23	12	16
Vehicles Entered	153	252	933	1338
Vehicles Exited	152	251	936	1339
Hourly Exit Rate	152	251	936	1339

Scenario A 2010 PM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95			0.92		1.00	0.98		1.00	0.91	
Flpb, ped/bikes	0.95	1.00			0.96		1.00	1.00		0.94	1.00	
Frt	1.00	0.98			0.95		1.00	0.98		1.00	0.89	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1465	1545			1416		1594	1606		1400	1416	
Flt Permitted	0.48	1.00			0.91		0.15	1.00		0.36	1.00	
Satd. Flow (perm)	741	1545			1303		258	1606		524	1416	
Volume (vph)	398	254	29	14	97	68	47	285	28	76	152	366
Peak-hour factor, PHF	0.94	0.87	0.73	0.44	0.89	0.89	0.78	0.82	0.70	0.86	0.90	0.79
Adj. Flow (vph)	423	292	40	32	109	76	60	348	40	88	169	463
RTOR Reduction (vph)	0	7	0	0	27	0	0	6	0	0	137	0
Lane Group Flow (vph)	423	325	0	0	190	0	60	382	0	88	495	0
Confl. Peds. (#/hr)	87		157	157		87	85		71	71		85
Confl. Bikes (#/hr)			5			2			3			13
Heavy Vehicles (%)	2%	1%	0%	0%	4%	0%	2%	1%	11%	3%	0%	1%
Turn Type	pm+pt		Perm		Perm		Perm		Perm		Perm	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	512	815			398		93	580		189	511	
v/s Ratio Prot	c0.14	0.21						0.24			c0.35	
v/s Ratio Perm	c0.30				0.15		0.23			0.17		
v/c Ratio	0.83	0.40			0.48		0.65	0.66		0.47	0.97	
Uniform Delay, d1	13.4	10.2			20.3		19.2	19.3		17.7	22.6	
Progression Factor	1.00	1.00			1.27		1.00	1.00		0.91	0.75	
Incremental Delay, d2	14.1	1.5			4.0		29.7	5.8		7.0	30.3	
Delay (s)	27.5	11.6			29.8		48.8	25.1		23.1	47.3	
Level of Service	C	B			C		D	C		C	D	
Approach Delay (s)		20.5			29.8			28.2			44.4	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			31.1				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			92.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

30: Sackville St & Queen St

10/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖↗	↖	↗
Sign Control	Free			Free	Stop	
Grade	4%			-4%	4%	
Volume (veh/h)	558	88	86	454	136	168
Peak Hour Factor	0.87	0.92	0.87	0.87	0.92	0.93
Hourly flow rate (vph)	641	96	99	522	148	181
Pedestrians	9			3	75	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			0	6	
Right turn flare (veh)						7
Median type					None	
Median storage veh)						
Upstream signal (m)	192			195		
pX, platoon unblocked						
vC, conflicting volume			812		1232	767
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			812		1232	767
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		0	43
cM capacity (veh/h)			770		138	319
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	737	273	348	328		
Volume Left	0	99	0	148		
Volume Right	96	0	0	181		
cSH	1700	770	1700	293		
Volume to Capacity	0.43	0.13	0.20	1.12		
Queue Length 95th (m)	0.0	3.3	0.0	102.8		
Control Delay (s)	0.0	4.7	0.0	127.6		
Lane LOS		A		F		
Approach Delay (s)	0.0	2.1		127.6		
Approach LOS				F		
Intersection Summary						
Average Delay		25.6				
Intersection Capacity Utilization		68.5%	ICU Level of Service	C		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

10/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	4%			-4%	6%	
Volume (veh/h)	423	50	57	460	121	96
Peak Hour Factor	0.88	0.73	0.59	0.86	0.88	0.80
Hourly flow rate (vph)	481	68	97	535	138	120
Pedestrians	3			3	35	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)	158			229		
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			584		1014	553
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			559		1014	526
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		28	73
cM capacity (veh/h)			922		191	453
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	549	275	357	258		
Volume Left	0	97	0	138		
Volume Right	68	0	0	120		
cSH	1700	922	1700	261		
Volume to Capacity	0.32	0.10	0.21	0.99		
Queue Length 95th (m)	0.0	2.7	0.0	72.9		
Control Delay (s)	0.0	4.0	0.0	93.7		
Lane LOS			A	F		
Approach Delay (s)	0.0	1.7		93.7		
Approach LOS				F		
Intersection Summary						
Average Delay			17.5			
Intersection Capacity Utilization			62.8%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	67	145	47	40	282	137	71	193	43	53	118	49
Peak Hour Factor	0.81	0.76	0.79	0.65	0.96	0.83	0.70	0.85	0.90	0.67	0.84	0.85
Hourly flow rate (vph)	83	191	59	62	294	165	101	227	48	79	140	58
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	333	355	165	376	277							
Volume Left (vph)	83	62	0	101	79							
Volume Right (vph)	59	0	165	48	58							
Hadj (s)	-0.02	0.12	-0.67	0.01	-0.03							
Departure Headway (s)	8.3	8.5	7.7	8.1	8.5							
Degree Utilization, x	0.77	0.84	0.35	0.84	0.65							
Capacity (veh/h)	410	410	451	429	385							
Control Delay (s)	34.0	41.0	13.6	41.4	25.9							
Approach Delay (s)	34.0	32.3		41.4	25.9							
Approach LOS	D	D		E	D							
Intersection Summary												
Delay			33.8									
HCM Level of Service			D									
Intersection Capacity Utilization			65.3%	ICU Level of Service		C						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

10/03/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↗		↕	↗	↗	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.97			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.98	1.00		1.00	1.00	0.99	1.00	
Frt		0.97			1.00	0.85		1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1963			1725	1498		1858	1354	1658	1798	
Flt Permitted		0.98			0.78	1.00		0.98	1.00	0.24	1.00	
Satd. Flow (perm)		1921			1370	1498		1817	1354	421	1798	
Volume (vph)	11	156	45	86	191	349	27	483	151	220	223	14
Peak-hour factor, PHF	0.93	0.93	0.93	0.99	0.99	0.99	0.96	0.96	0.96	0.98	0.98	0.98
Adj. Flow (vph)	12	168	48	87	193	353	28	503	157	224	228	14
RTOR Reduction (vph)	0	12	0	0	0	247	0	0	88	0	3	0
Lane Group Flow (vph)	0	216	0	0	280	106	0	531	69	224	239	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			2			4			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		21.0			21.0	21.0		32.0	32.0	45.0	45.0	
Effective Green, g (s)		24.0			24.0	24.0		35.0	35.0	48.0	48.0	
Actuated g/C Ratio		0.30			0.30	0.30		0.44	0.44	0.60	0.60	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		576			411	449		795	592	392	1079	
v/s Ratio Prot										c0.06	0.13	
v/s Ratio Perm		0.11			c0.20	0.07		c0.29	0.05	0.28		
v/c Ratio		0.38			0.68	0.24		0.67	0.12	0.57	0.22	
Uniform Delay, d1		22.1			24.6	21.1		17.9	13.3	10.5	7.4	
Progression Factor		1.00			1.00	1.00		0.62	0.77	1.00	1.00	
Incremental Delay, d2		1.9			8.8	1.2		3.5	0.3	5.9	0.5	
Delay (s)		23.9			33.5	22.3		14.6	10.6	16.4	7.9	
Level of Service		C			C	C		B	B	B	A	
Approach Delay (s)		23.9			27.2			13.7			12.0	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay		18.7					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		80.0					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		85.1%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

10/03/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.82		0.95			1.00	0.84
Flpb, ped/bikes	0.92	1.00		0.92	1.00	1.00		0.98			0.97	1.00
Frt	1.00	0.95		1.00	1.00	0.85		0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.98	1.00
Satd. Flow (prot)	1674	1694		1652	1892	1316		3141			3394	1386
Flt Permitted	0.40	1.00		0.39	1.00	1.00		0.80			0.66	1.00
Satd. Flow (perm)	710	1694		675	1892	1316		2526			2257	1386
Volume (vph)	74	204	87	75	355	67	111	427	95	55	185	41
Peak-hour factor, PHF	0.77	0.81	0.68	0.85	0.97	0.79	0.73	0.91	0.74	0.60	0.89	0.85
Adj. Flow (vph)	96	252	128	88	366	85	152	469	128	92	208	48
RTOR Reduction (vph)	0	23	0	0	0	51	0	22	0	0	0	24
Lane Group Flow (vph)	96	357	0	88	366	34	0	728	0	0	300	24
Confl. Peds. (#/hr)	161		163	163		161	187		228	228		187
Confl. Bikes (#/hr)			12			13			6			5
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		38.0			38.0	38.0
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		40.0			40.0	40.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40		0.50			0.50	0.50
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	284	678		270	757	526		1263			1129	693
v/s Ratio Prot		c0.21			0.19							
v/s Ratio Perm	0.14			0.13		0.03		c0.29			0.13	0.02
v/c Ratio	0.34	0.53		0.33	0.48	0.06		0.58			0.27	0.03
Uniform Delay, d1	16.7	18.2		16.6	17.9	14.8		14.0			11.5	10.2
Progression Factor	1.00	1.01		1.00	1.00	1.00		0.86			0.88	0.88
Incremental Delay, d2	3.2	2.9		3.2	2.2	0.2		1.5			0.6	0.1
Delay (s)	19.9	21.3		19.7	20.1	15.0		13.6			10.7	9.0
Level of Service	B	C		B	C	B		B			B	A
Approach Delay (s)		21.0			19.2			13.6			10.5	
Approach LOS		C			B			B			B	

Intersection Summary

HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

63: Clyde Street & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	  											
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			4%			0%		
Volume (veh/h)	0	0	0	6	71	31	9	46	7	22	52	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	7	77	34	10	50	8	24	57	54
Pedestrians	45			51			36			74		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			4			3			6		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												141
pX, platoon unblocked												
vC, conflicting volume	396	305	165	292	328	179	156				109	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	396	305	165	292	328	179	156				109	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	99	86	96	99				98	
cM capacity (veh/h)	429	568	853	581	552	774	1424				1417	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	117	67	135									
Volume Left	7	10	24									
Volume Right	34	8	54									
cSH	603	1424	1417									
Volume to Capacity	0.19	0.01	0.02									
Queue Length 95th (m)	5.4	0.2	0.4									
Control Delay (s)	12.4	1.1	1.5									
Lane LOS	B	A	A									
Approach Delay (s)	12.4	1.1	1.5									
Approach LOS	B											
Intersection Summary												
Average Delay	5.4											
Intersection Capacity Utilization	32.4%			ICU Level of Service				A				
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

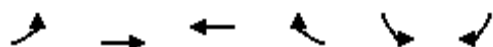
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.25		1.00	0.46	1.00	0.89		1.00	1.00	0.56
Flpb, ped/bikes	0.78	1.00	1.00		0.95	1.00	0.75	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1253	1448	354		1513	684	1298	1586		1723	1739	855
Flt Permitted	0.44	1.00	1.00		0.94	1.00	0.56	1.00		0.29	1.00	1.00
Satd. Flow (perm)	580	1448	354		1433	684	758	1586		529	1739	855
Volume (vph)	63	200	47	28	201	99	80	492	73	71	249	60
Peak-hour factor, PHF	0.93	0.89	0.84	0.78	0.75	0.85	0.83	0.95	0.80	0.78	0.90	0.83
Adj. Flow (vph)	68	225	56	36	268	116	96	518	91	91	277	72
RTOR Reduction (vph)	0	0	36	0	0	24	0	7	0	0	0	0
Lane Group Flow (vph)	68	225	20	0	304	92	96	602	0	91	277	72
Confl. Peds. (#/hr)	748		384	384		748	362		404	404		362
Confl. Bikes (#/hr)			3			9			9			16
Heavy Vehicles (%)	3%	21%	10%	14%	10%	1%	4%	2%	14%	7%	3%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	25.0	25.0	25.0		25.0	25.0	41.0	41.0		41.0	41.0	41.0
Effective Green, g (s)	28.0	28.0	28.0		28.0	28.0	44.0	44.0		44.0	44.0	44.0
Actuated g/C Ratio	0.35	0.35	0.35		0.35	0.35	0.55	0.55		0.55	0.55	0.55
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	203	507	124		502	239	417	872		291	956	470
v/s Ratio Prot		0.16						c0.38			0.16	
v/s Ratio Perm	0.12		0.06		c0.21	0.13	0.13			0.17		0.08
v/c Ratio	0.33	0.44	0.16		0.61	0.38	0.23	0.69		0.31	0.29	0.15
Uniform Delay, d1	19.1	20.0	17.9		21.4	19.5	9.3	13.1		9.8	9.6	8.8
Progression Factor	1.04	0.97	1.34		0.75	0.66	1.15	1.26		0.77	0.78	0.75
Incremental Delay, d2	3.9	2.5	2.4		5.2	4.5	1.2	4.3		2.7	0.7	0.7
Delay (s)	23.7	21.9	26.4		21.3	17.4	11.9	20.7		10.2	8.2	7.3
Level of Service	C	C	C		C	B	B	C		B	A	A
Approach Delay (s)		23.0			20.2			19.5			8.5	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM Average Control Delay			17.7				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			71.5%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Place

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	12	245	421	7	23	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	266	458	8	25	36
Pedestrians			3		84	
Lane Width (m)			3.7		3.7	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	549				841	545
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	549				841	545
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	93
cM capacity (veh/h)	947				306	499
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	279	465	61			
Volume Left	13	0	25			
Volume Right	0	8	36			
cSH	947	1700	396			
Volume to Capacity	0.01	0.27	0.15			
Queue Length 95th (m)	0.3	0.0	4.1			
Control Delay (s)	0.6	0.0	15.7			
Lane LOS	A		C			
Approach Delay (s)	0.6	0.0	15.7			
Approach LOS			C			
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		32.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.85		1.00	0.91			0.85			0.73	
Flpb, ped/bikes	0.58	1.00		0.55	1.00			0.92			0.93	
Frt	1.00	0.97		1.00	0.99			0.97			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	982	1251		867	1451			1541			1365	
Flt Permitted	0.50	1.00		0.52	1.00			0.91			0.95	
Satd. Flow (perm)	512	1251		471	1451			1419			1306	
Volume (vph)	19	230	32	18	263	22	25	73	17	11	57	65
Peak-hour factor, PHF	0.80	0.90	0.62	0.56	0.88	0.69	0.78	0.96	0.53	0.39	0.68	0.80
Adj. Flow (vph)	24	256	52	32	299	32	32	76	32	28	84	81
RTOR Reduction (vph)	0	9	0	0	5	0	0	13	0	0	6	0
Lane Group Flow (vph)	24	299	0	32	326	0	0	127	0	0	187	0
Confl. Peds. (#/hr)	691		566	566		691	252		296	296		252
Confl. Bikes (#/hr)			7			6			3			
Heavy Vehicles (%)	0%	20%	3%	6%	11%	0%	4%	0%	6%	9%	2%	3%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	39.0	39.0		39.0	39.0			29.0			29.0	
Effective Green, g (s)	41.0	41.0		41.0	41.0			31.0			31.0	
Actuated g/C Ratio	0.51	0.51		0.51	0.51			0.39			0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	262	641		241	744			550			506	
v/s Ratio Prot		c0.24			0.22							
v/s Ratio Perm	0.05			0.07				0.09			c0.14	
v/c Ratio	0.09	0.47		0.13	0.44			0.23			0.37	
Uniform Delay, d1	10.0	12.5		10.2	12.3			16.5			17.5	
Progression Factor	1.03	1.13		0.78	0.77			0.99			0.97	
Incremental Delay, d2	0.6	2.2		1.1	1.8			1.0			2.1	
Delay (s)	10.9	16.3		9.1	11.2			17.3			19.1	
Level of Service	B	B		A	B			B			B	
Approach Delay (s)		15.9			11.0			17.3			19.1	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay		15.0			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.42										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		36.1%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free				Stop			Stop
Grade	0%				1%				2%			-4%
Volume (veh/h)	13	264	13	17	281	21	8	19	42	2	7	25
Peak Hour Factor	0.81	0.91	0.68	0.71	0.84	0.76	0.75	0.95	0.75	0.50	0.74	0.78
Hourly flow rate (vph)	16	290	19	24	335	28	11	20	56	4	9	32
Pedestrians	122				22				297			436
Lane Width (m)	3.0				3.0				3.9			4.8
Walking Speed (m/s)	1.2				1.2				1.2			1.2
Percent Blockage	8				2				27			48
Right turn flare (veh)									4			
Median type							None				None	
Median storage veh												
Upstream signal (m)	80				81							
pX, platoon unblocked	0.93							0.93	0.93			0.93
vC, conflicting volume	798			606				1170	1475	619	1214	1471
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	782			606				1184	1513	619	1232	1508
tC, single (s)	4.2			4.1				7.2	6.5	6.2	7.2	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2				3.6	4.0	3.3	3.6	4.0
p0 queue free %	96			97				66	49	84	78	76
cM capacity (veh/h)	388			719				31	39	355	18	40
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	16	309	24	362	87	46						
Volume Left	16	0	24	0	11	4						
Volume Right	0	19	0	28	56	32						
cSH	388	1700	719	1700	102	67						
Volume to Capacity	0.04	0.18	0.03	0.21	0.85	0.67						
Queue Length 95th (m)	1.0	0.0	0.8	0.0	36.5	22.7						
Control Delay (s)	14.7	0.0	10.2	0.0	105.5	132.1						
Lane LOS	B		B		F	F						
Approach Delay (s)	0.7		0.6		105.5	132.1						
Approach LOS					F	F						
Intersection Summary												
Average Delay			18.5									
Intersection Capacity Utilization			47.5%		ICU Level of Service			A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

108: Clyde Street & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			2%			0%	
Volume (veh/h)	10	22	5	7	75	12	9	19	10	13	17	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	24	5	8	82	13	10	21	11	14	18	25
Pedestrians		75			59			48			68	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		6			5			4			6	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	302	244	154	229	251	153	118			91		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	302	244	154	229	251	153	118			91		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	96	99	99	86	98	99			99		
cM capacity (veh/h)	454	574	800	574	569	798	1375			1429		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	40	102	41	58								
Volume Left	11	8	10	14								
Volume Right	5	13	11	25								
cSH	556	591	1375	1429								
Volume to Capacity	0.07	0.17	0.01	0.01								
Queue Length 95th (m)	1.8	4.7	0.2	0.2								
Control Delay (s)	12.0	12.4	1.9	1.9								
Lane LOS	B	B	A	A								
Approach Delay (s)	12.0	12.4	1.9	1.9								
Approach LOS	B	B										
Intersection Summary												
Average Delay			8.0									
Intersection Capacity Utilization		32.0%		ICU Level of Service						A		
Analysis Period (min)		15										

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

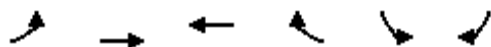
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	3.0	3.0	3.0	3.0	3.7	3.0	3.7	3.0	3.7	3.7	3.7
Grade (%)		-2%			0%			2%			0%	
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor		0.95		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes		0.90		1.00	0.94		1.00	0.83			0.89	
Flpb, ped/bikes		0.96		0.52	1.00		0.58	1.00			1.00	
Frt		0.98		1.00	0.99		1.00	0.94			0.98	
Flt Protected		1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		2447		884	1476		946	1471			1641	
Flt Permitted		0.90		0.54	1.00		0.65	1.00			0.99	
Satd. Flow (perm)		2218		507	1476		651	1471			1623	
Volume (vph)	30	241	32	76	247	23	92	238	157	5	116	24
Peak-hour factor, PHF	0.92	0.94	0.73	0.70	0.86	0.92	0.72	0.92	0.93	0.92	0.92	0.92
Adj. Flow (vph)	33	256	44	109	287	25	128	259	169	5	126	26
RTOR Reduction (vph)	0	15	0	0	4	0	0	28	0	0	9	0
Lane Group Flow (vph)	0	318	0	109	308	0	128	400	0	0	148	0
Confl. Peds. (#/hr)	435		420	420		435	271		340	340		271
Confl. Bikes (#/hr)			1						2			
Heavy Vehicles (%)	2%	22%	0%	0%	12%	2%	2%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm				Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		37.0		37.0	37.0		31.0	31.0			31.0	
Effective Green, g (s)		39.0		39.0	39.0		33.0	33.0			33.0	
Actuated g/C Ratio		0.49		0.49	0.49		0.41	0.41			0.41	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)		1081		247	720		269	607			669	
v/s Ratio Prot					0.21			c0.27				
v/s Ratio Perm		0.14		c0.22			0.20				0.09	
v/c Ratio		0.29		0.44	0.43		0.48	0.66			0.22	
Uniform Delay, d1		12.3		13.4	13.3		17.2	19.0			15.2	
Progression Factor		0.79		1.00	1.00		1.00	1.00			1.03	
Incremental Delay, d2		0.7		5.6	1.9		5.9	5.5			0.8	
Delay (s)		10.3		19.0	15.1		23.1	24.5			16.3	
Level of Service		B		B	B		C	C			B	
Approach Delay (s)		10.3			16.1			24.2			16.3	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay			17.9			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			73.0%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

177: Spring Garden Road & Brunswick Street

10/03/2010

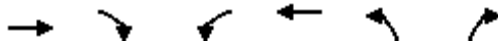


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		-1%	6%		-4%	
Volume (veh/h)	136	286	280	146	24	86
Peak Hour Factor	0.94	0.91	0.85	0.96	0.92	0.92
Hourly flow rate (vph)	145	314	329	152	26	93
Pedestrians		16	33		435	
Lane Width (m)		3.0	3.0		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		48	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		90	193			
pX, platoon unblocked					0.96	
vC, conflicting volume	916				1401	780
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	916				1416	780
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	62				43	53
cM capacity (veh/h)	378				46	200
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	145	314	329	152	120	
Volume Left	145	0	0	0	26	
Volume Right	0	0	0	152	93	
cSH	378	1700	1700	1700	116	
Volume to Capacity	0.38	0.18	0.19	0.09	1.03	
Queue Length 95th (m)	13.3	0.0	0.0	0.0	52.7	
Control Delay (s)	20.3	0.0	0.0	0.0	163.7	
Lane LOS	C				F	
Approach Delay (s)	6.4		0.0		163.7	
Approach LOS					F	
Intersection Summary						
Average Delay			21.2			
Intersection Capacity Utilization			42.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

10/03/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	327	69	33	298	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	355	75	36	324	0	0
Pedestrians	591				630	
Lane Width (m)	3.0				0.0	
Walking Speed (m/s)	1.2				1.2	
Percent Blockage	41				0	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.91		0.95	0.91
vC, conflicting volume			1060		2010	1023
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1067		1931	1025
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		100	100
cM capacity (veh/h)			593		38	259
Direction, Lane #	EB 1	WB 1				
Volume Total	430	360				
Volume Left	0	36				
Volume Right	75	0				
cSH	1700	593				
Volume to Capacity	0.25	0.06				
Queue Length 95th (m)	0.0	1.5				
Control Delay (s)	0.0	1.9				
Lane LOS		A				
Approach Delay (s)	0.0	1.9				
Approach LOS						
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		46.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Clyde Street & Brenton Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	10	117	0	43	0	0	0	28	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	11	127	0	47	0	0	0	30	72
Pedestrians	28			32			60			84		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			3			5			7		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	335	220	154	252	256	116	130				32	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	335	220	154	252	256	116	130				32	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	98	79	100	97				100	
cM capacity (veh/h)	461	639	846	618	610	845	1455				1537	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	138	47	102									
Volume Left	11	47	0									
Volume Right	0	0	72									
cSH	611	1455	1700									
Volume to Capacity	0.23	0.03	0.06									
Queue Length 95th (m)	6.6	0.8	0.0									
Control Delay (s)	12.6	7.6	0.0									
Lane LOS	B	A										
Approach Delay (s)	12.6	7.6	0.0									
Approach LOS	B											
Intersection Summary												
Average Delay	7.3											
Intersection Capacity Utilization	31.5%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

223: Clyde Street & South Park Street

10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	35	237	473	0	0	246
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	258	514	0	0	267
Pedestrians	52		163			169
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		14			14
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			141			143
pX, platoon unblocked	0.87	0.87			0.87	
vC, conflicting volume	997	735			566	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995	695			501	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	18			100	
cM capacity (veh/h)	194	314			883	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	296	514	267			
Volume Left	38	0	0			
Volume Right	258	0	0			
cSH	291	1700	1700			
Volume to Capacity	1.02	0.30	0.16			
Queue Length 95th (m)	82.3	0.0	0.0			
Control Delay (s)	96.4	0.0	0.0			
Lane LOS	F					
Approach Delay (s)	96.4	0.0	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		26.5				
Intersection Capacity Utilization		54.6%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

224: Clyde Street & Queen St

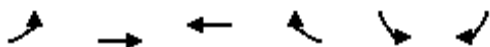
10/03/2010

																				
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR								
Lane Configurations																				
Sign Control		Stop			Stop			Free			Free									
Grade		0%			0%			0%			3%									
Volume (veh/h)	24	4	15	2	20	43	34	379	1	2	162	57								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92								
Hourly flow rate (vph)	26	4	16	2	22	47	37	412	1	2	176	62								
Pedestrians		94			157			19			78									
Lane Width (m)		3.7			3.7			3.7			3.7									
Walking Speed (m/s)		1.2			1.2			1.2			1.2									
Percent Blockage		8			13			2			7									
Right turn flare (veh)																				
Median type		None			None															
Median storage veh																				
Upstream signal (m)											141									
pX, platoon unblocked																				
vC, conflicting volume	927	949	320	892	980	648	332			570										
vC1, stage 1 conf vol																				
vC2, stage 2 conf vol																				
vCu, unblocked vol	927	949	320	892	980	648	332			570										
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1										
tC, 2 stage (s)																				
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2										
p0 queue free %	81	98	97	99	89	88	97			100										
cM capacity (veh/h)	141	200	652	176	192	380	1129			868										
Direction, Lane #	EB 1	WB 1	NB 1	SB 1																
Volume Total	47	71	450	240																
Volume Left	26	2	37	2																
Volume Right	16	47	1	62																
cSH	201	284	1129	868																
Volume to Capacity	0.23	0.25	0.03	0.00																
Queue Length 95th (m)	6.6	7.3	0.8	0.1																
Control Delay (s)	28.2	21.8	1.0	0.1																
Lane LOS	D	C	A	A																
Approach Delay (s)	28.2	21.8	1.0	0.1																
Approach LOS	D	C																		
Intersection Summary																				
Average Delay			4.1																	
Intersection Capacity Utilization			58.4%	ICU Level of Service						B										
Analysis Period (min)			15																	

HCM Unsignalized Intersection Capacity Analysis

225: Morris Street & Dresden Row

10/03/2010

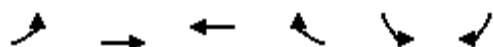


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	40	250	395	6	18	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	272	429	7	20	28
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	467				882	577
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467				882	577
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	94
cM capacity (veh/h)	1066				280	454
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	315	436	48			
Volume Left	43	0	20			
Volume Right	0	7	28			
cSH	1066	1700	362			
Volume to Capacity	0.04	0.26	0.13			
Queue Length 95th (m)	1.0	0.0	3.4			
Control Delay (s)	1.5	0.0	16.4			
Lane LOS	A		C			
Approach Delay (s)	1.5	0.0	16.4			
Approach LOS			C			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization		59.7%		ICU Level of Service	B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

226: Morris Street & Birmingham Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	26	213	385	10	5	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	232	418	11	5	33
Pedestrians		133	99		49	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		11	8		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	478				860	606
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478				860	606
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	92
cM capacity (veh/h)	1038				278	422
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	260	429	38			
Volume Left	28	0	5			
Volume Right	0	11	33			
cSH	1038	1700	393			
Volume to Capacity	0.03	0.25	0.10			
Queue Length 95th (m)	0.6	0.0	2.4			
Control Delay (s)	1.2	0.0	15.1			
Lane LOS	A		C			
Approach Delay (s)	1.2	0.0	15.1			
Approach LOS			C			
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		52.9%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

228: Artillery Place & Dresden Row

10/03/2010

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		6%			-4%			
Volume (veh/h)	24	21	112	26	34	172			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	26	23	122	28	37	187			
Pedestrians	102		74			46			
Lane Width (m)	3.7		3.7			3.7			
Walking Speed (m/s)	1.2		1.2			1.2			
Percent Blockage	9		6			4			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (m)	127								
pX, platoon unblocked									
vC, conflicting volume	573	284			252				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	573	284			252				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	93	97			97				
cM capacity (veh/h)	399	662			1199				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	49	150	224						
Volume Left	26	0	37						
Volume Right	23	28	0						
cSH	490	1700	1199						
Volume to Capacity	0.10	0.09	0.03						
Queue Length 95th (m)	2.5	0.0	0.7						
Control Delay (s)	13.2	0.0	1.6						
Lane LOS	B		A						
Approach Delay (s)	13.2	0.0	1.6						
Approach LOS	B								
Intersection Summary									
Average Delay	2.4								
Intersection Capacity Utilization	45.5%		ICU Level of Service		A				
Analysis Period (min)	15								

HCM Unsignalized Intersection Capacity Analysis 229: Doyle Street & Brunswick Street

10/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	76	16	4	238	113	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	83	17	4	259	123	57
Pedestrians	95			14	26	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			1	2	
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)	187					
pX, platoon unblocked						
vC, conflicting volume	539	260	274			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	539	260	274			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	98	100			
cM capacity (veh/h)	450	707	1184			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	100	263	179			
Volume Left	83	4	0			
Volume Right	17	0	57			
cSH	481	1184	1700			
Volume to Capacity	0.21	0.00	0.11			
Queue Length 95th (m)	5.9	0.1	0.0			
Control Delay (s)	14.4	0.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.4	0.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization	30.8%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

230: Doyle Street & Queen Street

10/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	26	24	201	75	33	119
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	26	218	82	36	129
Pedestrians	75		75			81
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	6		6			7
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)	59					
pX, platoon unblocked						
vC, conflicting volume	610	415			375	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	610	415			375	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	95			97	
cM capacity (veh/h)	388	555			1107	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	54	300	165			
Volume Left	28	0	36			
Volume Right	26	82	0			
cSH	453	1700	1107			
Volume to Capacity	0.12	0.18	0.03			
Queue Length 95th (m)	3.1	0.0	0.8			
Control Delay (s)	14.0	0.0	2.0			
Lane LOS	B		A			
Approach Delay (s)	14.0	0.0	2.0			
Approach LOS	B					
Intersection Summary						
Average Delay		2.1				
Intersection Capacity Utilization		47.4%		ICU Level of Service		A
Analysis Period (min)		15				

140: University Avenue & Summer Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.7	1.8	0.1	2.3	5.9
Delay / Veh (s)	11.5	9.0	54.4	44.0	14.6
Total Stops	161	41	5	138	345
Travel Dist (km)	61.5	130.5	0.2	46.2	238.4
Travel Time (hr)	3.4	5.0	0.1	3.4	11.9
Avg Speed (kph)	23	33	2	14	24
Vehicles Entered	534	733	5	189	1461
Vehicles Exited	536	732	5	189	1462
Hourly Exit Rate	536	732	5	189	1462

174: Queen Street & Birmingham Street Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.1	0.3	0.1	0.5
Delay / Veh (s)	1.3	1.1	8.9	4.3	2.9
Total Stops	23	6	110	29	168
Travel Dist (km)	23.3	22.1	9.4	3.7	58.4
Travel Time (hr)	0.8	0.6	0.6	0.2	2.1
Avg Speed (kph)	30	39	17	17	28
Vehicles Entered	229	219	109	56	613
Vehicles Exited	229	219	110	56	614
Hourly Exit Rate	229	219	110	56	614

175: Spring Garden Road & Queen Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.2	1.6	4.4	0.7	7.9
Delay / Veh (s)	14.0	15.1	35.4	17.9	22.2
Total Stops	149	241	422	95	907
Travel Dist (km)	23.0	15.9	57.2	7.6	103.6
Travel Time (hr)	1.8	2.0	5.9	0.9	10.6
Avg Speed (kph)	13	8	10	8	10
Vehicles Entered	306	388	444	141	1279
Vehicles Exited	306	389	443	141	1279
Hourly Exit Rate	306	389	443	141	1279

Scenario B 2010 AM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99			0.94		1.00	0.99		1.00	0.96	
Flpb, ped/bikes	0.94	1.00			0.99		1.00	1.00		0.96	1.00	
Frt	1.00	0.98			0.94		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1450	1609			1513		1626	1624		1470	1495	
Flt Permitted	0.65	1.00			0.92		0.15	1.00		0.57	1.00	
Satd. Flow (perm)	993	1609			1398		263	1624		888	1495	
Volume (vph)	221	293	31	6	31	30	8	144	22	200	242	432
Peak-hour factor, PHF	0.91	0.94	0.70	0.40	0.86	0.83	0.50	0.80	0.69	0.94	0.83	0.86
Adj. Flow (vph)	243	312	44	15	36	36	16	180	32	213	292	502
RTOR Reduction (vph)	0	7	0	0	25	0	0	9	0	0	86	0
Lane Group Flow (vph)	243	349	0	0	62	0	16	203	0	213	708	0
Confl. Peds. (#/hr)	49		52	52		49	27		25	25		27
Confl. Bikes (#/hr)			16						4			25
Heavy Vehicles (%)	2%	0%	6%	0%	0%	0%	0%	0%	5%	1%	3%	2%
Turn Type	pm+pt		Perm		Perm		Perm		Perm		Perm	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	600	849			427		95	586		321	540	
v/s Ratio Prot	0.07	c0.22						0.13			c0.47	
v/s Ratio Perm	0.15				0.04		0.06			0.24		
v/c Ratio	0.41	0.41			0.15		0.17	0.35		0.66	1.31	
Uniform Delay, d1	9.9	10.3			18.2		15.6	16.8		19.3	23.0	
Progression Factor	1.00	1.00			1.55		1.01	1.02		1.15	1.07	
Incremental Delay, d2	2.0	1.5			0.7		3.8	1.6		7.0	148.6	
Delay (s)	11.9	11.7			28.9		19.6	18.7		29.2	173.2	
Level of Service	B	B			C		B	B		C	F	
Approach Delay (s)		11.8			28.9			18.8			142.8	
Approach LOS		B			C			B			F	
Intersection Summary												
HCM Average Control Delay			82.1				HCM Level of Service			F		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			78.8%				ICU Level of Service		D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

30: Sackville St & Queen St

10/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖↗	↖	↗
Sign Control	Free			Free	Stop	
Grade	4%			-4%	4%	
Volume (veh/h)	478	164	124	367	34	73
Peak Hour Factor	0.91	0.82	0.87	0.82	0.85	0.88
Hourly flow rate (vph)	525	200	143	448	40	83
Pedestrians	4			5	44	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	4	
Right turn flare (veh)						7
Median type					None	
Median storage veh)						
Upstream signal (m)	192			195		
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			769		1182	674
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			753		1195	651
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			81		70	78
cM capacity (veh/h)			765		132	372
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	725	292	298	123		
Volume Left	0	143	0	40		
Volume Right	200	0	0	83		
cSH	1700	765	1700	406		
Volume to Capacity	0.43	0.19	0.18	0.30		
Queue Length 95th (m)	0.0	5.2	0.0	9.6		
Control Delay (s)	0.0	6.4	0.0	26.0		
Lane LOS		A		D		
Approach Delay (s)	0.0	3.2		26.0		
Approach LOS				D		
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			64.7%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

10/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖↗		↖↗
Sign Control	Free			Free	Stop	
Grade	4%			-4%	6%	
Volume (veh/h)	740	137	106	343	32	24
Peak Hour Factor	0.97	0.97	0.88	0.88	0.83	0.83
Hourly flow rate (vph)	763	141	120	390	39	29
Pedestrians	2			8	35	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			1	3	
Right turn flare (veh)						
Median type						None
Median storage veh)						
Upstream signal (m)	158			229		
pX, platoon unblocked			0.80		0.80	0.80
vC, conflicting volume			939		1306	877
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			924		1385	845
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			79		53	88
cM capacity (veh/h)			568		81	235
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	904	250	260	67		
Volume Left	0	120	0	39		
Volume Right	141	0	0	29		
cSH	1700	568	1700	113		
Volume to Capacity	0.53	0.21	0.15	0.60		
Queue Length 95th (m)	0.0	6.0	0.0	22.3		
Control Delay (s)	0.0	7.8	0.0	75.7		
Lane LOS		A		F		
Approach Delay (s)	0.0	3.8		75.7		
Approach LOS				F		
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			76.2%	ICU Level of Service	D	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	193	44	39	122	38	32	120	48	121	148	30
Peak Hour Factor	0.97	0.97	0.97	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95
Hourly flow rate (vph)	56	199	45	41	130	40	36	135	54	127	156	32
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	300	171	40	225	315							
Volume Left (vph)	56	41	0	36	127							
Volume Right (vph)	45	0	40	54	32							
Hadj (s)	-0.02	0.16	-0.67	-0.08	0.05							
Departure Headway (s)	6.1	6.9	6.1	6.1	6.0							
Degree Utilization, x	0.51	0.33	0.07	0.38	0.53							
Capacity (veh/h)	535	471	527	529	555							
Control Delay (s)	15.4	12.1	8.3	12.8	15.6							
Approach Delay (s)	15.4	11.4		12.8	15.6							
Approach LOS	C	B		B	C							
Intersection Summary												
Delay			14.1									
HCM Level of Service			B									
Intersection Capacity Utilization			73.4%			ICU Level of Service				D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↗		↕	↗	↗	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.97	1.00		1.00	1.00	0.98	1.00	
Frt		0.98			1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1996			1709	1502		1859	1349	1628	1813	
Flt Permitted		0.98			0.70	1.00		0.98	1.00	0.39	1.00	
Satd. Flow (perm)		1963			1227	1502		1817	1349	676	1813	
Volume (vph)	10	184	35	97	144	118	11	217	103	413	303	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	11	200	38	102	152	124	12	241	114	449	329	5
RTOR Reduction (vph)	0	8	0	0	0	85	0	0	81	0	1	0
Lane Group Flow (vph)	0	241	0	0	254	39	0	253	33	449	333	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			4			2			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		22.0			22.0	22.0		20.0	20.0	44.0	44.0	
Effective Green, g (s)		25.0			25.0	25.0		23.0	23.0	47.0	47.0	
Actuated g/C Ratio		0.31			0.31	0.31		0.29	0.29	0.59	0.59	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		613			383	469		522	388	635	1065	
v/s Ratio Prot										c0.18	0.18	
v/s Ratio Perm		0.12			c0.21	0.03		0.14	0.02	c0.24		
v/c Ratio		0.39			0.66	0.08		0.48	0.08	0.71	0.31	
Uniform Delay, d1		21.6			23.8	19.4		23.6	20.8	10.4	8.3	
Progression Factor		1.00			1.00	1.00		0.84	1.14	1.00	1.00	
Incremental Delay, d2		1.9			8.7	0.3		2.8	0.4	6.5	0.8	
Delay (s)		23.4			32.6	19.8		22.5	24.0	16.9	9.1	
Level of Service		C			C	B		C	C	B	A	
Approach Delay (s)		23.4			28.4			23.0			13.6	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay		20.1			HCM Level of Service					C		
HCM Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)					8.0		
Intersection Capacity Utilization		79.5%			ICU Level of Service					D		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.88		0.96			1.00	0.93
Flpb, ped/bikes	0.92	1.00		0.94	1.00	1.00		0.99			0.98	1.00
Frt	1.00	0.93		1.00	1.00	0.85		0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99	1.00
Satd. Flow (prot)	1582	1652		1665	1874	1369		3233			3472	1527
Flt Permitted	0.61	1.00		0.37	1.00	1.00		0.70			0.70	1.00
Satd. Flow (perm)	1019	1652		645	1874	1369		2304			2472	1527
Volume (vph)	36	179	168	49	157	31	87	278	81	95	315	37
Peak-hour factor, PHF	0.82	0.84	0.86	0.88	0.84	0.71	0.62	0.80	0.92	0.82	0.82	0.54
Adj. Flow (vph)	44	213	195	56	187	44	140	348	88	116	384	69
RTOR Reduction (vph)	0	41	0	0	0	26	0	18	0	0	0	35
Lane Group Flow (vph)	44	367	0	56	187	18	0	558	0	0	500	34
Confl. Peds. (#/hr)	104		118	118		104	74		164	164		74
Confl. Bikes (#/hr)			4			11			14			3
Heavy Vehicles (%)	6%	1%	1%	2%	1%	3%	1%	4%	1%	0%	3%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	31.0	31.0		31.0	31.0	31.0		37.0			37.0	37.0
Effective Green, g (s)	33.0	33.0		33.0	33.0	33.0		39.0			39.0	39.0
Actuated g/C Ratio	0.41	0.41		0.41	0.41	0.41		0.49			0.49	0.49
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	420	681		266	773	565		1123			1205	744
v/s Ratio Prot		c0.22			0.10							
v/s Ratio Perm	0.04			0.09		0.01		c0.24			0.20	0.02
v/c Ratio	0.10	0.54		0.21	0.24	0.03		0.50			0.41	0.05
Uniform Delay, d1	14.4	17.8		15.1	15.3	14.0		13.9			13.2	10.7
Progression Factor	1.01	1.01		1.00	1.00	1.00		0.63			0.83	0.68
Incremental Delay, d2	0.5	3.0		1.8	0.7	0.1		1.4			1.0	0.1
Delay (s)	15.1	20.9		16.9	16.1	14.1		10.0			11.9	7.4
Level of Service	B	C		B	B	B		B			B	A
Approach Delay (s)		20.3			15.9			10.0			11.4	
Approach LOS		C			B			B			B	
Intersection Summary												
HCM Average Control Delay			13.8				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			91.1%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.39		1.00	0.57	1.00	0.91		1.00	1.00	0.68
Flpb, ped/bikes	0.73	1.00	1.00		0.93	1.00	0.90	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1163	1564	545		1302	802	1499	1616		1790	1773	1021
Flt Permitted	0.58	1.00	1.00		0.92	1.00	0.42	1.00		0.37	1.00	1.00
Satd. Flow (perm)	709	1564	545		1213	802	658	1616		696	1773	1021
Volume (vph)	71	172	83	31	155	60	35	353	50	61	354	44
Peak-hour factor, PHF	0.61	0.84	0.83	0.86	0.90	0.83	0.73	0.87	0.69	0.67	0.84	0.92
Adj. Flow (vph)	116	205	100	36	172	72	48	406	72	91	421	48
RTOR Reduction (vph)	0	0	61	0	0	44	0	8	0	0	0	21
Lane Group Flow (vph)	116	205	39	0	208	28	48	470	0	91	421	27
Confl. Peds. (#/hr)	340		225	225		340	125		214	214		125
Confl. Bikes (#/hr)						2			2			15
Heavy Vehicles (%)	4%	12%	11%	20%	27%	8%	9%	3%	14%	3%	1%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	28.0	28.0	28.0		28.0	28.0	38.0	38.0		38.0	38.0	38.0
Effective Green, g (s)	31.0	31.0	31.0		31.0	31.0	41.0	41.0		41.0	41.0	41.0
Actuated g/C Ratio	0.39	0.39	0.39		0.39	0.39	0.51	0.51		0.51	0.51	0.51
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	275	606	211		470	311	337	828		357	909	523
v/s Ratio Prot		0.13						c0.29			0.24	
v/s Ratio Perm	0.16		0.07		c0.17	0.03	0.07			0.13		0.03
v/c Ratio	0.42	0.34	0.18		0.44	0.09	0.14	0.57		0.25	0.46	0.05
Uniform Delay, d1	17.9	17.3	16.2		18.1	15.5	10.3	13.4		10.9	12.5	9.8
Progression Factor	1.00	1.00	1.00		0.74	0.47	1.06	1.23		0.78	0.81	0.62
Incremental Delay, d2	4.7	1.5	1.9		3.0	0.6	0.9	2.7		1.6	1.6	0.2
Delay (s)	22.6	18.8	18.1		16.3	7.8	11.7	19.2		10.2	11.7	6.2
Level of Service	C	B	B		B	A	B	B		B	B	A
Approach Delay (s)		19.7			14.1			18.5			11.0	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay			15.7				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			58.2%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

76: Clyde Street & South Park Street

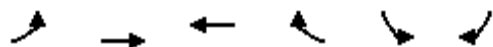
10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	14	54	376	0	0	432
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	59	409	0	0	470
Pedestrians	72		134			85
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	6		11			7
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			142			142
pX, platoon unblocked	0.93	0.90			0.90	
vC, conflicting volume	1084	566			481	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	924	516			421	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	87			100	
cM capacity (veh/h)	232	436			958	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	74	409	470			
Volume Left	15	0	0			
Volume Right	59	0	0			
cSH	369	1700	1700			
Volume to Capacity	0.20	0.24	0.28			
Queue Length 95th (m)	5.6	0.0	0.0			
Control Delay (s)	17.2	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	17.2	0.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		42.5%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	7	305	211	4	18	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	332	229	4	20	10
Pedestrians			3		84	
Lane Width (m)			3.7		3.7	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	318				665	316
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	318				665	316
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	99
cM capacity (veh/h)	1153				391	673
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	339	234	29			
Volume Left	8	0	20			
Volume Right	0	4	10			
cSH	1153	1700	454			
Volume to Capacity	0.01	0.14	0.06			
Queue Length 95th (m)	0.2	0.0	1.6			
Control Delay (s)	0.2	0.0	13.5			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	13.5			
Approach LOS			B			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		31.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.91			0.92			0.87			0.79	
Flpb, ped/bikes		1.00			1.00			0.95			0.94	
Frt		0.98			0.99			0.97			0.95	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1429			1274			1669			1499	
Flt Permitted		1.00			1.00			0.96			0.96	
Satd. Flow (perm)		1429			1274			1611			1456	
Volume (vph)	0	234	35	0	172	18	3	24	9	18	65	49
Peak-hour factor, PHF	0.53	0.84	0.74	0.60	0.86	0.75	0.38	0.86	0.75	0.75	0.77	0.72
Adj. Flow (vph)	0	279	47	0	200	24	8	28	12	24	84	68
RTOR Reduction (vph)	0	8	0	0	5	0	0	8	0	0	28	0
Lane Group Flow (vph)	0	318	0	0	219	0	0	41	0	0	148	0
Confl. Peds. (#/hr)	335		243	243		335	141		122	122		141
Confl. Bikes (#/hr)			11			4			2			2
Heavy Vehicles (%)	6%	12%	3%	0%	30%	0%	0%	0%	0%	0%	0%	6%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		40.0			40.0			28.0			28.0	
Effective Green, g (s)		42.0			42.0			30.0			30.0	
Actuated g/C Ratio		0.52			0.52			0.38			0.38	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		750			669			604			546	
v/s Ratio Prot		c0.22			0.17							
v/s Ratio Perm								0.03			c0.10	
v/c Ratio		0.42			0.33			0.07			0.27	
Uniform Delay, d1		11.6			10.9			16.0			17.4	
Progression Factor		0.81			0.71			0.96			0.97	
Incremental Delay, d2		1.7			1.3			0.2			1.2	
Delay (s)		11.1			9.0			15.5			18.2	
Level of Service		B			A			B			B	
Approach Delay (s)		11.1			9.0			15.5			18.2	
Approach LOS		B			A			B			B	
Intersection Summary												
HCM Average Control Delay		12.4			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.36										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		36.2%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free			Free			Stop			Stop		
Grade	0%			1%			2%			-4%		
Volume (veh/h)	13	238	6	10	172	14	4	5	8	5	11	7
Peak Hour Factor	0.65	0.92	0.38	0.83	0.75	0.88	0.33	0.50	0.67	0.42	0.92	0.58
Hourly flow rate (vph)	20	259	16	12	229	16	12	10	12	12	12	12
Pedestrians	96			2			216			324		
Lane Width (m)	3.0			3.0			3.9			4.8		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	7			0			20			36		
Right turn flare (veh)									4			
Median type	None								None			
Median storage veh												
Upstream signal (m)	80			81								
pX, platoon unblocked	0.96			0.92			0.94	0.94	0.92	0.94	0.94	0.96
vC, conflicting volume	569			490			898	1116	485	905	1116	657
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	553			447			834	1066	441	841	1065	644
tC, single (s)	4.1			4.2			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	97			99			89	90	97	87	88	96
cM capacity (veh/h)	634			806			108	103	423	94	104	274
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	294	257	34	36								
Volume Left	20	12	12	12								
Volume Right	16	16	12	12								
cSH	634	806	163	126								
Volume to Capacity	0.03	0.01	0.21	0.29								
Queue Length 95th (m)	0.7	0.3	5.8	8.3								
Control Delay (s)	1.1	0.6	35.9	44.8								
Lane LOS	A	A	E	E								
Approach Delay (s)	1.1	0.6	35.9	44.8								
Approach LOS			E	E								
Intersection Summary												
Average Delay	5.3											
Intersection Capacity Utilization	40.7%			ICU Level of Service					A			
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

174: Doyle Street & Queen Street

10/03/2010

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Volume (veh/h)	41	15	77	13	15	233			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	45	16	84	14	16	253			
Pedestrians	21		24			25			
Lane Width (m)	3.7		3.7			3.7			
Walking Speed (m/s)	1.2		1.2			1.2			
Percent Blockage	2		2			2			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (m)	61								
pX, platoon unblocked									
vC, conflicting volume	422	137			119				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	422	137			119				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	92	98			99				
cM capacity (veh/h)	560	876			1443				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	61	98	270						
Volume Left	45	0	16						
Volume Right	16	14	0						
cSH	620	1700	1443						
Volume to Capacity	0.10	0.06	0.01						
Queue Length 95th (m)	2.5	0.0	0.3						
Control Delay (s)	11.4	0.0	0.5						
Lane LOS	B		A						
Approach Delay (s)	11.4	0.0	0.5						
Approach LOS	B								
Intersection Summary									
Average Delay	2.0								
Intersection Capacity Utilization	35.6%		ICU Level of Service		A				
Analysis Period (min)	15								

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

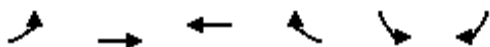
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0	4.6	3.0
Grade (%)		-2%			0%			2%			-5%	
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.90		1.00	0.98		1.00	0.80			0.96	
Flpb, ped/bikes	0.56	1.00		0.68	1.00		0.86	1.00			0.99	
Frt	1.00	0.97		1.00	0.99		1.00	0.91			0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	950	1386		1125	1400		1298	1367			1986	
Flt Permitted	0.60	1.00		0.54	1.00		0.48	1.00			0.97	
Satd. Flow (perm)	599	1386		640	1400		660	1367			1933	
Volume (vph)	29	197	40	125	201	6	27	75	103	11	201	22
Peak-hour factor, PHF	0.60	0.80	0.77	0.79	0.90	0.75	0.84	0.89	0.76	0.55	0.88	0.80
Adj. Flow (vph)	48	246	52	158	223	8	32	84	136	20	228	28
RTOR Reduction (vph)	0	10	0	0	2	0	0	73	0	0	5	0
Lane Group Flow (vph)	48	288	0	158	229	0	32	147	0	0	271	0
Confl. Peds. (#/hr)	282		199	199		282	87		144	144		87
Confl. Bikes (#/hr)			8			4			3			3
Heavy Vehicles (%)	0%	15%	3%	2%	24%	0%	11%	1%	1%	0%	1%	5%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.0	43.0		43.0	43.0		25.0	25.0			25.0	
Effective Green, g (s)	45.0	45.0		45.0	45.0		27.0	27.0			27.0	
Actuated g/C Ratio	0.56	0.56		0.56	0.56		0.34	0.34			0.34	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)	337	780		360	788		223	461			652	
v/s Ratio Prot		0.21			0.16			0.11				
v/s Ratio Perm	0.08			c0.25			0.05				c0.14	
v/c Ratio	0.14	0.37		0.44	0.29		0.14	0.32			0.42	
Uniform Delay, d1	8.3	9.7		10.2	9.2		18.4	19.7			20.4	
Progression Factor	0.85	0.72		1.00	1.00		1.00	1.00			1.14	
Incremental Delay, d2	0.9	1.3		3.9	0.9		1.3	1.8			1.9	
Delay (s)	8.0	8.3		14.0	10.1		19.8	21.5			25.1	
Level of Service	A	A		B	B		B	C			C	
Approach Delay (s)		8.2			11.7			21.3			25.1	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM Average Control Delay			15.6			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			52.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

177: Spring Garden Road & Brunswick Street

10/03/2010



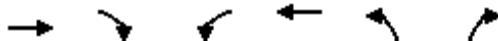
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		-1%	6%		-4%	
Volume (veh/h)	95	183	177	28	48	127
Peak Hour Factor	0.85	0.78	0.90	0.88	1.00	0.93
Hourly flow rate (vph)	112	235	197	32	48	137
Pedestrians		37	65		330	
Lane Width (m)		3.0	3.0		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		3	5		37	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		90	193			
pX, platoon unblocked						
vC, conflicting volume	558				1050	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	558				1050	564
tC, single (s)	4.1				*6.2	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				64	58
cM capacity (veh/h)	635				134	324
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	112	235	197	32	185	
Volume Left	112	0	0	0	48	
Volume Right	0	0	0	32	137	
cSH	635	1700	1700	1700	237	
Volume to Capacity	0.18	0.14	0.12	0.02	0.78	
Queue Length 95th (m)	4.8	0.0	0.0	0.0	43.2	
Control Delay (s)	11.9	0.0	0.0	0.0	59.0	
Lane LOS	B				F	
Approach Delay (s)	3.8		0.0		59.0	
Approach LOS					F	
Intersection Summary						
Average Delay		16.1				
Intersection Capacity Utilization		41.8%		ICU Level of Service		A
Analysis Period (min)		15				

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

10/03/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	281	41	17	198	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	305	45	18	215	0	0
Pedestrians	300				200	
Lane Width (m)	3.0				0.0	
Walking Speed (m/s)	1.2				1.2	
Percent Blockage	21				0	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			550		1080	528
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			518		1086	494
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		100	100
cM capacity (veh/h)			978		174	537
Direction, Lane #	EB 1	WB 1				
Volume Total	350	234				
Volume Left	0	18				
Volume Right	45	0				
cSH	1700	978				
Volume to Capacity	0.21	0.02				
Queue Length 95th (m)	0.0	0.4				
Control Delay (s)	0.0	0.9				
Lane LOS		A				
Approach Delay (s)	0.0	0.9				
Approach LOS						
Intersection Summary						
Average Delay		0.3				
Intersection Capacity Utilization		27.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Doyle Street & Brunswick Street

10/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	7	7	0	64	121	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	8	0	70	132	20
Pedestrians	24			5	7	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	2			0	1	
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)	187					
pX, platoon unblocked						
vC, conflicting volume	242	170	175			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	242	170	175			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	727	852	1372			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	15	70	151			
Volume Left	8	0	0			
Volume Right	8	0	20			
cSH	784	1372	1700			
Volume to Capacity	0.02	0.00	0.09			
Queue Length 95th (m)	0.5	0.0	0.0			
Control Delay (s)	9.7	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.7	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization	22.4%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

225: Clyde Street & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			4%			0%		
Volume (veh/h)	0	0	0	1	18	29	8	23	6	16	38	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	20	32	9	25	7	17	41	25
Pedestrians	75			31			31			28		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			3			3			2		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												141
pX, platoon unblocked												
vC, conflicting volume	279	244	160	196	253	87	141				63	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	279	244	160	196	253	87	141				63	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	100	97	97	99				99	
cM capacity (veh/h)	599	630	862	699	622	923	1442				1499	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	52	40	84									
Volume Left	1	9	17									
Volume Right	32	7	25									
cSH	777	1442	1499									
Volume to Capacity	0.07	0.01	0.01									
Queue Length 95th (m)	1.6	0.1	0.3									
Control Delay (s)	10.0	1.7	1.6									
Lane LOS	A	A	A									
Approach Delay (s)	10.0	1.7	1.6									
Approach LOS	A											
Intersection Summary												
Average Delay	4.1											
Intersection Capacity Utilization	29.3%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
226: Clyde Street & Birmingham Street

10/03/2010

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			2%			0%		
Volume (veh/h)	5	10	4	2	40	11	5	13	1	3	12	6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	5	11	4	2	43	12	5	14	1	3	13	7	
Pedestrians		49			35			41			9		
Lane Width (m)		3.7			3.7			3.7			3.7		
Walking Speed (m/s)		1.2			1.2			1.2			1.2		
Percent Blockage		4			3			4			1		
Right turn flare (veh)													
Median type		None				None							
Median storage veh													
Upstream signal (m)													
pX, platoon unblocked													
vC, conflicting volume	140	133	106	134	136	59	69			50			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	140	133	106	134	136	59	69			50			
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	99	98	100	100	94	99	100			100			
cM capacity (veh/h)	699	700	876	726	698	969	1468			1510			
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	21	58	21	23									
Volume Left	5	2	5	3									
Volume Right	4	12	1	7									
cSH	731	742	1468	1510									
Volume to Capacity	0.03	0.08	0.00	0.00									
Queue Length 95th (m)	0.7	1.9	0.1	0.0									
Control Delay (s)	10.1	10.3	2.0	1.1									
Lane LOS	B	B	A	A									
Approach Delay (s)	10.1	10.3	2.0	1.1									
Approach LOS	B	B											
Intersection Summary													
Average Delay		7.1											
Intersection Capacity Utilization		29.0%		ICU Level of Service				A					
Analysis Period (min)		15											

HCM Unsignalized Intersection Capacity Analysis

227: Clyde Street & Brenton Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	2	39	0	4	0	0	0	37	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	2	42	0	4	0	0	0	40	23
Pedestrians	90			18			48			50		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			2			4			4		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	222	168	190	126	180	68	153				18	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	222	168	190	126	180	68	153				18	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	100	94	100	100				100	
cM capacity (veh/h)	661	711	817	789	701	938	1428				1574	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	45	4	63									
Volume Left	2	4	0									
Volume Right	0	0	23									
cSH	705	1428	1700									
Volume to Capacity	0.06	0.00	0.04									
Queue Length 95th (m)	1.5	0.1	0.0									
Control Delay (s)	10.5	7.5	0.0									
Lane LOS	B	A										
Approach Delay (s)	10.5	7.5	0.0									
Approach LOS	B											
Intersection Summary												
Average Delay	4.5											
Intersection Capacity Utilization	31.0%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

228: Clyde Street & Queen St

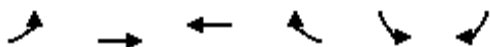
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			3%	
Volume (veh/h)	10	0	8	3	2	3	10	186	6	54	270	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	9	3	2	3	11	202	7	59	293	25
Pedestrians		85			165			17			83	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		7			14			1			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	823	904	408	841	913	453	403			374		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	812	898	373	832	908	453	368			374		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	99	98	99	99	99			94		
cM capacity (veh/h)	191	196	581	182	193	484	1042			1017		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	20	9	220	377								
Volume Left	11	3	11	59								
Volume Right	9	3	7	25								
cSH	272	242	1042	1017								
Volume to Capacity	0.07	0.04	0.01	0.06								
Queue Length 95th (m)	1.8	0.8	0.2	1.4								
Control Delay (s)	19.3	20.4	0.5	1.9								
Lane LOS	C	C	A	A								
Approach Delay (s)	19.3	20.4	0.5	1.9								
Approach LOS	C	C										
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			55.0%	ICU Level of Service						A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

230: Morris Street & Dresden Row

10/03/2010

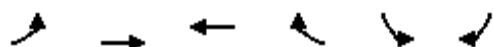


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	28	291	196	7	10	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	316	213	8	11	13
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		166				
pX, platoon unblocked						
vC, conflicting volume	252				685	361
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	252				685	361
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	98
cM capacity (veh/h)	1279				373	601
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	347	221	24			
Volume Left	30	0	11			
Volume Right	0	8	13			
cSH	1279	1700	470			
Volume to Capacity	0.02	0.13	0.05			
Queue Length 95th (m)	0.6	0.0	1.2			
Control Delay (s)	0.9	0.0	13.1			
Lane LOS	A		B			
Approach Delay (s)	0.9	0.0	13.1			
Approach LOS			B			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization		52.4%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

231: Morris Street & Birmingham Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	5	278	213	5	9	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	302	232	5	10	22
Pedestrians		100	100		50	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		9	9		4	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	287				697	384
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	287				697	384
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	96
cM capacity (veh/h)	1220				355	581
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	308	237	32			
Volume Left	5	0	10			
Volume Right	0	5	22			
cSH	1220	1700	485			
Volume to Capacity	0.00	0.14	0.07			
Queue Length 95th (m)	0.1	0.0	1.6			
Control Delay (s)	0.2	0.0	12.9			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		38.4%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

232: Artillery & Dresden Row

10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		6%			-4%
Volume (veh/h)	3	9	35	7	16	162
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	10	38	8	17	176
Pedestrians	20		32			18
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	2		3			2
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)	130					
pX, platoon unblocked						
vC, conflicting volume	305	80			66	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	305	80			66	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	649	949			1510	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	13	46	193			
Volume Left	3	0	17			
Volume Right	10	8	0			
cSH	851	1700	1510			
Volume to Capacity	0.02	0.03	0.01			
Queue Length 95th (m)	0.4	0.0	0.3			
Control Delay (s)	9.3	0.0	0.8			
Lane LOS	A		A			
Approach Delay (s)	9.3	0.0	0.8			
Approach LOS	A					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			30.6%	ICU Level of Service	A	
Analysis Period (min)			15			

47: Bell Road & Ahern Avenue Performance by approach

Approach	EB	WB	All
Total Delay (hr)	16.9	0.3	17.3
Delay / Veh (s)	90.5	3.9	62.5
Total Stops	56	22	78
Travel Dist (km)	78.8	71.8	150.6
Travel Time (hr)	19.0	2.2	21.2
Avg Speed (kph)	14	34	20
Vehicles Entered	682	322	1004
Vehicles Exited	666	323	989
Hourly Exit Rate	666	323	989

63: Queen St & Artillery Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.3	0.1	0.0	0.5
Delay / Veh (s)	1.1	13.4	8.7	5.2	4.8
Total Stops	8	18	35	19	80
Travel Dist (km)	26.2	8.9	3.9	1.5	40.6
Travel Time (hr)	0.9	0.6	0.2	0.1	1.7
Avg Speed (kph)	31	16	19	16	24
Vehicles Entered	245	94	35	23	397
Vehicles Exited	246	86	35	24	391
Hourly Exit Rate	246	86	35	24	391

73: Spring Garden Road & South Park Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.9	1.4	3.4	1.0	7.7
Delay / Veh (s)	20.2	21.0	29.6	9.9	20.5
Total Stops	227	167	289	160	843
Travel Dist (km)	19.5	16.8	54.8	16.7	107.8
Travel Time (hr)	2.4	1.8	4.7	1.4	10.3
Avg Speed (kph)	8	9	12	12	11
Vehicles Entered	335	240	421	361	1357
Vehicles Exited	331	237	405	364	1337
Hourly Exit Rate	331	237	405	364	1337

Scenario B 2010 PM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95			0.92		1.00	0.98		1.00	0.91	
Flpb, ped/bikes	0.95	1.00			0.96		1.00	1.00		0.94	1.00	
Frt	1.00	0.98			0.95		1.00	0.98		1.00	0.89	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1465	1545			1416		1594	1606		1400	1416	
Flt Permitted	0.48	1.00			0.91		0.15	1.00		0.36	1.00	
Satd. Flow (perm)	741	1545			1303		258	1606		524	1416	
Volume (vph)	398	254	29	14	97	68	47	285	28	76	152	366
Peak-hour factor, PHF	0.94	0.87	0.73	0.44	0.89	0.89	0.78	0.82	0.70	0.86	0.90	0.79
Adj. Flow (vph)	423	292	40	32	109	76	60	348	40	88	169	463
RTOR Reduction (vph)	0	7	0	0	27	0	0	6	0	0	137	0
Lane Group Flow (vph)	423	325	0	0	190	0	60	382	0	88	495	0
Confl. Peds. (#/hr)	87		157	157		87	85		71	71		85
Confl. Bikes (#/hr)			5			2			3			13
Heavy Vehicles (%)	2%	1%	0%	0%	4%	0%	2%	1%	11%	3%	0%	1%
Turn Type	pm+pt		Perm			Perm			Perm			
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	512	815			398		93	580		189	511	
v/s Ratio Prot	c0.14	0.21						0.24			c0.35	
v/s Ratio Perm	c0.30				0.15		0.23			0.17		
v/c Ratio	0.83	0.40			0.48		0.65	0.66		0.47	0.97	
Uniform Delay, d1	13.4	10.2			20.3		19.2	19.3		17.7	22.6	
Progression Factor	1.00	1.00			1.27		1.00	1.00		0.91	0.75	
Incremental Delay, d2	14.1	1.5			4.0		29.7	5.8		7.0	30.3	
Delay (s)	27.5	11.6			29.8		48.8	25.1		23.1	47.3	
Level of Service	C	B			C		D	C		C	D	
Approach Delay (s)		20.5			29.8			28.2			44.4	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			31.1				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			92.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

30: Sackville St & Queen St

10/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	4%			-4%	4%	
Volume (veh/h)	539	88	86	454	136	187
Peak Hour Factor	0.87	0.92	0.87	0.87	0.92	0.93
Hourly flow rate (vph)	620	96	99	522	148	201
Pedestrians	9			3	75	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			0	6	
Right turn flare (veh)						7
Median type					None	
Median storage veh						
Upstream signal (m)	192			195		
pX, platoon unblocked						
vC, conflicting volume			790		1210	745
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			790		1210	745
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		0	39
cM capacity (veh/h)			785		143	330
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	715	273	348	349		
Volume Left	0	99	0	148		
Volume Right	96	0	0	201		
cSH	1700	785	1700	337		
Volume to Capacity	0.42	0.13	0.20	1.03		
Queue Length 95th (m)	0.0	3.3	0.0	92.7		
Control Delay (s)	0.0	4.6	0.0	80.3		
Lane LOS		A		F		
Approach Delay (s)	0.0	2.0		80.3		
Approach LOS				F		
Intersection Summary						
Average Delay		17.4				
Intersection Capacity Utilization		67.6%		ICU Level of Service	C	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

10/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				 	 	 
Sign Control	Free			Free	Stop	
Grade	4%			-4%	6%	
Volume (veh/h)	423	50	57	460	121	77
Peak Hour Factor	0.88	0.73	0.59	0.86	0.88	0.80
Hourly flow rate (vph)	481	68	97	535	138	96
Pedestrians	3			3	35	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	158			229		
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			584		1014	553
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			559		1014	526
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		28	79
cM capacity (veh/h)			922		191	453
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	549	275	357	234		
Volume Left	0	97	0	138		
Volume Right	68	0	0	96		
cSH	1700	922	1700	251		
Volume to Capacity	0.32	0.10	0.21	0.93		
Queue Length 95th (m)	0.0	2.7	0.0	63.6		
Control Delay (s)	0.0	4.0	0.0	83.4		
Lane LOS		A		F		
Approach Delay (s)	0.0	1.7		83.4		
Approach LOS				F		
Intersection Summary						
Average Delay		14.6				
Intersection Capacity Utilization		61.7%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	67	145	47	40	282	137	71	193	43	53	118	49
Peak Hour Factor	0.81	0.76	0.79	0.65	0.96	0.83	0.70	0.85	0.90	0.67	0.84	0.85
Hourly flow rate (vph)	83	191	59	62	294	165	101	227	48	79	140	58
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	333	355	165	376	277							
Volume Left (vph)	83	62	0	101	79							
Volume Right (vph)	59	0	165	48	58							
Hadj (s)	-0.02	0.12	-0.67	0.01	-0.03							
Departure Headway (s)	8.3	8.5	7.7	8.1	8.5							
Degree Utilization, x	0.77	0.84	0.35	0.84	0.65							
Capacity (veh/h)	410	410	451	429	385							
Control Delay (s)	34.0	41.0	13.6	41.4	25.9							
Approach Delay (s)	34.0	32.3		41.4	25.9							
Approach LOS	D	D		E	D							
Intersection Summary												
Delay			33.8									
HCM Level of Service			D									
Intersection Capacity Utilization			65.3%	ICU Level of Service		C						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.97			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.98	1.00		1.00	1.00	0.99	1.00	
Frt		0.97			1.00	0.85		1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1963			1725	1498		1858	1354	1658	1798	
Flt Permitted		0.98			0.78	1.00		0.98	1.00	0.24	1.00	
Satd. Flow (perm)		1921			1370	1498		1817	1354	421	1798	
Volume (vph)	11	156	45	86	191	349	27	483	151	220	223	14
Peak-hour factor, PHF	0.93	0.93	0.93	0.99	0.99	0.99	0.96	0.96	0.96	0.98	0.98	0.98
Adj. Flow (vph)	12	168	48	87	193	353	28	503	157	224	228	14
RTOR Reduction (vph)	0	12	0	0	0	247	0	0	88	0	3	0
Lane Group Flow (vph)	0	216	0	0	280	106	0	531	69	224	239	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			2			4			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		21.0			21.0	21.0		32.0	32.0	45.0	45.0	
Effective Green, g (s)		24.0			24.0	24.0		35.0	35.0	48.0	48.0	
Actuated g/C Ratio		0.30			0.30	0.30		0.44	0.44	0.60	0.60	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		576			411	449		795	592	392	1079	
v/s Ratio Prot										c0.06	0.13	
v/s Ratio Perm		0.11			c0.20	0.07		c0.29	0.05	0.28		
v/c Ratio		0.38			0.68	0.24		0.67	0.12	0.57	0.22	
Uniform Delay, d1		22.1			24.6	21.1		17.9	13.3	10.5	7.4	
Progression Factor		1.00			1.00	1.00		0.62	0.78	1.00	1.00	
Incremental Delay, d2		1.9			8.8	1.2		3.5	0.3	5.9	0.5	
Delay (s)		23.9			33.5	22.3		14.7	10.7	16.4	7.9	
Level of Service		C			C	C		B	B	B	A	
Approach Delay (s)		23.9			27.2			13.8			12.0	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay		18.7			HCM Level of Service				B			
HCM Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)				12.0			
Intersection Capacity Utilization		85.1%			ICU Level of Service				E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.82		0.95			1.00	0.84
Flpb, ped/bikes	0.92	1.00		0.92	1.00	1.00		0.98			0.97	1.00
Frt	1.00	0.95		1.00	1.00	0.85		0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.98	1.00
Satd. Flow (prot)	1674	1694		1652	1892	1316		3141			3394	1386
Flt Permitted	0.40	1.00		0.39	1.00	1.00		0.80			0.66	1.00
Satd. Flow (perm)	710	1694		675	1892	1316		2526			2257	1386
Volume (vph)	74	204	87	75	355	67	111	427	95	55	185	41
Peak-hour factor, PHF	0.77	0.81	0.68	0.85	0.97	0.79	0.73	0.91	0.74	0.60	0.89	0.85
Adj. Flow (vph)	96	252	128	88	366	85	152	469	128	92	208	48
RTOR Reduction (vph)	0	23	0	0	0	51	0	22	0	0	0	24
Lane Group Flow (vph)	96	357	0	88	366	34	0	728	0	0	300	24
Confl. Peds. (#/hr)	161		163	163		161	187		228	228		187
Confl. Bikes (#/hr)			12			13			6			5
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		38.0			38.0	38.0
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		40.0			40.0	40.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40		0.50			0.50	0.50
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	284	678		270	757	526		1263			1129	693
v/s Ratio Prot		c0.21			0.19							
v/s Ratio Perm	0.14			0.13		0.03		c0.29			0.13	0.02
v/c Ratio	0.34	0.53		0.33	0.48	0.06		0.58			0.27	0.03
Uniform Delay, d1	16.7	18.2		16.6	17.9	14.8		14.0			11.5	10.2
Progression Factor	1.00	1.00		1.00	1.00	1.00		0.87			0.88	0.89
Incremental Delay, d2	3.2	2.9		3.2	2.2	0.2		1.5			0.6	0.1
Delay (s)	19.8	21.2		19.7	20.1	15.0		13.7			10.7	9.1
Level of Service	B	C		B	C	B		B			B	A
Approach Delay (s)		20.9			19.2			13.7			10.5	
Approach LOS		C			B			B			B	
Intersection Summary												
HCM Average Control Delay			16.2				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			88.3%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

63: Clyde Street & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			4%			0%		
Volume (veh/h)	0	0	0	6	71	49	9	46	7	22	52	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	7	77	53	10	50	8	24	57	54
Pedestrians	45			51			36			74		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			4			3			6		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												141
pX, platoon unblocked												
vC, conflicting volume	416	305	165	292	328	179	156				109	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	416	305	165	292	328	179	156				109	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	99	86	93	99				98	
cM capacity (veh/h)	405	568	853	581	552	774	1424				1417	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	137	67	135									
Volume Left	7	10	24									
Volume Right	53	8	54									
cSH	623	1424	1417									
Volume to Capacity	0.22	0.01	0.02									
Queue Length 95th (m)	6.3	0.2	0.4									
Control Delay (s)	12.4	1.1	1.5									
Lane LOS	B	A	A									
Approach Delay (s)	12.4	1.1	1.5									
Approach LOS	B											
Intersection Summary												
Average Delay	5.8											
Intersection Capacity Utilization	32.6%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

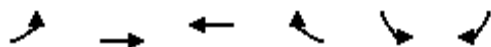
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.25		1.00	0.46	1.00	0.89		1.00	1.00	0.56
Flpb, ped/bikes	0.78	1.00	1.00		0.95	1.00	0.75	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1253	1448	354		1513	684	1298	1586		1723	1739	855
Flt Permitted	0.44	1.00	1.00		0.94	1.00	0.56	1.00		0.29	1.00	1.00
Satd. Flow (perm)	580	1448	354		1433	684	758	1586		529	1739	855
Volume (vph)	63	200	47	28	201	99	80	492	73	71	249	60
Peak-hour factor, PHF	0.93	0.89	0.84	0.78	0.75	0.85	0.83	0.95	0.80	0.78	0.90	0.83
Adj. Flow (vph)	68	225	56	36	268	116	96	518	91	91	277	72
RTOR Reduction (vph)	0	0	36	0	0	24	0	7	0	0	0	0
Lane Group Flow (vph)	68	225	20	0	304	92	96	602	0	91	277	72
Confl. Peds. (#/hr)	748		384	384		748	362		404	404		362
Confl. Bikes (#/hr)			3			9			9			16
Heavy Vehicles (%)	3%	21%	10%	14%	10%	1%	4%	2%	14%	7%	3%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	25.0	25.0	25.0		25.0	25.0	41.0	41.0		41.0	41.0	41.0
Effective Green, g (s)	28.0	28.0	28.0		28.0	28.0	44.0	44.0		44.0	44.0	44.0
Actuated g/C Ratio	0.35	0.35	0.35		0.35	0.35	0.55	0.55		0.55	0.55	0.55
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	203	507	124		502	239	417	872		291	956	470
v/s Ratio Prot		0.16						c0.38			0.16	
v/s Ratio Perm	0.12		0.06		c0.21	0.13	0.13			0.17		0.08
v/c Ratio	0.33	0.44	0.16		0.61	0.38	0.23	0.69		0.31	0.29	0.15
Uniform Delay, d1	19.1	20.0	17.9		21.4	19.5	9.3	13.1		9.8	9.6	8.8
Progression Factor	1.04	0.97	1.34		0.74	0.65	1.15	1.25		0.77	0.78	0.75
Incremental Delay, d2	3.9	2.5	2.4		5.2	4.5	1.2	4.3		2.7	0.7	0.7
Delay (s)	23.7	21.9	26.4		21.0	17.1	11.9	20.7		10.2	8.2	7.3
Level of Service	C	C	C		C	B	B	C		B	A	A
Approach Delay (s)		23.0			19.9			19.5			8.5	
Approach LOS		C			B			B			A	
Intersection Summary												
HCM Average Control Delay			17.7				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			71.5%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Place

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	12	245	421	7	23	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	266	458	8	25	36
Pedestrians			3		84	
Lane Width (m)			3.7		3.7	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	549				841	545
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	549				841	545
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	93
cM capacity (veh/h)	947				306	499
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	279	465	61			
Volume Left	13	0	25			
Volume Right	0	8	36			
cSH	947	1700	396			
Volume to Capacity	0.01	0.27	0.15			
Queue Length 95th (m)	0.3	0.0	4.1			
Control Delay (s)	0.6	0.0	15.7			
Lane LOS	A		C			
Approach Delay (s)	0.6	0.0	15.7			
Approach LOS			C			
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		32.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.86			0.91			0.85			0.73	
Flpb, ped/bikes		1.00			1.00			0.92			0.93	
Frt		0.98			0.99			0.97			0.94	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1268			1453			1541			1365	
Flt Permitted		1.00			1.00			0.91			0.95	
Satd. Flow (perm)		1268			1453			1419			1306	
Volume (vph)	0	249	32	0	263	22	25	73	17	11	57	65
Peak-hour factor, PHF	0.80	0.90	0.62	0.56	0.88	0.69	0.78	0.96	0.53	0.39	0.68	0.80
Adj. Flow (vph)	0	277	52	0	299	32	32	76	32	28	84	81
RTOR Reduction (vph)	0	8	0	0	5	0	0	13	0	0	6	0
Lane Group Flow (vph)	0	321	0	0	326	0	0	127	0	0	187	0
Confl. Peds. (#/hr)	691		566	566		691	252		296	296		252
Confl. Bikes (#/hr)			7			6			3			
Heavy Vehicles (%)	0%	20%	3%	6%	11%	0%	4%	0%	6%	9%	2%	3%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		39.0			39.0			29.0			29.0	
Effective Green, g (s)		41.0			41.0			31.0			31.0	
Actuated g/C Ratio		0.51			0.51			0.39			0.39	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		650			745			550			506	
v/s Ratio Prot		c0.25			0.22							
v/s Ratio Perm								0.09			c0.14	
v/c Ratio		0.49			0.44			0.23			0.37	
Uniform Delay, d1		12.7			12.3			16.5			17.5	
Progression Factor		1.13			0.78			1.00			0.97	
Incremental Delay, d2		2.4			1.8			1.0			2.1	
Delay (s)		16.8			11.3			17.4			19.1	
Level of Service		B			B			B			B	
Approach Delay (s)		16.8			11.3			17.4			19.1	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay		15.5			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.44										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		36.3%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

10/03/2010

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control		Free			Free			Stop			Stop		
Grade		0%			1%			2%			-4%		
Volume (veh/h)	13	283	13	17	263	21	8	19	42	2	7	25	
Peak Hour Factor	0.81	0.91	0.68	0.71	0.84	0.76	0.75	0.95	0.75	0.50	0.74	0.78	
Hourly flow rate (vph)	16	311	19	24	313	28	11	20	56	4	9	32	
Pedestrians		122			22			297			436		
Lane Width (m)		3.0			3.0			3.9			4.8		
Walking Speed (m/s)		1.2			1.2			1.2			1.2		
Percent Blockage		8			2			27			48		
Right turn flare (veh)										4			
Median type		None								None			
Median storage veh													
Upstream signal (m)		80			81								
pX, platoon unblocked	0.92			0.92			0.96	0.96	0.92	0.96	0.96	0.92	
vC, conflicting volume	777			627			1183	1474	640	1223	1470	885	
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	757			593			1063	1367	606	1105	1363	875	
tC, single (s)	4.2			4.1			7.2	6.5	6.2	7.2	6.5	6.2	
tC, 2 stage (s)													
tF (s)	2.3			2.2			3.6	4.0	3.3	3.6	4.0	3.3	
p0 queue free %	96			96			74	60	83	84	81	79	
cM capacity (veh/h)	394			666			41	49	330	25	50	152	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	346	365	87	46									
Volume Left	16	24	11	4									
Volume Right	19	28	56	32									
cSH	394	666	131	82									
Volume to Capacity	0.04	0.04	0.66	0.56									
Queue Length 95th (m)	1.0	0.8	27.1	18.6									
Control Delay (s)	1.4	1.1	74.2	94.1									
Lane LOS	A	A	F	F									
Approach Delay (s)	1.4	1.1	74.2	94.1									
Approach LOS			F	F									
Intersection Summary													
Average Delay			13.8										
Intersection Capacity Utilization			49.2%		ICU Level of Service					A			
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis

108: Clyde Street & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			2%			0%	
Volume (veh/h)	10	22	5	7	93	12	9	19	10	13	17	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	24	5	8	101	13	10	21	11	14	18	25
Pedestrians		75			59			48			68	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		6			5			4			6	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	311	244	154	229	251	153	118			91		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	311	244	154	229	251	153	118			91		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	96	99	99	82	98	99			99		
cM capacity (veh/h)	435	574	800	574	569	798	1375			1429		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	40	122	41	58								
Volume Left	11	8	10	14								
Volume Right	5	13	11	25								
cSH	548	588	1375	1429								
Volume to Capacity	0.07	0.21	0.01	0.01								
Queue Length 95th (m)	1.8	5.9	0.2	0.2								
Control Delay (s)	12.1	12.7	1.9	1.9								
Lane LOS	B	B	A	A								
Approach Delay (s)	12.1	12.7	1.9	1.9								
Approach LOS	B	B										
Intersection Summary												
Average Delay			8.5									
Intersection Capacity Utilization		32.1%		ICU Level of Service		A						
Analysis Period (min)		15										

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

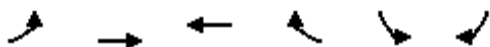
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	3.0	3.0	3.0	3.0	3.7	3.0	3.7	3.0	3.7	3.7	3.7
Grade (%)		-2%			0%			2%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.89		1.00	1.00		1.00	0.83			1.00	
Flpb, ped/bikes	1.00	1.00		0.61	1.00		0.58	1.00			1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.94			0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1807	1307		1026	1576		946	1471			1838	
Flt Permitted	0.50	1.00		0.51	1.00		0.65	1.00			0.99	
Satd. Flow (perm)	958	1307		556	1576		651	1471			1818	
Volume (vph)	49	241	32	94	247	23	92	238	157	5	116	24
Peak-hour factor, PHF	0.92	0.94	0.73	0.70	0.86	0.92	0.72	0.92	0.93	0.92	0.92	0.92
Adj. Flow (vph)	53	256	44	134	287	25	128	259	169	5	126	26
RTOR Reduction (vph)	0	8	0	0	4	0	0	28	0	0	9	0
Lane Group Flow (vph)	53	292	0	134	308	0	128	400	0	0	148	0
Confl. Peds. (#/hr)			420	420			271		340			
Confl. Bikes (#/hr)			1						2			
Heavy Vehicles (%)	2%	22%	0%	0%	12%	2%	2%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm				Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		31.0	31.0			31.0	
Effective Green, g (s)	39.0	39.0		39.0	39.0		33.0	33.0			33.0	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.41	0.41			0.41	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)	467	637		271	768		269	607			750	
v/s Ratio Prot		0.22			0.20			c0.27				
v/s Ratio Perm	0.06			c0.24			0.20				0.08	
v/c Ratio	0.11	0.46		0.49	0.40		0.48	0.66			0.20	
Uniform Delay, d1	11.1	13.5		13.8	13.1		17.2	19.0			15.0	
Progression Factor	0.90	0.74		1.00	1.00		1.00	1.00			1.03	
Incremental Delay, d2	0.5	2.2		6.3	1.6		5.9	5.5			0.6	
Delay (s)	10.4	12.2		20.2	14.6		23.1	24.5			16.0	
Level of Service	B	B		C	B		C	C			B	
Approach Delay (s)		11.9			16.3			24.2			16.0	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay			18.1			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			67.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

177: Spring Garden Road & Brunswick Street

10/03/2010

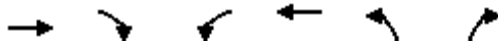


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		-1%	6%		-4%	
Volume (veh/h)	136	286	280	146	24	86
Peak Hour Factor	0.94	0.91	0.85	0.96	0.92	0.92
Hourly flow rate (vph)	145	314	329	152	26	93
Pedestrians		16	33		435	
Lane Width (m)		3.0	3.0		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		48	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		90	193			
pX, platoon unblocked						
vC, conflicting volume	916				1401	780
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	916				1401	780
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	62				47	53
cM capacity (veh/h)	378				49	200
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	145	314	329	152	120	
Volume Left	145	0	0	0	26	
Volume Right	0	0	0	152	93	
cSH	378	1700	1700	1700	119	
Volume to Capacity	0.38	0.18	0.19	0.09	1.00	
Queue Length 95th (m)	13.3	0.0	0.0	0.0	51.0	
Control Delay (s)	20.3	0.0	0.0	0.0	151.9	
Lane LOS	C				F	
Approach Delay (s)	6.4		0.0		151.9	
Approach LOS					F	
Intersection Summary						
Average Delay			19.9			
Intersection Capacity Utilization			42.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

10/03/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩		
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	327	69	33	298	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	355	75	36	324	0	0
Pedestrians	591				630	
Lane Width (m)	3.0				0.0	
Walking Speed (m/s)	1.2				1.2	
Percent Blockage	41				0	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.91		0.95	0.91
vC, conflicting volume			1060		2010	1023
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1067		1931	1025
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		100	100
cM capacity (veh/h)			593		38	259
Direction, Lane #	EB 1	WB 1				
Volume Total	430	360				
Volume Left	0	36				
Volume Right	75	0				
cSH	1700	593				
Volume to Capacity	0.25	0.06				
Queue Length 95th (m)	0.0	1.5				
Control Delay (s)	0.0	1.9				
Lane LOS		A				
Approach Delay (s)	0.0	1.9				
Approach LOS						
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		46.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Brenton Place & Brenton Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	0	0	0	10	117	0	43	0	0	0	28	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	11	127	0	47	0	0	0	30	72
Pedestrians	28			32			60			84		
Lane Width (m)	0.0			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			3			5			7		
Right turn flare (veh)												
Median type	None			None								
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	335	220	154	252	256	116	130				32	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	335	220	154	252	256	116	130				32	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	100	98	79	100	97				100	
cM capacity (veh/h)	461	639	846	618	610	845	1455				1537	
Direction, Lane #	WB 1	NB 1	SB 1									
Volume Total	138	47	102									
Volume Left	11	47	0									
Volume Right	0	0	72									
cSH	611	1455	1700									
Volume to Capacity	0.23	0.03	0.06									
Queue Length 95th (m)	6.6	0.8	0.0									
Control Delay (s)	12.6	7.6	0.0									
Lane LOS	B	A										
Approach Delay (s)	12.6	7.6	0.0									
Approach LOS	B											
Intersection Summary												
Average Delay	7.3											
Intersection Capacity Utilization	31.5%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

223: Brenton Place & South Park Street

10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	35	237	473	0	0	246
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	258	514	0	0	267
Pedestrians	52		163			169
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		14			14
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			141			143
pX, platoon unblocked	0.87	0.87			0.87	
vC, conflicting volume	997	735			566	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995	695			501	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	18			100	
cM capacity (veh/h)	194	314			883	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	296	514	267			
Volume Left	38	0	0			
Volume Right	258	0	0			
cSH	291	1700	1700			
Volume to Capacity	1.02	0.30	0.16			
Queue Length 95th (m)	82.3	0.0	0.0			
Control Delay (s)	96.4	0.0	0.0			
Lane LOS	F					
Approach Delay (s)	96.4	0.0	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		26.5				
Intersection Capacity Utilization		54.6%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

224: Clyde Street & Queen St

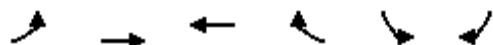
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			3%	
Volume (veh/h)	24	4	15	2	20	43	34	379	1	2	162	75
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	4	16	2	22	47	37	412	1	2	176	82
Pedestrians		94			157			19			78	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		8			13			2			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	937	959	330	902	999	648	352			570		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	937	959	330	902	999	648	352			570		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	81	98	97	99	88	88	97			100		
cM capacity (veh/h)	138	197	644	173	187	380	1110			868		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	71	450	260								
Volume Left	26	2	37	2								
Volume Right	16	47	1	82								
cSH	198	280	1110	868								
Volume to Capacity	0.24	0.25	0.03	0.00								
Queue Length 95th (m)	6.7	7.4	0.8	0.1								
Control Delay (s)	28.7	22.1	1.0	0.1								
Lane LOS	D	C	A	A								
Approach Delay (s)	28.7	22.1	1.0	0.1								
Approach LOS	D	C										
Intersection Summary												
Average Delay			4.1									
Intersection Capacity Utilization			59.8%	ICU Level of Service						B		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

225: Morris Street & Dresden Row

10/03/2010

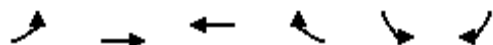


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	40	250	395	6	18	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	272	429	7	20	28
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	467				882	577
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467				882	577
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	94
cM capacity (veh/h)	1066				280	454
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	315	436	48			
Volume Left	43	0	20			
Volume Right	0	7	28			
cSH	1066	1700	362			
Volume to Capacity	0.04	0.26	0.13			
Queue Length 95th (m)	1.0	0.0	3.4			
Control Delay (s)	1.5	0.0	16.4			
Lane LOS	A		C			
Approach Delay (s)	1.5	0.0	16.4			
Approach LOS			C			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization		59.7%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

226: Morris Street & Birmingham Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	26	213	385	10	5	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	232	418	11	5	33
Pedestrians		133	99		49	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		11	8		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	478				860	606
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478				860	606
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	92
cM capacity (veh/h)	1038				278	422
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	260	429	38			
Volume Left	28	0	5			
Volume Right	0	11	33			
cSH	1038	1700	393			
Volume to Capacity	0.03	0.25	0.10			
Queue Length 95th (m)	0.6	0.0	2.4			
Control Delay (s)	1.2	0.0	15.1			
Lane LOS	A		C			
Approach Delay (s)	1.2	0.0	15.1			
Approach LOS			C			
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		52.9%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

228: Artillery Place & Dresden Row

10/03/2010

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Sign Control	Stop		Free			Free			
Grade	0%		6%			-4%			
Volume (veh/h)	24	21	93	26	34	172			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	26	23	101	28	37	187			
Pedestrians	102		74			46			
Lane Width (m)	3.7		3.7			3.7			
Walking Speed (m/s)	1.2		1.2			1.2			
Percent Blockage	9		6			4			
Right turn flare (veh)									
Median type	None								
Median storage veh									
Upstream signal (m)	127								
pX, platoon unblocked									
vC, conflicting volume	552	263			231				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	552	263			231				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	94	97			97				
cM capacity (veh/h)	410	680			1220				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	49	129	224						
Volume Left	26	0	37						
Volume Right	23	28	0						
cSH	503	1700	1220						
Volume to Capacity	0.10	0.08	0.03						
Queue Length 95th (m)	2.4	0.0	0.7						
Control Delay (s)	12.9	0.0	1.6						
Lane LOS	B		A						
Approach Delay (s)	12.9	0.0	1.6						
Approach LOS	B								
Intersection Summary									
Average Delay	2.4								
Intersection Capacity Utilization	35.7%		ICU Level of Service		A				
Analysis Period (min)	15								

HCM Unsignalized Intersection Capacity Analysis

229: Doyle Street & Brunswick Street

10/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	76	16	4	238	113	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	83	17	4	259	123	57
Pedestrians	95			14	26	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			1	2	
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)	187					
pX, platoon unblocked						
vC, conflicting volume	539	260	274			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	539	260	274			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	98	100			
cM capacity (veh/h)	450	707	1184			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	100	263	179			
Volume Left	83	4	0			
Volume Right	17	0	57			
cSH	481	1184	1700			
Volume to Capacity	0.21	0.00	0.11			
Queue Length 95th (m)	5.9	0.1	0.0			
Control Delay (s)	14.4	0.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.4	0.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization	30.8%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

230: Doyle Street & Queen Street

10/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	26	24	220	75	33	119
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	26	239	82	36	129
Pedestrians	75		75			81
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	6		6			7
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)	59					
pX, platoon unblocked						
vC, conflicting volume	631	436			396	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	631	436			396	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	95			97	
cM capacity (veh/h)	377	540			1088	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	54	321	165			
Volume Left	28	0	36			
Volume Right	26	82	0			
cSH	441	1700	1088			
Volume to Capacity	0.12	0.19	0.03			
Queue Length 95th (m)	3.2	0.0	0.8			
Control Delay (s)	14.3	0.0	2.1			
Lane LOS	B		A			
Approach Delay (s)	14.3	0.0	2.1			
Approach LOS	B					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization	48.3%		ICU Level of Service		A	
Analysis Period (min)			15			

155: Bell Road & Trollope Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	7.9	4.6	2.5	2.2	17.2
Delay / Veh (s)	54.0	27.8	34.3	28.7	37.3
Total Stops	25	363	157	188	733
Travel Dist (km)	8.2	139.1	12.3	44.3	203.9
Travel Time (hr)	8.3	7.5	2.8	3.4	22.1
Avg Speed (kph)	4	18	4	14	13
Vehicles Entered	528	594	263	276	1661
Vehicles Exited	529	587	265	277	1658
Hourly Exit Rate	529	587	265	277	1658

174: Queen Street & Birmingham Street Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.1	0.4	0.1	0.7
Delay / Veh (s)	1.4	1.6	11.7	4.7	3.7
Total Stops	27	13	119	28	187
Travel Dist (km)	23.5	23.9	10.1	4.2	61.8
Travel Time (hr)	0.8	0.6	0.7	0.3	2.4
Avg Speed (kph)	30	37	14	16	26
Vehicles Entered	231	244	119	63	657
Vehicles Exited	232	244	119	64	659
Hourly Exit Rate	232	244	119	64	659

175: Spring Garden Road & Queen Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.5	1.4	4.5	0.7	8.2
Delay / Veh (s)	17.3	14.9	34.6	16.7	22.9
Total Stops	167	197	468	98	930
Travel Dist (km)	24.0	13.9	60.4	8.3	106.6
Travel Time (hr)	2.1	1.8	6.2	0.9	11.0
Avg Speed (kph)	11	8	10	9	10
Vehicles Entered	318	341	473	154	1286
Vehicles Exited	320	341	466	157	1284
Hourly Exit Rate	320	341	466	157	1284

Scenario C 2010 AM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99			0.94		1.00	0.99		1.00	0.96	
Flpb, ped/bikes	0.94	1.00			0.99		1.00	1.00		0.96	1.00	
Frt	1.00	0.98			0.94		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1450	1609			1513		1626	1624		1470	1495	
Flt Permitted	0.65	1.00			0.92		0.15	1.00		0.57	1.00	
Satd. Flow (perm)	993	1609			1398		263	1624		888	1495	
Volume (vph)	221	293	31	6	31	30	8	144	22	200	242	432
Peak-hour factor, PHF	0.91	0.94	0.70	0.40	0.86	0.83	0.50	0.80	0.69	0.94	0.83	0.86
Adj. Flow (vph)	243	312	44	15	36	36	16	180	32	213	292	502
RTOR Reduction (vph)	0	7	0	0	25	0	0	9	0	0	86	0
Lane Group Flow (vph)	243	349	0	0	62	0	16	203	0	213	708	0
Confl. Peds. (#/hr)	49		52	52		49	27		25	25		27
Confl. Bikes (#/hr)			16						4			25
Heavy Vehicles (%)	2%	0%	6%	0%	0%	0%	0%	0%	5%	1%	3%	2%
Turn Type	pm+pt		Perm			Perm			Perm			
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	600	849			427		95	586		321	540	
v/s Ratio Prot	0.07	c0.22						0.13			c0.47	
v/s Ratio Perm	0.15				0.04		0.06			0.24		
v/c Ratio	0.41	0.41			0.15		0.17	0.35		0.66	1.31	
Uniform Delay, d1	9.9	10.3			18.2		15.6	16.8		19.3	23.0	
Progression Factor	1.00	1.00			1.55		1.01	1.02		1.15	1.07	
Incremental Delay, d2	2.0	1.5			0.7		3.8	1.6		7.0	148.6	
Delay (s)	11.9	11.7			28.9		19.6	18.7		29.2	173.2	
Level of Service	B	B			C		B	B		C	F	
Approach Delay (s)		11.8			28.9			18.8			142.8	
Approach LOS		B			C			B			F	
Intersection Summary												
HCM Average Control Delay			82.1				HCM Level of Service			F		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			78.8%				ICU Level of Service		D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: Sackville St & Queen St

10/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↱	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	4%			-4%	4%	
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	1.00			0.95	1.00	1.00
Frpb, ped/bikes	0.94			1.00	1.00	0.96
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	1675			3610	1789	1529
Flt Permitted	1.00			0.63	0.95	1.00
Satd. Flow (perm)	1675			2296	1789	1529
Volume (vph)	495	164	115	376	77	103
Peak-hour factor, PHF	0.91	0.82	0.87	0.82	0.85	0.88
Adj. Flow (vph)	544	200	132	459	91	117
RTOR Reduction (vph)	17	0	0	0	0	89
Lane Group Flow (vph)	727	0	0	591	91	28
Confl. Peds. (#/hr)		44	44		4	5
Confl. Bikes (#/hr)		31				2
Heavy Vehicles (%)	2%	1%	2%	2%	0%	0%
Turn Type		Perm			Perm	
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	50.0			50.0	16.0	16.0
Effective Green, g (s)	53.0			53.0	19.0	19.0
Actuated g/C Ratio	0.66			0.66	0.24	0.24
Clearance Time (s)	7.0			7.0	7.0	7.0
Lane Grp Cap (vph)	1110			1521	425	363
v/s Ratio Prot	c0.43				c0.05	
v/s Ratio Perm				0.26		0.02
v/c Ratio	0.66			0.39	0.21	0.08
Uniform Delay, d1	8.1			6.1	24.5	23.7
Progression Factor	1.30			1.00	1.09	1.37
Incremental Delay, d2	2.7			0.8	1.1	0.4
Delay (s)	13.2			6.9	27.9	32.9
Level of Service	B			A	C	C
Approach Delay (s)	13.2			6.9	30.7	
Approach LOS	B			A	C	
Intersection Summary						
HCM Average Control Delay		13.2		HCM Level of Service		B
HCM Volume to Capacity ratio		0.54				
Actuated Cycle Length (s)		80.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		68.2%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

10/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰↰			
Sign Control	Free		Free		Stop	
Grade	4%		-4%		6%	
Volume (veh/h)	740	137	115	369	0	0
Peak Hour Factor	0.97	0.97	0.88	0.88	0.83	0.83
Hourly flow rate (vph)	763	141	131	419	0	0
Pedestrians	2			8	35	
Lane Width (m)	3.7		3.7		0.0	
Walking Speed (m/s)	1.2		1.2		1.2	
Percent Blockage	0		1		0	
Right turn flare (veh)						
Median type						None
Median storage veh)						
Upstream signal (m)	158		34			
pX, platoon unblocked			0.80		0.82	0.80
vC, conflicting volume			939		1342	877
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			924		1256	845
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			78		100	100
cM capacity (veh/h)			586		104	242
Direction, Lane #	EB 1	WB 1	WB 2			
Volume Total	904	270	280			
Volume Left	0	131	0			
Volume Right	141	0	0			
cSH	1700	586	1700			
Volume to Capacity	0.53	0.22	0.16			
Queue Length 95th (m)	0.0	6.5	0.0			
Control Delay (s)	0.0	7.9	0.0			
Lane LOS		A				
Approach Delay (s)	0.0	3.9				
Approach LOS						
Intersection Summary						
Average Delay		1.5				
Intersection Capacity Utilization		77.0%		ICU Level of Service	D	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	77	191	44	39	122	38	32	120	48	123	148	30
Peak Hour Factor	0.97	0.97	0.97	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95
Hourly flow rate (vph)	79	197	45	41	130	40	36	135	54	129	156	32
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	322	171	40	225	317							
Volume Left (vph)	79	41	0	36	129							
Volume Right (vph)	45	0	40	54	32							
Hadj (s)	0.00	0.16	-0.67	-0.08	0.06							
Departure Headway (s)	6.2	7.0	6.2	6.2	6.1							
Degree Utilization, x	0.55	0.33	0.07	0.39	0.54							
Capacity (veh/h)	533	455	518	518	546							
Control Delay (s)	16.7	12.3	8.4	13.1	16.1							
Approach Delay (s)	16.7	11.6		13.1	16.1							
Approach LOS	C	B		B	C							
Intersection Summary												
Delay			14.8									
HCM Level of Service			B									
Intersection Capacity Utilization			74.6%	ICU Level of Service		D						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↗		↕	↗	↗	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.97	1.00		1.00	1.00	0.98	1.00	
Frt		0.98			1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1996			1709	1502		1859	1349	1628	1813	
Flt Permitted		0.98			0.70	1.00		0.98	1.00	0.39	1.00	
Satd. Flow (perm)		1963			1227	1502		1817	1349	676	1813	
Volume (vph)	10	184	35	97	144	118	11	217	103	413	303	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	11	200	38	102	152	124	12	241	114	449	329	5
RTOR Reduction (vph)	0	8	0	0	0	85	0	0	81	0	1	0
Lane Group Flow (vph)	0	241	0	0	254	39	0	253	33	449	333	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			4			2			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		22.0			22.0	22.0		20.0	20.0	44.0	44.0	
Effective Green, g (s)		25.0			25.0	25.0		23.0	23.0	47.0	47.0	
Actuated g/C Ratio		0.31			0.31	0.31		0.29	0.29	0.59	0.59	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		613			383	469		522	388	635	1065	
v/s Ratio Prot										c0.18	0.18	
v/s Ratio Perm		0.12			c0.21	0.03		0.14	0.02	c0.24		
v/c Ratio		0.39			0.66	0.08		0.48	0.08	0.71	0.31	
Uniform Delay, d1		21.6			23.8	19.4		23.6	20.8	10.4	8.3	
Progression Factor		1.00			0.82	0.47		0.84	1.16	1.00	1.00	
Incremental Delay, d2		1.9			8.3	0.3		2.8	0.4	6.5	0.8	
Delay (s)		23.4			27.9	9.4		22.6	24.4	16.9	9.1	
Level of Service		C			C	A		C	C	B	A	
Approach Delay (s)		23.4			21.9			23.2			13.6	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay		18.7			HCM Level of Service					B		
HCM Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)					8.0		
Intersection Capacity Utilization		79.5%			ICU Level of Service					D		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.88		0.96			1.00	0.93
Flpb, ped/bikes	0.92	1.00		0.94	1.00	1.00		0.99			0.98	1.00
Frt	1.00	0.93		1.00	1.00	0.85		0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99	1.00
Satd. Flow (prot)	1582	1652		1665	1874	1369		3233			3472	1527
Flt Permitted	0.61	1.00		0.37	1.00	1.00		0.70			0.70	1.00
Satd. Flow (perm)	1019	1652		645	1874	1369		2304			2472	1527
Volume (vph)	36	179	168	49	157	31	87	278	81	95	315	37
Peak-hour factor, PHF	0.82	0.84	0.86	0.88	0.84	0.71	0.62	0.80	0.92	0.82	0.82	0.54
Adj. Flow (vph)	44	213	195	56	187	44	140	348	88	116	384	69
RTOR Reduction (vph)	0	41	0	0	0	26	0	18	0	0	0	35
Lane Group Flow (vph)	44	367	0	56	187	18	0	558	0	0	500	34
Confl. Peds. (#/hr)	104		118	118		104	74		164	164		74
Confl. Bikes (#/hr)			4			11			14			3
Heavy Vehicles (%)	6%	1%	1%	2%	1%	3%	1%	4%	1%	0%	3%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	31.0	31.0		31.0	31.0	31.0		37.0			37.0	37.0
Effective Green, g (s)	33.0	33.0		33.0	33.0	33.0		39.0			39.0	39.0
Actuated g/C Ratio	0.41	0.41		0.41	0.41	0.41		0.49			0.49	0.49
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	420	681		266	773	565		1123			1205	744
v/s Ratio Prot		c0.22			0.10							
v/s Ratio Perm	0.04			0.09		0.01		c0.24			0.20	0.02
v/c Ratio	0.10	0.54		0.21	0.24	0.03		0.50			0.41	0.05
Uniform Delay, d1	14.4	17.8		15.1	15.3	14.0		13.9			13.2	10.7
Progression Factor	0.97	0.92		1.00	1.00	1.00		0.64			0.82	0.66
Incremental Delay, d2	0.5	2.9		1.8	0.7	0.1		1.4			1.0	0.1
Delay (s)	14.5	19.1		16.9	16.1	14.1		10.2			11.8	7.2
Level of Service	B	B		B	B	B		B			B	A
Approach Delay (s)		18.7			15.9			10.2			11.3	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay		13.4					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		80.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		91.1%					ICU Level of Service		F			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

76: Brenton Place & South Park Street

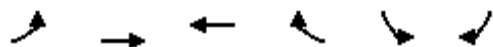
10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	14	57	376	0	9	432
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	62	409	0	10	470
Pedestrians	72		134			85
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	6		11			7
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			142			142
pX, platoon unblocked	0.93	0.90			0.90	
vC, conflicting volume	1104	566			481	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945	516			421	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	86			99	
cM capacity (veh/h)	221	436			958	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	77	409	479			
Volume Left	15	0	10			
Volume Right	62	0	0			
cSH	366	1700	958			
Volume to Capacity	0.21	0.24	0.01			
Queue Length 95th (m)	6.0	0.0	0.2			
Control Delay (s)	17.4	0.0	0.3			
Lane LOS	C		A			
Approach Delay (s)	17.4	0.0	0.3			
Approach LOS	C					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization		49.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	7	305	211	4	18	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	332	229	4	20	10
Pedestrians		1	3		80	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		0	0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	314				661	313
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	314				661	313
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	99
cM capacity (veh/h)	1161				394	677
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	339	234	29			
Volume Left	8	0	20			
Volume Right	0	4	10			
cSH	1161	1700	458			
Volume to Capacity	0.01	0.14	0.06			
Queue Length 95th (m)	0.2	0.0	1.6			
Control Delay (s)	0.2	0.0	13.4			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	13.4			
Approach LOS			B			
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		32.0%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

174: Doyle Street & Queen Street

10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	41	15	91	0	0	345
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	16	99	0	0	375
Pedestrians	21		24			25
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	2		2			2
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			61			237
pX, platoon unblocked						
vC, conflicting volume	519	145			120	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	519	145			120	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			100	
cM capacity (veh/h)	497	867			1441	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	61	99	375			
Volume Left	45	0	0			
Volume Right	16	0	0			
cSH	562	1700	1700			
Volume to Capacity	0.11	0.06	0.22			
Queue Length 95th (m)	2.8	0.0	0.0			
Control Delay (s)	12.2	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.2	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			34.0%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

10/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	275	41	17	195	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	299	45	18	212	0	0
Pedestrians	300					
Lane Width (m)	3.0					
Walking Speed (m/s)	1.2					
Percent Blockage	21					
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.93		0.94	0.93
vC, conflicting volume			343		870	321
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			296		828	272
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		100	100
cM capacity (veh/h)			1180		251	715
Direction, Lane #	EB 1	WB 1				
Volume Total	343	230				
Volume Left	0	18				
Volume Right	45	0				
cSH	1700	1180				
Volume to Capacity	0.20	0.02				
Queue Length 95th (m)	0.0	0.4				
Control Delay (s)	0.0	0.8				
Lane LOS		A				
Approach Delay (s)	0.0	0.8				
Approach LOS						
Intersection Summary						
Average Delay		0.3				
Intersection Capacity Utilization		27.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Doyle Street & Brunswick Street

10/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↕	↕	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	0	0	15	77	121	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	16	84	132	20
Pedestrians	24					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)					187	
pX, platoon unblocked						
vC, conflicting volume	282	165	175			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	282	165	175			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	700	879	1401			
Direction, Lane #	NB 1	SB 1				
Volume Total	100	151				
Volume Left	16	0				
Volume Right	0	20				
cSH	1401	1700				
Volume to Capacity	0.01	0.09				
Queue Length 95th (m)	0.3	0.0				
Control Delay (s)	1.3	0.0				
Lane LOS	A					
Approach Delay (s)	1.3	0.0				
Approach LOS						
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			20.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

225: Clyde Street & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			4%			0%	
Volume (veh/h)	0	6	0	1	18	0	11	0	10	16	48	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	0	1	20	0	12	0	11	17	52	25
Pedestrians		75			31			31			28	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		6			3			3			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	242	240	171	194	247	64	152			42		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	242	240	171	194	247	64	152			42		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	97	100	99			99		
cM capacity (veh/h)	582	590	795	660	585	950	1337			1526		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	7	21	23	95								
Volume Left	0	1	12	17								
Volume Right	0	0	11	25								
cSH	590	588	1337	1526								
Volume to Capacity	0.01	0.04	0.01	0.01								
Queue Length 95th (m)	0.3	0.8	0.2	0.3								
Control Delay (s)	11.2	11.3	4.1	1.4								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.2	11.3	4.1	1.4								
Approach LOS	B	B										
Intersection Summary												
Average Delay			3.7									
Intersection Capacity Utilization			28.8%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

226: Clyde Street & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			2%			0%	
Volume (veh/h)	15	10	4	2	17	28	5	18	1	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	11	4	2	18	30	5	20	1	0	0	0
Pedestrians		49			35			41			9	
Lane Width (m)		3.7			3.7			3.7			0.0	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			3			4			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	129	116	90	117	115	64	49			56		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	129	116	90	117	115	64	49			56		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	100	100	97	97	100			100		
cM capacity (veh/h)	725	717	895	747	718	970	1492			1503		
Direction, Lane #	EB 1	WB 1	NB 1									
Volume Total	32	51	26									
Volume Left	16	2	5									
Volume Right	4	30	1									
cSH	742	851	1492									
Volume to Capacity	0.04	0.06	0.00									
Queue Length 95th (m)	1.0	1.5	0.1									
Control Delay (s)	10.1	9.5	1.6									
Lane LOS	B	A	A									
Approach Delay (s)	10.1	9.5	1.6									
Approach LOS	B	A										
Intersection Summary												
Average Delay	7.8											
Intersection Capacity Utilization	30.2%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

227: Brenton Place & Brenton Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	6	0	2	42	0	4	0	0	0	37	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	0	2	46	0	4	0	0	0	40	23
Pedestrians		90			18			48			50	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		8			2			4			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	223	168	190	130	180	68	153			18		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	223	168	190	130	180	68	153			18		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	93	100	100			100		
cM capacity (veh/h)	569	656	754	733	647	938	1318			1574		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	7	48	4	63								
Volume Left	0	2	4	0								
Volume Right	0	0	0	23								
cSH	656	650	1318	1574								
Volume to Capacity	0.01	0.07	0.00	0.00								
Queue Length 95th (m)	0.2	1.8	0.1	0.0								
Control Delay (s)	10.5	11.0	7.7	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	10.5	11.0	7.7	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			5.2									
Intersection Capacity Utilization			31.1%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

228: Clyde Street & Queen St

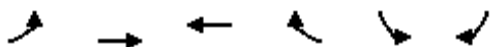
10/03/2010

																				
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR								
Lane Configurations																				
Sign Control		Stop			Stop			Free			Free									
Grade		0%			0%			0%			3%									
Volume (veh/h)	10	0	5	3	2	3	10	209	6	54	275	29								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92								
Hourly flow rate (vph)	11	0	5	3	2	3	11	227	7	59	299	32								
Pedestrians		85			165			17			83									
Lane Width (m)		3.7			3.7			3.7			3.7									
Walking Speed (m/s)		1.2			1.2			1.2			1.2									
Percent Blockage		7			14			1			7									
Right turn flare (veh)																				
Median type		None			None															
Median storage veh																				
Upstream signal (m)											141									
pX, platoon unblocked																				
vC, conflicting volume	857	938	417	872	950	478	415			399										
vC1, stage 1 conf vol																				
vC2, stage 2 conf vol																				
vCu, unblocked vol	857	938	417	872	950	478	415			399										
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1										
tC, 2 stage (s)																				
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2										
p0 queue free %	94	100	99	98	99	99	99			94										
cM capacity (veh/h)	189	196	581	182	193	468	1060			996										
Direction, Lane #	EB 1	WB 1	NB 1	SB 1																
Volume Total	16	9	245	389																
Volume Left	11	3	11	59																
Volume Right	5	3	7	32																
cSH	243	241	1060	996																
Volume to Capacity	0.07	0.04	0.01	0.06																
Queue Length 95th (m)	1.6	0.9	0.2	1.4																
Control Delay (s)	20.9	20.5	0.5	1.9																
Lane LOS	C	C	A	A																
Approach Delay (s)	20.9	20.5	0.5	1.9																
Approach LOS	C	C																		
Intersection Summary																				
Average Delay			2.1																	
Intersection Capacity Utilization			55.7%	ICU Level of Service						B										
Analysis Period (min)			15																	

HCM Unsignalized Intersection Capacity Analysis

230: Morris Street & Dresden Row

10/03/2010

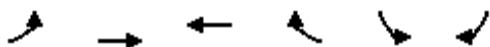


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	23	319	186	7	10	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	347	202	8	11	24
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		166				
pX, platoon unblocked						
vC, conflicting volume	241				694	350
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	241				694	350
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	96
cM capacity (veh/h)	1291				370	610
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	372	210	35			
Volume Left	25	0	11			
Volume Right	0	8	24			
cSH	1291	1700	507			
Volume to Capacity	0.02	0.12	0.07			
Queue Length 95th (m)	0.5	0.0	1.7			
Control Delay (s)	0.7	0.0	12.6			
Lane LOS	A		B			
Approach Delay (s)	0.7	0.0	12.6			
Approach LOS			B			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization		53.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

231: Morris Street & Birmingham Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	10	301	213	5	7	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	327	232	5	8	11
Pedestrians		133	99		49	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		11	8		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	286				731	416
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	286				731	416
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1223				338	540
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	338	237	18			
Volume Left	11	0	8			
Volume Right	0	5	11			
cSH	1223	1700	433			
Volume to Capacity	0.01	0.14	0.04			
Queue Length 95th (m)	0.2	0.0	1.0			
Control Delay (s)	0.3	0.0	13.7			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	13.7			
Approach LOS			B			
Intersection Summary						
Average Delay		0.6				
Intersection Capacity Utilization		43.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

232: Artillery & Dresden Row

10/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		6%			-4%
Volume (veh/h)	0	0	0	0	30	165
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	33	179
Pedestrians	20					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			130			
pX, platoon unblocked						
vC, conflicting volume	265	20			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	265	20			20	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			98	
cM capacity (veh/h)	710	1058			1596	
Direction, Lane #						
SB 1						
Volume Total	212					
Volume Left	33					
Volume Right	0					
cSH	1596					
Volume to Capacity	0.02					
Queue Length 95th (m)	0.5					
Control Delay (s)	1.3					
Lane LOS	A					
Approach Delay (s)	1.3					
Approach LOS						
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			13.7%		ICU Level of Service	A
Analysis Period (min)			15			

47: Bell Road & Ahern Avenue Performance by approach

Approach	EB	WB	All
Total Delay (hr)	0.1	0.5	0.7
Delay / Veh (s)	2.6	4.7	4.1
Total Stops	9	40	49
Travel Dist (km)	33.8	95.8	129.5
Travel Time (hr)	1.0	3.0	4.0
Avg Speed (kph)	35	32	33
Vehicles Entered	161	419	580
Vehicles Exited	163	418	581
Hourly Exit Rate	163	418	581

60: University Avenue & Robie Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	8.8	1.4	0.9	6.4	17.5
Delay / Veh (s)	95.4	12.4	7.8	22.2	28.9
Total Stops	504	228	141	625	1498
Travel Dist (km)	43.1	16.3	66.0	80.7	206.2
Travel Time (hr)	10.0	1.8	2.5	8.3	22.6
Avg Speed (kph)	5	9	27	10	10
Vehicles Entered	332	391	416	1043	2182
Vehicles Exited	335	392	412	1045	2184
Hourly Exit Rate	335	392	412	1045	2184

63: Queen St & Artillery Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.0	0.2	0.0	0.3
Delay / Veh (s)	0.7	0.5	4.3	3.4	1.7
Total Stops	1	1	63	9	74
Travel Dist (km)	33.4	10.9	12.7	1.6	58.7
Travel Time (hr)	1.0	0.3	0.6	0.1	1.9
Avg Speed (kph)	35	38	21	21	31
Vehicles Entered	284	116	145	22	567
Vehicles Exited	285	116	148	22	571
Hourly Exit Rate	285	116	148	22	571

Scenario C 2010 PM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95			0.92		1.00	0.98		1.00	0.91	
Flpb, ped/bikes	0.96	1.00			0.96		1.00	1.00		0.94	1.00	
Frt	1.00	0.98			0.95		1.00	0.98		1.00	0.89	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1477	1545			1415		1594	1606		1398	1417	
Flt Permitted	0.43	1.00			0.91		0.14	1.00		0.38	1.00	
Satd. Flow (perm)	674	1545			1294		240	1606		557	1417	
Volume (vph)	398	254	29	14	97	68	47	285	28	76	152	366
Peak-hour factor, PHF	0.94	0.87	0.73	0.44	0.89	0.89	0.78	0.82	0.70	0.86	0.90	0.79
Adj. Flow (vph)	423	292	40	32	109	76	60	348	40	88	169	463
RTOR Reduction (vph)	0	7	0	0	27	0	0	6	0	0	137	0
Lane Group Flow (vph)	423	325	0	0	190	0	60	383	0	88	495	0
Confl. Peds. (#/hr)	87		157	157		87	85		71	71		85
Confl. Bikes (#/hr)			5			2			3			13
Heavy Vehicles (%)	2%	1%	0%	0%	4%	0%	2%	1%	11%	3%	0%	1%
Turn Type	pm+pt		Perm			Perm			Perm			
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.0	34.0			16.0		26.0	26.0		26.0	26.0	
Effective Green, g (s)	36.0	36.0			18.0		28.0	28.0		28.0	28.0	
Actuated g/C Ratio	0.50	0.50			0.25		0.39	0.39		0.39	0.39	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	493	773			324		93	625		217	551	
v/s Ratio Prot	c0.17	0.21						0.24			c0.35	
v/s Ratio Perm	c0.26				0.15		0.25			0.16		
v/c Ratio	0.86	0.42			0.59		0.65	0.61		0.41	0.90	
Uniform Delay, d1	14.1	11.4			23.7		17.9	17.6		16.0	20.7	
Progression Factor	1.00	1.00			1.24		1.00	1.00		0.86	0.67	
Incremental Delay, d2	17.4	1.7			7.6		29.7	4.4		4.8	18.0	
Delay (s)	31.5	13.1			36.9		47.6	22.1		18.6	32.0	
Level of Service	C	B			D		D	C		B	C	
Approach Delay (s)		23.4			36.9			25.5			30.4	
Approach LOS		C			D			C			C	
Intersection Summary												
HCM Average Control Delay			27.5				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			92.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: Sackville St & Queen St

10/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖↗	↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	4%			-4%	4%	
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	1.00			0.95	1.00	1.00
Frpb, ped/bikes	0.95			1.00	1.00	0.96
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	1745			3637	1771	1488
Flt Permitted	1.00			0.69	0.95	1.00
Satd. Flow (perm)	1745			2526	1771	1488
Volume (vph)	558	88	65	475	201	311
Peak-hour factor, PHF	0.87	0.92	0.87	0.87	0.92	0.93
Adj. Flow (vph)	641	96	75	546	218	334
RTOR Reduction (vph)	7	0	0	0	0	105
Lane Group Flow (vph)	730	0	0	621	218	229
Confl. Peds. (#/hr)		75	75		9	3
Confl. Bikes (#/hr)		14				9
Heavy Vehicles (%)	1%	2%	0%	2%	1%	3%
Turn Type		Perm			Perm	
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	41.0			41.0	25.0	25.0
Effective Green, g (s)	44.0			44.0	28.0	28.0
Actuated g/C Ratio	0.55			0.55	0.35	0.35
Clearance Time (s)	7.0			7.0	7.0	7.0
Lane Grp Cap (vph)	960			1389	620	521
v/s Ratio Prot	c0.42				0.12	
v/s Ratio Perm				0.25		c0.15
v/c Ratio	0.76			0.45	0.35	0.44
Uniform Delay, d1	13.9			10.7	19.3	20.0
Progression Factor	0.86			1.00	1.29	1.53
Incremental Delay, d2	5.5			1.0	1.5	2.6
Delay (s)	17.5			11.8	26.3	33.1
Level of Service	B			B	C	C
Approach Delay (s)	17.5			11.8	30.4	
Approach LOS	B			B	C	
Intersection Summary						
HCM Average Control Delay		19.4		HCM Level of Service		B
HCM Volume to Capacity ratio		0.64				
Actuated Cycle Length (s)		80.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		71.6%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

10/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	4%			-4%	6%	
Volume (veh/h)	423	50	78	506	0	0
Peak Hour Factor	0.88	0.73	0.59	0.86	0.88	0.80
Hourly flow rate (vph)	481	68	132	588	0	0
Pedestrians	3			3	35	
Lane Width (m)	3.7			3.7	0.0	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)	158			34		
pX, platoon unblocked			0.94		0.95	0.94
vC, conflicting volume			584		1112	553
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			559		939	526
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		100	100
cM capacity (veh/h)			950		213	467
Direction, Lane #	EB 1	WB 1	WB 2			
Volume Total	549	328	392			
Volume Left	0	132	0			
Volume Right	68	0	0			
cSH	1700	950	1700			
Volume to Capacity	0.32	0.14	0.23			
Queue Length 95th (m)	0.0	3.7	0.0			
Control Delay (s)	0.0	4.7	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	2.1				
Approach LOS						
Intersection Summary						
Average Delay	1.2					
Intersection Capacity Utilization	56.2%			ICU Level of Service	B	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	113	174	47	40	282	137	71	193	43	24	118	49
Peak Hour Factor	0.81	0.76	0.79	0.65	0.96	0.83	0.70	0.85	0.90	0.67	0.84	0.85
Hourly flow rate (vph)	140	229	59	62	294	165	101	227	48	36	140	58
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	428	355	165	376	234							
Volume Left (vph)	140	62	0	101	36							
Volume Right (vph)	59	0	165	48	58							
Hadj (s)	0.02	0.12	-0.67	0.01	-0.08							
Departure Headway (s)	8.4	8.9	8.0	8.5	9.1							
Degree Utilization, x	1.00	0.87	0.37	0.89	0.59							
Capacity (veh/h)	428	408	449	426	381							
Control Delay (s)	71.8	47.9	14.5	49.7	24.7							
Approach Delay (s)	71.8	37.3		49.7	24.7							
Approach LOS	F	E		E	C							
Intersection Summary												
Delay			47.9									
HCM Level of Service			E									
Intersection Capacity Utilization			75.4%	ICU Level of Service		D						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.97			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.98	1.00		1.00	1.00	0.99	1.00	
Frt		0.97			1.00	0.85		1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1963			1725	1498		1858	1354	1658	1798	
Flt Permitted		0.98			0.78	1.00		0.98	1.00	0.24	1.00	
Satd. Flow (perm)		1921			1370	1498		1817	1354	421	1798	
Volume (vph)	11	156	45	86	191	349	27	483	151	220	223	14
Peak-hour factor, PHF	0.93	0.93	0.93	0.99	0.99	0.99	0.96	0.96	0.96	0.98	0.98	0.98
Adj. Flow (vph)	12	168	48	87	193	353	28	503	157	224	228	14
RTOR Reduction (vph)	0	12	0	0	0	247	0	0	88	0	3	0
Lane Group Flow (vph)	0	216	0	0	280	106	0	531	69	224	239	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			2			4			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		21.0			21.0	21.0		32.0	32.0	45.0	45.0	
Effective Green, g (s)		24.0			24.0	24.0		35.0	35.0	48.0	48.0	
Actuated g/C Ratio		0.30			0.30	0.30		0.44	0.44	0.60	0.60	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		576			411	449		795	592	392	1079	
v/s Ratio Prot										c0.06	0.13	
v/s Ratio Perm		0.11			c0.20	0.07		c0.29	0.05	0.28		
v/c Ratio		0.38			0.68	0.24		0.67	0.12	0.57	0.22	
Uniform Delay, d1		22.1			24.6	21.1		17.9	13.3	10.5	7.4	
Progression Factor		1.00			0.70	0.74		0.63	0.76	1.00	1.00	
Incremental Delay, d2		1.9			8.3	1.2		3.5	0.3	5.9	0.5	
Delay (s)		23.9			25.5	16.8		14.8	10.5	16.4	7.9	
Level of Service		C			C	B		B	B	B	A	
Approach Delay (s)		23.9			20.7			13.8			12.0	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay		16.7					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		80.0					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		85.1%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.82		0.95			1.00	0.84
Flpb, ped/bikes	0.92	1.00		0.92	1.00	1.00		0.98			0.97	1.00
Frt	1.00	0.95		1.00	1.00	0.85		0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.98	1.00
Satd. Flow (prot)	1674	1694		1652	1892	1316		3141			3394	1386
Flt Permitted	0.40	1.00		0.39	1.00	1.00		0.80			0.66	1.00
Satd. Flow (perm)	710	1694		675	1892	1316		2526			2257	1386
Volume (vph)	74	204	87	75	355	67	111	427	95	55	185	41
Peak-hour factor, PHF	0.77	0.81	0.68	0.85	0.97	0.79	0.73	0.91	0.74	0.60	0.89	0.85
Adj. Flow (vph)	96	252	128	88	366	85	152	469	128	92	208	48
RTOR Reduction (vph)	0	23	0	0	0	51	0	22	0	0	0	24
Lane Group Flow (vph)	96	357	0	88	366	34	0	728	0	0	300	24
Confl. Peds. (#/hr)	161		163	163		161	187		228	228		187
Confl. Bikes (#/hr)			12			13			6			5
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		38.0			38.0	38.0
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		40.0			40.0	40.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40		0.50			0.50	0.50
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	284	678		270	757	526		1263			1129	693
v/s Ratio Prot		c0.21			0.19							
v/s Ratio Perm	0.14			0.13		0.03		c0.29			0.13	0.02
v/c Ratio	0.34	0.53		0.33	0.48	0.06		0.58			0.27	0.03
Uniform Delay, d1	16.7	18.2		16.6	17.9	14.8		14.0			11.5	10.2
Progression Factor	1.00	1.01		1.00	1.00	1.00		0.87			0.86	0.87
Incremental Delay, d2	3.2	2.9		3.2	2.2	0.2		1.5			0.6	0.1
Delay (s)	19.9	21.3		19.7	20.1	15.0		13.8			10.5	9.0
Level of Service	B	C		B	C	B		B			B	A
Approach Delay (s)		21.0			19.2			13.8			10.3	
Approach LOS		C			B			B			B	
Intersection Summary												
HCM Average Control Delay			16.2				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			88.3%				ICU Level of Service		E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

63: Clyde Street & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			4%			0%	
Volume (veh/h)	0	13	0	6	71	0	34	0	14	22	69	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	14	0	7	77	0	37	0	15	24	75	54
Pedestrians		45			51			36			74	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			4			3			6	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	389	335	183	326	355	133	174			66		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	389	335	183	326	355	133	174			66		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	97	100	99	85	100	97			98		
cM capacity (veh/h)	412	515	801	517	502	821	1348			1468		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	14	84	52	153								
Volume Left	0	7	37	24								
Volume Right	0	0	15	54								
cSH	515	503	1348	1468								
Volume to Capacity	0.03	0.17	0.03	0.02								
Queue Length 95th (m)	0.6	4.5	0.6	0.4								
Control Delay (s)	12.2	13.6	5.5	1.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	12.2	13.6	5.5	1.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay			5.9									
Intersection Capacity Utilization			32.4%	ICU Level of Service						A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

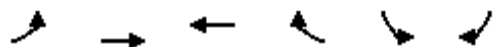
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.25		1.00	0.46	1.00	0.89		1.00	1.00	0.56
Flpb, ped/bikes	0.74	1.00	1.00		0.94	1.00	0.76	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1197	1448	354		1502	684	1312	1586		1723	1739	855
Flt Permitted	0.47	1.00	1.00		0.93	1.00	0.55	1.00		0.30	1.00	1.00
Satd. Flow (perm)	597	1448	354		1413	684	754	1586		544	1739	855
Volume (vph)	63	200	47	28	176	99	105	492	73	58	262	60
Peak-hour factor, PHF	0.93	0.89	0.84	0.78	0.75	0.85	0.83	0.95	0.80	0.78	0.90	0.83
Adj. Flow (vph)	68	225	56	36	235	116	127	518	91	74	291	72
RTOR Reduction (vph)	0	0	37	0	0	27	0	6	0	0	0	0
Lane Group Flow (vph)	68	225	19	0	271	90	127	603	0	74	291	72
Confl. Peds. (#/hr)	748		384	384		748	362		404	404		362
Confl. Bikes (#/hr)			3			9			9			16
Heavy Vehicles (%)	3%	21%	10%	14%	10%	1%	4%	2%	14%	7%	3%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	24.0	24.0	24.0		24.0	24.0	42.0	42.0		42.0	42.0	42.0
Effective Green, g (s)	27.0	27.0	27.0		27.0	27.0	45.0	45.0		45.0	45.0	45.0
Actuated g/C Ratio	0.34	0.34	0.34		0.34	0.34	0.56	0.56		0.56	0.56	0.56
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	201	489	119		477	231	424	892		306	978	481
v/s Ratio Prot		0.16						c0.38			0.17	
v/s Ratio Perm	0.11		0.05		c0.19	0.13	0.17			0.14		0.08
v/c Ratio	0.34	0.46	0.16		0.57	0.39	0.30	0.68		0.24	0.30	0.15
Uniform Delay, d1	19.8	20.8	18.6		21.7	20.2	9.2	12.4		8.9	9.2	8.4
Progression Factor	1.03	1.02	1.39		0.70	0.58	1.21	1.28		0.76	0.78	0.75
Incremental Delay, d2	4.0	2.7	2.5		4.7	4.7	1.7	4.0		1.8	0.8	0.6
Delay (s)	24.3	23.9	28.2		20.0	16.4	12.9	19.8		8.6	7.9	6.9
Level of Service	C	C	C		B	B	B	B		A	A	A
Approach Delay (s)		24.7			18.9			18.6			7.9	
Approach LOS		C			B			B			A	
Intersection Summary												
HCM Average Control Delay			17.3				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			69.5%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Place

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	12	245	421	7	23	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	266	458	8	25	36
Pedestrians			3		84	
Lane Width (m)			3.7		3.7	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	549				841	545
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	549				841	545
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	93
cM capacity (veh/h)	947				306	499
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	279	465	61			
Volume Left	13	0	25			
Volume Right	0	8	36			
cSH	947	1700	396			
Volume to Capacity	0.01	0.27	0.15			
Queue Length 95th (m)	0.3	0.0	4.1			
Control Delay (s)	0.6	0.0	15.7			
Lane LOS	A		C			
Approach Delay (s)	0.6	0.0	15.7			
Approach LOS			C			
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		32.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶		↶	↶			↶			↶	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						1.00	
Frpb, ped/bikes		0.85		1.00	1.00						0.73	
Flpb, ped/bikes		1.00		0.55	1.00						0.90	
Frt		0.98		1.00	1.00						0.94	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		1258		872	1598						1321	
Flt Permitted		1.00		0.52	1.00						0.99	
Satd. Flow (perm)		1258		472	1598						1321	
Volume (vph)	0	236	32	35	263	0	0	0	0	11	57	65
Peak-hour factor, PHF	0.80	0.90	0.62	0.56	0.88	0.69	0.78	0.96	0.53	0.39	0.68	0.80
Adj. Flow (vph)	0	262	52	62	299	0	0	0	0	28	84	81
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	305	0	62	299	0	0	0	0	0	186	0
Confl. Peds. (#/hr)	691		566	566		691	252		296	296		252
Confl. Bikes (#/hr)			7			6			3			
Heavy Vehicles (%)	0%	20%	3%	6%	11%	0%	4%	0%	6%	9%	2%	3%
Turn Type				Perm						Perm		
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		40.0		40.0	40.0						28.0	
Effective Green, g (s)		42.0		42.0	42.0						30.0	
Actuated g/C Ratio		0.52		0.52	0.52						0.38	
Clearance Time (s)		6.0		6.0	6.0						6.0	
Lane Grp Cap (vph)		660		248	839						495	
v/s Ratio Prot		c0.24			0.19							
v/s Ratio Perm				0.13							0.14	
v/c Ratio		0.46		0.25	0.36						0.38	
Uniform Delay, d1		11.9		10.4	11.1						18.2	
Progression Factor		1.02		0.83	0.86						0.92	
Incremental Delay, d2		2.1		2.2	1.1						2.2	
Delay (s)		14.2		10.8	10.7						18.9	
Level of Service		B		B	B						B	
Approach Delay (s)		14.2			10.7			0.0			18.9	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM Average Control Delay			13.8			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			45.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Free				Free				Stop			Stop
Grade	0%				1%				2%			-4%
Volume (veh/h)	13	266	0	0	301	91	8	50	59	0	0	0
Peak Hour Factor	0.81	0.91	0.68	0.71	0.84	0.76	0.75	0.95	0.75	0.50	0.74	0.78
Hourly flow rate (vph)	16	292	0	0	358	120	11	53	79	0	0	0
Pedestrians	122				22				297			436
Lane Width (m)	3.0				3.0				3.9			0.0
Walking Speed (m/s)	1.2				1.2				1.2			1.2
Percent Blockage	8				2				27			0
Right turn flare (veh)									4			
Median type							None				None	
Median storage veh												
Upstream signal (m)	80				81							
pX, platoon unblocked	0.88							0.88	0.88			0.88
vC, conflicting volume	914			589				1162	1535	611	1266	1476
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	903			589				1183	1607	611	1302	1539
tC, single (s)	4.2			4.1				7.2	6.5	6.2	7.2	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2				3.6	4.0	3.3	3.6	4.0
p0 queue free %	98			100				85	21	78	100	100
cM capacity (veh/h)	647			729				73	67	358	26	74
Direction, Lane #	EB 1	EB 2	WB 1	NB 1								
Volume Total	16	292	478	142								
Volume Left	16	0	0	11								
Volume Right	0	0	120	79								
cSH	647	1700	1700	152								
Volume to Capacity	0.02	0.17	0.28	0.93								
Queue Length 95th (m)	0.6	0.0	0.0	50.9								
Control Delay (s)	10.7	0.0	0.0	96.1								
Lane LOS	B			F								
Approach Delay (s)	0.6	0.0		96.1								
Approach LOS				F								
Intersection Summary												
Average Delay			14.9									
Intersection Capacity Utilization			45.5%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

108: Clyde Street & Birmingham Street

10/03/2010

																					
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR									
Lane Configurations																					
Sign Control		Stop			Stop			Free			Free										
Grade		0%			0%			2%			0%										
Volume (veh/h)	30	22	5	7	67	43	9	29	10	0	0	0									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92									
Hourly flow rate (vph)	33	24	5	8	73	47	10	32	11	0	0	0									
Pedestrians		75			59			48			68										
Lane Width (m)		3.7			3.7			3.7			0.0										
Walking Speed (m/s)		1.2			1.2			1.2			1.2										
Percent Blockage		6			5			4			0										
Right turn flare (veh)																					
Median type		None			None																
Median storage veh																					
Upstream signal (m)																					
pX, platoon unblocked																					
vC, conflicting volume	283	196	123	181	191	164	75			101											
vC1, stage 1 conf vol																					
vC2, stage 2 conf vol																					
vCu, unblocked vol	283	196	123	181	191	164	75			101											
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1											
tC, 2 stage (s)																					
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2											
p0 queue free %	93	96	99	99	88	94	99			100											
cM capacity (veh/h)	491	617	833	624	622	836	1426			1416											
Direction, Lane #	EB 1	WB 1	NB 1																		
Volume Total	62	127	52																		
Volume Left	33	8	10																		
Volume Right	5	47	11																		
cSH	555	686	1426																		
Volume to Capacity	0.11	0.19	0.01																		
Queue Length 95th (m)	2.8	5.1	0.2																		
Control Delay (s)	12.3	11.4	1.5																		
Lane LOS	B	B	A																		
Approach Delay (s)	12.3	11.4	1.5																		
Approach LOS	B	B																			
Intersection Summary																					
Average Delay		9.5																			
Intersection Capacity Utilization		32.4%		ICU Level of Service		A															
Analysis Period (min)		15																			

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕		↕	↕		↕	↕			↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	3.0	3.0	3.0	3.0	3.7	3.0	3.7	3.0	3.7	3.7	3.7
Grade (%)		-2%			0%			2%			0%	
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor		0.95		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes		0.90		1.00	0.94		1.00	0.77			0.77	
Flpb, ped/bikes		0.94		0.54	1.00		0.74	1.00			1.00	
Frt		0.98		1.00	0.99		1.00	0.92			0.95	
Flt Protected		0.99		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		2426		915	1476		1203	1341			1371	
Flt Permitted		0.86		0.53	1.00		0.54	1.00			0.81	
Satd. Flow (perm)		2113		512	1476		681	1341			1117	
Volume (vph)	49	239	32	76	247	23	100	201	232	40	123	89
Peak-hour factor, PHF	0.92	0.94	0.73	0.70	0.86	0.92	0.72	0.92	0.93	0.92	0.92	0.92
Adj. Flow (vph)	53	254	44	109	287	25	139	218	249	43	134	97
RTOR Reduction (vph)	0	14	0	0	4	0	0	28	0	0	23	0
Lane Group Flow (vph)	0	337	0	109	308	0	139	439	0	0	251	0
Confl. Peds. (#/hr)	436		420	420		436	271		340	340		271
Confl. Bikes (#/hr)			1						2			
Heavy Vehicles (%)	2%	22%	0%	0%	12%	2%	2%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		37.0		37.0	37.0		31.0	31.0			31.0	
Effective Green, g (s)		39.0		39.0	39.0		33.0	33.0			33.0	
Actuated g/C Ratio		0.49		0.49	0.49		0.41	0.41			0.41	
Clearance Time (s)		6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)		1030		250	720		281	553			461	
v/s Ratio Prot					0.21			c0.33				
v/s Ratio Perm		0.16		c0.21			0.20				0.22	
v/c Ratio		0.33		0.44	0.43		0.49	0.79			0.54	
Uniform Delay, d1		12.5		13.3	13.3		17.3	20.5			17.8	
Progression Factor		0.91		1.00	1.00		1.00	1.00			1.02	
Incremental Delay, d2		0.8		5.4	1.9		6.1	11.2			4.4	
Delay (s)		12.1		18.8	15.1		23.5	31.8			22.6	
Level of Service		B		B	B		C	C			C	
Approach Delay (s)		12.1			16.1			29.9			22.6	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM Average Control Delay			21.4			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			85.2%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

177: Spring Garden Road & Brunswick Street

10/03/2010

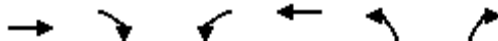


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		-1%	6%		-4%	
Volume (veh/h)	244	286	280	146	24	86
Peak Hour Factor	0.94	0.91	0.85	0.96	0.92	0.92
Hourly flow rate (vph)	260	314	329	152	26	93
Pedestrians		16	33		435	
Lane Width (m)		3.0	3.0		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		48	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		90	193			
pX, platoon unblocked						
vC, conflicting volume	916				1631	780
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	916				1631	780
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	31				0	53
cM capacity (veh/h)	378				18	200
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	260	314	329	152	120	
Volume Left	260	0	0	0	26	
Volume Right	0	0	0	152	93	
cSH	378	1700	1700	1700	62	
Volume to Capacity	0.69	0.18	0.19	0.09	1.92	
Queue Length 95th (m)	37.5	0.0	0.0	0.0	84.9	
Control Delay (s)	33.0	0.0	0.0	0.0	574.6	
Lane LOS	D				F	
Approach Delay (s)	14.9		0.0		574.6	
Approach LOS					F	
Intersection Summary						
Average Delay			65.8			
Intersection Capacity Utilization			48.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

10/03/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	314	69	33	273	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	341	75	36	297	0	0
Pedestrians	300					
Lane Width (m)	3.0					
Walking Speed (m/s)	1.2					
Percent Blockage	21					
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.90		0.95	0.90
vC, conflicting volume			416		1047	379
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			355		920	313
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	100
cM capacity (veh/h)			1089		218	658
Direction, Lane #	EB 1	WB 1				
Volume Total	416	333				
Volume Left	0	36				
Volume Right	75	0				
cSH	1700	1089				
Volume to Capacity	0.24	0.03				
Queue Length 95th (m)	0.0	0.8				
Control Delay (s)	0.0	1.2				
Lane LOS		A				
Approach Delay (s)	0.0	1.2				
Approach LOS						
Intersection Summary						
Average Delay		0.5				
Intersection Capacity Utilization		43.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Brenton Place & Brenton Street

10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	13	0	10	142	0	43	0	0	0	28	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	14	0	11	154	0	47	0	0	0	30	72
Pedestrians		28			32			60			84	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		2			3			5			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	349	220	154	259	256	116	130			32		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	349	220	154	259	256	116	130			32		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	100	98	74	100	97			100		
cM capacity (veh/h)	412	623	825	590	595	845	1420			1537		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	14	165	47	102								
Volume Left	0	11	47	0								
Volume Right	0	0	0	72								
cSH	623	595	1420	1537								
Volume to Capacity	0.02	0.28	0.03	0.00								
Queue Length 95th (m)	0.5	8.6	0.8	0.0								
Control Delay (s)	10.9	13.4	7.6	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	10.9	13.4	7.6	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay		8.3										
Intersection Capacity Utilization		33.2%	ICU Level of Service						A			
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis

223: Brenton Place & South Park Street

10/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	T
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	35	262	473	0	14	246
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	285	514	0	15	267
Pedestrians	52		163			169
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		14			14
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			141			143
pX, platoon unblocked	0.87	0.87			0.87	
vC, conflicting volume	1027	735			566	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1016	695			501	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	9			98	
cM capacity (veh/h)	186	314			883	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	323	514	283			
Volume Left	38	0	15			
Volume Right	285	0	0			
cSH	291	1700	883			
Volume to Capacity	1.11	0.30	0.02			
Queue Length 95th (m)	100.4	0.0	0.4			
Control Delay (s)	125.0	0.0	0.7			
Lane LOS	F		A			
Approach Delay (s)	125.0	0.0	0.7			
Approach LOS	F					
Intersection Summary						
Average Delay		36.2				
Intersection Capacity Utilization		56.2%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

224: Clyde Street & Queen St

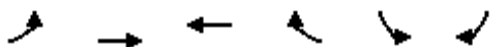
10/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			3%	
Volume (veh/h)	24	4	2	2	20	43	34	425	1	2	146	80
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	4	2	2	22	47	37	462	1	2	159	87
Pedestrians		94			157			19			78	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		8			13			2			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	973	994	315	923	1037	698	340			620		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	973	994	315	923	1037	698	340			620		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	80	98	100	99	88	87	97			100		
cM capacity (veh/h)	129	188	656	171	177	356	1121			831		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	33	71	500	248								
Volume Left	26	2	37	2								
Volume Right	2	47	1	87								
cSH	143	265	1121	831								
Volume to Capacity	0.23	0.27	0.03	0.00								
Queue Length 95th (m)	6.4	7.9	0.8	0.1								
Control Delay (s)	37.6	23.4	1.0	0.1								
Lane LOS	E	C	A	A								
Approach Delay (s)	37.6	23.4	1.0	0.1								
Approach LOS	E	C										
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			61.9%		ICU Level of Service					B		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

225: Morris Street & Dresden Row

10/03/2010

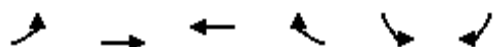


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	30	306	378	6	18	43
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	333	411	7	20	47
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	448				903	558
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	448				903	558
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				93	90
cM capacity (veh/h)	1082				276	465
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	365	417	66			
Volume Left	33	0	20			
Volume Right	0	7	47			
cSH	1082	1700	387			
Volume to Capacity	0.03	0.25	0.17			
Queue Length 95th (m)	0.7	0.0	4.6			
Control Delay (s)	1.0	0.0	16.2			
Lane LOS	A		C			
Approach Delay (s)	1.0	0.0	16.2			
Approach LOS			C			
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization		60.9%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

226: Morris Street & Birmingham Street

10/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	36	259	385	10	34	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	282	418	11	37	14
Pedestrians		133	99		49	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		11	8		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	478				932	606
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478				932	606
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				85	97
cM capacity (veh/h)	1038				250	422
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	321	429	51			
Volume Left	39	0	37			
Volume Right	0	11	14			
cSH	1038	1700	281			
Volume to Capacity	0.04	0.25	0.18			
Queue Length 95th (m)	0.9	0.0	4.9			
Control Delay (s)	1.4	0.0	20.6			
Lane LOS	A		C			
Approach Delay (s)	1.4	0.0	20.6			
Approach LOS			C			
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization		59.8%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

228: Dresden Row &

10/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		6%			-4%
Volume (veh/h)	0	0	0	0	126	196
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	137	213
Pedestrians	102					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			127			
pX, platoon unblocked						
vC, conflicting volume	589	102			102	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	589	102			102	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			91	
cM capacity (veh/h)	428	953			1490	
Direction, Lane #						
SB 1						
Volume Total	350					
Volume Left	137					
Volume Right	0					
cSH	1490					
Volume to Capacity	0.09					
Queue Length 95th (m)	2.3					
Control Delay (s)	3.5					
Lane LOS	A					
Approach Delay (s)	3.5					
Approach LOS						
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			20.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

229: Doyle Street & Brunswick Street

10/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↕	↕	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	0	0	37	313	113	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	40	340	123	57
Pedestrians	95					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)					187	
pX, platoon unblocked						
vC, conflicting volume	667	246	274			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	667	246	274			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	97			
cM capacity (veh/h)	411	793	1289			
Direction, Lane #	NB 1	SB 1				
Volume Total	380	179				
Volume Left	40	0				
Volume Right	0	57				
cSH	1289	1700				
Volume to Capacity	0.03	0.11				
Queue Length 95th (m)	0.7	0.0				
Control Delay (s)	1.1	0.0				
Lane LOS	A					
Approach Delay (s)	1.1	0.0				
Approach LOS						
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			38.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

230: Doyle Street & Queen Street

10/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	26	24	258	0	0	226
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	26	280	0	0	246
Pedestrians			75			81
Lane Width (m)			3.7			3.7
Walking Speed (m/s)			1.2			1.2
Percent Blockage			6			7
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			58			237
pX, platoon unblocked						
vC, conflicting volume	601	361			280	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	601	361			280	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	96			100	
cM capacity (veh/h)	433	636			1282	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	54	280	246			
Volume Left	28	0	0			
Volume Right	26	0	0			
cSH	512	1700	1700			
Volume to Capacity	0.11	0.16	0.14			
Queue Length 95th (m)	2.7	0.0	0.0			
Control Delay (s)	12.9	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.9	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		33.1%	ICU Level of Service	A		
Analysis Period (min)		15				

174: Queen Street & Birmingham Street Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.0	0.6	0.2	0.9
Delay / Veh (s)	0.9	0.5	12.7	5.8	4.4
Total Stops	0	0	177	53	230
Travel Dist (km)	24.4	22.9	19.7	7.2	74.1
Travel Time (hr)	0.7	0.6	1.2	0.4	2.9
Avg Speed (kph)	34	41	16	17	25
Vehicles Entered	219	230	178	105	732
Vehicles Exited	220	229	179	106	734
Hourly Exit Rate	220	229	179	106	734

175: Spring Garden Road & Queen Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.0	1.3	7.1	2.3	11.8
Delay / Veh (s)	13.1	13.9	54.6	33.3	31.5
Total Stops	139	190	539	238	1106
Travel Dist (km)	20.6	14.0	59.4	13.2	107.3
Travel Time (hr)	1.6	1.7	8.9	2.7	14.8
Avg Speed (kph)	13	8	7	5	8
Vehicles Entered	288	345	474	248	1355
Vehicles Exited	288	344	468	248	1348
Hourly Exit Rate	288	344	468	248	1348

177: Spring Garden Road & Brunswick Street Performance by approach

Approach	EB	WB	SB	All
Total Delay (hr)	0.3	0.3	0.7	1.3
Delay / Veh (s)	2.4	2.5	22.1	4.7
Total Stops	82	70	105	257
Travel Dist (km)	20.6	32.2	5.9	58.7
Travel Time (hr)	0.8	1.2	0.9	2.8
Avg Speed (kph)	26	28	7	21
Vehicles Entered	461	396	110	967
Vehicles Exited	460	395	109	964
Hourly Exit Rate	460	395	109	964

Scenario D 2010 AM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

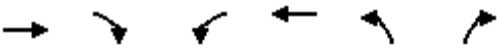
08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99			0.94		1.00	0.99		1.00	0.96	
Flpb, ped/bikes	0.94	1.00			0.99		1.00	1.00		0.96	1.00	
Frt	1.00	0.98			0.94		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1450	1609			1513		1626	1624		1470	1495	
Flt Permitted	0.65	1.00			0.92		0.15	1.00		0.57	1.00	
Satd. Flow (perm)	993	1609			1398		263	1624		888	1495	
Volume (vph)	221	293	31	6	31	30	8	144	22	200	242	432
Peak-hour factor, PHF	0.91	0.94	0.70	0.40	0.86	0.83	0.50	0.80	0.69	0.94	0.83	0.86
Adj. Flow (vph)	243	312	44	15	36	36	16	180	32	213	292	502
RTOR Reduction (vph)	0	7	0	0	25	0	0	9	0	0	86	0
Lane Group Flow (vph)	243	349	0	0	62	0	16	203	0	213	708	0
Confl. Peds. (#/hr)	49		52	52		49	27		25	25		27
Confl. Bikes (#/hr)			16						4			25
Heavy Vehicles (%)	2%	0%	6%	0%	0%	0%	0%	0%	5%	1%	3%	2%
Turn Type	pm+pt		Perm		Perm		Perm		Perm		Perm	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	600	849			427		95	586		321	540	
v/s Ratio Prot	0.07	c0.22						0.13			c0.47	
v/s Ratio Perm	0.15				0.04		0.06			0.24		
v/c Ratio	0.41	0.41			0.15		0.17	0.35		0.66	1.31	
Uniform Delay, d1	9.9	10.3			18.2		15.6	16.8		19.3	23.0	
Progression Factor	1.00	1.00			1.55		1.01	1.02		1.15	1.07	
Incremental Delay, d2	2.0	1.5			0.7		3.8	1.6		7.0	148.6	
Delay (s)	11.9	11.7			28.9		19.6	18.7		29.2	173.2	
Level of Service	B	B			C		B	B		C	F	
Approach Delay (s)		11.8			28.9			18.8			142.8	
Approach LOS		B			C			B			F	
Intersection Summary												
HCM Average Control Delay			82.1				HCM Level of Service			F		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			78.8%				ICU Level of Service		D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: Sackville St & Queen St

08/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↶	↷
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	4%			-4%	4%	
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	1.00			0.95	1.00	1.00
Frpb, ped/bikes	0.94			1.00	1.00	0.96
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	1675			3610	1789	1529
Flt Permitted	1.00			0.63	0.95	1.00
Satd. Flow (perm)	1675			2296	1789	1529
Volume (vph)	495	164	115	376	77	103
Peak-hour factor, PHF	0.91	0.82	0.87	0.82	0.85	0.88
Adj. Flow (vph)	544	200	132	459	91	117
RTOR Reduction (vph)	17	0	0	0	0	89
Lane Group Flow (vph)	727	0	0	591	91	28
Confl. Peds. (#/hr)		44	44		4	5
Confl. Bikes (#/hr)		31				2
Heavy Vehicles (%)	2%	1%	2%	2%	0%	0%
Turn Type	Perm			Perm		
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	50.0			50.0	16.0	16.0
Effective Green, g (s)	53.0			53.0	19.0	19.0
Actuated g/C Ratio	0.66			0.66	0.24	0.24
Clearance Time (s)	7.0			7.0	7.0	7.0
Lane Grp Cap (vph)	1110			1521	425	363
v/s Ratio Prot	c0.43				c0.05	
v/s Ratio Perm				0.26		0.02
v/c Ratio	0.66			0.39	0.21	0.08
Uniform Delay, d1	8.1			6.1	24.5	23.7
Progression Factor	1.18			1.00	1.09	1.39
Incremental Delay, d2	2.7			0.8	1.1	0.4
Delay (s)	12.2			6.9	27.9	33.3
Level of Service	B			A	C	C
Approach Delay (s)	12.2			6.9	31.0	
Approach LOS	B			A	C	
Intersection Summary						
HCM Average Control Delay		12.7		HCM Level of Service		B
HCM Volume to Capacity ratio		0.54				
Actuated Cycle Length (s)		80.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		68.2%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

08/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰↰			
Sign Control	Free		Free		Stop	
Grade	4%		-4%		6%	
Volume (veh/h)	740	137	115	369	0	0
Peak Hour Factor	0.97	0.97	0.88	0.88	0.83	0.83
Hourly flow rate (vph)	763	141	131	419	0	0
Pedestrians	2			8	35	
Lane Width (m)	3.7		3.7		0.0	
Walking Speed (m/s)	1.2		1.2		1.2	
Percent Blockage	0		1		0	
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)	158		34			
pX, platoon unblocked			0.79		0.82	0.79
vC, conflicting volume			939		1342	877
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			923		1257	844
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			78		100	100
cM capacity (veh/h)			584		103	241
Direction, Lane #	EB 1	WB 1	WB 2			
Volume Total	904	270	280			
Volume Left	0	131	0			
Volume Right	141	0	0			
cSH	1700	584	1700			
Volume to Capacity	0.53	0.22	0.16			
Queue Length 95th (m)	0.0	6.5	0.0			
Control Delay (s)	0.0	7.9	0.0			
Lane LOS		A				
Approach Delay (s)	0.0	3.9				
Approach LOS						
Intersection Summary						
Average Delay		1.5				
Intersection Capacity Utilization		77.0%		ICU Level of Service	D	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	77	191	44	39	122	38	32	120	48	123	148	40
Peak Hour Factor	0.97	0.97	0.97	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95
Hourly flow rate (vph)	79	197	45	41	130	40	36	135	54	129	156	42
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	322	171	40	225	327							
Volume Left (vph)	79	41	0	36	129							
Volume Right (vph)	45	0	40	54	42							
Hadj (s)	0.00	0.16	-0.67	-0.08	0.04							
Departure Headway (s)	6.3	7.1	6.2	6.3	6.1							
Degree Utilization, x	0.56	0.34	0.07	0.39	0.56							
Capacity (veh/h)	530	451	513	515	547							
Control Delay (s)	16.9	12.4	8.5	13.2	16.6							
Approach Delay (s)	16.9	11.6		13.2	16.6							
Approach LOS	C	B		B	C							
Intersection Summary												
Delay			15.0									
HCM Level of Service			C									
Intersection Capacity Utilization			75.4%			ICU Level of Service				D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↗		↕	↗	↗	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.96		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.97	1.00		1.00	1.00	0.97	1.00	
Frt		0.98			1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1997			1709	1545		1859	1351	1625	1813	
Flt Permitted		0.98			0.72	1.00		0.98	1.00	0.42	1.00	
Satd. Flow (perm)		1965			1252	1545		1819	1351	711	1813	
Volume (vph)	10	184	35	97	144	118	11	217	103	413	303	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	11	200	38	102	152	124	12	241	114	449	329	5
RTOR Reduction (vph)	0	8	0	0	0	84	0	0	78	0	1	0
Lane Group Flow (vph)	0	241	0	0	254	40	0	253	36	449	333	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			4			2			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		23.0			23.0	23.0		22.0	22.0	43.0	43.0	
Effective Green, g (s)		26.0			26.0	26.0		25.0	25.0	46.0	46.0	
Actuated g/C Ratio		0.32			0.32	0.32		0.31	0.31	0.58	0.58	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		639			407	502		568	422	603	1042	
v/s Ratio Prot										c0.16	0.18	
v/s Ratio Perm		0.12			c0.20	0.03		0.14	0.03	c0.27		
v/c Ratio		0.38			0.62	0.08		0.45	0.08	0.74	0.32	
Uniform Delay, d1		20.8			22.9	18.7		22.0	19.4	10.9	8.9	
Progression Factor		1.00			0.83	0.48		0.81	1.06	1.00	1.00	
Incremental Delay, d2		1.7			6.7	0.3		2.2	0.3	8.1	0.8	
Delay (s)		22.5			25.8	9.4		19.9	20.9	19.0	9.7	
Level of Service		C			C	A		B	C	B	A	
Approach Delay (s)		22.5			20.4			20.2			15.0	
Approach LOS		C			C			C			B	
Intersection Summary												
HCM Average Control Delay		18.3			HCM Level of Service					B		
HCM Volume to Capacity ratio		0.69										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)					8.0		
Intersection Capacity Utilization		79.5%			ICU Level of Service					D		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.88		0.96			1.00	0.93
Flpb, ped/bikes	0.92	1.00		0.94	1.00	1.00		0.99			0.98	1.00
Frt	1.00	0.93		1.00	1.00	0.85		0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.99	1.00
Satd. Flow (prot)	1582	1652		1665	1874	1369		3233			3472	1527
Flt Permitted	0.61	1.00		0.37	1.00	1.00		0.70			0.70	1.00
Satd. Flow (perm)	1019	1652		645	1874	1369		2304			2472	1527
Volume (vph)	36	179	168	49	157	31	87	278	81	95	315	37
Peak-hour factor, PHF	0.82	0.84	0.86	0.88	0.84	0.71	0.62	0.80	0.92	0.82	0.82	0.54
Adj. Flow (vph)	44	213	195	56	187	44	140	348	88	116	384	69
RTOR Reduction (vph)	0	41	0	0	0	26	0	18	0	0	0	35
Lane Group Flow (vph)	44	367	0	56	187	18	0	558	0	0	500	34
Confl. Peds. (#/hr)	104		118	118		104	74		164	164		74
Confl. Bikes (#/hr)			4			11			14			3
Heavy Vehicles (%)	6%	1%	1%	2%	1%	3%	1%	4%	1%	0%	3%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	31.0	31.0		31.0	31.0	31.0		37.0			37.0	37.0
Effective Green, g (s)	33.0	33.0		33.0	33.0	33.0		39.0			39.0	39.0
Actuated g/C Ratio	0.41	0.41		0.41	0.41	0.41		0.49			0.49	0.49
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	420	681		266	773	565		1123			1205	744
v/s Ratio Prot		c0.22			0.10							
v/s Ratio Perm	0.04			0.09		0.01		c0.24			0.20	0.02
v/c Ratio	0.10	0.54		0.21	0.24	0.03		0.50			0.41	0.05
Uniform Delay, d1	14.4	17.8		15.1	15.3	14.0		13.9			13.2	10.7
Progression Factor	1.01	1.01		1.00	1.00	1.00		0.64			0.79	0.62
Incremental Delay, d2	0.5	3.0		1.8	0.7	0.1		1.4			1.0	0.1
Delay (s)	15.1	20.9		16.9	16.1	14.1		10.2			11.4	6.7
Level of Service	B	C		B	B	B		B			B	A
Approach Delay (s)		20.3			15.9			10.2			10.8	
Approach LOS		C			B			B			B	
Intersection Summary												
HCM Average Control Delay			13.7				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			91.1%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.39		1.00	0.57	1.00	0.91		1.00	1.00	0.68
Flpb, ped/bikes	0.72	1.00	1.00		0.93	1.00	0.91	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1151	1564	545		1299	802	1515	1616		1790	1773	1021
Flt Permitted	0.59	1.00	1.00		0.92	1.00	0.40	1.00		0.35	1.00	1.00
Satd. Flow (perm)	715	1564	545		1211	802	632	1616		667	1773	1021
Volume (vph)	71	172	83	31	152	60	38	353	50	55	360	44
Peak-hour factor, PHF	0.61	0.84	0.83	0.86	0.90	0.83	0.73	0.87	0.69	0.67	0.84	0.92
Adj. Flow (vph)	116	205	100	36	169	72	52	406	72	82	429	48
RTOR Reduction (vph)	0	0	59	0	0	42	0	8	0	0	0	25
Lane Group Flow (vph)	116	205	41	0	205	30	52	470	0	82	429	23
Confl. Peds. (#/hr)	340		225	225		340	125		214	214		125
Confl. Bikes (#/hr)						2			2			15
Heavy Vehicles (%)	4%	12%	11%	20%	27%	8%	9%	3%	14%	3%	1%	2%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	30.0	30.0	30.0		30.0	30.0	36.0	36.0		36.0	36.0	36.0
Effective Green, g (s)	33.0	33.0	33.0		33.0	33.0	39.0	39.0		39.0	39.0	39.0
Actuated g/C Ratio	0.41	0.41	0.41		0.41	0.41	0.49	0.49		0.49	0.49	0.49
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	295	645	225		500	331	308	788		325	864	498
v/s Ratio Prot		0.13						c0.29			0.24	
v/s Ratio Perm	0.16		0.08		c0.17	0.04	0.08			0.12		0.02
v/c Ratio	0.39	0.32	0.18		0.41	0.09	0.17	0.60		0.25	0.50	0.05
Uniform Delay, d1	16.5	15.9	14.9		16.6	14.3	11.4	14.8		12.0	13.9	10.8
Progression Factor	1.00	1.00	1.00		0.78	0.51	1.00	1.15		0.77	0.77	0.58
Incremental Delay, d2	3.9	1.3	1.8		2.4	0.5	1.1	3.2		1.8	2.0	0.2
Delay (s)	20.4	17.2	16.7		15.4	7.9	12.6	20.3		11.0	12.6	6.4
Level of Service	C	B	B		B	A	B	C		B	B	A
Approach Delay (s)		18.0			13.5			19.5			11.9	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM Average Control Delay			15.8				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			80.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			58.0%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

76: Clyde Street & South Park Street

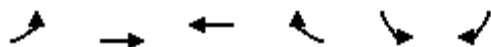
08/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	14	57	376	0	9	432
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	62	409	0	10	470
Pedestrians	72		134			85
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	6		11			7
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			142			142
pX, platoon unblocked	0.92	0.90			0.90	
vC, conflicting volume	1104	566			481	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945	516			421	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	86			99	
cM capacity (veh/h)	220	436			958	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	77	409	479			
Volume Left	15	0	10			
Volume Right	62	0	0			
cSH	365	1700	958			
Volume to Capacity	0.21	0.24	0.01			
Queue Length 95th (m)	6.0	0.0	0.2			
Control Delay (s)	17.5	0.0	0.3			
Lane LOS	C		A			
Approach Delay (s)	17.5	0.0	0.3			
Approach LOS	C					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization		49.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Street

08/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	7	305	199	4	18	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	332	216	4	20	23
Pedestrians		1	3		80	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		0	0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	301				648	299
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301				648	299
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	97
cM capacity (veh/h)	1174				401	689
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	339	221	42			
Volume Left	8	0	20			
Volume Right	0	4	23			
cSH	1174	1700	518			
Volume to Capacity	0.01	0.13	0.08			
Queue Length 95th (m)	0.1	0.0	2.0			
Control Delay (s)	0.2	0.0	12.6			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	12.6			
Approach LOS			B			
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization		32.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		1.00			1.00						1.00	
Frpb, ped/bikes		0.91			1.00						0.79	
Flpb, ped/bikes		1.00			1.00						0.93	
Frt		0.98			1.00						0.95	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		1425			1364						1491	
Flt Permitted		1.00			1.00						0.99	
Satd. Flow (perm)		1425			1364						1491	
Volume (vph)	0	228	35	0	184	0	0	0	0	18	65	49
Peak-hour factor, PHF	0.53	0.84	0.74	0.60	0.86	0.75	0.38	0.86	0.75	0.75	0.77	0.72
Adj. Flow (vph)	0	271	47	0	214	0	0	0	0	24	84	68
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	28	0
Lane Group Flow (vph)	0	310	0	0	214	0	0	0	0	0	148	0
Confl. Peds. (#/hr)	335		243	243		335	141		122	122		141
Confl. Bikes (#/hr)			11			4			2			2
Heavy Vehicles (%)	6%	12%	3%	0%	30%	0%	0%	0%	0%	0%	0%	6%
Turn Type										Perm		
Protected Phases		4			8						6	
Permitted Phases										6		
Actuated Green, G (s)		48.0			48.0						20.0	
Effective Green, g (s)		50.0			50.0						22.0	
Actuated g/C Ratio		0.62			0.62						0.28	
Clearance Time (s)		6.0			6.0						6.0	
Lane Grp Cap (vph)		891			853						410	
v/s Ratio Prot		c0.22			0.16							
v/s Ratio Perm											0.10	
v/c Ratio		0.35			0.25						0.36	
Uniform Delay, d1		7.2			6.7						23.3	
Progression Factor		0.75			0.85						0.92	
Incremental Delay, d2		1.0			0.7						2.4	
Delay (s)		6.5			6.4						23.8	
Level of Service		A			A						C	
Approach Delay (s)		6.5			6.4			0.0			23.8	
Approach LOS		A			A			A			C	
Intersection Summary												
HCM Average Control Delay			10.7			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			38.5%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			1%			2%			-4%	
Volume (veh/h)	13	229	0	0	173	115	4	22	17	0	0	0
Peak Hour Factor	0.65	0.92	0.38	0.83	0.75	0.88	0.33	0.50	0.67	0.42	0.92	0.58
Hourly flow rate (vph)	20	249	0	0	231	131	12	44	25	0	0	0
Pedestrians		96			2			216			324	
Lane Width (m)		3.0			3.0			3.9			0.0	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		7			0			20			0	
Right turn flare (veh)									4			
Median type								None			None	
Median storage veh												
Upstream signal (m)		81			80							
pX, platoon unblocked	0.96			0.97			0.98	0.98	0.97	0.98	0.98	0.96
vC, conflicting volume	685			465			897	1190	467	946	1125	716
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	673			446			843	1143	448	893	1076	705
tC, single (s)	4.1			4.2			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	98			100			93	72	94	100	100	100
cM capacity (veh/h)	892			846			176	155	439	161	171	395
Direction, Lane #	EB 1	WB 1	NB 1									
Volume Total	269	361	81									
Volume Left	20	0	12									
Volume Right	0	131	25									
cSH	892	1700	232									
Volume to Capacity	0.02	0.21	0.35									
Queue Length 95th (m)	0.5	0.0	11.4									
Control Delay (s)	0.9	0.0	31.3									
Lane LOS	A		D									
Approach Delay (s)	0.9	0.0	31.3									
Approach LOS			D									
Intersection Summary												
Average Delay			3.9									
Intersection Capacity Utilization		42.3%		ICU Level of Service			A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

174: Doyle Street & Queen Street

08/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	41	15	91	0	0	345
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	16	99	0	0	375
Pedestrians	21		24			25
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	2		2			2
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			61			237
pX, platoon unblocked						
vC, conflicting volume	519	145			120	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	519	145			120	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			100	
cM capacity (veh/h)	497	867			1441	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	61	99	375			
Volume Left	45	0	0			
Volume Right	16	0	0			
cSH	562	1700	1700			
Volume to Capacity	0.11	0.06	0.22			
Queue Length 95th (m)	2.8	0.0	0.0			
Control Delay (s)	12.2	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.2	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization		34.0%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0	4.6	3.0
Grade (%)		-2%			0%			2%			-5%	
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.90		1.00	0.98		1.00	0.79			0.88	
Flpb, ped/bikes	0.54	1.00		0.67	1.00		1.00	1.00			0.98	
Frt	1.00	0.97		1.00	0.99		1.00	0.90			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	925	1383		1114	1398		1503	1348			1734	
Flt Permitted	0.61	1.00		0.55	1.00		0.36	1.00			0.93	
Satd. Flow (perm)	593	1383		640	1398		571	1348			1617	
Volume (vph)	29	192	40	123	191	6	36	76	116	31	212	103
Peak-hour factor, PHF	0.60	0.80	0.77	0.79	0.90	0.75	0.84	0.89	0.76	0.55	0.88	0.80
Adj. Flow (vph)	48	240	52	156	212	8	43	85	153	56	241	129
RTOR Reduction (vph)	0	10	0	0	2	0	0	81	0	0	20	0
Lane Group Flow (vph)	48	282	0	156	218	0	43	157	0	0	406	0
Confl. Peds. (#/hr)	282		199	199		282	87		144	144		87
Confl. Bikes (#/hr)			8			4			3			3
Heavy Vehicles (%)	0%	15%	3%	2%	24%	0%	11%	1%	1%	0%	1%	5%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.0	43.0		43.0	43.0		25.0	25.0			25.0	
Effective Green, g (s)	45.0	45.0		45.0	45.0		27.0	27.0			27.0	
Actuated g/C Ratio	0.56	0.56		0.56	0.56		0.34	0.34			0.34	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)	334	778		360	786		193	455			546	
v/s Ratio Prot		0.20			0.16			0.12				
v/s Ratio Perm	0.08			c0.24			0.08				c0.25	
v/c Ratio	0.14	0.36		0.43	0.28		0.22	0.35			0.74	
Uniform Delay, d1	8.3	9.6		10.1	9.1		19.0	19.9			23.4	
Progression Factor	0.70	0.60		1.00	1.00		1.00	1.00			0.99	
Incremental Delay, d2	0.9	1.3		3.8	0.9		2.7	2.1			8.2	
Delay (s)	6.7	7.1		13.9	10.0		21.6	21.9			31.3	
Level of Service	A	A		B	A		C	C			C	
Approach Delay (s)		7.0			11.6			21.9			31.3	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM Average Control Delay			18.4			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			70.2%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

177: Spring Garden Road & Brunswick Street

08/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		-1%	6%		-4%	
Volume (veh/h)	123	183	177	28	48	127
Peak Hour Factor	0.85	0.78	0.90	0.88	1.00	0.93
Hourly flow rate (vph)	145	235	197	32	48	137
Pedestrians		37	65		330	
Lane Width (m)		3.0	3.0		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		3	5		37	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		90	193			
pX, platoon unblocked						
vC, conflicting volume	558				1116	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	558				1116	564
tC, single (s)	4.1				*6.2	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	77				58	58
cM capacity (veh/h)	635				115	324
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	145	235	197	32	185	
Volume Left	145	0	0	0	48	
Volume Right	0	0	0	32	137	
cSH	635	1700	1700	1700	220	
Volume to Capacity	0.23	0.14	0.12	0.02	0.84	
Queue Length 95th (m)	6.6	0.0	0.0	0.0	48.6	
Control Delay (s)	12.3	0.0	0.0	0.0	71.7	
Lane LOS	B				F	
Approach Delay (s)	4.7		0.0		71.7	
Approach LOS					F	
Intersection Summary						
Average Delay			18.9			
Intersection Capacity Utilization			43.3%		ICU Level of Service	A
Analysis Period (min)			15			

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

08/03/2010

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	275	41	29	195	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	299	45	32	212	0	0
Pedestrians	300					
Lane Width (m)	3.0					
Walking Speed (m/s)	1.2					
Percent Blockage	21					
Right turn flare (veh)						
Median type				None		
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			343		896	321
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			299		870	275
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	100
cM capacity (veh/h)			1182		234	715
Direction, Lane #	EB 1	WB 1				
Volume Total	343	243				
Volume Left	0	32				
Volume Right	45	0				
cSH	1700	1182				
Volume to Capacity	0.20	0.03				
Queue Length 95th (m)	0.0	0.6				
Control Delay (s)	0.0	1.3				
Lane LOS		A				
Approach Delay (s)	0.0	1.3				
Approach LOS						
Intersection Summary						
Average Delay		0.5				
Intersection Capacity Utilization		35.5%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Doyle Street & Brunswick Street

08/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↕	↕	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	0	0	15	77	121	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	16	84	132	20
Pedestrians	24					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)					187	
pX, platoon unblocked						
vC, conflicting volume	282	165	175			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	282	165	175			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	700	879	1401			
Direction, Lane #	NB 1	SB 1				
Volume Total	100	151				
Volume Left	16	0				
Volume Right	0	20				
cSH	1401	1700				
Volume to Capacity	0.01	0.09				
Queue Length 95th (m)	0.3	0.0				
Control Delay (s)	1.3	0.0				
Lane LOS	A					
Approach Delay (s)	1.3	0.0				
Approach LOS						
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			20.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

225: Clyde Street & Dresden Row

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			4%			0%	
Volume (veh/h)	0	6	0	1	18	0	11	0	10	16	26	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	0	1	20	0	12	0	11	17	28	25
Pedestrians		75			31			31			28	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		6			3			3			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	218	216	147	170	223	64	128			42		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	218	216	147	170	223	64	128			42		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	97	100	99			99		
cM capacity (veh/h)	604	608	820	684	603	950	1364			1526		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	7	21	23	71								
Volume Left	0	1	12	17								
Volume Right	0	0	11	25								
cSH	608	607	1364	1526								
Volume to Capacity	0.01	0.03	0.01	0.01								
Queue Length 95th (m)	0.2	0.8	0.2	0.3								
Control Delay (s)	11.0	11.1	4.0	1.9								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.0	11.1	4.0	1.9								
Approach LOS	B	B										
Intersection Summary												
Average Delay			4.4									
Intersection Capacity Utilization		28.8%		ICU Level of Service		A						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
226: Clyde Street & Birmingham Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			2%			0%	
Volume (veh/h)	15	10	4	2	17	28	5	18	1	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	11	4	2	18	30	5	20	1	0	0	0
Pedestrians		49			35			41			9	
Lane Width (m)		3.7			3.7			3.7			0.0	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			3			4			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	129	116	90	117	115	64	49			56		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	129	116	90	117	115	64	49			56		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	100	100	97	97	100			100		
cM capacity (veh/h)	725	717	895	747	718	970	1492			1503		
Direction, Lane #	EB 1	WB 1	NB 1									
Volume Total	32	51	26									
Volume Left	16	2	5									
Volume Right	4	30	1									
cSH	742	851	1492									
Volume to Capacity	0.04	0.06	0.00									
Queue Length 95th (m)	1.0	1.5	0.1									
Control Delay (s)	10.1	9.5	1.6									
Lane LOS	B	A	A									
Approach Delay (s)	10.1	9.5	1.6									
Approach LOS	B	A										
Intersection Summary												
Average Delay			7.8									
Intersection Capacity Utilization		30.2%		ICU Level of Service				A				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

227: Clyde Street & Brenton Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	6	0	2	42	0	4	0	0	0	49	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	0	2	46	0	4	0	0	0	53	23
Pedestrians		90			18			48			50	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		8			2			4			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	236	181	203	143	193	68	166			18		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	236	181	203	143	193	68	166			18		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	93	100	100			100		
cM capacity (veh/h)	557	645	742	719	636	938	1303			1574		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	7	48	4	76								
Volume Left	0	2	4	0								
Volume Right	0	0	0	23								
cSH	645	639	1303	1574								
Volume to Capacity	0.01	0.07	0.00	0.00								
Queue Length 95th (m)	0.2	1.8	0.1	0.0								
Control Delay (s)	10.6	11.1	7.8	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	10.6	11.1	7.8	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			4.7									
Intersection Capacity Utilization			31.2%	ICU Level of Service						A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

228: Clyde Street & Queen St

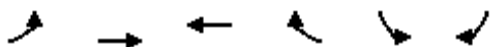
08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			3%	
Volume (veh/h)	10	0	5	3	2	3	10	209	6	54	285	29
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	5	3	2	3	11	227	7	59	310	32
Pedestrians		85			165			17			83	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		7			14			1			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	867	948	428	883	961	478	426			399		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	867	948	428	883	961	478	426			399		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	99	98	99	99	99			94		
cM capacity (veh/h)	185	193	573	179	190	468	1051			996		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	16	9	245	400								
Volume Left	11	3	11	59								
Volume Right	5	3	7	32								
cSH	239	237	1051	996								
Volume to Capacity	0.07	0.04	0.01	0.06								
Queue Length 95th (m)	1.7	0.9	0.2	1.4								
Control Delay (s)	21.1	20.7	0.5	1.9								
Lane LOS	C	C	A	A								
Approach Delay (s)	21.1	20.7	0.5	1.9								
Approach LOS	C	C										
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			56.2%	ICU Level of Service						B		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

230: Morris Street & Dresden Row

08/03/2010

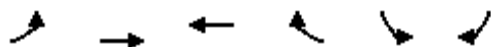


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	23	319	196	7	10	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	347	213	8	11	0
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		166				
pX, platoon unblocked						
vC, conflicting volume	252				705	361
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	252				705	361
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	100
cM capacity (veh/h)	1279				365	601
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	372	221	11			
Volume Left	25	0	11			
Volume Right	0	8	0			
cSH	1279	1700	365			
Volume to Capacity	0.02	0.13	0.03			
Queue Length 95th (m)	0.5	0.0	0.7			
Control Delay (s)	0.7	0.0	15.2			
Lane LOS	A		C			
Approach Delay (s)	0.7	0.0	15.2			
Approach LOS			C			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		53.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

231: Morris Street &

08/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	10	301	223	5	7	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	327	242	5	8	11
Pedestrians		133	99		49	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		11	8		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	297				742	427
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	297				742	427
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	98
cM capacity (veh/h)	1211				333	533
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	338	248	18			
Volume Left	11	0	8			
Volume Right	0	5	11			
cSH	1211	1700	427			
Volume to Capacity	0.01	0.15	0.04			
Queue Length 95th (m)	0.2	0.0	1.0			
Control Delay (s)	0.3	0.0	13.8			
Lane LOS	A		B			
Approach Delay (s)	0.3	0.0	13.8			
Approach LOS			B			
Intersection Summary						
Average Delay		0.6				
Intersection Capacity Utilization		43.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

232: Artillery & Dresden Row

08/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		6%			-4%
Volume (veh/h)	0	0	0	0	30	165
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	33	179
Pedestrians	20					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			130			
pX, platoon unblocked						
vC, conflicting volume	265	20			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	265	20			20	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			98	
cM capacity (veh/h)	710	1058			1596	
Direction, Lane #						
SB 1						
Volume Total	212					
Volume Left	33					
Volume Right	0					
cSH	1596					
Volume to Capacity	0.02					
Queue Length 95th (m)	0.5					
Control Delay (s)	1.3					
Lane LOS	A					
Approach Delay (s)	1.3					
Approach LOS						
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			13.7%		ICU Level of Service	A
Analysis Period (min)			15			

63: Queen St & Artillery Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.0	0.1	0.0	0.2
Delay / Veh (s)	0.8	0.5	3.6	3.1	1.5
Total Stops	0	0	61	9	70
Travel Dist (km)	32.1	9.6	12.0	1.9	55.6
Travel Time (hr)	0.9	0.2	0.5	0.1	1.8
Avg Speed (kph)	35	40	23	23	31
Vehicles Entered	276	98	132	26	532
Vehicles Exited	277	98	132	26	533
Hourly Exit Rate	277	98	132	26	533

73: Spring Garden Road & South Park Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.6	1.0	1.8	0.6	5.1
Delay / Veh (s)	17.3	15.6	15.7	10.0	15.1
Total Stops	226	142	269	97	734
Travel Dist (km)	19.7	15.6	55.9	9.9	101.1
Travel Time (hr)	2.2	1.4	3.1	0.9	7.6
Avg Speed (kph)	9	11	18	12	14
Vehicles Entered	342	229	416	231	1218
Vehicles Exited	344	229	411	228	1212
Hourly Exit Rate	344	229	411	228	1212

75: Sackville St & Summer Street Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.3	0.7	4.8	5.8
Delay / Veh (s)	7.7	10.1	19.9	16.4
Total Stops	85	253	871	1209
Travel Dist (km)	42.9	38.1	92.8	173.8
Travel Time (hr)	1.3	1.6	7.2	10.1
Avg Speed (kph)	33	24	14	18
Vehicles Entered	156	264	868	1288
Vehicles Exited	151	264	860	1275
Hourly Exit Rate	151	264	860	1275

Scenario D 2010 PM

HCM Signalized Intersection Capacity Analysis

28: Sackville St & Brunswick Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.1	3.7	3.7	4.2	3.7	3.7	3.6	3.7	3.0	3.7	3.7
Grade (%)		-7%			10%			2%			-3%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95			0.92		1.00	0.98		1.00	0.91	
Flpb, ped/bikes	0.95	1.00			0.96		1.00	1.00		0.94	1.00	
Frt	1.00	0.98			0.95		1.00	0.98		1.00	0.89	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1465	1545			1416		1594	1606		1400	1416	
Flt Permitted	0.48	1.00			0.91		0.15	1.00		0.36	1.00	
Satd. Flow (perm)	741	1545			1303		258	1606		524	1416	
Volume (vph)	398	254	29	14	97	68	47	285	28	76	152	366
Peak-hour factor, PHF	0.94	0.87	0.73	0.44	0.89	0.89	0.78	0.82	0.70	0.86	0.90	0.79
Adj. Flow (vph)	423	292	40	32	109	76	60	348	40	88	169	463
RTOR Reduction (vph)	0	7	0	0	27	0	0	6	0	0	137	0
Lane Group Flow (vph)	423	325	0	0	190	0	60	382	0	88	495	0
Confl. Peds. (#/hr)	87		157	157		87	85		71	71		85
Confl. Bikes (#/hr)			5			2			3			13
Heavy Vehicles (%)	2%	1%	0%	0%	4%	0%	2%	1%	11%	3%	0%	1%
Turn Type	pm+pt		Perm			Perm			Perm			
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	36.0	36.0			20.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	38.0	38.0			22.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio	0.53	0.53			0.31		0.36	0.36		0.36	0.36	
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	512	815			398		93	580		189	511	
v/s Ratio Prot	c0.14	0.21						0.24			c0.35	
v/s Ratio Perm	c0.30				0.15		0.23			0.17		
v/c Ratio	0.83	0.40			0.48		0.65	0.66		0.47	0.97	
Uniform Delay, d1	13.4	10.2			20.3		19.2	19.3		17.7	22.6	
Progression Factor	1.00	1.00			1.27		1.00	1.00		0.91	0.75	
Incremental Delay, d2	14.1	1.5			4.0		29.7	5.8		7.0	30.3	
Delay (s)	27.5	11.6			29.8		48.8	25.1		23.1	47.3	
Level of Service	C	B			C		D	C		C	D	
Approach Delay (s)		20.5			29.8			28.2			44.4	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM Average Control Delay			31.1				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			72.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			92.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

30: Sackville St & Queen St

08/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖↗	↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	4%			-4%	4%	
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	1.00			0.95	1.00	1.00
Frpb, ped/bikes	0.95			1.00	1.00	0.96
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	1745			3637	1771	1486
Flt Permitted	1.00			0.72	0.95	1.00
Satd. Flow (perm)	1745			2628	1771	1486
Volume (vph)	558	88	65	475	201	311
Peak-hour factor, PHF	0.87	0.92	0.87	0.87	0.92	0.93
Adj. Flow (vph)	641	96	75	546	218	334
RTOR Reduction (vph)	7	0	0	0	0	126
Lane Group Flow (vph)	730	0	0	621	218	208
Confl. Peds. (#/hr)		75	75		9	3
Confl. Bikes (#/hr)		14				9
Heavy Vehicles (%)	1%	2%	0%	2%	1%	3%
Turn Type		Perm			Perm	
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	44.0			44.0	22.0	22.0
Effective Green, g (s)	47.0			47.0	25.0	25.0
Actuated g/C Ratio	0.59			0.59	0.31	0.31
Clearance Time (s)	7.0			7.0	7.0	7.0
Lane Grp Cap (vph)	1025			1544	553	464
v/s Ratio Prot	c0.42				0.12	
v/s Ratio Perm				0.24		c0.14
v/c Ratio	0.71			0.40	0.39	0.45
Uniform Delay, d1	11.7			8.9	21.6	22.0
Progression Factor	0.89			1.00	1.28	1.59
Incremental Delay, d2	4.1			0.8	2.0	3.0
Delay (s)	14.5			9.7	29.7	38.1
Level of Service	B			A	C	D
Approach Delay (s)	14.5			9.7	34.7	
Approach LOS	B			A	C	
Intersection Summary						
HCM Average Control Delay		18.8		HCM Level of Service		B
HCM Volume to Capacity ratio		0.62				
Actuated Cycle Length (s)		80.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		71.6%		ICU Level of Service		C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

31: Sackville St & Dresden Row

08/03/2010

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰↱			
Sign Control	Free		Free		Stop	
Grade	4%		-4%		6%	
Volume (veh/h)	423	50	78	506	0	0
Peak Hour Factor	0.88	0.73	0.59	0.86	0.88	0.80
Hourly flow rate (vph)	481	68	132	588	0	0
Pedestrians	3			3	35	
Lane Width (m)	3.7		3.7		0.0	
Walking Speed (m/s)	1.2		1.2		1.2	
Percent Blockage	0		0		0	
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)	158		34			
pX, platoon unblocked			0.94		0.96	0.94
vC, conflicting volume			584		1112	553
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			557		941	524
tC, single (s)			4.1		6.9	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		100	100
cM capacity (veh/h)			948		214	466
Direction, Lane #	EB 1	WB 1	WB 2			
Volume Total	549	328	392			
Volume Left	0	132	0			
Volume Right	68	0	0			
cSH	1700	948	1700			
Volume to Capacity	0.32	0.14	0.23			
Queue Length 95th (m)	0.0	3.7	0.0			
Control Delay (s)	0.0	4.7	0.0			
Lane LOS		A				
Approach Delay (s)	0.0	2.1				
Approach LOS						
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		56.2%		ICU Level of Service	B	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

33: Morris Street & Queen St

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	113	174	47	40	282	137	71	193	43	24	118	66
Peak Hour Factor	0.81	0.76	0.79	0.65	0.96	0.83	0.70	0.85	0.90	0.67	0.84	0.85
Hourly flow rate (vph)	140	229	59	62	294	165	101	227	48	36	140	78
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	428	355	165	376	254							
Volume Left (vph)	140	62	0	101	36							
Volume Right (vph)	59	0	165	48	78							
Hadj (s)	0.02	0.12	-0.67	0.01	-0.12							
Departure Headway (s)	8.5	8.8	8.0	8.4	8.9							
Degree Utilization, x	1.01	0.87	0.37	0.88	0.63							
Capacity (veh/h)	420	403	442	415	383							
Control Delay (s)	75.8	46.5	14.4	48.1	25.8							
Approach Delay (s)	75.8	36.3		48.1	25.8							
Approach LOS	F	E		E	D							
Intersection Summary												
Delay			48.1									
HCM Level of Service			E									
Intersection Capacity Utilization			76.5%	ICU Level of Service		D						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

36: Sackville St & Bell Road

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↑	↕	↕	↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	4.8	3.7	3.7	3.2	3.7	3.7	3.7	3.7	3.0	3.3	3.7
Grade (%)		2%			-1%			2%			-2%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		0.97			1.00	0.93		1.00	0.85	1.00	1.00	
Flpb, ped/bikes		1.00			0.98	1.00		1.00	1.00	1.00	1.00	
Frt		0.97			1.00	0.85		1.00	0.85	1.00	0.99	
Flt Protected		1.00			0.98	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1963			1723	1500		1858	1353	1668	1798	
Flt Permitted		0.98			0.83	1.00		0.97	1.00	0.18	1.00	
Satd. Flow (perm)		1925			1457	1500		1815	1353	315	1798	
Volume (vph)	11	156	45	86	191	349	27	483	151	220	223	14
Peak-hour factor, PHF	0.93	0.93	0.93	0.99	0.99	0.99	0.96	0.96	0.96	0.98	0.98	0.98
Adj. Flow (vph)	12	168	48	87	193	353	28	503	157	224	228	14
RTOR Reduction (vph)	0	12	0	0	0	225	0	0	98	0	3	0
Lane Group Flow (vph)	0	216	0	0	280	128	0	531	59	224	239	0
Confl. Peds. (#/hr)	18		48	48		18	11		61	61		11
Confl. Bikes (#/hr)			2			4			8			8
Turn Type	Perm			Perm		Perm	Perm		Perm	pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		26.0			26.0	26.0		27.0	27.0	40.0	40.0	
Effective Green, g (s)		29.0			29.0	29.0		30.0	30.0	43.0	43.0	
Actuated g/C Ratio		0.36			0.36	0.36		0.38	0.38	0.54	0.54	
Clearance Time (s)		7.0			7.0	7.0		7.0	7.0	4.0	7.0	
Lane Grp Cap (vph)		698			528	544		681	507	322	966	
v/s Ratio Prot										c0.08	0.13	
v/s Ratio Perm		0.11			c0.19	0.09		c0.29	0.04	0.30		
v/c Ratio		0.31			0.53	0.24		0.78	0.12	0.70	0.25	
Uniform Delay, d1		18.3			20.1	17.8		22.1	16.3	13.6	9.9	
Progression Factor		1.00			0.87	0.83		0.75	1.17	1.00	1.00	
Incremental Delay, d2		1.2			3.6	1.0		6.4	0.3	11.8	0.6	
Delay (s)		19.5			21.1	15.8		22.9	19.4	25.4	10.5	
Level of Service		B			C	B		C	B	C	B	
Approach Delay (s)		19.5			18.1			22.1			17.7	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay		19.5			HCM Level of Service					B		
HCM Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		80.0			Sum of lost time (s)					12.0		
Intersection Capacity Utilization		85.1%			ICU Level of Service					E		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

38: University Avenue & South Park Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			3%			3%			-1%	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	1.00
Frpb, ped/bikes	1.00	0.94		1.00	1.00	0.82		0.95			1.00	0.84
Flpb, ped/bikes	0.92	1.00		0.92	1.00	1.00		0.98			0.97	1.00
Frt	1.00	0.95		1.00	1.00	0.85		0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99			0.98	1.00
Satd. Flow (prot)	1673	1694		1651	1892	1316		3141			3394	1386
Flt Permitted	0.41	1.00		0.40	1.00	1.00		0.80			0.65	1.00
Satd. Flow (perm)	725	1694		690	1892	1316		2525			2244	1386
Volume (vph)	74	204	87	75	355	67	111	427	95	55	185	41
Peak-hour factor, PHF	0.77	0.81	0.68	0.85	0.97	0.79	0.73	0.91	0.74	0.60	0.89	0.85
Adj. Flow (vph)	96	252	128	88	366	85	152	469	128	92	208	48
RTOR Reduction (vph)	0	23	0	0	0	48	0	22	0	0	0	25
Lane Group Flow (vph)	96	357	0	88	366	37	0	727	0	0	300	23
Confl. Peds. (#/hr)	161		163	163		161	187		228	228		187
Confl. Bikes (#/hr)			12			13			6			5
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	31.0	31.0		31.0	31.0	31.0		37.0			37.0	37.0
Effective Green, g (s)	33.0	33.0		33.0	33.0	33.0		39.0			39.0	39.0
Actuated g/C Ratio	0.41	0.41		0.41	0.41	0.41		0.49			0.49	0.49
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lane Grp Cap (vph)	299	699		285	780	543		1231			1094	676
v/s Ratio Prot		c0.21			0.19							
v/s Ratio Perm	0.13			0.13		0.03		c0.29			0.13	0.02
v/c Ratio	0.32	0.51		0.31	0.47	0.07		0.59			0.27	0.03
Uniform Delay, d1	15.9	17.5		15.8	17.1	14.2		14.8			12.1	10.7
Progression Factor	1.00	1.00		1.00	1.00	1.00		0.87			0.77	0.70
Incremental Delay, d2	2.8	2.6		2.8	2.0	0.2		1.7			0.6	0.1
Delay (s)	18.7	20.2		18.6	19.1	14.4		14.4			9.9	7.6
Level of Service	B	C		B	B	B		B			A	A
Approach Delay (s)		19.9			18.3			14.4			9.6	
Approach LOS		B			B			B			A	
Intersection Summary												
HCM Average Control Delay		15.9					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.55										
Actuated Cycle Length (s)		80.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		88.3%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

63: Clyde Street & Dresden Row

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			4%			0%	
Volume (veh/h)	0	13	0	6	71	0	34	0	14	22	34	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	14	0	7	77	0	37	0	15	24	37	54
Pedestrians		45			51			36			74	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			4			3			6	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	351	297	145	288	317	133	136			66		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	351	297	145	288	317	133	136			66		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	97	100	99	85	100	97			98		
cM capacity (veh/h)	440	541	841	549	528	821	1392			1468		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	14	84	52	115								
Volume Left	0	7	37	24								
Volume Right	0	0	15	54								
cSH	541	529	1392	1468								
Volume to Capacity	0.03	0.16	0.03	0.02								
Queue Length 95th (m)	0.6	4.2	0.6	0.4								
Control Delay (s)	11.8	13.1	5.5	1.7								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.8	13.1	5.5	1.7								
Approach LOS	B	B										
Intersection Summary												
Average Delay			6.6									
Intersection Capacity Utilization		32.1%		ICU Level of Service		A						
Analysis Period (min)		15										

HCM Signalized Intersection Capacity Analysis

73: Spring Garden Road & South Park Street

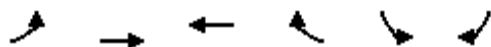
08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	2.9	2.9	3.2	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.0	3.0
Grade (%)		0%			0%			2%			-2%	
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.25		1.00	0.46	1.00	0.89		1.00	1.00	0.56
Flpb, ped/bikes	0.71	1.00	1.00		0.94	1.00	0.78	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1155	1448	355		1495	684	1349	1586		1723	1739	855
Flt Permitted	0.52	1.00	1.00		0.94	1.00	0.52	1.00		0.23	1.00	1.00
Satd. Flow (perm)	633	1448	355		1413	684	737	1586		425	1739	855
Volume (vph)	63	200	47	28	176	99	105	492	73	58	262	60
Peak-hour factor, PHF	0.93	0.89	0.84	0.78	0.75	0.85	0.83	0.95	0.80	0.78	0.90	0.83
Adj. Flow (vph)	68	225	56	36	235	116	127	518	91	74	291	72
RTOR Reduction (vph)	0	0	30	0	0	12	0	8	0	0	0	1
Lane Group Flow (vph)	68	225	26	0	271	105	127	601	0	74	291	71
Confl. Peds. (#/hr)	748		384	384		748	362		404	404		362
Confl. Bikes (#/hr)			3			9			9			16
Heavy Vehicles (%)	3%	21%	10%	14%	10%	1%	4%	2%	14%	7%	3%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	31.0	31.0	31.0		31.0	31.0	35.0	35.0		35.0	35.0	35.0
Effective Green, g (s)	34.0	34.0	34.0		34.0	34.0	38.0	38.0		38.0	38.0	38.0
Actuated g/C Ratio	0.42	0.42	0.42		0.42	0.42	0.48	0.48		0.48	0.48	0.48
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	269	615	151		601	291	350	753		202	826	406
v/s Ratio Prot		0.16						c0.38			0.17	
v/s Ratio Perm	0.11		0.07		c0.19	0.15	0.17			0.17		0.08
v/c Ratio	0.25	0.37	0.17		0.45	0.36	0.36	0.80		0.37	0.35	0.17
Uniform Delay, d1	14.8	15.7	14.3		16.4	15.6	13.3	17.8		13.3	13.2	12.0
Progression Factor	1.11	1.03	1.42		0.74	0.70	1.02	1.08		0.77	0.79	0.78
Incremental Delay, d2	2.0	1.5	2.2		2.4	3.3	2.8	8.3		4.9	1.2	0.9
Delay (s)	18.3	17.6	22.4		14.5	14.2	16.4	27.5		15.2	11.7	10.3
Level of Service	B	B	C		B	B	B	C		B	B	B
Approach Delay (s)		18.5			14.4			25.6			12.0	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM Average Control Delay		18.9										
HCM Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		80.0								8.0		
Intersection Capacity Utilization		69.5%								C		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

79: Morris Street & Brenton Place

08/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	12	245	403	7	23	51
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	266	438	8	25	55
Pedestrians			3		84	
Lane Width (m)			3.7		3.7	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		7	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		87				
pX, platoon unblocked						
vC, conflicting volume	530				821	526
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	530				821	526
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	89
cM capacity (veh/h)	963				314	512
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	279	446	80			
Volume Left	13	0	25			
Volume Right	0	8	55			
cSH	963	1700	428			
Volume to Capacity	0.01	0.26	0.19			
Queue Length 95th (m)	0.3	0.0	5.2			
Control Delay (s)	0.5	0.0	15.3			
Lane LOS	A		C			
Approach Delay (s)	0.5	0.0	15.3			
Approach LOS			C			
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization		33.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

89: Spring Garden Road & Dresden Row

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↷	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.0	3.0	4.8	3.0
Grade (%)		0%			0%			4%			-4%	
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		1.00			1.00						1.00	
Frpb, ped/bikes		0.85			1.00						0.73	
Flpb, ped/bikes		1.00			1.00						0.90	
Frt		0.98			1.00						0.94	
Flt Protected		1.00			1.00						0.99	
Satd. Flow (prot)		1258			1598						1321	
Flt Permitted		1.00			1.00						0.99	
Satd. Flow (perm)		1258			1598						1321	
Volume (vph)	0	236	32	0	281	0	0	0	0	11	57	65
Peak-hour factor, PHF	0.80	0.90	0.62	0.56	0.88	0.69	0.78	0.96	0.53	0.39	0.68	0.80
Adj. Flow (vph)	0	262	52	0	319	0	0	0	0	28	84	81
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	17	0
Lane Group Flow (vph)	0	305	0	0	319	0	0	0	0	0	176	0
Confl. Peds. (#/hr)	691		566	566		691	252		296	296		252
Confl. Bikes (#/hr)			7			6			3			
Heavy Vehicles (%)	0%	20%	3%	6%	11%	0%	4%	0%	6%	9%	2%	3%
Turn Type										Perm		
Protected Phases		4			8						6	
Permitted Phases										6		
Actuated Green, G (s)		48.0			48.0						20.0	
Effective Green, g (s)		50.0			50.0						22.0	
Actuated g/C Ratio		0.62			0.62						0.28	
Clearance Time (s)		6.0			6.0						6.0	
Lane Grp Cap (vph)		786			999						363	
v/s Ratio Prot		c0.24			0.20							
v/s Ratio Perm											0.13	
v/c Ratio		0.39			0.32						0.48	
Uniform Delay, d1		7.4			7.0						24.3	
Progression Factor		1.21			0.85						0.95	
Incremental Delay, d2		1.3			0.8						4.5	
Delay (s)		10.3			6.7						27.5	
Level of Service		B			A						C	
Approach Delay (s)		10.3			6.7			0.0			27.5	
Approach LOS		B			A			A			C	
Intersection Summary												
HCM Average Control Delay			12.9			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			40.6%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

91: Spring Garden Road & Birmingham Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			1%			2%			-4%	
Volume (veh/h)	13	266	0	0	284	91	8	50	59	0	0	0
Peak Hour Factor	0.81	0.91	0.68	0.71	0.84	0.76	0.75	0.95	0.75	0.50	0.74	0.78
Hourly flow rate (vph)	16	292	0	0	338	120	11	53	79	0	0	0
Pedestrians		122			22			297			436	
Lane Width (m)		3.0			3.0			3.9			0.0	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		8			2			27			0	
Right turn flare (veh)									4			
Median type								None			None	
Median storage veh												
Upstream signal (m)		80			81							
pX, platoon unblocked	0.90			0.97			0.91	0.91	0.97	0.91	0.91	0.90
vC, conflicting volume	894			589			1141	1515	611	1246	1455	956
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	882			578			1110	1521	600	1225	1455	951
tC, single (s)	4.2			4.1			7.2	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.0	3.3	3.6	4.0	3.3
p0 queue free %	98			100			87	32	78	100	100	100
cM capacity (veh/h)	669			716			85	78	353	39	86	261
Direction, Lane #	EB 1	WB 1	NB 1									
Volume Total	308	458	142									
Volume Left	16	0	11									
Volume Right	0	120	79									
cSH	669	1700	177									
Volume to Capacity	0.02	0.27	0.80									
Queue Length 95th (m)	0.6	0.0	41.3									
Control Delay (s)	0.8	0.0	73.4									
Lane LOS	A		F									
Approach Delay (s)	0.8	0.0	73.4									
Approach LOS			F									
Intersection Summary												
Average Delay			11.8									
Intersection Capacity Utilization		44.4%		ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

108: Clyde Street & Birmingham Street

08/03/2010

																					
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR									
Lane Configurations																					
Sign Control		Stop			Stop			Free			Free										
Grade		0%			0%			2%			0%										
Volume (veh/h)	30	22	5	7	67	43	9	29	10	0	0	0									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92									
Hourly flow rate (vph)	33	24	5	8	73	47	10	32	11	0	0	0									
Pedestrians		75			59			48			68										
Lane Width (m)		3.7			3.7			3.7			0.0										
Walking Speed (m/s)		1.2			1.2			1.2			1.2										
Percent Blockage		6			5			4			0										
Right turn flare (veh)																					
Median type		None			None																
Median storage veh																					
Upstream signal (m)																					
pX, platoon unblocked																					
vC, conflicting volume	283	196	123	181	191	164	75			101											
vC1, stage 1 conf vol																					
vC2, stage 2 conf vol																					
vCu, unblocked vol	283	196	123	181	191	164	75			101											
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1											
tC, 2 stage (s)																					
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2											
p0 queue free %	93	96	99	99	88	94	99			100											
cM capacity (veh/h)	491	617	833	624	622	836	1426			1416											
Direction, Lane #	EB 1	WB 1	NB 1																		
Volume Total	62	127	52																		
Volume Left	33	8	10																		
Volume Right	5	47	11																		
cSH	555	686	1426																		
Volume to Capacity	0.11	0.19	0.01																		
Queue Length 95th (m)	2.8	5.1	0.2																		
Control Delay (s)	12.3	11.4	1.5																		
Lane LOS	B	B	A																		
Approach Delay (s)	12.3	11.4	1.5																		
Approach LOS	B	B																			
Intersection Summary																					
Average Delay		9.5																			
Intersection Capacity Utilization		32.4%		ICU Level of Service		A															
Analysis Period (min)		15																			

HCM Signalized Intersection Capacity Analysis

175: Spring Garden Road & Queen Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	3.0	3.0	3.0	3.0	3.7	3.0	3.7	3.0	3.7	3.7	3.7
Grade (%)		-2%			0%			2%			0%	
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.89		1.00	0.93		1.00	0.77			0.77	
Flpb, ped/bikes	0.59	1.00		0.61	1.00		0.74	1.00			1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.92			0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1067	1305		1021	1468		1203	1341			1371	
Flt Permitted	0.52	1.00		0.52	1.00		0.54	1.00			0.81	
Satd. Flow (perm)	587	1305		556	1468		681	1341			1117	
Volume (vph)	49	239	32	93	230	23	100	201	232	40	123	89
Peak-hour factor, PHF	0.92	0.94	0.73	0.70	0.86	0.92	0.72	0.92	0.93	0.92	0.92	0.92
Adj. Flow (vph)	53	254	44	133	267	25	139	218	249	43	134	97
RTOR Reduction (vph)	0	8	0	0	4	0	0	28	0	0	25	0
Lane Group Flow (vph)	53	290	0	133	288	0	139	439	0	0	249	0
Confl. Peds. (#/hr)	435		420	420		435	271		340	340		271
Confl. Bikes (#/hr)			1						2			
Heavy Vehicles (%)	2%	22%	0%	0%	12%	2%	2%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		31.0	31.0			31.0	
Effective Green, g (s)	39.0	39.0		39.0	39.0		33.0	33.0			33.0	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.41	0.41			0.41	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lane Grp Cap (vph)	286	636		271	716		281	553			461	
v/s Ratio Prot		0.22			0.20			c0.33				
v/s Ratio Perm	0.09			c0.24			0.20				0.22	
v/c Ratio	0.19	0.46		0.49	0.40		0.49	0.79			0.54	
Uniform Delay, d1	11.5	13.5		13.8	13.1		17.3	20.5			17.8	
Progression Factor	0.53	0.50		1.00	1.00		1.00	1.00			1.06	
Incremental Delay, d2	1.4	2.3		6.2	1.7		6.1	11.2			4.4	
Delay (s)	7.5	9.0		20.0	14.7		23.5	31.8			23.2	
Level of Service	A	A		C	B		C	C			C	
Approach Delay (s)		8.8			16.4			29.9			23.2	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM Average Control Delay			20.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			80.8%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

177: Spring Garden Road & Brunswick Street

08/03/2010

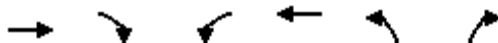


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		-1%	6%		-4%	
Volume (veh/h)	244	286	280	146	24	86
Peak Hour Factor	0.94	0.91	0.85	0.96	0.92	0.92
Hourly flow rate (vph)	260	314	329	152	26	93
Pedestrians		16	33		435	
Lane Width (m)		3.0	3.0		4.8	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		48	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		90	193			
pX, platoon unblocked						
vC, conflicting volume	916				1631	780
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	916				1631	780
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	31				0	53
cM capacity (veh/h)	378				18	200
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	260	314	329	152	120	
Volume Left	260	0	0	0	26	
Volume Right	0	0	0	152	93	
cSH	378	1700	1700	1700	62	
Volume to Capacity	0.69	0.18	0.19	0.09	1.92	
Queue Length 95th (m)	37.5	0.0	0.0	0.0	84.9	
Control Delay (s)	33.0	0.0	0.0	0.0	574.6	
Lane LOS	D				F	
Approach Delay (s)	14.9		0.0		574.6	
Approach LOS					F	
Intersection Summary						
Average Delay			65.8			
Intersection Capacity Utilization			48.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

187: Spring Garden Road & Brenton Street

08/03/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩		
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	314	69	51	273	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	341	75	55	297	0	0
Pedestrians	591			3	630	
Lane Width (m)	3.0			3.0	0.0	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	41			0	0	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)	88			78		
pX, platoon unblocked			0.92		0.95	0.92
vC, conflicting volume			1046		2007	1012
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1050		1951	1013
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		100	100
cM capacity (veh/h)			611		36	267
Direction, Lane #	EB 1	WB 1				
Volume Total	416	352				
Volume Left	0	55				
Volume Right	75	0				
cSH	1700	611				
Volume to Capacity	0.24	0.09				
Queue Length 95th (m)	0.0	2.3				
Control Delay (s)	0.0	2.9				
Lane LOS		A				
Approach Delay (s)	0.0	2.9				
Approach LOS						
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		54.1%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

192: Brenton Place & Brenton Street

08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	13	0	10	142	0	43	0	0	0	46	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	14	0	11	154	0	47	0	0	0	50	72
Pedestrians		28			32			60			84	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		2			3			5			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	369	239	174	278	275	116	150			32		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	369	239	174	278	275	116	150			32		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	100	98	73	100	97			100		
cM capacity (veh/h)	398	607	805	572	580	845	1397			1537		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	14	165	47	122								
Volume Left	0	11	47	0								
Volume Right	0	0	0	72								
cSH	607	579	1397	1537								
Volume to Capacity	0.02	0.29	0.03	0.00								
Queue Length 95th (m)	0.5	8.9	0.8	0.0								
Control Delay (s)	11.1	13.7	7.7	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	11.1	13.7	7.7	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			8.0									
Intersection Capacity Utilization			33.2%	ICU Level of Service						A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

223: Brenton Place & South Park Street

08/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	R
Sign Control	Stop		Free			Free
Grade	0%		2%			0%
Volume (veh/h)	35	262	473	0	14	246
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	285	514	0	15	267
Pedestrians	52		163			169
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		14			14
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			141			143
pX, platoon unblocked	0.88	0.87			0.87	
vC, conflicting volume	1027	735			566	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	978	694			499	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	9			98	
cM capacity (veh/h)	198	313			881	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	323	514	283			
Volume Left	38	0	15			
Volume Right	285	0	0			
cSH	293	1700	881			
Volume to Capacity	1.10	0.30	0.02			
Queue Length 95th (m)	99.0	0.0	0.4			
Control Delay (s)	121.6	0.0	0.7			
Lane LOS	F		A			
Approach Delay (s)	121.6	0.0	0.7			
Approach LOS	F					
Intersection Summary						
Average Delay		35.2				
Intersection Capacity Utilization		56.2%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

224: Clyde Street & Queen St

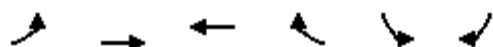
08/03/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			3%	
Volume (veh/h)	24	4	2	2	20	43	34	425	1	2	163	80
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	4	2	2	22	47	37	462	1	2	177	87
Pedestrians		94			157			19			78	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		8			13			2			7	
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)											141	
pX, platoon unblocked												
vC, conflicting volume	991	1013	334	942	1056	698	358			620		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	991	1013	334	942	1056	698	358			620		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	79	98	100	99	87	87	97			100		
cM capacity (veh/h)	125	183	641	166	173	356	1104			831		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	33	71	500	266								
Volume Left	26	2	37	2								
Volume Right	2	47	1	87								
cSH	138	262	1104	831								
Volume to Capacity	0.24	0.27	0.03	0.00								
Queue Length 95th (m)	6.6	8.1	0.8	0.1								
Control Delay (s)	38.9	23.8	1.0	0.1								
Lane LOS	E	C	A	A								
Approach Delay (s)	38.9	23.8	1.0	0.1								
Approach LOS	E	C										
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			62.7%		ICU Level of Service			B				
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

225: Morris Street & Dresden Row

08/03/2010

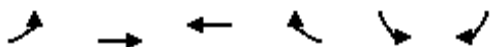


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	30	306	395	6	18	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	333	429	7	20	9
Pedestrians		113	60		31	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		10	5		3	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		168				
pX, platoon unblocked						
vC, conflicting volume	467				921	577
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467				921	577
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				93	98
cM capacity (veh/h)	1066				269	454
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	365	436	28			
Volume Left	33	0	20			
Volume Right	0	7	9			
cSH	1066	1700	307			
Volume to Capacity	0.03	0.26	0.09			
Queue Length 95th (m)	0.7	0.0	2.3			
Control Delay (s)	1.1	0.0	17.9			
Lane LOS	A		C			
Approach Delay (s)	1.1	0.0	17.9			
Approach LOS			C			
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		60.8%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

226: Morris Street & Birmingham Street

08/03/2010



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↰		↰	↰
Sign Control		Free	Free		Stop	
Grade		3%	3%		0%	
Volume (veh/h)	36	259	402	10	34	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	282	437	11	37	14
Pedestrians		133	99		49	
Lane Width (m)		3.7	3.7		3.7	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		11	8		4	
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)		247				
pX, platoon unblocked						
vC, conflicting volume	497				950	624
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	497				950	624
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				85	97
cM capacity (veh/h)	1022				243	412
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	321	448	51			
Volume Left	39	0	37			
Volume Right	0	11	14			
cSH	1022	1700	274			
Volume to Capacity	0.04	0.26	0.19			
Queue Length 95th (m)	0.9	0.0	5.1			
Control Delay (s)	1.4	0.0	21.1			
Lane LOS	A		C			
Approach Delay (s)	1.4	0.0	21.1			
Approach LOS			C			
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization		60.7%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

228: Artillery Place & Dresden Row

08/03/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		6%			-4%
Volume (veh/h)	0	0	0	0	126	196
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	137	213
Pedestrians	102					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			127			
pX, platoon unblocked						
vC, conflicting volume	589	102			102	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	589	102			102	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			91	
cM capacity (veh/h)	428	953			1490	
Direction, Lane #						
SB 1						
Volume Total	350					
Volume Left	137					
Volume Right	0					
cSH	1490					
Volume to Capacity	0.09					
Queue Length 95th (m)	2.3					
Control Delay (s)	3.5					
Lane LOS	A					
Approach Delay (s)	3.5					
Approach LOS						
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			20.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

229: Doyle Street & Brunswick Street

08/03/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↕	↕	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-4%	
Volume (veh/h)	0	0	37	313	113	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	40	340	123	57
Pedestrians	95					
Lane Width (m)	0.0					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)					187	
pX, platoon unblocked						
vC, conflicting volume	667	246	274			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	667	246	274			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	97			
cM capacity (veh/h)	411	793	1289			
Direction, Lane #	NB 1	SB 1				
Volume Total	380	179				
Volume Left	40	0				
Volume Right	0	57				
cSH	1289	1700				
Volume to Capacity	0.03	0.11				
Queue Length 95th (m)	0.7	0.0				
Control Delay (s)	1.1	0.0				
Lane LOS	A					
Approach Delay (s)	1.1	0.0				
Approach LOS						
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		38.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

230: Doyle Street & Queen Street

08/03/2010

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	26	24	258	0	0	226
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	26	280	0	0	246
Pedestrians			75			81
Lane Width (m)			3.7			3.7
Walking Speed (m/s)			1.2			1.2
Percent Blockage			6			7
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)			58			237
pX, platoon unblocked						
vC, conflicting volume	601	361			280	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	601	361			280	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	96			100	
cM capacity (veh/h)	433	636			1282	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	54	280	246			
Volume Left	28	0	0			
Volume Right	26	0	0			
cSH	512	1700	1700			
Volume to Capacity	0.11	0.16	0.14			
Queue Length 95th (m)	2.7	0.0	0.0			
Control Delay (s)	12.9	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.9	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization		33.1%		ICU Level of Service	A	
Analysis Period (min)			15			

155: Bell Road & Trollope Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	4.8	4.4	2.9	1.8	13.9
Delay / Veh (s)	34.2	28.4	37.4	26.9	31.6
Total Stops	27	343	183	155	708
Travel Dist (km)	8.0	130.1	13.2	39.0	190.3
Travel Time (hr)	5.2	7.2	3.3	2.9	18.5
Avg Speed (kph)	4	18	4	15	13
Vehicles Entered	506	557	281	244	1588
Vehicles Exited	507	551	281	244	1583
Hourly Exit Rate	507	551	281	244	1583

174: Queen Street & Birmingham Street Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.1	1.0	0.3	1.3
Delay / Veh (s)	1.2	0.9	21.9	8.0	6.6
Total Stops	8	3	156	74	241
Travel Dist (km)	21.6	24.7	18.1	8.0	72.4
Travel Time (hr)	0.7	0.6	1.5	0.5	3.3
Avg Speed (kph)	33	40	12	15	22
Vehicles Entered	209	246	158	114	727
Vehicles Exited	209	246	158	114	727
Hourly Exit Rate	209	246	158	114	727

175: Spring Garden Road & Queen Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.1	1.4	23.5	2.1	28.2
Delay / Veh (s)	11.7	13.5	201.7	34.8	74.7
Total Stops	141	212	697	204	1254
Travel Dist (km)	24.3	15.5	55.3	11.7	106.8
Travel Time (hr)	1.7	1.8	25.1	2.4	31.1
Avg Speed (kph)	14	9	4	5	5
Vehicles Entered	338	381	426	220	1365
Vehicles Exited	339	378	415	219	1351
Hourly Exit Rate	339	378	415	219	1351

Scenario C 2010 AM with modifications

47: Bell Road & Ahern Avenue Performance by approach

Approach	EB	WB	All
Total Delay (hr)	0.0	0.1	0.1
Delay / Veh (s)	4.6	4.0	4.3
Total Stops	4	3	7
Travel Dist (km)	7.5	12.9	20.4
Travel Time (hr)	0.2	0.4	0.6
Avg Speed (kph)	32	32	32
Vehicles Entered	34	54	88
Vehicles Exited	37	54	91
Hourly Exit Rate	222	324	546

60: University Avenue & Robie Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.4	0.2	0.2	0.3	1.1
Delay / Veh (s)	29.4	13.1	7.6	10.1	13.2
Total Stops	45	27	34	48	154
Travel Dist (km)	6.8	2.0	13.5	9.4	31.8
Travel Time (hr)	0.6	0.2	0.5	0.6	1.9
Avg Speed (kph)	11	9	27	17	17
Vehicles Entered	52	48	85	119	304
Vehicles Exited	54	48	87	123	312
Hourly Exit Rate	324	288	522	738	1872

63: Queen St & Artillery Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0
Delay / Veh (s)	0.8	0.2	3.7	4.3	1.7
Total Stops	0	0	11	4	15
Travel Dist (km)	5.6	1.2	1.9	0.7	9.3
Travel Time (hr)	0.2	0.0	0.1	0.0	0.3
Avg Speed (kph)	34	39	22	20	30
Vehicles Entered	50	12	21	9	92
Vehicles Exited	49	12	22	9	92
Hourly Exit Rate	294	72	132	54	552

**Scenario C 2010 PM with
modifications**

174: Queen Street & Birmingham Street Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.1	0.6	0.2	1.0
Delay / Veh (s)	0.8	1.4	12.3	6.2	4.4
Total Stops	0	2	167	78	247
Travel Dist (km)	24.0	26.9	18.7	9.3	78.8
Travel Time (hr)	0.7	0.7	1.1	0.5	3.1
Avg Speed (kph)	34	38	16	17	25
Vehicles Entered	234	264	169	133	800
Vehicles Exited	235	262	169	133	799
Hourly Exit Rate	235	262	169	133	799

175: Spring Garden Road & Queen Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.9	1.4	4.0	1.0	8.3
Delay / Veh (s)	21.2	14.9	32.1	15.1	22.1
Total Stops	243	206	416	163	1028
Travel Dist (km)	22.6	14.2	57.0	12.5	106.3
Travel Time (hr)	2.4	1.8	5.6	1.3	11.2
Avg Speed (kph)	9	8	10	9	10
Vehicles Entered	317	350	449	237	1353
Vehicles Exited	315	350	447	236	1348
Hourly Exit Rate	315	350	447	236	1348

177: Spring Garden Road & Brunswick Street Performance by approach

Approach	EB	WB	SB	All
Total Delay (hr)	0.3	0.3	0.9	1.5
Delay / Veh (s)	3.0	2.5	25.1	6.0
Total Stops	87	67	114	268
Travel Dist (km)	17.5	32.0	7.0	56.5
Travel Time (hr)	0.7	1.1	1.2	3.1
Avg Speed (kph)	24	28	6	19
Vehicles Entered	379	395	132	906
Vehicles Exited	377	394	130	901
Hourly Exit Rate	377	394	130	901

Scenario D 2010 AM with modifications

63: Queen St & Artillery Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0
Delay / Veh (s)	1.0	0.3	3.1	1.1	1.4
Total Stops	0	0	10	0	10
Travel Dist (km)	5.2	1.8	2.1	0.3	9.4
Travel Time (hr)	0.2	0.0	0.1	0.0	0.3
Avg Speed (kph)	35	40	23	27	32
Vehicles Entered	44	18	23	4	89
Vehicles Exited	45	19	24	4	92
Hourly Exit Rate	270	114	144	24	552

73: Spring Garden Road & South Park Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.3	0.2	0.3	0.1	0.8
Delay / Veh (s)	18.3	19.2	14.9	4.9	14.5
Total Stops	39	27	38	18	122
Travel Dist (km)	3.2	2.4	9.2	1.9	16.6
Travel Time (hr)	0.4	0.3	0.5	0.1	1.2
Avg Speed (kph)	9	9	19	18	14
Vehicles Entered	52	34	66	42	194
Vehicles Exited	53	35	69	42	199
Hourly Exit Rate	318	210	414	252	1194

75: Sackville St & Summer Street Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.5	0.6
Delay / Veh (s)	6.3	7.4	12.9	11.3
Total Stops	11	37	157	205
Travel Dist (km)	5.6	6.2	16.1	27.9
Travel Time (hr)	0.2	0.2	1.0	1.4
Avg Speed (kph)	33	29	17	21
Vehicles Entered	21	37	150	208
Vehicles Exited	21	38	148	207
Hourly Exit Rate	126	228	888	1242

**Scenario D 2010 PM with
modifications**

155: Bell Road & Trollope Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.9	3.8	5.1	1.8	14.7
Delay / Veh (s)	27.5	24.9	58.9	27.8	32.6
Total Stops	30	315	232	159	736
Travel Dist (km)	8.0	130.9	14.6	38.3	191.8
Travel Time (hr)	4.3	6.7	5.5	2.8	19.2
Avg Speed (kph)	4	20	3	14	12
Vehicles Entered	514	558	309	241	1622
Vehicles Exited	512	556	309	235	1612
Hourly Exit Rate	512	556	309	235	1612

174: Queen Street & Birmingham Street Performance by approach

Approach	EB	WB	NB	NE	All
Total Delay (hr)	0.1	0.1	0.6	0.2	1.0
Delay / Veh (s)	1.1	1.2	13.6	8.4	5.1
Total Stops	8	4	172	66	250
Travel Dist (km)	22.2	24.4	18.9	7.5	72.9
Travel Time (hr)	0.7	0.6	1.2	0.5	3.1
Avg Speed (kph)	33	39	15	15	24
Vehicles Entered	214	238	173	108	733
Vehicles Exited	212	238	172	107	729
Hourly Exit Rate	212	238	172	107	729

175: Spring Garden Road & Queen Street Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.5	1.8	3.6	1.0	7.9
Delay / Veh (s)	17.8	18.3	28.4	16.9	21.4
Total Stops	199	233	411	151	994
Travel Dist (km)	21.6	14.6	58.4	11.4	106.1
Travel Time (hr)	2.0	2.2	5.2	1.3	10.8
Avg Speed (kph)	11	7	11	8	10
Vehicles Entered	300	355	456	218	1329
Vehicles Exited	300	356	452	217	1325
Hourly Exit Rate	300	356	452	217	1325

Appendix E

Meeting Minutes

Minutes of Meeting

Date of Meeting	December 14, 2009	Start Time	2:00 PM	Project Number
Project Name	Spring Garden Road Area Transportation Study			
Location	1701 Hollis Street			
Regarding	Project initiation			
Attendees	Ray Rice (AECOM), Roddy MacIntyre (HRM), Vanessa Skelton (AECOM), Peter Bigelow (HRM), Barry Yanchyshyn (HRM)			
Distribution	attendees			

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

Item		Assigned
1.0	INTRODUCTION	
	An introduction was provided by all meeting attendees. Other members of the Steering committee not available for this meeting were Alan Taylor a Transportation Planner from Traffic and Right of Way Services and [REDACTED] from the Real Estate division.	
2.0	SCHEDULE	
	Due to the later than anticipated start to the project, the schedule has been changed from that which was originally submitted as part of the proposal. A tentative revised schedule was prepared and was circulated at the meeting. Traffic counts originally scheduled for the very start of the study have been scheduled for the first and second week of January in order to avoid skewed traffic counts during the Christmas season. There are other projects for HRM that are driving the timelines for this transportation study. The library construction project will be presented to council in late January and will include a financial plan. The library will be partially financed through the sale of municipally owned parking lots in the area. The architects for this project are expected to be hired at the beginning of February and will be looking for results from our report. The real estate division of HRM will also require the results of the study in order to release the parcels of land to the market. The	

Item		Assigned
	proposed March deadline for this study matches the needs of the real estate division. The project schedule as presented will be adopted as the updated schedule.	
3.0	TRAFFIC DATA COLLECTION PROGRAM	
	It is anticipated that traffic counts will be undertaken in the first two weeks of January. The existing traffic model is a macroscopic view of the Halifax region. The traffic counts undertaken to populate the model were both manual counts and miovision counts and were collected midweek (Tuesday, Wednesday and Thursday). Our traffic data will be collected to match the same hours and days. Due to the fact that data will be collected in January which is typically not a high volume month, the turning percentages at each intersection will be the crucial piece of information. These turning percentages will be used to balance the volumes collected with the surrounding intersections already in the Synchro model.	
4.0	IDENTIFICATION OF STAKEHOLDERS	
	Stakeholders for this project will include: The Library Steering Committee, the management team from HRM including the Real Property Planning section for related projects, and the local business association who had submitted the proposal for a one-way street system. The transportation study report will be an internal document and will be released as required. The baseline scenario is an important component of the study as it will demonstrate how the current traffic patterns operate within the Spring Garden Road area.	
5.0	DISCUSSION OF ISSUES	
	The construction of the new library is expected to be a \$55 million investment. The vacant land in the area, which is currently used as parking lots, will be sold to help finance the project. The type of development and size of development will depend partially on the results of the traffic study. It is anticipated that the new developments will contain enough parking to handle the demand from the buildings themselves as well as provide parking to replace the parking lots that will be removed. It may be possible that the parking demand will factor into the type of building to be constructed. Reports are available which discuss the potential uses for the lots to ensure the vitality of the district. It is the intention that the future	

Item		Assigned
	development will expand the district and promote revitalization of the area. A main issue for this transportation study is whether additional vehicles generated by new developments can be accommodated on the existing road network. There are several stores within the area that attract many customers with vehicles. It is often difficult to find parking along Dresden Row. Along Spring Garden Road, there are many vehicles simply cruising which makes it very slow and congested. It is a very pedestrian oriented street and has many crosswalks. It is also a transit corridor. Other development known at this time consists of a tower of condos on the City Centre building and the Trillium project on the south side of Spring Garden Road which will contain high-end condos and commercial on the ground floor. Dalhousie is planning to consolidate the engineering departments on the nearby campus and possibly construct a residence. Richard Harvey should have information regarding the City Centre development. The planning department also has a growth study which should discuss growth projections for the area. There are a limited number of sites that are available for redevelopment. The maximum build out has been determined and is described in the report entitled "HRM by Design" which is available on the website. Background growth figures will be developed from growth projections in the area and will be collected from Richard Harvey. Also, historic traffic volumes for various pertinent road sections will be provided in order to assist in the development of background growth projections. There are three blocks of protected heritage area between Clyde Street and Morris Street. Merchants are concerned about any loss of parking since there is a general sense that most of their clients use cars. Due to a lack of driveways, parking for residents is mainly on the street. Many of the on-street parking spaces are restricted to 1-2 hours. Exemptions are provided in some cases for residents. All no parking zones must remain in any future road network. The proposed streetscape plan for Spring Garden Road contained 3 parking stalls. There is no expectation that the transportation study will increase or decrease parking. Some methods to direct drivers to available parking would be beneficial. The Collier study recommends different parking scenarios.	RM RM
6.0	DISCUSSION OF METHODOLOGY	
	The parking turnover rates used in the existing Synchro model will be	

Item		Assigned
	used for the additional streets added to the model. The proposed one-way system will be modeled as proposed and then may be modified as required. A new traffic signal is included at Queen Street and Sackville Street as part of the one-way system. This signal will be investigated as part of the traffic model. All aspects of the methodology as submitted in the proposal are acceptable.	
7.0	INFORMATION GATHERING	
	Information was provided by HRM to Ray Rice at the meeting who will forward the material to Vanessa.	RR
8.0	BILLING REQUIREMENTS	
	A letter confirming Worker's compensation coverage and Insurance is required. These letters were included in the proposal so it will be verified if these conditions have been met with the information provided in the proposal.	RR and RM

Minutes of Meeting

Date of Meeting	February 5, 2010	Start Time	1:00 PM	Project Number	60144708
Project Name	Spring Garden Road Area Transportation Study				
Location	1701 Hollis Street				
Regarding	Project initiation				
Attendees	Ray Rice (AECOM), Roddy MacIntyre (HRM), Vanessa Skelton (AECOM), Barry Yanchyshyn (HRM)				
Distribution	Attendees, Peter Bigelow (HRM)				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

Item		Assigned
1.0	DISCUSSION OF METHODOLOGY	
	VS reviewed the traffic counting program and the input into the Synchro model. The network size was reduced but all other factors remained the same as in the existing model such as lane designation and heavy vehicle percentages. Once the existing situation was analysed, the traffic was redistributed as per the scenarios B-D. The volumes for each scenario were input into the model and results were tabulated.	
2.0	PRESENTATION OF REDISTRIBUTION PATTERNS	
	The distribution patterns were presented and reviewed for each scenario. One suggestion was made with regard to scenario C and the distribution of traffic originally northbound on Dresden. The assumption was made that traffic would reroute by turning left at Birmingham and heading north along Birmingham instead of Dresden. The suggestion was that traffic could head north on Dresden, turn right on Clyde and then left on Birmingham. This change will be added to the redistribution scenarios.	VS
3.0	VOLUME IMPACTS	
	The volumes distribution for each scenario was presented and particular attention was drawn to intersections where an increase in volume was observed. (Spring Garden/ Brunswick,	

Item		Assigned
	Artillery/Birmingham/Queen, Queen/Morris and Queen/Sackville) These intersections may experience increased delay.	
4.0	PRESENTATION OF INTERSECTION ANALYSIS	
	Synchro analysis was used to determine the delays at the intersections. The delays are reported as per HCM (Highway Capacity Manual) calculations except for the intersection of Artillery/Queen/Birmingham where the unusual configuration could not be analysed using Synchro. For this intersection, the SimTraffic delay results were included in the analysis. The intersections in the Spring Garden area analysed using both the Synchro and SimTraffic modelling software. The results from both SimTraffic and Synchro were compared and the SimTraffic results seemed too optimistic therefore the Synchro results were used. The approaches with poor levels of service (E, F) were flagged but since a high delay for a low volume should not be equally compared to a high delay for a high volume, it was decided that vehicle-hours of delay would be used to compare the intersections for all scenarios. Each intersection was reviewed for changes in overall delay. Many intersections had relatively stable results however the intersections that had changes in delay were discussed in more detail. The concept of a roundabout at the intersection of Queen/Artillery/Birmingham was mentioned and this idea had been considered. VS had discussed a roundabout with Steve Sargeant, AECOM's roundabout specialist, and due to the geometry of the roadways it is not considered feasible. The space required is not available and the main flow of traffic along Queen Street would deviate from the existing continuous flow pattern. This concept will be discussed in the interim report. The many pedestrians in the area were mentioned as contributing factors to delay, especially at the intersection of Spring Garden and Brunswick. At the intersection of Dresden Row and Spring Garden, with the reduction in conflicting movements, the signals may be able to be removed. This will be considered as a possible modification. The intersection of Morris and Queen is approaching capacity and signals may need to be considered in the future. HRM monitors intersection volumes and has recently installed traffic signals at the	VS VS

Item		Assigned
	intersection of Queen and South.	
5.0	DISCUSSION OF IMPACTS	
	The impacts related to access and the changes in geometry were discussed. The availability of on-street parking was discussed and it was mentioned that one of the reasons for testing the one-way scenario was to increase on-street parking. The Birmingham and Dresden parking lots would likely be equally used by patrons and the smaller lot on Birmingham has 82 spaces while the lot on Dresden has 109 spaces. The location for access points to the future underground parking was discussed. These locations are not currently known but will be important in assigning future traffic. Ross Cantwell from Colliers will be contacted to learn if any updated information is available regarding the layout of the Queen Street parcel of land.	BY
6.0	SCHEDULE	
	The project is mainly on schedule and there was some float time built into the schedule for the development of future traffic projections. This task is now underway and a conference call was held this week to discuss the available data. The growth study mentioned at the previous meeting seems to be non-existent. The project is on track for the completion of the interim report by February 19. This will allow Peter to provide information on this study at his meeting on February 23.	
7.0	NEXT MEETING	
	The next meeting was tentatively scheduled for Thursday, February 18.	

Minutes of Meeting

Date of Meeting	February 22, 2010	Start Time	1:00 PM	Project Number	60144708
Project Name	Spring Garden Road Area Transportation Study				
Location	1701 Hollis Street				
Regarding	Project initiation				
Attendees	Ray Rice (AECOM), Roddy MacIntyre (HRM), Vanessa Skelton (AECOM), Barry Yanchyshyn (HRM), Peter Bigelow (HRM)				
Distribution	Attendees, Alan Taylor				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

Item		Assigned
1.0	PRESENTATION OF INTERIM REPORT	
	VS presented an overview of the report. In the final report, recommendations may be included regarding the optimal locations for vehicle access to the library and new developments. The cost of the traffic signals at Queen and Sackville could likely be somewhat higher than mentioned in the report. Other signals in HRM usually cost in the \$200,000 to \$250,000 range. Particular mention was made about the high pedestrian volumes along Spring Garden Road and in the area in general. These pedestrians have an impact on traffic flow as pedestrians crossing the road interrupt the free flow of vehicular traffic. There have been public misconceptions that the congestion along Spring Garden Road must be due to a high volume of vehicles as is the case in many instances in other locations. It was suggested that the section of the report dealing with the intersection level of service could be expanded to discuss in more details the intersections with the poor levels of service. Since this report may be released to the public, the language and wording may need to be adjusted for readers with little to no traffic engineering knowledge.	

Item		Assigned
	An additional impact in Scenario C and D is the removal of existing parking on Brenton Place. Responses to the issues of the business community: • To investigate the one-way system • To maximize on-street parking • To change Doyle to a one-way street and • To change Brenton Place to a one-way street were provided in the report. As a result of the analyses, Scenario D was the recommended option. This scenario provides improved traffic flow and improves pedestrian movement. The narrowing of Spring Garden Road at Birmingham and at Dresden Row reduces the distance for pedestrians to cross and therefore increases safety.	
2.0	PRESENTATION OF FUTURE TRAFFIC FORECASTS	
	Presentation sheets were distributed at the meeting. Background growth figures were determined from population growth as presented in Census records and from the Colliers report. It was determined that the overall growth of the region would be the most appropriate growth rate to use. A blend of interim growth rates provides for a 0.9% annual growth rate. Specific attention was given to intersections which were already exhibiting a poor level of service since additional volumes will negatively affect intersections that are near or at capacity. For new developments, information was taken from the traffic impact studies for the Trillium development and the City Centre Atlantic development. The Trillium development is a high-end condo development and is likely to produce more vehicle trips. Other potential residential developments may not be as high end and therefore will not generate as many trips. This corresponds with the results of the Colliers report which stated that the new developments are not expected to provide as much parking as the Trillium development. There is expected to be high transit use for work trips to this downtown area. For the land use of Specialty Retail in the Spring Garden Area since this is a very pedestrian oriented area, low range rates have been used for PM peak hour trip generation rates. Also, there are no published rates for the AM peak hour for the Land Use, however it is expected that this area will have some traffic in the AM peak hour related to the Specialty Retail. AM trip rates have been assumed to be 50% of the	

Item		Assigned
	PM rate with reversal of the directional split. Should the development traffic produce a negative impact on intersection operations in the area, a possible solution may be to advance the timeline of various transit projects.	
3.0	SCHEDULE	
	The project is on schedule to be completed by the end of March.	
4.0	NEXT MEETING	
	The next meeting is to be determined.	