

Memorandum

To: Bruce Hyman and Jeremiah Bartlett, City of Portland
 From: Lucy Gibson, P.E.
 Date: October 17, 2018
 Re: Libbytown Alternatives Analysis – Revised October 2018

DuBois & King is working with the City of Portland and PACTS to update the *Libbytown Traffic Circulation and Streetscape Study* with an analysis of current and future base conditions and alternative analyses in which the I-295 Exit 5 ramps remain in the street network.

Existing Conditions

Traffic Analysis

Multimodal counts were conducted for this study from 6:00 a.m. to 6:00 p.m. at the locations shown in Table 1, and included passenger cars, bicycles, pedestrians, buses, medium trucks and heavy trucks (i.e. semi-trailers). The Park/St John intersection also included queue observations during the peak morning and afternoon hours for use in Synchro and SimTraffic model calibration.

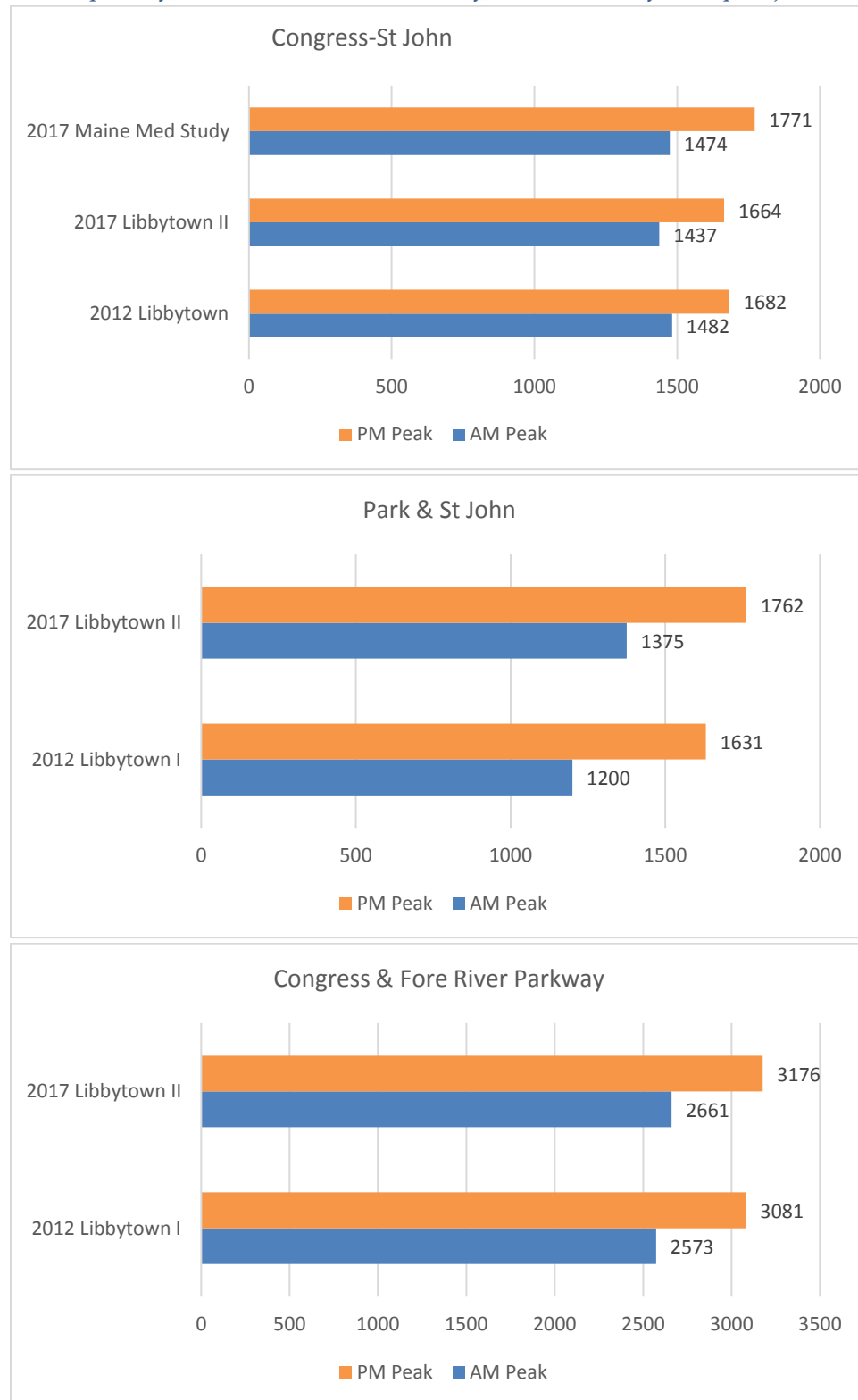
Table 1: Traffic Counts

Location	Date	Counted by
Park Ave/St. John St	Tuesday, 6/20/2017	Accurate Counts LLC
Congress St/St John St	Tuesday, 6/20/2017	Accurate Counts LLC
Congress St/Valley St	Tuesday, 6/20/2017	Accurate Counts LLC
Congress St./Fore River Parkway	Wednesday, 7/26/2017	Gorrill Palmer

Based on discussion with Maine DOT, it was determined that this analysis should reflect peak summer conditions, adjustment factors were not applied in the following analyses.

The recent counts were compared to adjusted peak hour counts from the 2012 *Libbytown Traffic Circulation and Streetscape Study*, as well as recent counts conducted by Gorrill Palmer for the 2017 Maine Medical traffic study, shown in the charts on in Figure 1. The 2017 volumes are slightly higher than the 2012, and the DuBois & King counts show good agreement with the Maine Medical Center study counts.

Figure 1: Comparison of Peak Hour Traffic Volumes at Selected Intersections (2012 Libbytown Traffic Circulation and Streetscape Study, 2017 Maine Medical Traffic Study, and 2017-18 Libbytown Update)



Synchro model calibration

A synchro model was updated with the new traffic counts, and also with recent traffic circulation and operations changes. Using existing signal timings from the City of Portland with the raw, unadjusted volumes; the actual queue lengths and delays were compared with those modeled by Synchro and SimTraffic. The charts in Figure 2 summarize the AM and PM peak hour results for modeled and observed queue lengths.

Figure 2: Comparison of Observed, Synchro and SimTraffic 95th Percentile Queues for Park Ave/St John St Intersection



The Synchro and SimTraffic queue results vary by intersection approach. On average, Synchro queues were 11% higher than observed and SimTraffic queues were 27% longer than observed. In particular, the SimTraffic queues for the northbound approach to Park/St John were significantly longer than both observed queues and Synchro due to the SimTraffic modeling lane utilization inaccurately, with vehicles

avoiding the leftmost lane in order to be in the right lane on Park Ave to access the I-295 entrance ramps. Calibration adjustments were attempted, but they did not make a significant difference.

Existing Vehicular Level of Service

The level of service (LOS) of the study intersections was modeled with Synchro for the AM and PM peak hour traffic volumes. The results are summarized on Table 2, and full results are attached to this report.

Table 2: Level of Service Results: Existing 2017 Conditions

Intersection	AM Peak		PM Peak	
	Delay (sec)	LOS	Delay (sec)	LOS
Fore River Parkway/I-295/Congress*	37.7	D	42.1	D
St John/Congress	27.5	C	38.3	D
Valley/Congress	28.1	C	22.0	C
St John/Park	27.6	C	31.6	C
I-295 NB exit /Congress (ramp LOS only)	17.8	C	12.3	B

** This intersection was evaluated with its geometry and signal operations as they existing in 2017*

Multimodal Connectivity and Safety

There are numerous concerns related to multimodal transportation in the study area which are documented in detail in *Connecting Libbytown* and the *Libbytown Traffic Circulation and Streetscape Study*. The following are items of particular relevance to the evaluation of circulation and safety alternatives, and are illustrated in Figure 3.

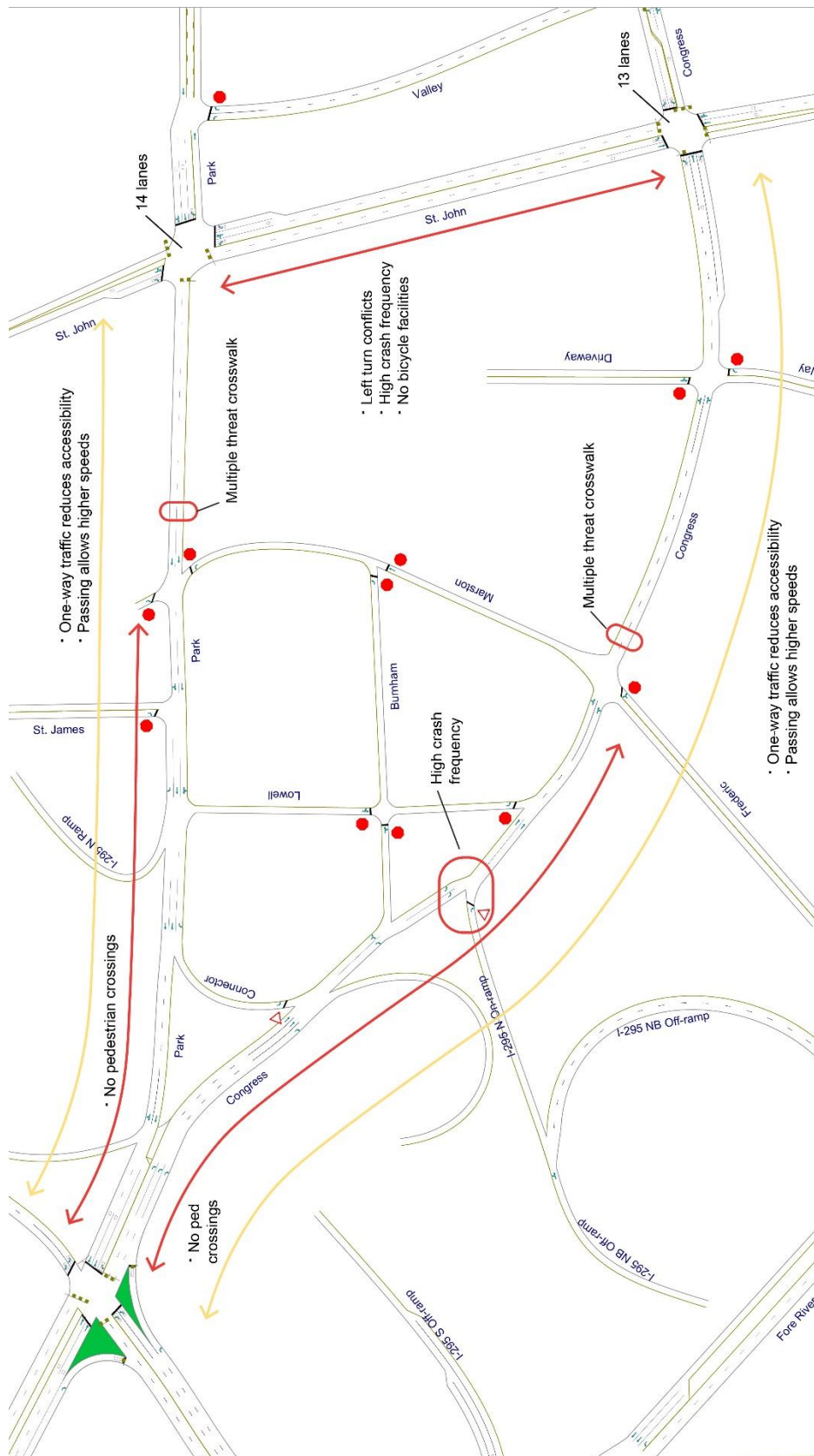
- Lack of pedestrian crossings of Park and Congress between Marston and Fore River Parkway hampers pedestrian mobility and creates a hazard as people attempt unprotected crossings.
- Crosswalks on Park and Congress just east of Marston both have the “double threat” concern due to the 2 lane/1-way approaches. A vehicle stopping for a pedestrian blocks the view of the pedestrian for an oncoming driver, and have high potential for injury crashes.
- Signalized intersections in the study area have long wait times for pedestrian phases, leading people to cross without the benefit of a protected phase.
- Bicycle connectivity is absent between the Bayside Trail and the Fore River Parkway Trail/Portland Transportation Center. An ongoing design project to extend the Bayside Trail to the Fore River Parkway is seeking to address this gap.

Public Safety and Resiliency

Several concerns in the study area related to community safety and resiliency include the following:

- Congress Street is the primary access to the Maine Medical Center from points west via Outer Congress St and I-295 from points south. Emergency access during train crossings is blocked from the at-grade rail crossing, and rail traffic is getting more frequent in recent years.
- Flooding and related road closures along Park Avenue are becoming more frequent. With the one-way operations of Congress and Park, there are no alternate routes to provide access to Outer Congress, the Portland Transportation Center, nor to I-295 south when Park Avenue is closed.

Figure 3: Existing Safety and Congestion Issues



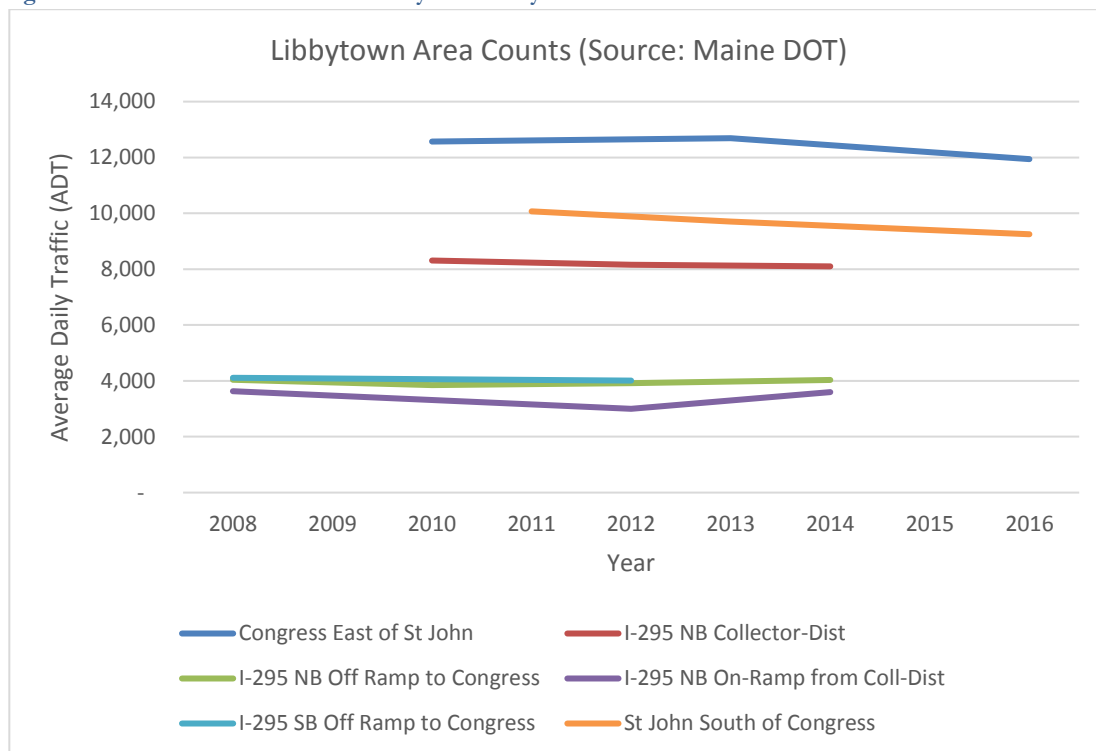
Future Conditions

A design year of 2027 is proposed for the 1- and 2- way conversion scenarios, as the implementation would primarily be through signalization and reconfiguration of existing pavement, and be implemented within the existing right-of-way. The projection of current traffic volumes to reflect future 2027 year traffic included adjusting for future background growth, and adding traffic expected from planned and proposed developments. The traffic analysis is based on peak summer traffic conditions, and the volumes were not adjusted to reflect annual average traffic.

Baseline Traffic Growth

Figure 4 shows time series data for Maine DOT counts in the study area, which show trends in traffic volumes are generally flat. Based on discussion with Maine DOT staff, a growth rate of 0.5% per year is used to project future traffic volumes as an allowance for possible future growth.

Figure 4: Historic Traffic Counts in Libbys town Study Area



In addition to 0.5% per year background growth, the future traffic forecasts also include traffic expected from the following developments:

- **Thompsons Point.** PM Peak traffic was included in the future year scenarios as described in the Traffic Movement Permit (TMP). AM peak hour volumes were not addressed in the permit. The permit volumes that were used are attached to this memorandum.
- **Maine Medical.** Both AM and PM peak hour traffic generated by a parking garage proposed on St. John St. is included in the future year analyses, as described in a memorandum from Gorrill Palmer

entitled, “Preliminary Traffic Assessment Maine Medical Center Expansion – Portland, Maine” and dated July 13, 2017. An excerpt is attached to this report that shows the proposed development volumes.

Planned Signal Operations Changes

The analysis incorporates the following changes in traffic operations:

- The signal phasing and timing for Congress/Fore River Parkway was changed to be consistent with the Thompson’s Point Traffic Movement Permit, and are attached to this memorandum.
- The existing signal at Congress/Valley is removed, as currently planned due to the existing traffic volumes not meeting signal warrants.

Traffic Circulation Alternatives

The following future scenarios are evaluated in Synchro for the 2027 AM and PM conditions, and SimTraffic for 2027 PM conditions, as the PM peak hour has the most critical operations and congestion:

No Build

This alternative provides a baseline for comparing the other alternatives. It incorporates the planned changed and development traffic as described in the previous section.

C1P2: Congress one-way/Park two-way

This scenario converts Park Ave to two-way operation in order to achieve the following objectives:

- To improve emergency response time reliability by providing an alternative to Congress St when the at-grade railroad crossing on Congress Street is closed due to train traffic.
- Greater visibility and accessibility for local businesses along Park Ave, including HP Hood, La Quinta, and Bunker Brewing.
- Speed reduction on Park Ave resulting from the presence of oncoming traffic and narrower lane widths should result in increased safety for all users.
- More efficient traffic circulation afforded by two-way circulation on Park Ave

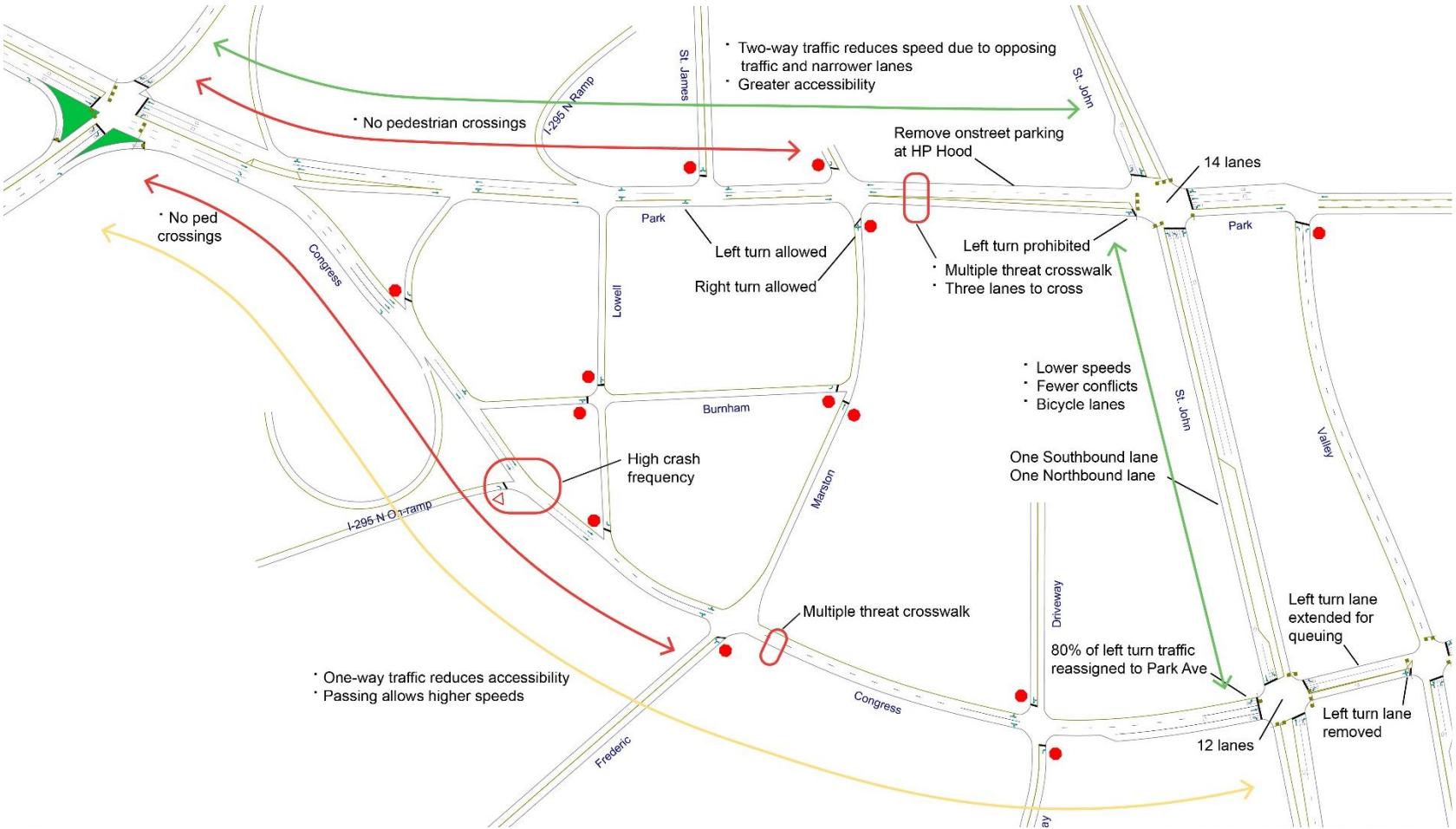
C2P2: Congress two-way/Park two-way

This scenario converts both Congress and Park to two-way operation to extend the benefits of conversion to two-way streets, which requires traffic control at the intersection of Congress and Park. A modern roundabout is proposed based on safety and cost considerations with hybrid geometry of 2 circulating lanes in the westbound direction for the two-lane Park St approach; and a single circulating lane for the eastbound and northbound approaches. A signalized intersection is also possible, but a roundabout is preferred for the expected lower construction cost, lower maintenance cost, and superior safety record. In addition, the following objectives are intended:

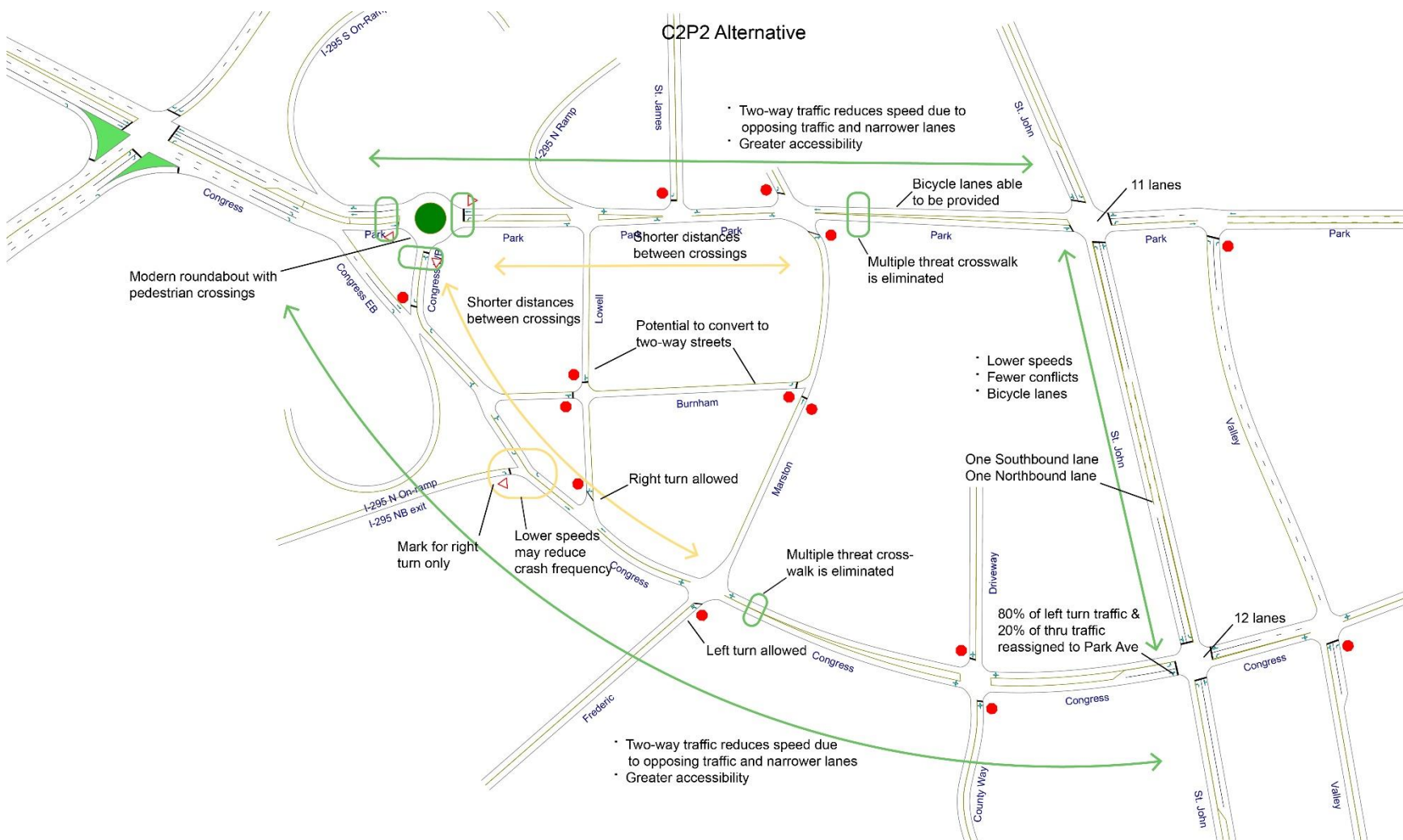
- Westbound bike traffic will be possible on Park Ave
- Improving traffic circulation and reduced vehicle miles traveled should result from improved connectivity and more direct travel with two-way operations on both Park and Congress
- Congress would provide access between I-295, the Portland Transportation, Maine Medical and downtown during roadway flooding events that require the closure of Park Ave.

Figures 5 and 6 illustrate the issues, design modifications and traffic assumptions for each alternative.

Figure 5: C1P2 Features and Issues



C2P2 Alternative



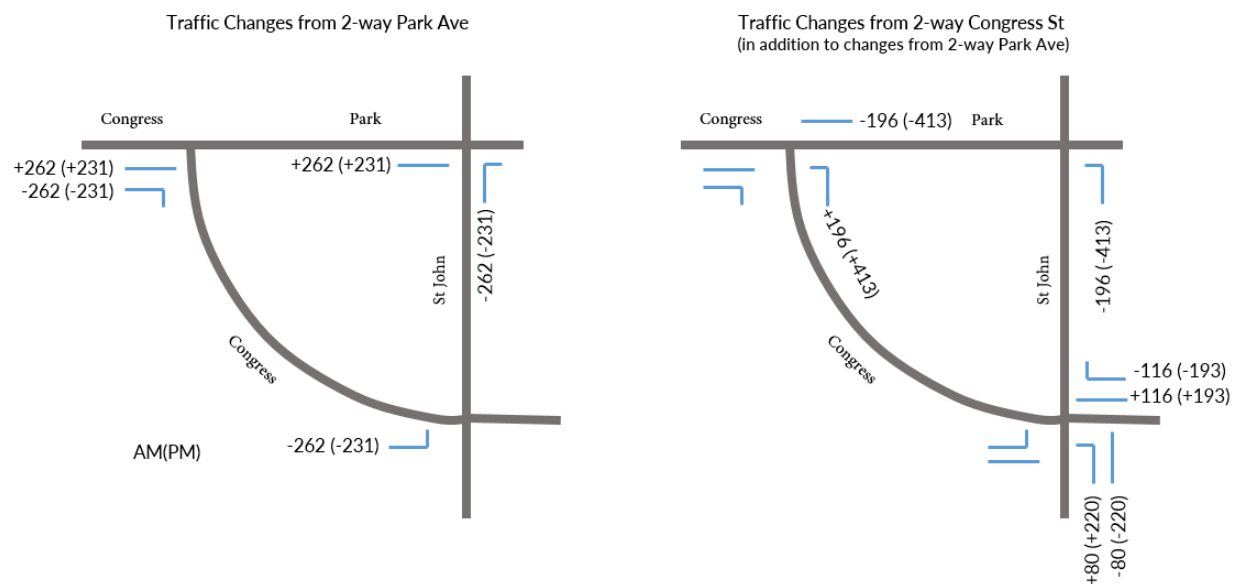
Changes in traffic volumes

The following diagrams show the projected changes for traffic volumes at the key study area intersections.

Assumptions made for projecting these changes include the following:

- For C1P2: 80% of the Congress eastbound volume turning left at St John will instead use Park Ave eastbound. The diagram to the left shows the resulting change in the AM and PM peak hour.
- For C2P2: In addition to the changes for C1P2, 80% of northbound left turns from St. John to Park will instead use westbound Congress St. This changes the traffic volumes at the Congress/St John intersection as shown in the diagram below, on the right.

Figure 7: Traffic Volume Changes from One-way to Two-way Street Conversions



Evaluation of Alternatives

The alternatives were assessed from a multimodal transportation and community planning perspective. In the tables that present the evaluation, the most favorable alternatives are highlighted in light green, and the least favorable are highlighted in light red.

Traffic Analysis

Based on discussions with Maine DOT, traffic analysis included an evaluation of level of service (LOS) and delay using Synchro, and of queuing using both Synchro and SimTraffic.

LOS and Delay (Synchro)

The analysis results of the 2027 AM and PM peak hour LOS for three scenarios are summarized in Table 3.

Table 3: Level of Service and Delay Results

Intersection	AM Peak					
	No Build		C1P2		C2P2	
	LOS	Delay	LOS	Delay	LOS	Delay
Congress Street/Fore River Parkway	D	37.5	D	37.5	D	37.5
Congress Street/Saint John Street	D	42.5	C	22.9	C	26.3
Park Ave /Saint John Street	C	28.4	D	44.8	C	20.8
I-295 NB/Congress (Ramp only)	C	18.5	C	15.6	B	14.6
Congress Street/Park Street					A	8.8
Intersection	PM Peak					
	No Build		C1P2		C2P2	
	LOS	Delay	LOS	Delay	LOS	Delay
Congress Street/Fore River Parkway	E	58.8	E	58.8	E	58.8
Congress Street/Saint John Street	E	76.5	D	38.8	D	35.4
Park Ave /Saint John Street	C	29.2	D	40.6	C	28.6
I-295 NB /Congress (Ramp only)	C	16.6	B	12.5	B	14.9
Congress Street/Park Ave					B	11.4

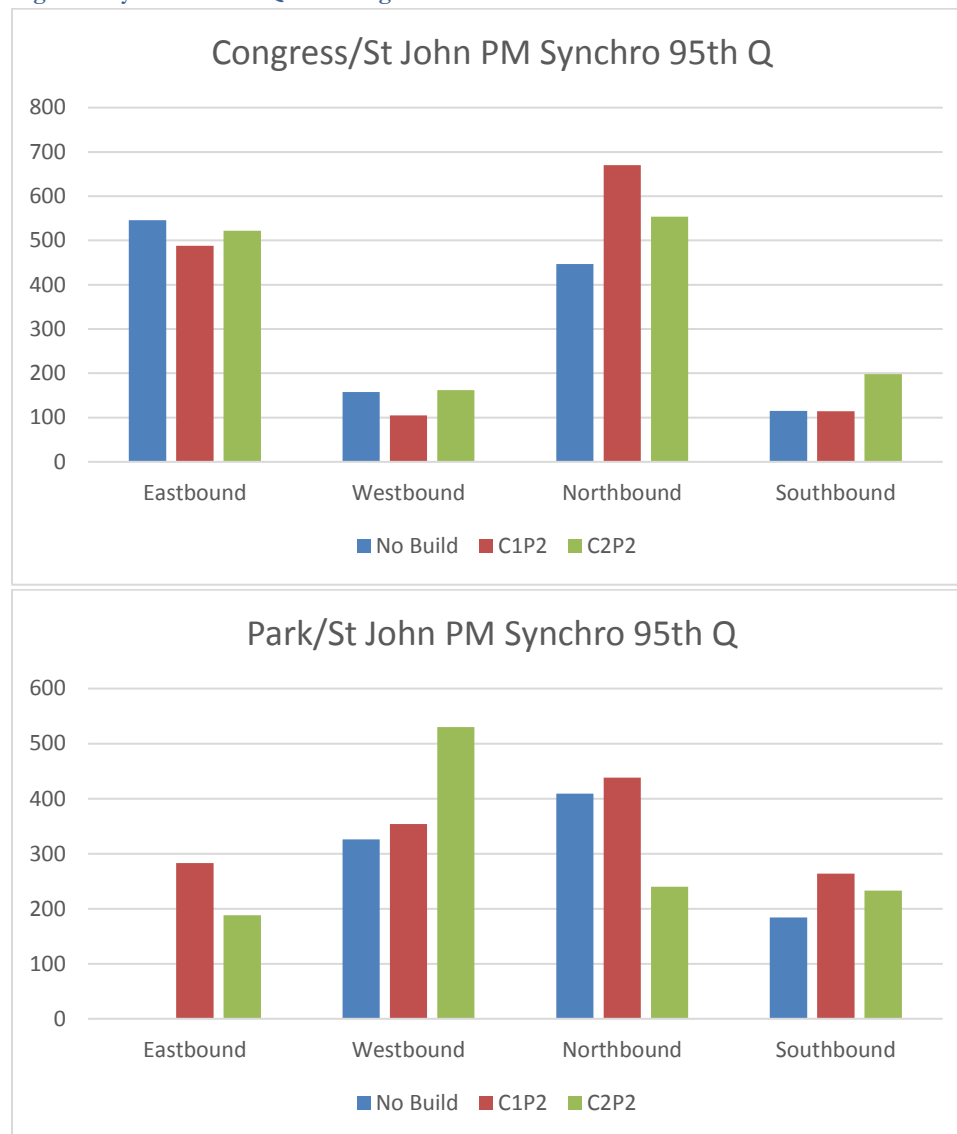
The results above show the following:

- Congress-St John is improved in both C1P2 and C2P2 scenarios
- Park-St John LOS is worse in the C1P2 scenario, but improved in the C2P2 scenario
- The LOS for the I-295 NB exit ramp to Congress has improved LOS in both C1P2 and C2P2
- The new intersection of Congress-Park in the C2P2 scenario has very high LOS

Queueing (SimTraffic)

Vehicle queues at intersections are of particular concern in an urban street network. They were evaluated using both Synchro and SimTraffic at key critical intersections. Synchro produced 95th % queue lengths for both AM and PM peak hours. With PM being far more critical in terms of both traffic congestion and queueing, SimTraffic modeling was conducted for the PM peak hour. Full results are attached to this report.

Figure 8: Synchro 95th % Queue Lengths



None of the queue lengths will result in blockage of upstream signalized intersections.

Sim Traffic Queues were computed using an average of ten 1-hour simulations. Complete results are attached. The charts shown in Figure 9 summarize the highest queue on each approach, as each alternative has different lane assignments.

Figure 9: SimTraffic 95th % Queues



The SimTraffic queues were on average shorter than the Synchro queues, and again, in no cases did they extend to upstream signalized intersections. The highest queue modeled in any scenario was the northbound St John St approach in the No Build scenario, which was in part due to poor modeling of lane utilization for the northbound left turns.

The SimTraffic results also provided queue lengths for the I-295 northbound ramp at Congress Street, to determine if the changes on Congress Street would affect queuing on the ramp. The results are summarized in Table 4.

Table 4: SimTraffic 95th Queue Results for the I-295 Northbound ramp to Congress St

Scenario	Queue Length (ft)
No Build	593
C1P2	71
C2P2	119

With lower volumes on Congress at the ramp junction, level of service for the ramp improves and queuing is significantly reduced in both the C1P2 and C2P2 scenarios. The queuing is slightly longer in the C2P2 due to there being only one eastbound lane on Congress St, with higher traffic density. The combination of lower queue lengths and lower volumes on Congress should have a beneficial crash reduction effect at this high crash location.

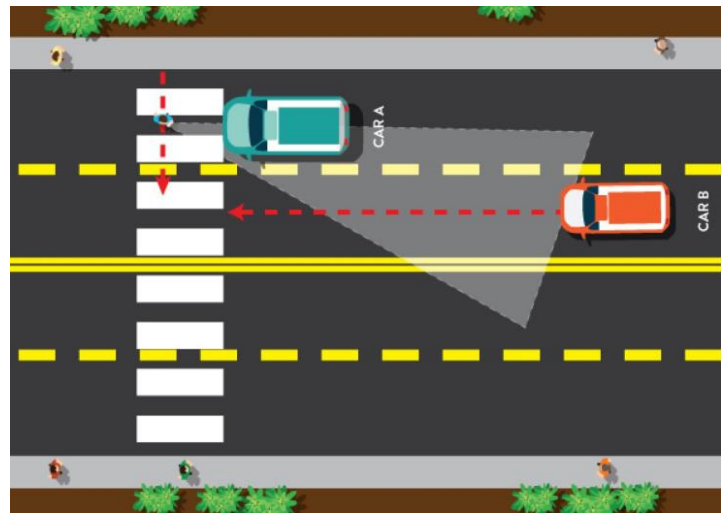
Queue lengths at the roundabout for alternative C2P2 were found to be negligible, and had no effect on adjacent intersections. Results are included in the attachments

Multimodal Evaluation

The following sections provide discussion on bicycle and pedestrian transportation.

Pedestrian Network

The lack of pedestrian crossings as described earlier forms an obstacle for safe pedestrian travel through the study area, and can create a hazard for people walking and driving when pedestrians attempt unprotected crossings. In addition, the existing crossings pose a “double threat” in the current configuration, with two approach lanes in the same direction. (see illustration to the right)



Bicycle Network

An important goal of this project is to address the significant gap in the bicycle network as described in detail in “*Connecting Libbytown*.” Recent work to advance extension of the Bayside Trail to connect to the Portland Transportation Center has identified the preferred alternative, which is to provide bicycle lanes on Park Avenue between St John St and Marston St, and a shared street on Marston and Frederick to the Fore River Parkway Trail. The C1P2 Alternative may preclude this bicycle connection as it requires three travel lanes through the railroad underpass on Park Ave.

Multimodal Summary Table

Table 5 summarizes the above discussion on multimodal considerations.

Table 5: Multimodal Evaluation Summary

Scenario	Pedestrian Network	Bicycle Network
No Build	No additional pedestrian crossings; double threat crossings on Park and Congress remain in place	Potential for bicycle network with contraflow bike lane
C1P2	No additional pedestrian crossings; double threat crossings on Park and Congress remain in place; though volume on Congress is lower and speeds on Park will be reduced due to 2-way traffic	Park Ave cannot accommodate separated bicycle facilities through the railroad bridge due to inadequate width available.
C2P2	Additional safe crossing for pedestrians at Congress/Park intersection	Bicycle facilities can be provided on Park Ave as planned for Bayside Trail extension to Transportation Center (<i>Connecting Libbytown</i>)

Intersection Efficiency

There is a “diseconomy of scale” for the operations of signalized intersections, which is recognized in the analytical methods used to assess intersection operations, but not always considered in evaluations of alternatives. These effects include: greater “lost time” for clearing larger intersections between phases, longer pedestrian phases due to increased crossing distance, unequal utilization of additional through or turn lanes, need for protected signal phases as intersections get larger, and longer queues resulting from longer signal cycles. These factors are discussed in detail in an Institute for Transportation Engineers (ITE) Journal article, attached to this report. The total number of approach and exit lanes for the critical study intersections is provided as a measure of intersection scale efficiency, with lower numbers indicating more efficient and compact intersections. The results are summarized in Table 6.

Table 6: Efficiency Evaluation: Total Intersection Approach and Exit Lanes

Scenario	Park/St John	Congress/St John
No Build	14	13
C1P2	14	12
C2P2	11	12

Speed and Safety

Reducing vehicle speeds and providing a “slow and steady” traffic flow is desirable in an urban setting to provide optimal capacity during peak hours, and alleviate the potential for “road rage.” Conversion of a 2-lane/1-way street to 2-way operation with 1 lane in each direction can help to achieve this type of flow, as there are few opportunities to pass in the 2-way scenario, and intersections operation at peak capacity at traffic speeds of around 25 mph.

Table 7: Speed and Safety Evaluation

Scenario	Speed/Safety
No Build	Higher speeds and ability to pass maintained
C1P2	Lower speeds on Park Ave due to narrower width and oncoming traffic; but ability to pass on westbound Park maintained
C2P2	Lower speeds on both Congress and Park due to friction created by two-way operations; no passing on Park and Congress reduces speeds and improves safety.

Community Impacts

The analysis of community impacts focused on several issues that were identified in *Connecting Libbytown* and the *Libbytown Traffic Circulation and Streetscape Study*, as well as more recent issues with railroad crossing closures on Congress and flood-related road closures on Park Ave. Other community concerns included poor accessibility to neighborhood destinations, and economic impacts from reduced visibility and inconvenient access for neighborhood businesses. An additional concern that the street reconfigurations are intended to address is poor access to Maine Medical Center along Congress Street due to frequent railroad crossings.

Table 7 summarizes the impacts for each scenario.

Table 8: Community Impacts Evaluation

Scenario	Accessibility	Emergency Access Impacts	Resiliency Impacts
No Build	Poor accessibility and inconvenient circulation is not addressed by this alternative	Access to Maine Medical from I-295 Exit 12 remains hindered by at-grade railroad crossings.	With Park Ave the only westbound route in the study area, flooding will more frequently affect circulation.
C1P2	Accessibility is improved along Park Ave in this alternative, but not along Congress St	Park Avenue provides an access route to Maine Medical that is not subject to railroad crossings.	With Park Ave the only westbound route in the study area, flooding will more frequently affect circulation.
C2P2	Accessibility is improved along both Park Ave and Congress St in this alternative	Park Avenue provides an access route to Maine Medical that is not subject to railroad crossings.	Congress provides two-way travel, and an alternative to Park Ave when it is closed due to flooding.

Conclusions

The following table summarizes the above analysis results for each performance measure:

Measure	No Build	C1P2	C2P2
Level of Service			
Pedestrian			
Bicycle			
Efficiency			
Speed Management			
Economic Activity			
Public Safety Access			

Red = worst | white = median | green = best

The analysis of alternatives shows that C2P2 is the most favorable in terms of the following:

- Vehicle level of service
- Queuing (95th % Synchro and SimTraffic)
- Promoting moderate vehicle speeds and safety
- Providing safer and more frequent pedestrian crossings
- Compatibility with plans to connect the Bayside Trail and Fore River Parkway bicycle facilities
- Intersection Efficiency
- Addressing community accessibility, public safety, and resiliency

The C1P2 alternative has many advantages over the no-build scenario. Because it will be less costly to implement, it could be desirable as a phased step toward implementation of C2P2, as well as a temporary measure to address construction impacts of the Maine Medical proposed parking garage.

Attachments

- 1) Traffic counts used in the study
- 2) 20017/Existing Synchro Results
- 3) Thompson's Point Traffic Movement Permit Volumes
- 4) Excerpt from Maine Medical Traffic Study – future garage traffic
- 5) Thompson's Point signal timing plans for Congress/Fore River Parkway
- 6) Future Traffic Volumes for study intersections
- 7) Future/Alternatives Synchro results
- 8) Future/Alternatives SimTraffic results
- 9) FHWA report excerpt on one-way/two-way street operations
- 10) ITE Journal publication on intersection efficiency

File Name: C:\Users\stev\Documents\2017\Petra\Portland, ME\Dubois King\623897F2\62389702.ppd

Start Date: 6/20/2017

Start Time: 7:00:00 AM

Site Code: 62389702

Comment 1: N/S Street : St. John Street

Comment 2: E/W Street: Congress Street

Comment 3: City/State : Portland, ME

Comment 4: Weather : Clear

Start Time	St. John St From North				Congress St From East				St. John St From South				Congress St From West				15 min veh	Hourly Veh
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
07:00 AM	21	30	0	0	2	1	36	0	0	34	5	0	57	117	22	0	325	
07:15 AM	25	28	0	0	5	0	36	0	0	40	5	0	58	125	21	0	343	
07:30 AM	25	48	0	0	4	0	50	0	0	51	4	0	78	144	21	0	425	
07:45 AM	25	46	0	0	10	1	45	0	0	57	6	0	78	146	25	0	439	1532
08:00 AM	21	45	0	0	4	0	39	0	0	49	4	0	60	150	26	0	398	1605
08:15 AM	10	38	0	0	7	0	23	0	0	42	6	0	73	141	32	0	372	1634
08:30 AM	18	39	0	0	7	0	30	0	0	46	3	0	61	136	28	0	368	1577
08:45 AM	26	43	0	0	6	0	33	0	0	40	4	0	73	116	32	0	373	1511
09:00 AM	22	34	0	0	7	0	56	0	0	36	14	0	56	117	28	0	370	1483
09:15 AM	15	36	0	0	6	0	24	0	0	45	5	0	53	107	24	0	315	1426
09:30 AM	12	61	0	0	10	0	54	0	0	48	5	0	50	89	25	0	354	1412
09:45 AM	13	26	0	0	9	0	34	0	0	43	8	0	60	113	18	0	324	1363
10:00 AM	16	26	0	0	14	0	36	0	0	49	16	0	50	88	22	0	317	1310
10:15 AM	17	51	0	0	10	0	42	0	0	45	18	0	59	118	16	0	376	1371
10:30 AM	15	50	0	0	11	1	45	0	0	54	7	0	50	114	17	0	364	1381
10:45 AM	10	39	0	0	14	0	48	0	0	51	10	0	57	131	24	0	384	1441
11:00 AM	8	38	0	0	10	3	67	0	0	54	5	0	53	83	29	0	350	1474
11:15 AM	14	46	0	0	9	0	60	0	0	77	9	0	72	104	23	0	414	1512
11:30 AM	19	43	0	0	18	0	48	0	0	62	10	0	73	100	31	0	404	1552
11:45 AM	23	46	0	0	15	0	55	0	0	67	7	0	82	107	35	0	437	1605
12:00 PM	14	40	0	0	18	1	57	0	0	68	5	0	69	100	27	0	399	1654
12:15 PM	20	47	0	0	14	1	55	0	0	80	8	0	72	118	26	0	441	1681
12:30 PM	17	48	0	0	15	0	56	0	0	70	15	0	57	125	23	0	426	1703
12:45 PM	25	69	0	0	14	1	60	0	0	85	10	0	53	107	30	0	454	1720
01:00 PM	16	54	0	0	13	0	43	0	0	73	11	0	49	108	35	0	402	1723
01:15 PM	21	53	0	0	14	0	61	0	0	68	10	0	64	89	27	0	407	1689
01:30 PM	10	43	0	0	20	0	47	0	0	76	13	0	66	116	26	0	417	1680
01:45 PM	19	44	0	0	22	0	49	0	0	70	13	0	51	95	28	0	391	1617
02:00 PM	15	53	0	0	24	1	63	0	0	60	9	0	70	106	32	0	433	1648
02:15 PM	11	66	0	0	11	1	54	0	0	67	10	0	57	114	35	0	426	1667
02:30 PM	13	58	0	0	11	0	54	0	0	68	6	0	64	108	29	0	411	1661
02:45 PM	14	59	0	0	13	0	54	0	0	69	6	0	66	86	45	0	412	1682
03:00 PM	19	62	0	0	17	3	60	0	0	95	12	0	76	93	24	0	461	1710
03:15 PM	14	50	0	1	12	0	56	0	0	80	11	0	61	99	22	0	406	1690
03:30 PM	8	43	0	0	16	0	63	0	0	77	7	0	73	103	26	0	416	1695
03:45 PM	14	43	0	0	17	0	57	0	0	94	4	0	64	98	30	0	421	1704
04:00 PM	20	52	0	0	21	0	69	0	0	91	7	0	75	104	30	0	469	1712
04:15 PM	13	58	0	0	16	1	56	0	0	114	14	0	71	104	24	1	472	1778
04:30 PM	15	52	0	0	20	0	66	0	0	108	6	0	97	110	31	0	505	1867
04:45 PM	17	47	0	0	22	0	71	0	0	100	10	0	71	120	33	0	491	1937
05:00 PM	18	43	0	0	9	0	78	0	0	99	7	0	77	90	20	0	441	1909
05:15 PM	12	50	0	0	10	0	70	0	0	90	4	0	81	120	37	0	474	1911
05:30 PM	21	51	0	0	13	0	63	0	0	77	9	0	66	115	22	0	437	1843
05:45 PM	22	51	0	0	11	0	63	0	0	57	9	0	53	118	30	0	414	1766
06:00 PM	10	35	0	0	22	0	50	0	0	66	6	0	46	88	24	0	347	1672
06:15 PM	17	33	0	0	11	0	58	0	0	54	7	0	62	114	53	0	409	1607
06:30 PM	26	36	0	0	8	0	47	0	0	73	8	0	57	118	54	0	427	1597
06:45 PM	17	28	0	0	7	1	42	0	0	64	5	0	38	96	23	0	321	1504

Start Time	St. John St From North				Congress St From East				St. John St From South				Congress St From West			
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
AM peak	81	177	0	0	25	1	157	0	0	199	20	0	289	581	104	
AM bike	0	0	0	12	0	0	0	10	0	1	1	0	0	1	1	6
AM HV		1				7				3				22		
AM %HV		0.4%				3.8%				1.4%				2.3%		
AM phf	0.931															

1634

PM Peak	65	209	0	0	79	1	262	0	0	413	37	0	314	438	118	1
PM bike	0	4	0	22	1	2	2	10	0	3	0	11	0	1	0	21
PM HV		1				6				3				14		
PM %HV		0.4%				1.8%				0.7%				1.6%		
AM phf	0.959															

1937

PM Peak	46	159	129	100	577	67	485	269	216	
PM bike-ped	0	0	0	20	0	5	0	9	0	16
PM HV		2			2			8		
PM %HV		0.6%			0.3%			0.8%		
PM phf	0.968									

Portland: Fore River Parkway
 Wednesday July 26, 2017
 Sunny
 Count By:Dawn & Patrick & James

File Name : Portland Fore River Parkway J&P&D AM 072617
 Site Code : 00072617
 Start Date : 7/26/2017
 Page No : 5

	Off Ramp From North				Congress Street From East				Fore River Parkway From South				Congress Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	116	0	0	116	0	113	8	121	84	0	150	234	169	199	0	368	839
08:00 AM	128	0	0	128	0	67	9	76	63	0	103	166	126	173	0	299	669
08:15 AM	119	0	0	119	0	92	11	103	47	0	131	178	135	213	0	348	748
08:30 AM	125	0	0	125	0	89	15	104	53	0	135	188	143	208	0	351	768
Total Volume	488	0	0	488	0	361	43	404	247	0	519	766	573	793	0	1366	3024
% App. Total	100	0	0		0	89.4	10.6		32.2	0	67.8		41.9	58.1	0		
PHF	.953	.000	.000	.953	.000	.799	.717	.835	.735	.000	.865	.818	.848	.931	.000	.928	.901

Portland:Fore River Parkway
 Wednesday July 26, 2017
 Sunny
 Count By:Dawn & Patrick & Logan

File Name : Portland Fore River Parkway L&P&D PM 072617
 Site Code : 02072617
 Start Date : 7/26/2017
 Page No : 5

	Off Ramp From North				Congress St From East				Fore River Parkway From South				Congress St From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	134	0	0	134	0	160	33	193	33	0	215	248	159	192	0	351	926
04:45 PM	122	0	0	122	0	141	26	167	41	0	197	238	141	240	0	381	908
05:00 PM	117	0	0	117	0	168	17	185	44	0	244	288	150	219	0	369	959
05:15 PM	139	0	0	139	0	161	24	185	27	0	208	235	123	218	0	341	900
Total Volume	512	0	0	512	0	630	100	730	145	0	864	1009	573	869	0	1442	3693
% App. Total	100	0	0		0	86.3	13.7		14.4	0	85.6		39.7	60.3	0		
PHF	.921	.000	.000	.921	.000	.938	.758	.946	.824	.000	.885	.876	.901	.905	.000	.946	.963

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2017 AM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑
Traffic Volume (vph)	0	793	573	43	361	0	519	0	247	0	0	488
Future Volume (vph)	0	793	573	43	361	0	519	0	247	0	0	488
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			1.00
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.86
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3471	1553	1703	3406		3433		1583			1596
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3471	1553	1703	3406		3433		1583			1596
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	881	637	48	401	0	577	0	274	0	0	542
RTOR Reduction (vph)	0	0	338	0	0	0	0	0	168	0	0	333
Lane Group Flow (vph)	0	881	299	48	401	0	577	0	106	0	0	209
Heavy Vehicles (%)	4%	4%	4%	6%	6%	6%	2%	2%	2%	3%	3%	3%
Turn Type	NA	Perm	Prot	NA			Perm		Perm			Perm
Protected Phases	4		3	8								
Permitted Phases		4					2		2			6
Actuated Green, G (s)		55.7	55.7	8.5	70.2		58.6		58.6			58.6
Effective Green, g (s)		55.7	55.7	8.5	70.2		58.6		58.6			58.6
Actuated g/C Ratio		0.37	0.37	0.06	0.46		0.39		0.39			0.39
Clearance Time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0			3.0
Lane Grp Cap (vph)		1271	569	95	1573		1323		610			615
v/s Ratio Prot		c0.25		c0.03	0.12							
v/s Ratio Perm			0.19				c0.17		0.07			0.13
v/c Ratio		0.69	0.52	0.51	0.25		0.44		0.17			0.34
Uniform Delay, d1		40.9	37.8	69.7	24.9		34.5		30.7			33.0
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		3.1	3.4	4.2	0.4		1.0		0.6			1.5
Delay (s)		44.0	41.2	73.9	25.3		35.5		31.4			34.5
Level of Service		D	D	E	C		D		C			C
Approach Delay (s)		42.8			30.5			34.2			34.5	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			37.7				HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			152.0				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			68.3%				ICU Level of Service		C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2017 AM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	289	581	104	25	0	157	0	199	20	81	177	0
Future Volume (vph)	289	581	104	25	0	157	0	199	20	81	177	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00		0.98		0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00		1.00		1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1873	1925	1583	1736		1520		3470		1779	1881	
Flt Permitted	0.95	1.00	1.00	0.95		1.00		1.00		0.37	1.00	
Satd. Flow (perm)	1873	1925	1583	1736		1520		3470		684	1881	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	311	625	112	27	0	169	0	214	22	87	190	0
RTOR Reduction (vph)	0	0	61	0	0	106	0	8	0	0	0	0
Lane Group Flow (vph)	311	625	51	27	0	63	0	228	0	87	190	0
Confl. Peds. (#/hr)	12					12			10	10		
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type	pm+pt	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4		4			8				6		
Actuated Green, G (s)	47.9	47.9	47.9	3.0		39.7		12.5		24.9	24.9	
Effective Green, g (s)	47.9	47.9	47.9	3.0		39.7		12.5		24.9	24.9	
Actuated g/C Ratio	0.45	0.45	0.45	0.03		0.37		0.12		0.23	0.23	
Clearance Time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	846	869	715	49		569		409		237	441	
v/s Ratio Prot	0.04	c0.32		c0.02				c0.07		0.03	c0.10	
v/s Ratio Perm	0.13		0.03			0.04				0.06		
v/c Ratio	0.37	0.72	0.07	0.55		0.11		0.56		0.37	0.43	
Uniform Delay, d1	19.1	23.6	16.4	50.8		21.6		44.1		32.9	34.5	
Progression Factor	1.00	1.00	1.00	0.69		0.19		1.00		1.00	1.00	
Incremental Delay, d2	0.3	5.1	0.2	12.5		0.4		1.7		1.0	0.7	
Delay (s)	19.4	28.7	16.6	47.8		4.5		45.8		33.8	35.2	
Level of Service	B	C	B	D		A		D		C	D	
Approach Delay (s)		24.6			10.4			45.8			34.8	
Approach LOS		C			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			27.5					HCM 2000 Level of Service		C		
HCM 2000 Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			106.0					Sum of lost time (s)		22.0		
Intersection Capacity Utilization			53.8%					ICU Level of Service		A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: Valley & Congress

2017 AM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	659	15	18	185	29	12	30	68	0	0	0
Future Volume (vph)	5	659	15	18	185	29	12	30	68	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	1.00		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	1752	1839		1752	1807			1854	1599			
Flt Permitted	0.58	1.00		0.15	1.00			0.99	1.00			
Satd. Flow (perm)	1071	1839		285	1807			1854	1599			
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	1.00	1.00	1.00
Adj. Flow (vph)	5	709	16	19	199	31	13	32	73	0	0	0
RTOR Reduction (vph)	0	1	0	0	5	0	0	0	59	0	0	0
Lane Group Flow (vph)	5	724	0	19	225	0	0	45	14	0	0	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	1%	1%	1%	1%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4			8			2		2			
Actuated Green, G (s)	52.0	52.0		52.0	52.0			20.0	20.0			
Effective Green, g (s)	52.0	52.0		52.0	52.0			20.0	20.0			
Actuated g/C Ratio	0.49	0.49		0.49	0.49			0.19	0.19			
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	525	902		139	886			349	301			
v/s Ratio Prot		0.39			0.12							
v/s Ratio Perm	0.00			0.07				0.02	0.01			
v/c Ratio	0.01	0.80		0.14	0.25			0.13	0.05			
Uniform Delay, d1	13.8	22.7		14.7	15.7			35.8	35.2			
Progression Factor	0.51	1.10		1.00	1.00			1.00	1.00			
Incremental Delay, d2	0.0	6.0		2.0	0.7			0.8	0.3			
Delay (s)	7.1	31.0		16.8	16.4			36.5	35.5			
Level of Service	A	C		B	B			D	D			
Approach Delay (s)		30.9			16.4			35.9			0.0	
Approach LOS		C			B			D			A	
Intersection Summary												
HCM 2000 Control Delay			28.1			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			106.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			48.1%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2017 AM Existing.syn

29: St. John & Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	71	420	47	272	164	165	86	218	120
Future Volume (vph)	0	0	0	71	420	47	272	164	165	86	218	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Lane Util. Factor				1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frpb, ped/bikes				1.00	1.00		1.00	1.00	0.96		1.00	0.97
Flpb, ped/bikes				0.99	1.00		1.00	1.00	1.00		1.00	1.00
Frt				1.00	0.98		1.00	1.00	0.85		1.00	0.85
Flt Protected				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (prot)				1749	3470		1665	1730	1509		1855	1554
Flt Permitted				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (perm)				1749	3470		1665	1730	1509		1855	1554
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	0	0	80	472	53	306	184	185	97	245	135
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	128	0	0	50
Lane Group Flow (vph)	0	0	0	80	525	0	242	248	57	0	342	85
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	3%	3%	3%	1%	1%	1%
Turn Type				Perm	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases					8		2	2		6	6	
Permitted Phases				8					2			6
Actuated Green, G (s)				22.9	22.9		25.1	25.1	25.1		24.4	24.4
Effective Green, g (s)				22.9	22.9		25.1	25.1	25.1		24.4	24.4
Actuated g/C Ratio				0.26	0.26		0.29	0.29	0.29		0.28	0.28
Clearance Time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)				458	909		478	496	433		517	433
v/s Ratio Prot					c0.15		c0.15	0.14			c0.18	
v/s Ratio Perm				0.05					0.04			0.05
v/c Ratio				0.17	0.58		0.51	0.50	0.13		0.66	0.20
Uniform Delay, d1				24.9	28.0		26.0	25.9	23.1		27.8	24.0
Progression Factor				1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2				0.2	0.9		0.8	0.8	0.1		3.2	0.2
Delay (s)				25.1	28.9		26.8	26.7	23.2		31.0	24.2
Level of Service				C	C		C	C	C		C	C
Approach Delay (s)		0.0			28.4			25.8			29.1	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			27.6			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			87.4			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			70.8%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

13: Congress & I-295 NB Exit

2017 AM Existing.syn
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	341	689	0	0	0
Future Volume (Veh/h)	0	341	689	0	0	0
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	359	725	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	725	362			725	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	725	362			725	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	43			100	
cM capacity (veh/h)	360	634			874	
Direction, Lane #	EB 1	SE 1	SE 2			
Volume Total	359	362	362			
Volume Left	0	0	0			
Volume Right	359	0	0			
cSH	634	1700	1700			
Volume to Capacity	0.57	0.21	0.21			
Queue Length 95th (ft)	89	0	0			
Control Delay (s)	17.8	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	17.8	0.0				
Approach LOS	C					
Intersection Summary						
Average Delay		5.9				
Intersection Capacity Utilization		46.8%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2017 PM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑
Traffic Volume (vph)	0	869	573	100	630	0	864	0	145	0	0	512
Future Volume (vph)	0	869	573	100	630	0	864	0	145	0	0	512
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			1.00
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.86
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			1611
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			1611
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	915	603	105	663	0	909	0	153	0	0	539
RTOR Reduction (vph)	0	0	327	0	0	0	0	0	67	0	0	267
Lane Group Flow (vph)	0	915	276	105	663	0	909	0	86	0	0	272
Turn Type		NA	Perm	Prot	NA		Perm		Perm			Perm
Protected Phases		4		3	8							
Permitted Phases			4				2		2			6
Actuated Green, G (s)		49.8	49.8	14.4	70.2		58.6		58.6			58.6
Effective Green, g (s)		49.8	49.8	14.4	70.2		58.6		58.6			58.6
Actuated g/C Ratio		0.33	0.33	0.09	0.46		0.39		0.39			0.39
Clearance Time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0			3.0
Lane Grp Cap (vph)		1159	518	167	1634		1323		610			621
v/s Ratio Prot		c0.26		c0.06	0.19							
v/s Ratio Perm			0.17				c0.26		0.05			0.17
v/c Ratio		0.79	0.53	0.63	0.41		0.69		0.14			0.44
Uniform Delay, d1		46.3	41.6	66.2	27.1		39.0		30.3			34.5
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		5.5	3.9	7.2	0.8		2.9		0.5			2.2
Delay (s)		51.8	45.5	73.4	27.8		42.0		30.8			36.8
Level of Service		D	D	E	C		D		C			D
Approach Delay (s)		49.3			34.1			40.4			36.8	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			42.1			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			152.0			Sum of lost time (s)			24.0			
Intersection Capacity Utilization			87.1%			ICU Level of Service			E			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2017 PM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	314	438	118	79	0	262	0	413	37	65	209	0
Future Volume (vph)	314	438	118	79	0	262	0	413	37	65	209	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		0.95		1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1888	1925	1583	1770		1583		3495		1770	1863	
Flt Permitted	0.95	1.00	1.00	0.95		1.00		1.00		0.19	1.00	
Satd. Flow (perm)	1888	1925	1583	1770		1583		3495		350	1863	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	327	456	123	82	0	273	0	430	39	68	218	0
RTOR Reduction (vph)	0	0	87	0	0	199	0	7	0	0	0	0
Lane Group Flow (vph)	327	456	36	82	0	74	0	462	0	68	218	0
Turn Type	pm+pt	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4		4			8				6		
Actuated Green, G (s)	30.3	30.3	30.3	5.0		28.3		17.5		29.7	29.7	
Effective Green, g (s)	30.3	30.3	30.3	5.0		28.3		17.5		29.7	29.7	
Actuated g/C Ratio	0.29	0.29	0.29	0.05		0.27		0.17		0.29	0.29	
Clearance Time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	550	560	461	85		430		588		198	532	
v/s Ratio Prot	0.04	c0.24		c0.05				c0.13		0.02	c0.12	
v/s Ratio Perm	0.13		0.02			0.05				0.07		
v/c Ratio	0.59	0.81	0.08	0.96		0.17		0.79		0.34	0.41	
Uniform Delay, d1	31.6	34.2	26.7	49.4		28.9		41.5		28.6	30.1	
Progression Factor	1.00	1.00	1.00	0.61		0.12		1.00		1.00	1.00	
Incremental Delay, d2	1.7	12.3	0.3	81.8		0.8		6.9		1.0	0.5	
Delay (s)	33.3	46.5	27.0	112.1		4.3		48.3		29.6	30.6	
Level of Service	C	D	C	F		A		D		C	C	
Approach Delay (s)		39.1			29.2			48.3			30.3	
Approach LOS		D			C			D			C	
Intersection Summary												
HCM 2000 Control Delay			38.3									
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			104.0							22.0		
Intersection Capacity Utilization			59.5%							B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

25: Valley & Congress

2017 PM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	504	16	37	317	21	37	49	52	0	0	0
Future Volume (vph)	16	504	16	37	317	21	37	49	52	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00			
Satd. Flow (prot)	1770	1854		1770	1845			1824	1583			
Flt Permitted	0.44	1.00		0.26	1.00			0.98	1.00			
Satd. Flow (perm)	818	1854		480	1845			1824	1583			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	16	520	16	38	327	22	38	51	54	0	0	0
RTOR Reduction (vph)	0	1	0	0	2	0	0	0	41	0	0	0
Lane Group Flow (vph)	16	535	0	38	347	0	0	89	13	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4			8			2		2			
Actuated Green, G (s)	45.0	45.0		45.0	45.0			25.0	25.0			
Effective Green, g (s)	45.0	45.0		45.0	45.0			25.0	25.0			
Actuated g/C Ratio	0.43	0.43		0.43	0.43			0.24	0.24			
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	353	802		207	798			438	380			
v/s Ratio Prot		c0.29			0.19							
v/s Ratio Perm	0.02			0.08				0.05	0.01			
v/c Ratio	0.05	0.67		0.18	0.43			0.20	0.03			
Uniform Delay, d1	17.1	23.5		18.2	20.6			31.5	30.3			
Progression Factor	0.36	0.72		1.00	1.00			1.00	1.00			
Incremental Delay, d2	0.2	3.0		1.9	1.7			1.0	0.2			
Delay (s)	6.2	19.8		20.1	22.3			32.6	30.4			
Level of Service	A	B		C	C			C	C			
Approach Delay (s)		19.4			22.1			31.8			0.0	
Approach LOS		B			C			C			A	
Intersection Summary												
HCM 2000 Control Delay			22.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			104.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			43.7%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

29: St. John & Park

2017 PM Existing.syn

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	100	577	67	485	269	216	46	159	129
Future Volume (vph)	0	0	0	100	577	67	485	269	216	46	159	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Lane Util. Factor				1.00	0.95		0.95	0.95	1.00		1.00	1.00
Flpb, ped/bikes				1.00	1.00		1.00	1.00	0.96		1.00	0.97
Flpb, ped/bikes				0.99	1.00		1.00	1.00	1.00		1.00	1.00
Frt				1.00	0.98		1.00	1.00	0.85		1.00	0.85
Flt Protected				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (prot)				1764	3501		1698	1761	1536		1860	1552
Flt Permitted				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (perm)				1764	3501		1698	1761	1536		1860	1552
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	103	595	69	500	277	223	47	164	133
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	93	0	0	81
Lane Group Flow (vph)	0	0	0	103	664	0	380	397	130	0	211	52
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Perm	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases					8		2	2		6	6	
Permitted Phases				8					2			6
Actuated Green, G (s)				26.4	26.4		29.4	29.4	29.4		24.3	24.3
Effective Green, g (s)				26.4	26.4		29.4	29.4	29.4		24.3	24.3
Actuated g/C Ratio				0.28	0.28		0.31	0.31	0.31		0.26	0.26
Clearance Time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)				489	971		524	544	474		475	396
v/s Ratio Prot					c0.19		0.22	c0.23			c0.11	
v/s Ratio Perm				0.06					0.08			0.03
v/c Ratio				0.21	0.68		0.73	0.73	0.27		0.44	0.13
Uniform Delay, d1				26.4	30.6		29.3	29.3	24.8		29.7	27.3
Progression Factor				1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2				0.2	2.0		5.0	4.9	0.3		0.7	0.2
Delay (s)				26.6	32.6		34.2	34.2	25.1		30.4	27.4
Level of Service				C	C		C	C	C		C	C
Approach Delay (s)		0.0			31.8			32.2			29.2	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			31.6									
HCM 2000 Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			95.1						15.0			
Intersection Capacity Utilization			71.3%						C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 13: Congress & I-295 NB exit

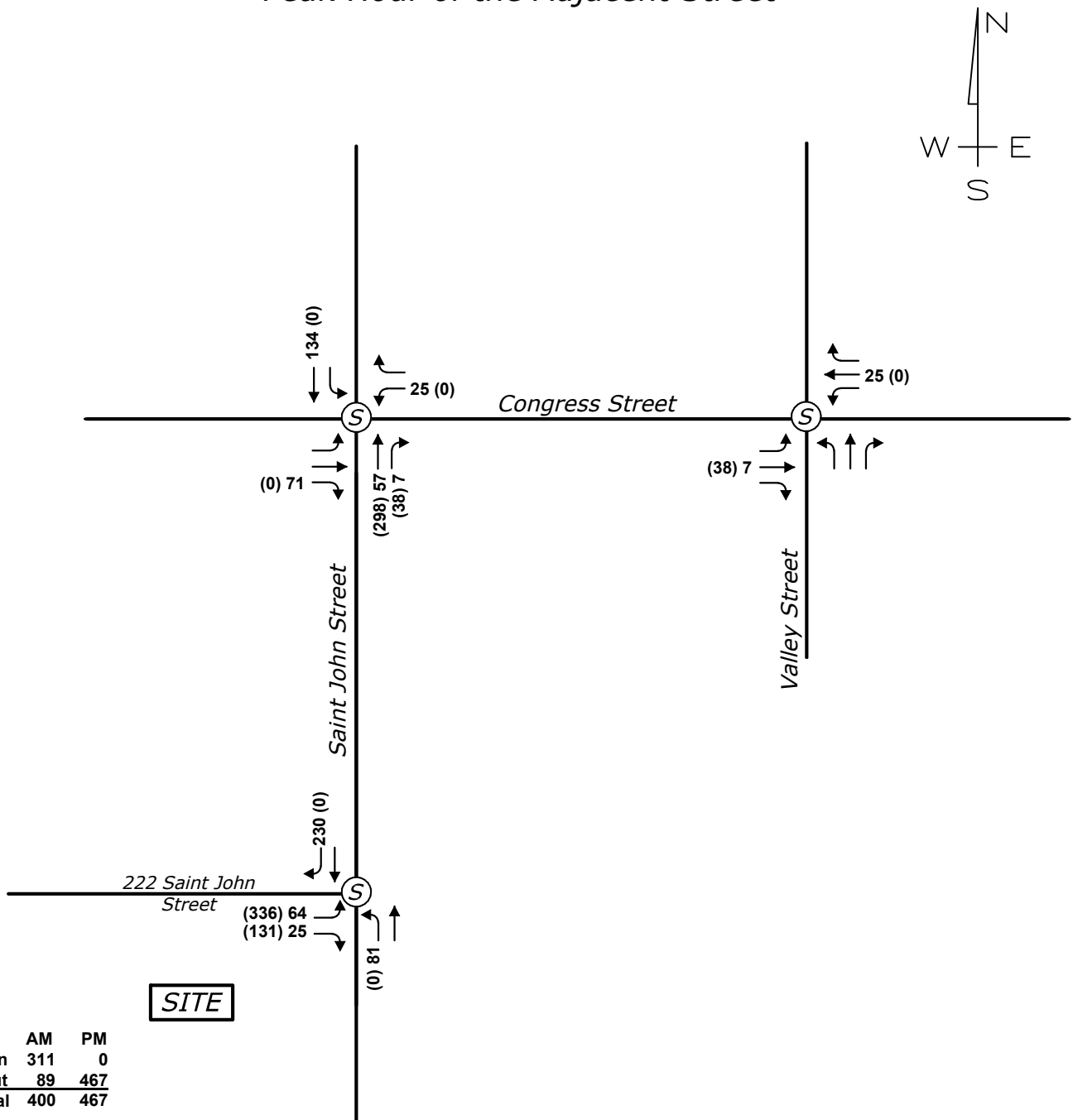
2017 PM Existing.syn
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	254	612	0	0	0
Future Volume (Veh/h)	0	254	612	0	0	0
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	230	554	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	554	277			554	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	554	277			554	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	68			100	
cM capacity (veh/h)	462	720			1012	
Direction, Lane #	EB 1	SE 1	SE 2			
Volume Total	230	277	277			
Volume Left	0	0	0			
Volume Right	230	0	0			
cSH	720	1700	1700			
Volume to Capacity	0.32	0.16	0.16			
Queue Length 95th (ft)	34	0	0			
Control Delay (s)	12.3	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.3	0.0				
Approach LOS	B					
Intersection Summary						
Average Delay		3.6				
Intersection Capacity Utilization		34.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Saint John Street Garage Trip Assignment

Figure No. 10

Peak Hour of the Adjacent Street



	AM	PM
In	311	0
Out	89	467
Total	400	467

MAINE MEDICAL CENTER EXPANSION PORTLAND, MAINE

Design: ET Scale: NONE
 Draft: Date: JULY 2017
 Checked: RED File Name: 2866.01-TRAFF.dwg

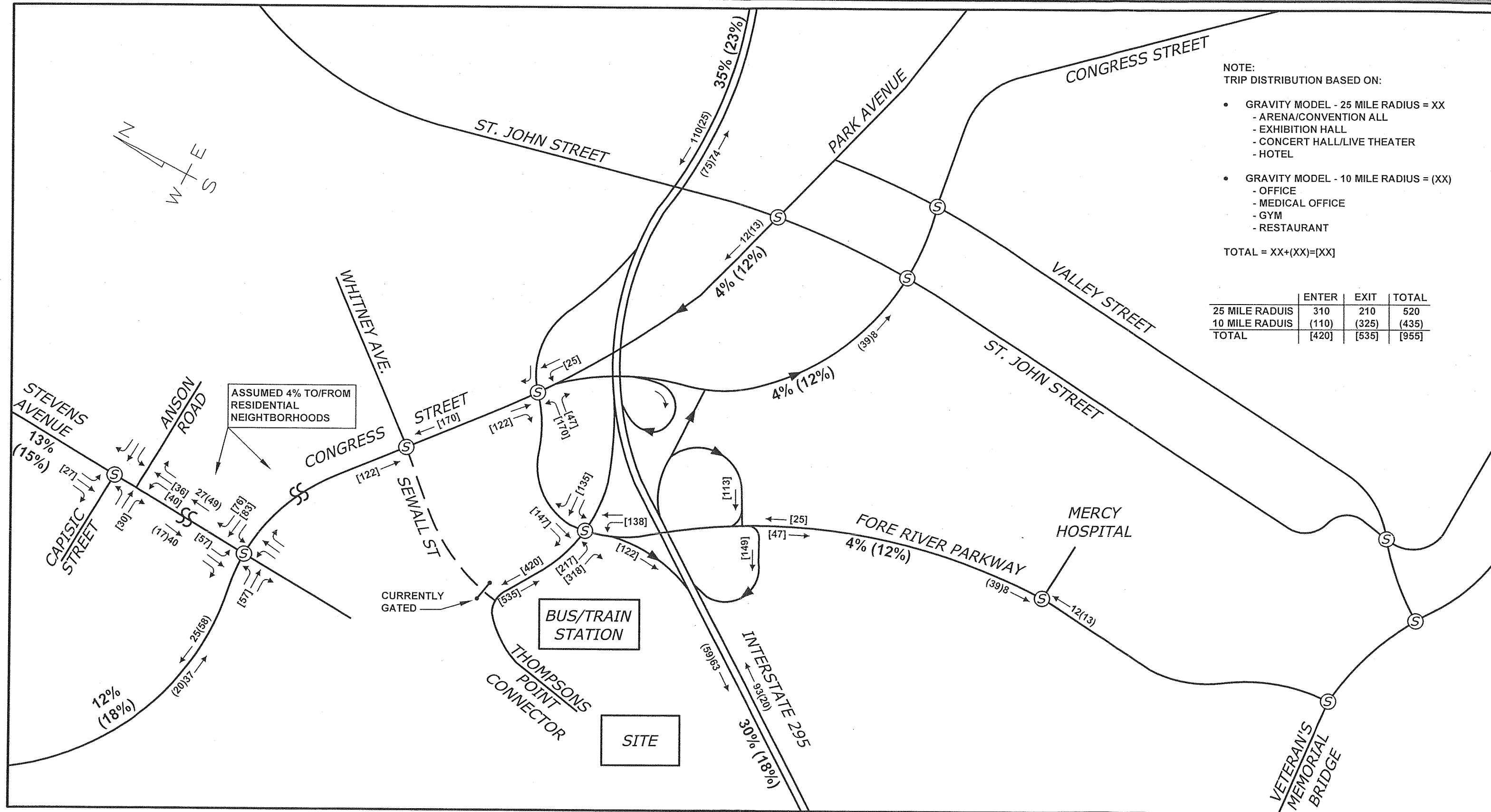


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Trip Distribution and Assignment

4



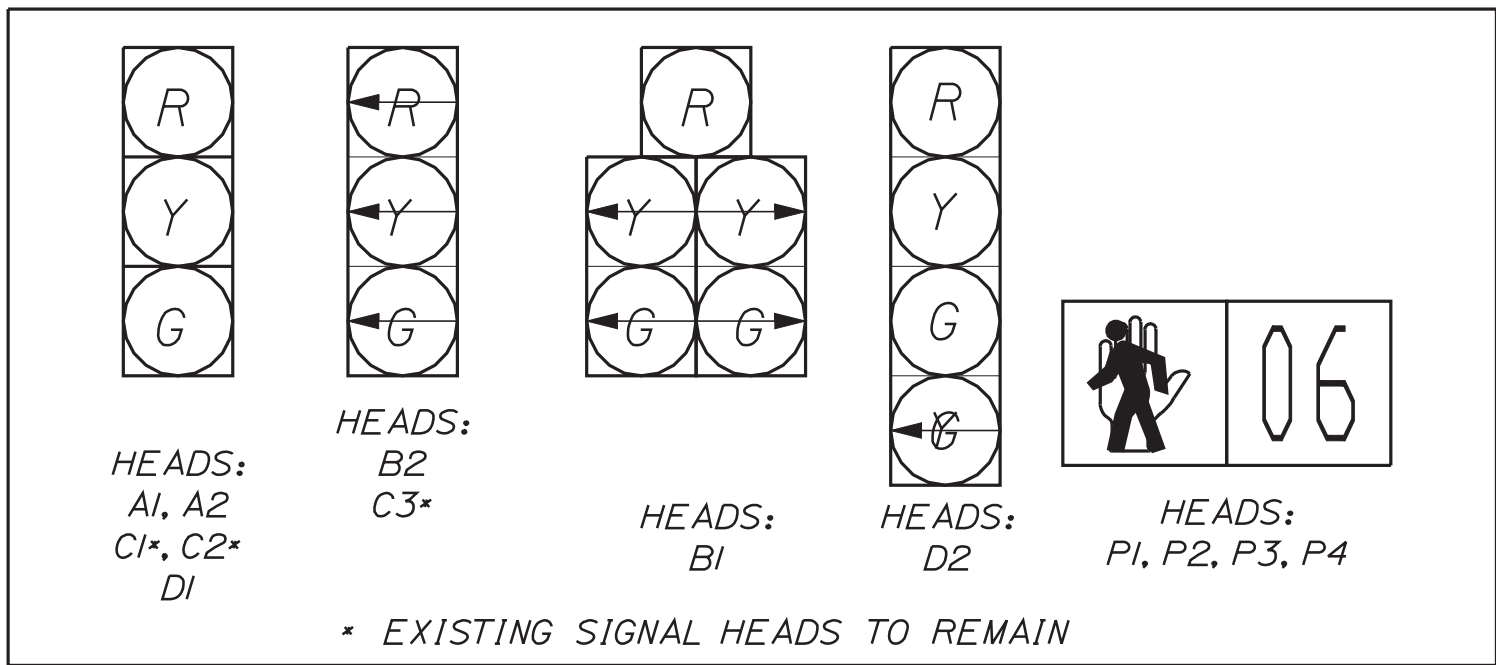
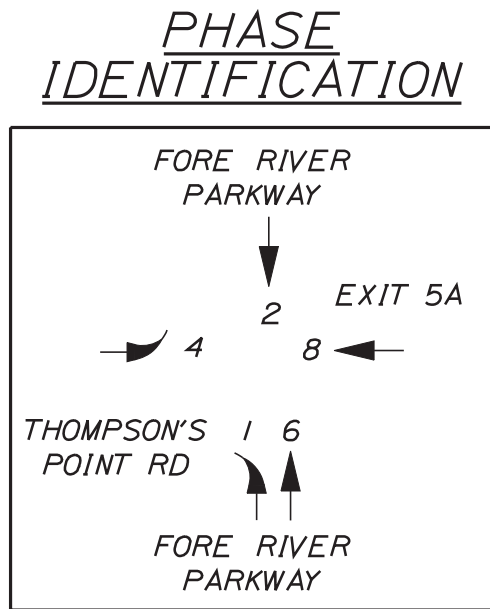
THOMPSONS POINT MASTER PLAN, PORTLAND, MAINE

Design: JJB/RED Scale: NONE
 Draft: DB Date: APR 2011
 Checked: JJB File Name: 2419_TRAFF.dwg

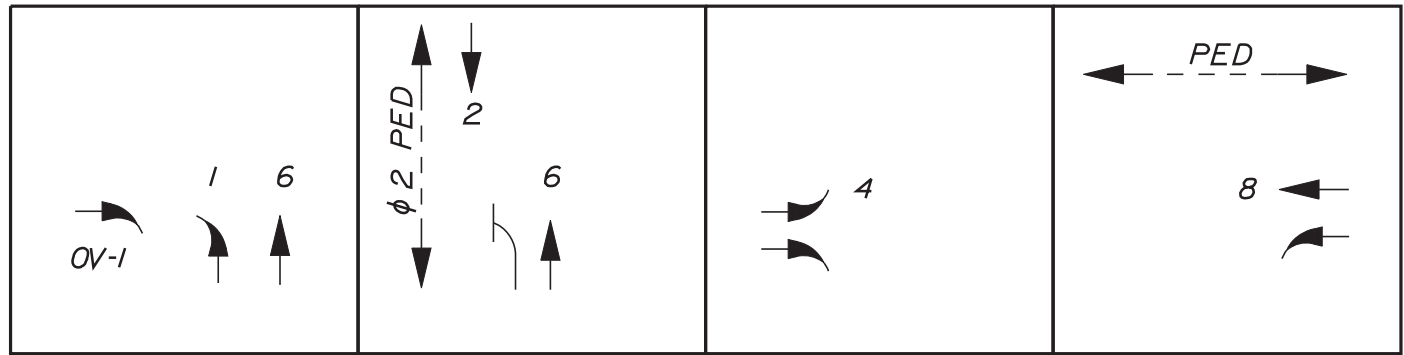
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THOMPSON'S POINT ROAD /
FORE RIVER PARKWAY /EXIT 5A OFF RAMP

SIGNAL HEADS



SIGNAL PHASING SEQUENCE

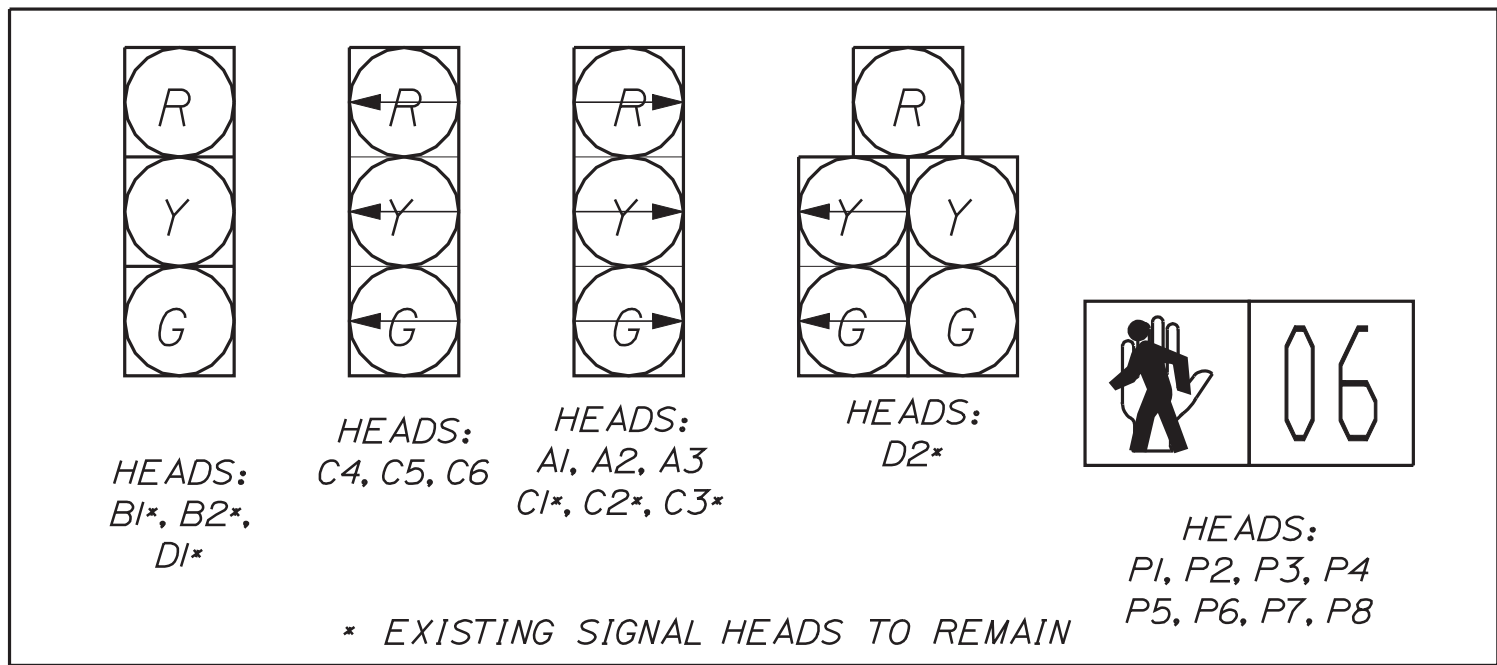
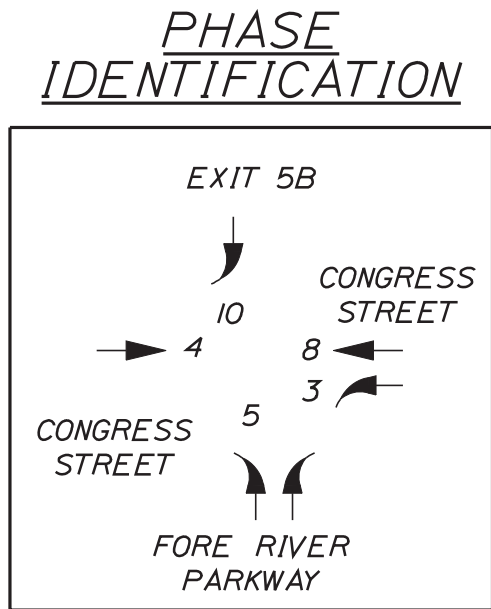


	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	PHASE 7	PHASE 8
MINIMUM INITIAL	4.0	4.0		4.0		4.0		4.0
PASSAGE TIME	3.0	3.0		3.0		3.0		3.0
MAXIMUM GREEN I	6.0	14.0		12.0		26.0		4.0
MAXIMUM GREEN II	-	29.0		-		-		29.0
YELLOW	3.0	4.0		4.0		4.0		4.0
ALL RED	2.0	2.0		2.0		2.0		2.0
FLASH	R	Y		R		Y		R
PHASE RECALL	NONE	SOFT		NONE		SOFT		NONE
WALK	-	5.0		-		-		5.0
WALK / DON'T WALK	-	25.0		-		-		25.0
DETECTOR MODE *	PRES.	PRES.		PRES.		PRES.		PRES.

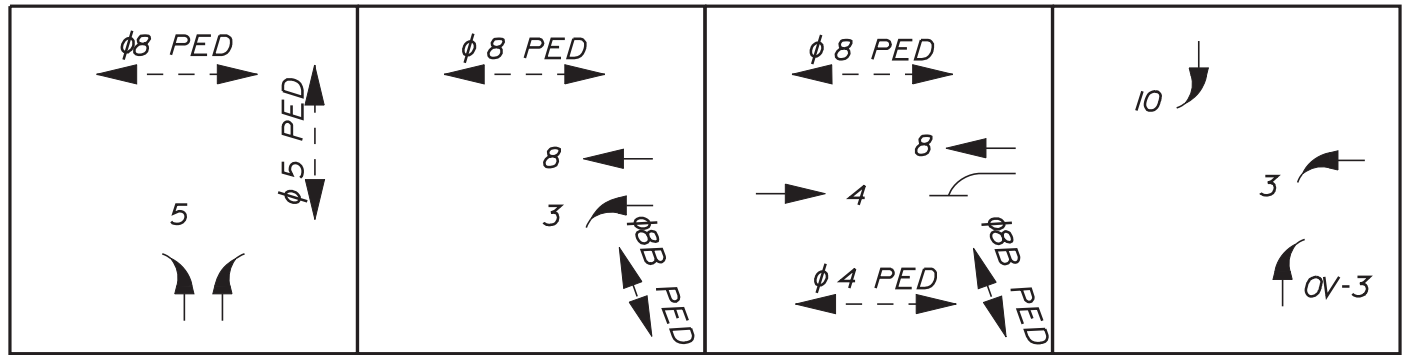
PRES. = PRESENCE; Y=YELLOW; R=RED
GREEN TIME TO BE EXTENDED IF PEDESTRIAN PHASE IS ACTIVATED (MAX I TO MAX II)
* THE RAMP QUEUE DETECTOR SHALL GIVE PRIORITY TO PHASE 8 (MAX GREEN II)WHEN ACTIVATED FOR 5 SECONDS OR MORE

CONGRESS ST/PARK AVE &
FORE RIVER PKWY/EXIT 5B OFF RAMP

SIGNAL HEADS



SIGNAL PHASING SEQUENCE

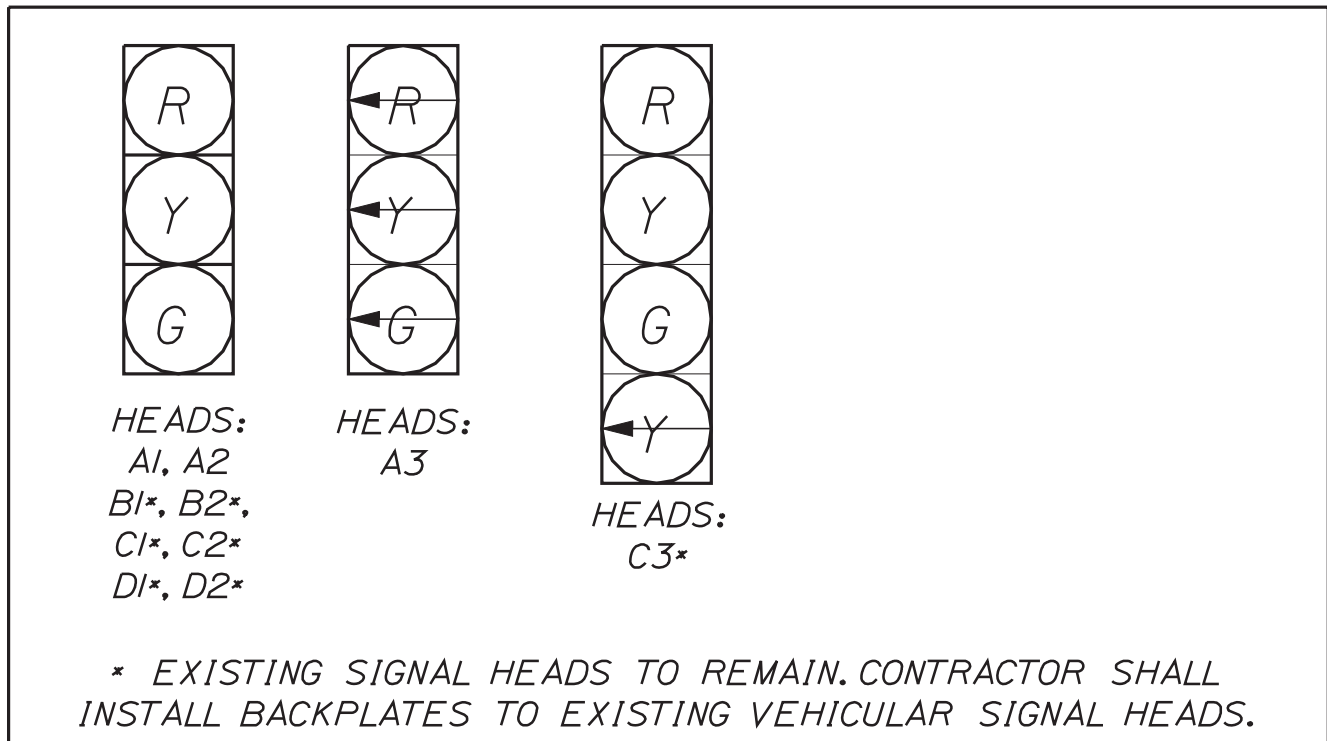


	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	PHASE 7	PHASE 8	PHASE 9	PHASE 10
MINIMUM INITIAL			4.0	4.0	4.0			4.0		4.0
PASSAGE TIME			3.0	3.0	3.0			3.0		3.0
MAXIMUM GREEN I			5.0	14.0	29.0			16.0		5.0
MAXIMUM GREEN II			-	-	-			25.0		16.0
YELLOW			4.0	4.0	4.0			4.0		4.0
ALL RED			2.0	2.0	2.0			2.0		2.0
FLASH			Y	Y	R			Y		R
PHASE RECALL			NONE	SOFT	NONE			SOFT		NONE
WALK *			-	5.0	5.0			5.0		-
WALK/DON'T WALK *			-	17.0	20.0			21.0		-
DETECTOR MODE **			PRES.	PRES.	PRES.			PRES.		PRES.

PRES. = PRESENCE; Y=YELLOW; R=RED
GREEN TIME TO BE EXTENDED IF PEDESTRIAN PHASE IS ACTIVATED (MAX I TO MAX II)
* PHASE 8B WALK = 5 SECONDS,WALK/DON'T WALK = 7 SECONDS
** THE RAMP QUEUE DETECTOR SHALL GIVE PRIORITY TO PHASE 10 (MAX GREEN II)WHEN ACTIVATED FOR 5 SECONDS OR MORE

SEWALL/WHITNEY & CONGRESS STREET

SIGNAL HEADS



NOTE:EXISTING SIGNAL TIMING AND PHASING SHALL BE MAINTAINED

Congress/Fore River Parkway

0.5% Annual Growth

AM Peak Hour Count

Wednesday, July 26, 2017

	2017	2027	Thompson Pt Traffic	2027
Count	10% growth			No Build
Off Ramp from North				
Right	488	512		512
Congress St From East				
Thru	361	379		379
Left	43	45		45
Fore River Parkway from South				
Right	247	259		259
Left	519	545		545
Congress St from West				
Right	573	602		602
Thru	793	833		833
TOTAL	3024	3175	0	3175
phf	0.901			

PM Peak Hour Count

Wednesday, July 26, 2017

	Count-All	10% growth	Thompson Pt Traffic	No Build
Off Ramp from North				
Right	512	538		538
Congress St From East				
Thru	630	662		662
Left	100	105	25	130
Fore River Parkway from South				
Right	145	152	47	199
Left	864	907	170	1077
Congress St from West				
Right	573	602	122	724
Thru	869	912		912
TOTAL	3,693	3878	364	4242
phf	0.963			

Park/St John

0.5% Annual Growth

AM Peak Hour Count

Tuesday, June 20, 2017

2027

2027

	Count-All	10% growth	Thomp sons Pt	Maine Med Garage	2027 AM No Build	Dvol C1P2	2027 AM C1P2	Dvol C2P2	2027 AM C2P2
St John from north									
Right	120	126			126		126		126
Thru	218	229		134	363		363		363
Left	86	90			90		90		90
Park Ave From East									
Right	47	49			49		49		49
Thru	420	441			441		441		441
Left	71	75			75		75		75
St John from south									
Right	165	173			173	-138	35		35
Thru	164	172		21	193		193		193
Left	272	286		36	322		322	-196	126
Park Ave from West									
Right	0	0			0	0	0		0
Thru	0	0			0	262	262		262
Left	0	0			0		0		0
TOTAL	1563	1641	0	191	1832	124	1956	-196	1760
phf	0.89				0				

PM Peak Hour Count

Tuesday, June 20, 2017

	Count-All	10% growth	Thomp sons Pt	Maine Med Garage	2027 AM No Build	Dvol C1P2	2027 AM C1P2	Dvol C2P2	2027 AM C2P2
St John from north									
Right	129	135			135		135		135
Thru	159	167			167		167		167
Left	46	48			48		48		48
Park Ave From East									
Right	67	70			70		70		70
Thru	577	606	25		631		631		631
Left	100	105			105		105		105
St John from south									
Right	216	227			227	-182	45		45
Thru	269	282		106	388		388		388
Left	485	509		192	701		701	-413	288
Park Ave from West									
Right	0	0			0	0	0		0
Thru	0	0			0	231	231		231
Left	0	0			0		0		0
TOTAL	2048	2149	25	298	2472	49	2521	-413	2108
phf	0.97				0				

Congress/St John

0.5% Annual Growth

AM Peak Hour Count

Tuesday, June 20, 2017

					2027				
	Count-All	10 year growth	Thomp sons Pt	Maine Med Garage	2027 AM No Build	Dvol C1P2	2027 AM C1P2	Dvol C2P2	2027 AM C2P2
St John from north									
Thru	177	186		134	320		320		320
Left	81	85			85		85		85
Congress St From East									
Right	157	165			165		165	-116	49
Thru	1	1			1		1	116	117
Left	25	26		25	51		51		51
St John from south									
Right	20	21		7	28		28		28
Thru	199	209		57	266		266	-80	186
Left		0						80	80
Congress St from West									
Right	104	109			109		109		109
Thru	581	610			610		610		610
Left	289	303		71	374	-262	112		112
TOTAL	1634	1715	0	294	2009	-262	1747	0	1747
phf	0.93								

PM Peak Hour Count

Tuesday, June 20, 2017

					207 PM				
	Count-All	10% growth	Thomp sons Pt	Maine Med Garage	207 PM No Build	Dvol C1P2	2027 PM C1P2	Dvol C2P2	2027 PM C2P2
St John from north									
Thru	209	219			219		219		219
Left	65	68			68		68		68
Congress St From East									
Right	262	275			275		275	-193	82
Thru	1	1			1		1	193	194
Left	79	83			83		83		83
St John from south									
Right	37	39		38	77		77		77
Thru	413	434		298	732		732	-220	512
Left								220	220
Congress St from West									
Right	118	124			124		124		124
Thru	438	460	47		507		507		507
Left	314	330			330	-231	99		99
TOTAL	1936	2033	47	336	2416	-231	2185	0	2185
phf	0.96								

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2027 AM No Build

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑↑
Traffic Volume (vph)	0	833	602	45	379	0	545	0	259	0	0	512
Future Volume (vph)	0	833	602	45	379	0	545	0	259	0	0	512
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	877	634	47	399	0	574	0	273	0	0	539
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	877	634	47	399	0	574	0	273	0	0	539
Turn Type		NA	pm+ov	Prot	NA		Prot		pt+ov			Prot
Protected Phases		4	5	3 10	8		5		3 10			10
Permitted Phases			4						5			
Actuated Green, G (s)		36.0	63.6	30.9	46.0		27.6		58.5			26.9
Effective Green, g (s)		36.0	63.6	30.9	46.0		27.6		58.5			26.9
Actuated g/C Ratio		0.30	0.54	0.26	0.39		0.23		0.49			0.23
Clearance Time (s)		6.0	6.0		6.0		6.0					6.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0					3.0
Lane Grp Cap (vph)		1075	849	461	1373		799		941			632
v/s Ratio Prot		c0.25	c0.17	0.03	c0.11		0.17		0.08			c0.19
v/s Ratio Perm			0.23						0.10			
v/c Ratio		0.82	0.75	0.10	0.29		0.72		0.29			0.85
Uniform Delay, d1		38.2	21.2	33.3	25.0		41.9		17.7			43.9
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		4.9	3.6	0.1	0.1		3.1		0.2			10.8
Delay (s)		43.1	24.8	33.4	25.1		45.0		17.9			54.7
Level of Service		D	C	C	C		D		B			D
Approach Delay (s)		35.4			26.0			36.3			54.7	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			37.5				HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			118.5				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			57.3%				ICU Level of Service		B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2027 AM No Build

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	374	610	109	51	0	165	0	266	28	85	320	0
Future Volume (vph)	374	610	109	51	0	165	0	266	28	85	320	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		0.95		1.00	1.00	
Flt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1888	1925	1583	1770		1583		3489		1770	1863	
Flt Permitted	0.95	1.00	1.00	0.95		1.00		1.00		0.29	1.00	
Satd. Flow (perm)	1888	1925	1583	1770		1583		3489		533	1863	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	390	635	114	53	0	172	0	277	29	89	333	0
RTOR Reduction (vph)	0	0	73	0	0	135	0	8	0	0	0	0
Lane Group Flow (vph)	390	635	41	53	0	37	0	298	0	89	333	0
Turn Type	pm+pt	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4		4			8				6		
Actuated Green, G (s)	34.0	34.0	34.0	3.0		20.6		11.6		19.0	19.0	
Effective Green, g (s)	34.0	34.0	34.0	3.0		20.6		11.6		19.0	19.0	
Actuated g/C Ratio	0.36	0.36	0.36	0.03		0.22		0.12		0.20	0.20	
Clearance Time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	675	688	566	55		343		426		137	372	
v/s Ratio Prot	0.10	c0.33		c0.03				0.09		0.02	c0.18	
v/s Ratio Perm	0.11		0.03			0.02				0.11		
v/c Ratio	0.58	0.92	0.07	0.96		0.11		0.70		0.65	0.90	
Uniform Delay, d1	24.7	29.2	20.1	45.9		29.8		40.0		35.5	37.0	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		0.78	0.70	
Incremental Delay, d2	1.2	19.9	0.2	107.4		0.6		5.0		8.1	19.1	
Delay (s)	25.9	49.2	20.3	153.3		30.5		45.0		35.8	45.2	
Level of Service	C	D	C	F		C		D		D	D	
Approach Delay (s)		38.3			59.4			45.0			43.2	
Approach LOS		D			E			D			D	
Intersection Summary												
HCM 2000 Control Delay			42.5			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			95.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			64.2%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

29: St. John & Park

2027 AM No Build

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	75	441	49	322	193	173	90	363	126
Future Volume (vph)	0	0	0	75	441	49	322	193	173	90	363	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Lane Util. Factor				1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frpb, ped/bikes				1.00	1.00		1.00	1.00	0.96		1.00	0.97
Flpb, ped/bikes				0.99	1.00		1.00	1.00	1.00		1.00	1.00
Frt				1.00	0.98		1.00	1.00	0.85		1.00	0.85
Flt Protected				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (prot)				1764	3503		1698	1764	1536		1863	1552
Flt Permitted				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (perm)				1764	3503		1698	1764	1536		1863	1552
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	77	455	51	332	199	178	93	374	130
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	111	0	0	56
Lane Group Flow (vph)	0	0	0	77	506	0	262	269	67	0	467	74
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Perm	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases					8		2	2		6	6	
Permitted Phases				8					2			6
Actuated Green, G (s)				19.1	19.1		32.0	32.0	32.0		28.9	28.9
Effective Green, g (s)				19.1	19.1		32.0	32.0	32.0		28.9	28.9
Actuated g/C Ratio				0.20	0.20		0.34	0.34	0.34		0.30	0.30
Clearance Time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)				354	704		571	594	517		566	472
v/s Ratio Prot					c0.14		c0.15	0.15			c0.25	
v/s Ratio Perm				0.04					0.04			0.05
v/c Ratio				0.22	0.72		0.46	0.45	0.13		0.83	0.16
Uniform Delay, d1				31.7	35.4		24.7	24.6	21.8		30.7	24.2
Progression Factor				1.00	1.00		0.48	0.48	0.52		1.00	1.00
Incremental Delay, d2				0.3	3.5		2.2	2.1	0.4		9.5	0.2
Delay (s)				32.0	39.0		14.1	13.9	11.8		40.2	24.3
Level of Service				C	D		B	B	B		D	C
Approach Delay (s)		0.0			38.0			13.4			36.8	
Approach LOS		A			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			28.4									
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			95.0						15.0			
Intersection Capacity Utilization			72.0%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

13: I-295 NB exit

2027 AM No Build
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	324	755	0	0	0
Future Volume (Veh/h)	0	324	755	0	0	0
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	341	795	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	795	398			795	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	795	398			795	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	43			100	
cM capacity (veh/h)	325	602			822	
Direction, Lane #	EB 1	SE 1	SE 2			
Volume Total	341	398	398			
Volume Left	0	0	0			
Volume Right	341	0	0			
cSH	602	1700	1700			
Volume to Capacity	0.57	0.23	0.23			
Queue Length 95th (ft)	88	0	0			
Control Delay (s)	18.5	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	18.5	0.0				
Approach LOS	C					
Intersection Summary						
Average Delay			5.6			
Intersection Capacity Utilization			47.6%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2027 PM No Build

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑↑
Traffic Volume (vph)	0	912	724	130	662	0	1077	0	199	0	0	538
Future Volume (vph)	0	912	724	130	662	0	1077	0	199	0	0	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	960	762	137	697	0	1134	0	209	0	0	566
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	960	762	137	697	0	1134	0	209	0	0	566
Turn Type		NA	pm+ov	Prot	NA		Prot		pt+ov			Prot
Protected Phases		4	5	3 10	8		5		3 10			10
Permitted Phases			4						5			
Actuated Green, G (s)		36.0	77.0	27.0	44.0		41.0		68.0			25.0
Effective Green, g (s)		36.0	77.0	27.0	44.0		41.0		68.0			25.0
Actuated g/C Ratio		0.28	0.60	0.21	0.34		0.32		0.53			0.20
Clearance Time (s)		6.0	6.0		6.0		6.0					6.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0					3.0
Lane Grp Cap (vph)		995	952	373	1216		1099		989			544
v/s Ratio Prot		c0.27	0.26	0.08	c0.20		c0.33		0.04			c0.20
v/s Ratio Perm			0.23						0.09			
v/c Ratio		0.96	0.80	0.37	0.57		1.03		0.21			1.04
Uniform Delay, d1		45.4	19.6	43.2	34.3		43.5		15.8			51.5
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		20.3	4.9	0.6	0.7		35.7		0.1			49.5
Delay (s)		65.7	24.5	43.8	35.0		79.2		15.9			101.0
Level of Service		E	C	D	C		E		B			F
Approach Delay (s)		47.5			36.4			69.3			101.0	
Approach LOS		D			D			E			F	
Intersection Summary												
HCM 2000 Control Delay			58.8				HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			128.0				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			81.2%				ICU Level of Service		D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2027 PM No Build

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	507	124	83	0	275	0	732	77	68	219	0
Future Volume (vph)	330	507	124	83	0	275	0	732	77	68	219	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		0.95		1.00	1.00	
Flt	1.00	1.00	0.85	1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1888	1925	1583	1770		1583		3489		1770	1863	
Flt Permitted	0.95	1.00	1.00	0.95		1.00		1.00		0.16	1.00	
Satd. Flow (perm)	1888	1925	1583	1770		1583		3489		291	1863	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	344	528	129	86	0	286	0	762	80	71	228	0
RTOR Reduction (vph)	0	0	96	0	0	238	0	8	0	0	0	0
Lane Group Flow (vph)	344	528	33	86	0	48	0	835	0	71	228	0
Turn Type	pm+pt	NA	Perm	Prot		Perm		NA		pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4		4			8				6		
Actuated Green, G (s)	24.0	24.0	24.0	4.0		16.0		20.6		28.0	28.0	
Effective Green, g (s)	24.0	24.0	24.0	4.0		16.0		20.6		28.0	28.0	
Actuated g/C Ratio	0.25	0.25	0.25	0.04		0.17		0.22		0.29	0.29	
Clearance Time (s)	5.0	5.0	5.0	5.0		5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	476	486	399	74		266		756		123	549	
v/s Ratio Prot	0.09	c0.27		c0.05				c0.24		0.01	c0.12	
v/s Ratio Perm	0.09		0.02			0.03				0.16		
v/c Ratio	0.72	1.09	0.08	1.16		0.18		1.10		0.58	0.42	
Uniform Delay, d1	32.4	35.5	27.1	45.5		33.9		37.2		29.4	26.9	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00		1.17	0.89	
Incremental Delay, d2	5.4	66.2	0.4	155.0		1.5		65.3		6.1	0.5	
Delay (s)	37.8	101.7	27.5	200.5		35.4		102.5		40.6	24.4	
Level of Service	D	F	C	F		D		F		D	C	
Approach Delay (s)		70.2			73.6			102.5			28.3	
Approach LOS		E			E			F			C	
Intersection Summary												
HCM 2000 Control Delay			76.5			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			95.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			73.6%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2027 PM No Build

29: St. John & Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	105	631	70	701	388	227	48	167	135
Future Volume (vph)	0	0	0	105	631	70	701	388	227	48	167	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Lane Util. Factor				1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frpb, ped/bikes				1.00	1.00		1.00	1.00	0.96		1.00	0.97
Flpb, ped/bikes				0.99	1.00		1.00	1.00	1.00		1.00	1.00
Frt				1.00	0.99		1.00	1.00	0.85		1.00	0.85
Flt Protected				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (prot)				1764	3504		1698	1760	1536		1861	1552
Flt Permitted				0.95	1.00		0.95	0.99	1.00		0.99	1.00
Satd. Flow (perm)				1764	3504		1698	1760	1536		1861	1552
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	108	651	72	723	400	234	49	172	139
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	68	0	0	66
Lane Group Flow (vph)	0	0	0	108	723	0	549	574	166	0	221	73
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Perm	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases					8		2	2		6	6	
Permitted Phases				8					2			6
Actuated Green, G (s)				21.8	21.8		41.4	41.4	41.4		16.8	16.8
Effective Green, g (s)				21.8	21.8		41.4	41.4	41.4		16.8	16.8
Actuated g/C Ratio				0.23	0.23		0.44	0.44	0.44		0.18	0.18
Clearance Time (s)				5.0	5.0		5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)				404	804		739	766	669		329	274
v/s Ratio Prot					c0.21		0.32	c0.33			c0.12	
v/s Ratio Perm				0.06					0.11			0.05
v/c Ratio				0.27	0.90		0.74	0.75	0.25		0.67	0.27
Uniform Delay, d1				30.0	35.5		22.4	22.5	17.0		36.5	33.8
Progression Factor				1.00	1.00		0.65	0.65	0.57		1.00	1.00
Incremental Delay, d2				0.4	12.8		3.0	3.0	0.4		5.3	0.5
Delay (s)				30.4	48.4		17.5	17.6	10.1		41.8	34.3
Level of Service				C	D		B	B	B		D	C
Approach Delay (s)		0.0			46.0			16.2			38.9	
Approach LOS		A			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			29.2									
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			95.0						15.0			
Intersection Capacity Utilization			76.7%									
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 13: I-295 NB exit

2027 PM No Build
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	350	612	0	0	0
Future Volume (Veh/h)	0	350	612	0	0	0
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	368	644	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	644	322			644	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644	322			644	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	45			100	
cM capacity (veh/h)	405	674			937	
Direction, Lane #	EB 1	SE 1	SE 2			
Volume Total	368	322	322			
Volume Left	0	0	0			
Volume Right	368	0	0			
cSH	674	1700	1700			
Volume to Capacity	0.55	0.19	0.19			
Queue Length 95th (ft)	83	0	0			
Control Delay (s)	16.6	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	16.6	0.0				
Approach LOS	C					
Intersection Summary						
Average Delay			6.0			
Intersection Capacity Utilization			45.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2027 AM C1P2 - 3 lanes on Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑↑
Traffic Volume (vph)	0	833	602	45	379	0	545	0	259	0	0	512
Future Volume (vph)	0	833	602	45	379	0	545	0	259	0	0	512
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	877	634	47	399	0	574	0	273	0	0	539
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	877	634	47	399	0	574	0	273	0	0	539
Turn Type		NA	pm+ov	Prot	NA		Prot		pt+ov			Prot
Protected Phases		4	5	3 10	8		5		3 10			10
Permitted Phases			4						5			
Actuated Green, G (s)		36.0	63.6	30.9	46.0		27.6		58.5			26.9
Effective Green, g (s)		36.0	63.6	30.9	46.0		27.6		58.5			26.9
Actuated g/C Ratio		0.30	0.54	0.26	0.39		0.23		0.49			0.23
Clearance Time (s)		6.0	6.0		6.0		6.0					6.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0					3.0
Lane Grp Cap (vph)		1075	849	461	1373		799		941			632
v/s Ratio Prot		c0.25	c0.17	0.03	c0.11		0.17		0.08			c0.19
v/s Ratio Perm			0.23						0.10			
v/c Ratio		0.82	0.75	0.10	0.29		0.72		0.29			0.85
Uniform Delay, d1		38.2	21.2	33.3	25.0		41.9		17.7			43.9
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		4.9	3.6	0.1	0.1		3.1		0.2			10.8
Delay (s)		43.1	24.8	33.4	25.1		45.0		17.9			54.7
Level of Service		D	C	C	C		D		B			D
Approach Delay (s)		35.4			26.0			36.3			54.7	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			37.5				HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			118.5				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			57.3%				ICU Level of Service		B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2027 AM C1P2 - 3 lanes on Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	610	109	51	0	165	0	266	28	85	320	0
Future Volume (vph)	112	610	109	51	0	165	0	266	28	85	320	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	
Flt	1.00	1.00	0.85	1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1888	1925	1583	1770		1583		1863	1583	1770	1863	
Flt Permitted	0.95	1.00	1.00	0.36		1.00		1.00	1.00	0.28	1.00	
Satd. Flow (perm)	1888	1925	1583	667		1583		1863	1583	521	1863	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	118	642	115	54	0	174	0	280	29	89	337	0
RTOR Reduction (vph)	0	0	56	0	0	98	0	0	23	0	0	0
Lane Group Flow (vph)	118	642	59	54	0	76	0	280	6	89	337	0
Turn Type	pm+pt	NA	Perm	pm+pt		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4		4	8		8			2	6		
Actuated Green, G (s)	46.3	46.3	46.3	39.3		39.3		19.7	19.7	27.1	27.1	
Effective Green, g (s)	46.3	46.3	46.3	39.3		39.3		19.7	19.7	27.1	27.1	
Actuated g/C Ratio	0.51	0.51	0.51	0.44		0.44		0.22	0.22	0.30	0.30	
Clearance Time (s)	5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	971	990	814	310		691		407	346	190	560	
v/s Ratio Prot	0.01	c0.33		0.00				c0.15		0.01	c0.18	
v/s Ratio Perm	0.05		0.04	0.07		c0.05			0.00	0.13		
v/c Ratio	0.12	0.65	0.07	0.17		0.11		0.69	0.02	0.47	0.60	
Uniform Delay, d1	11.3	15.9	11.0	18.9		15.0		32.3	27.6	27.0	26.8	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	3.3	0.2	0.3		0.3		4.8	0.0	1.8	1.8	
Delay (s)	11.4	19.2	11.2	19.2		15.3		37.1	27.6	28.8	28.7	
Level of Service	B	B	B	B		B		D	C	C	C	
Approach Delay (s)		17.1			16.2			36.2			28.7	
Approach LOS		B			B			D			C	
Intersection Summary												
HCM 2000 Control Delay			22.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			70.0%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2027 AM C1P2 - 3 lanes on Park

29: St. John & Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	262	0	75	441	49	322	193	35	90	363	126
Future Volume (vph)	0	262	0	75	441	49	322	193	35	90	363	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		1.00		1.00	0.95		0.97	1.00			1.00	1.00
Frpb, ped/bikes		1.00		1.00	0.99		1.00	0.99			1.00	0.97
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt		1.00		1.00	0.98		1.00	0.98			1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)		1881		1787	3500		3467	1824			1863	1556
Flt Permitted		1.00		0.23	1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)		1881		437	3500		3467	1824			1863	1556
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	276	0	79	464	52	339	203	37	95	382	133
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	0	82
Lane Group Flow (vph)	0	276	0	79	516	0	339	236	0	0	477	51
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type		NA		pm+pt	NA		Split	NA		Split	NA	Perm
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases				8								6
Actuated Green, G (s)		24.5		37.6	37.6		38.3	38.3			39.1	39.1
Effective Green, g (s)		24.5		37.6	37.6		38.3	38.3			39.1	39.1
Actuated g/C Ratio		0.19		0.29	0.29		0.29	0.29			0.30	0.30
Clearance Time (s)		6.0		6.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		354		189	1012		1021	537			560	467
v/s Ratio Prot		c0.15		0.02	c0.15		0.10	c0.13			c0.26	
v/s Ratio Perm				0.10								0.03
v/c Ratio		0.78		0.42	0.51		0.33	0.44			0.85	0.11
Uniform Delay, d1		50.2		35.9	38.5		35.8	37.1			42.7	32.9
Progression Factor		1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		10.4		1.5	0.4		0.9	2.6			11.9	0.1
Delay (s)		60.6		37.4	38.9		36.7	39.7			54.6	33.0
Level of Service		E		D	D		D	D			D	C
Approach Delay (s)		60.6			38.7			38.0			49.9	
Approach LOS		E			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			44.8			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			22.0			
Intersection Capacity Utilization			80.4%			ICU Level of Service			D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 13: O-295 NB exit

2027 AM C1P2 - 3 lanes on Park
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	377	506	0	0	0
Future Volume (Veh/h)	0	377	506	0	0	0
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	397	533	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	533	266			533	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	533	266			533	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	46			100	
cM capacity (veh/h)	477	732			1031	
Direction, Lane #	EB 1	SE 1	SE 2			
Volume Total	397	266	266			
Volume Left	0	0	0			
Volume Right	397	0	0			
cSH	732	1700	1700			
Volume to Capacity	0.54	0.16	0.16			
Queue Length 95th (ft)	82	0	0			
Control Delay (s)	15.6	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	15.6	0.0				
Approach LOS	C					
Intersection Summary						
Average Delay		6.7				
Intersection Capacity Utilization		44.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2027 PM C1P2 - 3 lanes on Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑↑
Traffic Volume (vph)	0	912	724	130	662	0	1077	0	199	0	0	538
Future Volume (vph)	0	912	724	130	662	0	1077	0	199	0	0	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	960	762	137	697	0	1134	0	209	0	0	566
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	960	762	137	697	0	1134	0	209	0	0	566
Turn Type		NA	pm+ov	Prot	NA		Prot		pt+ov			Prot
Protected Phases		4	5	3 10	8		5		3 10			10
Permitted Phases			4						5			
Actuated Green, G (s)		36.0	77.0	27.0	44.0		41.0		68.0			25.0
Effective Green, g (s)		36.0	77.0	27.0	44.0		41.0		68.0			25.0
Actuated g/C Ratio		0.28	0.60	0.21	0.34		0.32		0.53			0.20
Clearance Time (s)		6.0	6.0		6.0		6.0					6.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0					3.0
Lane Grp Cap (vph)		995	952	373	1216		1099		989			544
v/s Ratio Prot		c0.27	0.26	0.08	c0.20		c0.33		0.04			c0.20
v/s Ratio Perm			0.23						0.09			
v/c Ratio		0.96	0.80	0.37	0.57		1.03		0.21			1.04
Uniform Delay, d1		45.4	19.6	43.2	34.3		43.5		15.8			51.5
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		20.3	4.9	0.6	0.7		35.7		0.1			49.5
Delay (s)		65.7	24.5	43.8	35.0		79.2		15.9			101.0
Level of Service		E	C	D	C		E		B			F
Approach Delay (s)		47.5			36.4			69.3			101.0	
Approach LOS		D			D			E			F	
Intersection Summary												
HCM 2000 Control Delay			58.8				HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			128.0				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			81.2%				ICU Level of Service		D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2027 PM C1P2 - 3 lanes on Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	99	507	124	83	0	275	0	732	77	68	219	0
Future Volume (vph)	99	507	124	83	0	275	0	732	77	68	219	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00		0.85		1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1888	1925	1583	1770		1583		1863	1583	1770	1863	
Flt Permitted	0.95	1.00	1.00	0.21		1.00		1.00	1.00	0.09	1.00	
Satd. Flow (perm)	1888	1925	1583	391		1583		1863	1583	172	1863	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	104	534	131	87	0	289	0	771	81	72	231	0
RTOR Reduction (vph)	0	0	91	0	0	144	0	0	47	0	0	0
Lane Group Flow (vph)	104	534	40	87	0	145	0	771	34	72	231	0
Turn Type	pm+pt	NA	Perm	pm+pt		Perm		NA	Perm	pm+pt	NA	
Protected Phases	7	4		3				2		1	6	
Permitted Phases	4		4	8		8			2	6		
Actuated Green, G (s)	27.7	27.7	27.7	26.9		26.9		38.3	38.3	45.7	45.7	
Effective Green, g (s)	27.7	27.7	27.7	26.9		26.9		38.3	38.3	45.7	45.7	
Actuated g/C Ratio	0.31	0.31	0.31	0.30		0.30		0.43	0.43	0.51	0.51	
Clearance Time (s)	5.0	5.0	5.0	5.0		5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	581	592	487	141		473		792	673	129	945	
v/s Ratio Prot	0.00	c0.28		c0.01				c0.41		c0.01	0.12	
v/s Ratio Perm	0.05		0.03	0.17		0.09			0.02	0.27		
v/c Ratio	0.18	0.90	0.08	0.62		0.31		0.97	0.05	0.56	0.24	
Uniform Delay, d1	22.8	29.8	22.1	36.6		24.3		25.4	15.2	20.1	12.4	
Progression Factor	1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	19.4	0.3	7.8		1.7		25.4	0.0	5.2	0.1	
Delay (s)	23.0	49.3	22.5	44.4		26.0		50.7	15.2	25.2	12.6	
Level of Service	C	D	C	D		C		D	B	C	B	
Approach Delay (s)		41.2			30.3			47.4			15.6	
Approach LOS		D			C			D			B	
Intersection Summary												
HCM 2000 Control Delay			38.3									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			90.0							20.0		
Intersection Capacity Utilization			89.4%									ICU Level of Service E
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

29: St. John & Park

2027 PM C1P2 - 3 lanes on Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	231	0	105	631	70	701	388	45	48	167	135
Future Volume (vph)	0	231	0	105	631	70	701	388	45	48	167	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0		6.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		1.00		1.00	0.95		0.97	1.00			1.00	1.00
Frpb, ped/bikes		1.00		1.00	0.99		1.00	1.00			1.00	0.96
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt		1.00		1.00	0.98		1.00	0.98			1.00	0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)		1881		1787	3500		3467	1843			1860	1535
Flt Permitted		1.00		0.25	1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)		1881		461	3500		3467	1843			1860	1535
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	243	0	111	664	74	738	408	47	51	176	142
RTOR Reduction (vph)	0	0	0	0	0	0	0	3	0	0	0	98
Lane Group Flow (vph)	0	243	0	111	738	0	738	452	0	0	227	44
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type		NA		pm+pt	NA		Split	NA		Split	NA	Perm
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases				8								6
Actuated Green, G (s)		21.4		37.7	37.7		56.7	56.7			20.6	20.6
Effective Green, g (s)		21.4		37.7	37.7		56.7	56.7			20.6	20.6
Actuated g/C Ratio		0.16		0.29	0.29		0.44	0.44			0.16	0.16
Clearance Time (s)		6.0		6.0	5.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		309		228	1015		1512	803			294	243
v/s Ratio Prot		0.13		0.03	c0.21		0.21	c0.25			c0.12	
v/s Ratio Perm				0.11								0.03
v/c Ratio		0.79		0.49	0.73		0.49	0.56			0.77	0.18
Uniform Delay, d1		52.1		36.2	41.5		26.3	27.4			52.4	47.4
Progression Factor		1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		12.4		1.6	2.6		1.1	2.8			11.9	0.4
Delay (s)		64.5		37.8	44.1		27.4	30.2			64.3	47.7
Level of Service		E		D	D		C	C			E	D
Approach Delay (s)		64.5			43.3			28.5			57.9	
Approach LOS		E			D			C			E	
Intersection Summary												
HCM 2000 Control Delay			40.6			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			22.0			
Intersection Capacity Utilization			71.3%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 13: O-295 NB exit

2027 PM C1P2 - 3 lanes on Park
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	254	480	0	0	0
Future Volume (Veh/h)	0	254	480	0	0	0
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	267	505	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	505	252			505	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	505	252			505	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	64			100	
cM capacity (veh/h)	496	747			1056	
Direction, Lane #	EB 1	SE 1	SE 2			
Volume Total	267	252	252			
Volume Left	0	0	0			
Volume Right	267	0	0			
cSH	747	1700	1700			
Volume to Capacity	0.36	0.15	0.15			
Queue Length 95th (ft)	41	0	0			
Control Delay (s)	12.5	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.5	0.0				
Approach LOS	B					
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization			35.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2027 AM C2P2

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑↑
Traffic Volume (vph)	0	833	602	45	379	0	545	0	259	0	0	512
Future Volume (vph)	0	833	602	45	379	0	545	0	259	0	0	512
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	877	634	47	399	0	574	0	273	0	0	539
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	877	634	47	399	0	574	0	273	0	0	539
Turn Type		NA	pm+ov	Prot	NA		Prot		pt+ov			Prot
Protected Phases		4	5	3 10	8		5		3 10			10
Permitted Phases			4						5			
Actuated Green, G (s)		36.0	63.6	30.9	46.0		27.6		58.5			26.9
Effective Green, g (s)		36.0	63.6	30.9	46.0		27.6		58.5			26.9
Actuated g/C Ratio		0.30	0.54	0.26	0.39		0.23		0.49			0.23
Clearance Time (s)		6.0	6.0		6.0		6.0					6.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0					3.0
Lane Grp Cap (vph)		1075	849	461	1373		799		941			632
v/s Ratio Prot		c0.25	c0.17	0.03	c0.11		0.17		0.08			c0.19
v/s Ratio Perm			0.23						0.10			
v/c Ratio		0.82	0.75	0.10	0.29		0.72		0.29			0.85
Uniform Delay, d1		38.2	21.2	33.3	25.0		41.9		17.7			43.9
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		4.9	3.6	0.1	0.1		3.1		0.2			10.8
Delay (s)		43.1	24.8	33.4	25.1		45.0		17.9			54.7
Level of Service		D	C	C	C		D		B			D
Approach Delay (s)		35.4			26.0			36.3			54.7	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			37.5				HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			118.5				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			57.3%				ICU Level of Service		B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2027 AM C2P2

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	610	109	51	117	49	80	186	28	85	320	20
Future Volume (vph)	112	610	109	51	117	49	80	186	28	85	320	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0		5.0	5.0		6.0	5.0		6.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.96		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1888	1881		1770	1780		1770	1827		1770	1846	
Flt Permitted	0.65	1.00		0.20	1.00		0.29	1.00		0.62	1.00	
Satd. Flow (perm)	1285	1881		364	1780		544	1827		1151	1846	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	118	642	115	54	123	52	84	196	29	89	337	21
RTOR Reduction (vph)	0	7	0	0	16	0	0	6	0	0	2	0
Lane Group Flow (vph)	118	750	0	54	159	0	84	219	0	89	356	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	49.9	49.9		49.9	49.9		16.9	16.9		20.9	20.9	
Effective Green, g (s)	49.9	49.9		49.9	49.9		16.9	16.9		20.9	20.9	
Actuated g/C Ratio	0.55	0.55		0.55	0.55		0.19	0.19		0.23	0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	5.0		6.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	712	1042		201	986		145	343		316	428	
v/s Ratio Prot		c0.40			0.09		0.02	c0.12		0.02	c0.19	
v/s Ratio Perm	0.09			0.15			0.09			0.04		
v/c Ratio	0.17	0.72		0.27	0.16		0.58	0.64		0.28	0.83	
Uniform Delay, d1	9.8	14.9		10.5	9.8		32.7	33.7		28.7	32.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	4.3		3.3	0.4		5.5	3.9		0.5	12.9	
Delay (s)	10.3	19.2		13.8	10.2		38.2	37.6		29.2	45.8	
Level of Service	B	B		B	B		D	D		C	D	
Approach Delay (s)		18.0			11.0			37.8			42.5	
Approach LOS		B			B			D			D	
Intersection Summary												
HCM 2000 Control Delay			26.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			82.0%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

29: St. John & Park

2027 AM C2P2

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	262	30	75	441	49	126	363	35	90	229	126
Future Volume (vph)	0	262	30	75	441	49	126	363	35	90	229	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		6.0	5.0		6.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt		0.99		1.00	0.98		1.00	0.99		1.00	0.95	
Flt Protected		1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1847		1783	1845		1782	1850		1772	1755	
Flt Permitted		1.00		0.28	1.00		0.31	1.00		0.52	1.00	
Satd. Flow (perm)		1847		529	1845		585	1850		965	1755	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	276	32	79	464	52	133	382	37	95	241	133
RTOR Reduction (vph)	0	6	0	0	0	0	0	5	0	0	26	0
Lane Group Flow (vph)	0	302	0	79	516	0	133	414	0	95	348	0
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type		NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		4		3	8		5	2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		18.8		28.0	28.0		37.0	37.0		26.5	26.5	
Effective Green, g (s)		18.8		28.0	28.0		37.0	37.0		26.5	26.5	
Actuated g/C Ratio		0.25		0.37	0.37		0.49	0.49		0.35	0.35	
Clearance Time (s)		5.0		6.0	5.0		6.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		462		250	688		360	912		340	620	
v/s Ratio Prot		0.16		0.01	c0.28		0.02	c0.22			c0.20	
v/s Ratio Perm				0.10			0.16			0.10		
v/c Ratio		0.65		0.32	0.75		0.37	0.45		0.28	0.56	
Uniform Delay, d1		25.2		16.6	20.5		11.8	12.4		17.4	19.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.3		0.7	4.6		0.6	1.6		0.5	1.2	
Delay (s)		28.5		17.3	25.1		12.5	14.0		17.9	20.7	
Level of Service		C		B	C		B	B		B	C	
Approach Delay (s)		28.5			24.0			13.7			20.1	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM 2000 Control Delay			20.8			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			75.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			66.9%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

13: I-295 NB exit

2027 AM C2P2
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	253	393	0	0	235
Future Volume (Veh/h)	0	253	393	0	0	235
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	266	414	0	0	247
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	661	414			414	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	661	414			414	
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	58			100	
cM capacity (veh/h)	427	638			1145	
Direction, Lane #	EB 1	SE 1	NW 1			
Volume Total	266	414	247			
Volume Left	0	0	0			
Volume Right	266	0	0			
cSH	638	1700	1700			
Volume to Capacity	0.42	0.24	0.15			
Queue Length 95th (ft)	51	0	0			
Control Delay (s)	14.6	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	14.6	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization			43.0%		ICU Level of Service	A
Analysis Period (min)			15			

Intersection				
Intersection Delay, s/veh	8.8			
Intersection LOS	A			
Approach	EB	WB		NB
Entry Lanes	1	2		1
Conflicting Circle Lanes	2	2		2
Adj Approach Flow, veh/h	388	522		242
Demand Flow Rate, veh/h	396	532		247
Vehicles Circulating, veh/h	13	241		396
Vehicles Exiting, veh/h	760	402		13
Follow-Up Headway, s	3.186	3.186		3.186
Ped Vol Crossing Leg, #/h	0	0		0
Ped Cap Adj	1.000	1.000		1.000
Approach Delay, s/veh	6.8	10.9		7.5
Approach LOS	A	B		A
Lane	Left	Left	Right	Left
Designated Moves	T	L	TR	LR
Assumed Moves	T	L	TR	LR
RT Channelized				
Lane Util	1.000	0.024	0.976	1.000
Critical Headway, s	4.113	4.293	4.113	4.113
Entry Flow, veh/h	396	13	519	247
Cap Entry Lane, veh/h	1120	943	955	856
Entry HV Adj Factor	0.980	1.000	0.980	0.980
Flow Entry, veh/h	388	13	509	242
Cap Entry, veh/h	1098	943	936	839
V/C Ratio	0.354	0.014	0.544	0.288
Control Delay, s/veh	6.8	3.9	11.1	7.5
LOS	A	A	B	A
95th %tile Queue, veh	2	0	3	1

HCM Signalized Intersection Capacity Analysis

2: Fore River/I-295 S Off-ramp & Congress

2027 PM C2P2

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑↑		↑			↑↑
Traffic Volume (vph)	0	912	724	130	662	0	1077	0	199	0	0	538
Future Volume (vph)	0	912	724	130	662	0	1077	0	199	0	0	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0		6.0		6.0			6.0
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00			0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85			0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (prot)		3539	1583	1770	3539		3433		1583			2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00			1.00
Satd. Flow (perm)		3539	1583	1770	3539		3433		1583			2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	960	762	137	697	0	1134	0	209	0	0	566
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	960	762	137	697	0	1134	0	209	0	0	566
Turn Type		NA	pm+ov	Prot	NA		Prot		pt+ov			Prot
Protected Phases		4	5	3 10	8		5		3 10			10
Permitted Phases			4						5			
Actuated Green, G (s)		36.0	77.0	27.0	44.0		41.0		68.0			25.0
Effective Green, g (s)		36.0	77.0	27.0	44.0		41.0		68.0			25.0
Actuated g/C Ratio		0.28	0.60	0.21	0.34		0.32		0.53			0.20
Clearance Time (s)		6.0	6.0		6.0		6.0					6.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0					3.0
Lane Grp Cap (vph)		995	952	373	1216		1099		989			544
v/s Ratio Prot		c0.27	0.26	0.08	c0.20		c0.33		0.04			c0.20
v/s Ratio Perm			0.23						0.09			
v/c Ratio		0.96	0.80	0.37	0.57		1.03		0.21			1.04
Uniform Delay, d1		45.4	19.6	43.2	34.3		43.5		15.8			51.5
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00			1.00
Incremental Delay, d2		20.3	4.9	0.6	0.7		35.7		0.1			49.5
Delay (s)		65.7	24.5	43.8	35.0		79.2		15.9			101.0
Level of Service		E	C	D	C		E		B			F
Approach Delay (s)		47.5			36.4			69.3			101.0	
Approach LOS		D			D			E			F	
Intersection Summary												
HCM 2000 Control Delay			58.8				HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			128.0				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			81.2%				ICU Level of Service		D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

23: St. John & Congress

2027 PM C2P2

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	99	507	124	83	194	82	220	512	77	68	219	25
Future Volume (vph)	99	507	124	83	194	82	220	512	77	68	219	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	14	13	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0		5.0	5.0		6.0	5.0		6.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flt	1.00	0.97		1.00	0.96		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1888	1868		1770	1780		1770	1826		1770	1834	
Flt Permitted	0.51	1.00		0.15	1.00		0.24	1.00		0.26	1.00	
Satd. Flow (perm)	1017	1868		283	1780		440	1826		477	1834	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	104	534	131	87	204	86	232	539	81	72	231	26
RTOR Reduction (vph)	0	10	0	0	16	0	0	6	0	0	4	0
Lane Group Flow (vph)	104	655	0	87	274	0	232	614	0	72	253	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	39.2	39.2		39.2	39.2		31.6	31.6		23.2	23.2	
Effective Green, g (s)	39.2	39.2		39.2	39.2		31.6	31.6		23.2	23.2	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.35	0.35		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	5.0		6.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	442	813		123	775		325	641		168	472	
v/s Ratio Prot		c0.35			0.15		0.09	c0.34		0.02	c0.14	
v/s Ratio Perm	0.10			0.31			0.16			0.09		
v/c Ratio	0.24	0.81		0.71	0.35		0.71	0.96		0.43	0.54	
Uniform Delay, d1	16.0	22.1		20.7	16.9		22.8	28.6		34.2	28.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	8.4		29.0	1.3		7.2	25.3		1.8	1.2	
Delay (s)	17.2	30.5		49.7	18.2		30.1	53.8		36.0	29.9	
Level of Service	B	C		D	B		C	D		D	C	
Approach Delay (s)		28.7			25.5			47.4			31.3	
Approach LOS		C			C			D			C	
Intersection Summary												
HCM 2000 Control Delay			35.4			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			91.7%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2027 PM C2P2

29: St. John & Park

10/17/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	231	50	105	631	70	288	388	45	48	167	135
Future Volume (vph)	0	231	50	105	631	70	288	388	45	48	167	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		6.0	5.0		6.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt		0.98		1.00	0.98		1.00	0.98		1.00	0.93	
Flt Protected		1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1822		1781	1845		1784	1845		1772	1713	
Flt Permitted		1.00		0.35	1.00		0.22	1.00		0.50	1.00	
Satd. Flow (perm)		1822		656	1845		408	1845		934	1713	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	243	53	111	664	74	303	408	47	51	176	142
RTOR Reduction (vph)	0	10	0	0	0	0	0	6	0	0	39	0
Lane Group Flow (vph)	0	286	0	111	738	0	303	449	0	51	279	0
Confl. Peds. (#/hr)	13		10	10		13	15		10	10		15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type		NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		4		3	8		5	2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		22.6		33.4	33.4		31.6	31.6		16.1	16.1	
Effective Green, g (s)		22.6		33.4	33.4		31.6	31.6		16.1	16.1	
Actuated g/C Ratio		0.30		0.45	0.45		0.42	0.42		0.21	0.21	
Clearance Time (s)		5.0		6.0	5.0		6.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		549		364	821		346	777		200	367	
v/s Ratio Prot		0.16		0.02	c0.40		c0.11	0.24			0.16	
v/s Ratio Perm				0.12			c0.26			0.05		
v/c Ratio		0.52		0.30	0.90		0.88	0.58		0.26	0.76	
Uniform Delay, d1		21.7		13.3	19.2		16.9	16.6		24.5	27.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9		0.5	12.6		21.1	3.1		0.7	8.7	
Delay (s)		22.6		13.7	31.8		37.9	19.7		25.1	36.4	
Level of Service		C		B	C		D	B		C	D	
Approach Delay (s)		22.6			29.5			27.0			34.8	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			75.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			84.6%			ICU Level of Service				E		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

13: I-295 NB exit

2027 PM C2P2
10/17/2018

						
Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (veh/h)	0	254	403	0	0	527
Future Volume (Veh/h)	0	254	403	0	0	527
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	267	424	0	0	555
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	979	424			424	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	979	424			424	
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	58			100	
cM capacity (veh/h)	277	630			1135	
Direction, Lane #	EB 1	SE 1	NW 1			
Volume Total	267	424	555			
Volume Left	0	0	0			
Volume Right	267	0	0			
cSH	630	1700	1700			
Volume to Capacity	0.42	0.25	0.33			
Queue Length 95th (ft)	53	0	0			
Control Delay (s)	14.9	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	14.9	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			43.6%		ICU Level of Service	A
Analysis Period (min)			15			

Intersection				
Intersection Delay, s/veh	11.4			
Intersection LOS	B			
Approach	EB	WB	NB	
Entry Lanes	1	2	1	
Conflicting Circle Lanes	2	2	2	
Adj Approach Flow, veh/h	317	718	554	
Demand Flow Rate, veh/h	323	732	565	
Vehicles Circulating, veh/h	13	559	323	
Vehicles Exiting, veh/h	1278	329	13	
Follow-Up Headway, s	3.186	3.186	3.186	
Ped Vol Crossing Leg, #/h	0	0	0	
Ped Cap Adj	1.000	1.000	1.000	
Approach Delay, s/veh	6.0	11.8	13.8	
Approach LOS	A	B	B	
Lane	Left	Left	Right	Left
Designated Moves	T	LT	TR	LR
Assumed Moves	T	LT	TR	LR
RT Channelized				
Lane Util	1.000	0.470	0.530	1.000
Critical Headway, s	4.113	4.293	4.113	4.113
Entry Flow, veh/h	323	344	388	565
Cap Entry Lane, veh/h	1120	743	764	901
Entry HV Adj Factor	0.980	0.981	0.981	0.981
Flow Entry, veh/h	317	337	380	554
Cap Entry, veh/h	1098	729	749	884
V/C Ratio	0.288	0.463	0.508	0.627
Control Delay, s/veh	6.0	11.4	12.2	13.8
LOS	A	B	B	B
95th %tile Queue, veh	1	2	3	5

Intersection: 2: Fore River/I-295 S Off-ramp & Congress

Movement	EB	EB	EB	WB	WB	WB	NE	NE	NE	SW	SW
Directions Served	T	T	R	L	T	T	L	L	R	R	R
Maximum Queue (ft)	535	571	305	194	225	231	722	688	67	536	492
Average Queue (ft)	438	528	298	59	151	156	501	465	3	345	308
95th Queue (ft)	630	609	367	136	222	224	735	686	47	562	520
Link Distance (ft)	518	518			210	210	885	885	885	765	765
Upstream Blk Time (%)	6	44		0	1	1	0	0		0	
Queuing Penalty (veh)	0	0		0	5	6	0	0		0	
Storage Bay Dist (ft)			280	200							
Storage Blk Time (%)		28	18	0	2						
Queuing Penalty (veh)		203	81	0	3						

Intersection: 13: I-295 NB exit

Movement	EB	B14	SE	SE
Directions Served	R	T	T	T
Maximum Queue (ft)	502	407	146	154
Average Queue (ft)	249	145	50	56
95th Queue (ft)	593	452	148	156
Link Distance (ft)	421	385	120	120
Upstream Blk Time (%)	38	32	15	19
Queuing Penalty (veh)	0	0	45	57
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 23: St. John & Congress

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	R	T	TR	L	T
Maximum Queue (ft)	387	386	275	134	216	522	532	104	167
Average Queue (ft)	336	298	129	95	149	461	481	45	72
95th Queue (ft)	452	450	322	166	243	591	563	89	138
Link Distance (ft)	357	357			181	480	480	789	789
Upstream Blk Time (%)	59	18			22	48	72		
Queuing Penalty (veh)	270	85			79	0	0		
Storage Bay Dist (ft)			250	110					
Storage Blk Time (%)		31	0	10	39				
Queuing Penalty (veh)		38	0	29	33				

Intersection: 29: St. John & Park

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	125	172	192	804	821	125	280	105
Average Queue (ft)	56	140	164	664	749	101	127	71
95th Queue (ft)	108	181	183	974	946	169	237	125
Link Distance (ft)	152	152	152	789	789		344	
Upstream Blk Time (%)	0	6	53	1	12		0	
Queuing Penalty (veh)	0	15	143	7	83		0	
Storage Bay Dist (ft)						100		80
Storage Blk Time (%)					58	0	20	2
Queuing Penalty (veh)					131	3	27	4

Zone Summary

Zone wide Queuing Penalty: 1347

Intersection: 2: Fore River/I-295 S Off-ramp & Congress

Movement	EB	EB	EB	WB	WB	WB	NE	NE	NE	SW	SW
Directions Served	T	T	R	L	T	T	L	L	R	R	R
Maximum Queue (ft)	554	561	305	210	237	246	781	739	308	555	499
Average Queue (ft)	515	537	302	84	181	184	525	485	54	359	321
95th Queue (ft)	613	550	337	180	247	247	840	802	389	578	535
Link Distance (ft)	518	518			210	210	885	885	885	765	765
Upstream Blk Time (%)	25	68		0	4	4	4	3	2	0	
Queuing Penalty (veh)	0	0		0	14	16	0	0	0	0	
Storage Bay Dist (ft)			280	200							
Storage Blk Time (%)		48	11	0	5						
Queuing Penalty (veh)		347	49	1	7						

Intersection: 13: O-295 NB exit

Movement	EB	SB	SB
Directions Served	R	L	L
Maximum Queue (ft)	89	2	41
Average Queue (ft)	35	0	4
95th Queue (ft)	71	2	22
Link Distance (ft)	454	106	106
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 23: St. John & Congress

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	R	T	R	L	T
Maximum Queue (ft)	158	356	275	174	199	505	452	84	258
Average Queue (ft)	60	223	76	63	115	371	88	46	101
95th Queue (ft)	121	352	227	130	191	558	363	90	218
Link Distance (ft)	351	351			176	480	480		790
Upstream Blk Time (%)	0	1		0	2	10	3		
Queuing Penalty (veh)	0	5		0	6	0	0		
Storage Bay Dist (ft)			250	180				60	
Storage Blk Time (%)		8	0	0	2			6	13
Queuing Penalty (veh)		10	0	0	1			14	9

Intersection: 25: Valley & Congress

Movement	EB	WB	WB	NB	NB
Directions Served	LTR	L	TR	LT	R
Maximum Queue (ft)	107	43	79	97	70
Average Queue (ft)	12	13	6	43	25
95th Queue (ft)	62	38	41	82	52
Link Distance (ft)	176		345	573	
Upstream Blk Time (%)	0				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)		70			100
Storage Blk Time (%)		0	0	0	0
Queuing Penalty (veh)		0	0	0	0

Intersection: 29: St. John & Park

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	TR	L	T	TR	L	L	TR	LT	R
Maximum Queue (ft)	227	145	189	189	282	332	408	339	105
Average Queue (ft)	97	65	156	164	170	192	234	188	79
95th Queue (ft)	191	125	189	190	252	288	362	327	134
Link Distance (ft)	431	158	158	158			790	342	
Upstream Blk Time (%)		0	19	24				2	
Queuing Penalty (veh)		1	48	62				0	
Storage Bay Dist (ft)					400	400			80
Storage Blk Time (%)							0	40	3
Queuing Penalty (veh)							2	54	7

Zone Summary

Zone wide Queuing Penalty: 654

Intersection: 2: Fore River/I-295 S Off-ramp & Congress

Movement	EB	EB	EB	WB	WB	WB	NE	NE	NE	SW	SW
Directions Served	T	T	R	L	T	T	L	L	R	R	R
Maximum Queue (ft)	552	574	305	219	255	262	736	712	228	400	370
Average Queue (ft)	521	540	304	75	173	176	503	469	63	258	222
95th Queue (ft)	597	581	315	160	244	241	803	773	433	386	347
Link Distance (ft)	523	523			282	282	885	885	885	746	746
Upstream Blk Time (%)	19	64			0	0	5	5	3		
Queuing Penalty (veh)	0	0			0	0	0	0	0		
Storage Bay Dist (ft)			280	200							
Storage Blk Time (%)		44	15	0	3						
Queuing Penalty (veh)		315	68	0	4						

Intersection: 13: I-295 NB exit

Movement	EB	SB	NW
Directions Served	R	L	R
Maximum Queue (ft)	143	77	36
Average Queue (ft)	47	14	5
95th Queue (ft)	119	56	36
Link Distance (ft)	473	97	107
Upstream Blk Time (%)	0	1	0
Queuing Penalty (veh)	0	4	1
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 23: St. John & Congress

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	125	371	199	199	275	526	144	239
Average Queue (ft)	66	260	99	111	210	400	54	124
95th Queue (ft)	138	405	195	187	346	608	110	204
Link Distance (ft)		358	191	191		492		791
Upstream Blk Time (%)		3	6	1		20		
Queuing Penalty (veh)		20	10	2		0		
Storage Bay Dist (ft)	100				250		250	
Storage Blk Time (%)	2	35			0	34		0
Queuing Penalty (veh)	12	34			1	74		0

Intersection: 25: Valley & Congress

Movement	EB	WB	NB	NB
Directions Served	LTR	LTR	LT	R
Maximum Queue (ft)	119	203	122	80
Average Queue (ft)	15	41	43	27
95th Queue (ft)	66	153	103	57
Link Distance (ft)	191	345	578	
Upstream Blk Time (%)	0	1		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				100
Storage Blk Time (%)			1	0
Queuing Penalty (veh)			1	0

Intersection: 29: St. John & Park

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	265	125	181	269	452	125	343
Average Queue (ft)	106	47	174	151	180	53	178
95th Queue (ft)	217	94	191	266	396	132	315
Link Distance (ft)	467	164	164		791		361
Upstream Blk Time (%)		0	37		0		2
Queuing Penalty (veh)		0	151		0		0
Storage Bay Dist (ft)				250		100	
Storage Blk Time (%)				5	1	0	37
Queuing Penalty (veh)				23	4	1	18

Intersection: 34: Congress WB & Park

Movement	EB	WB	WB	NB
Directions Served	T	L	T	LR
Maximum Queue (ft)	76	64	216	123
Average Queue (ft)	10	19	182	98
95th Queue (ft)	47	66	253	142
Link Distance (ft)	83		202	107
Upstream Blk Time (%)	0		9	12
Queuing Penalty (veh)	0		64	64
Storage Bay Dist (ft)		40		
Storage Blk Time (%)		0	85	
Queuing Penalty (veh)		2	10	

Zone Summary

Zone wide Queuing Penalty: 886