Transportation Study

Station & Parking Improvement for Salem Commuter Rail Station

MBTA Contract No. W92PS02

Prepared for Massachusetts Bay Transportation Authority

Prepared by Howard/Stein-Hudson Associates, Inc. In Association with AFCOM

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Appendix A. Synchro Reports

Introduction

This report describes transportation conditions related to the proposed new parking garage (the Project) at the MBTA's Salem Commuter Rail Station in Salem, Massachusetts, including:

- Evaluation of existing roadway and traffic conditions;
- Assessment of changes in parking activity due to the increased parking capacity; and
- Impact analysis of the parking garage on future traffic operations.

Project Description

The current MBTA station contains a surface parking lot with 340 spaces for commuter rail passengers and serves as a bus stop for seven MBTA bus routes. All vehicles enter and exit the Project site via the unsignalized intersection of Bridge Street/MBTA Driveway.

As shown in the site plan in **Figure 1**, the existing lot will be replaced with a multi-level garage containing 801 parking spaces. Approximately 650 spaces will be designated as commuter rail passenger parking and approximately 150 spaces designated for parkers associated with the new J. Michael Ruane Judicial Center, located on nearby Bridge Street. In total, the new garage will provide an additional 310 on-site parking spaces for commuter rail riders. It is anticipated that the increased parking capacity will be used by current rail passengers who are now unable to find parking at the existing site.

As shown in the site plan, an at-grade taxi lane and kiss-and-ride drop-off/pick-up area will be provided near the train platform. Bus routes will continue to have designated stops along the bus-only curb.

Adjacent to the Project site, the City operates a parking lot with 123 surface spaces, providing all-day parking. For this study, it has been assumed that the City parking lot will continue to operate as an independent parking facility.¹

In this study, it has been assumed that the intersection of Bridge Street/MBTA Driveway will continue to serve as the Project site's sole access/egress driveway when the new garage is complete.

Study Area

As shown in **Figure 1**, the Project site is bounded by the MBTA commuter rail tracks on the east, the City parking lot and active railroad tracks to the south, the North River to the north and elevated Route 114/North Street roadway to the west. Across Bridge Street to the south of the Project site is the newly constructed J. Michael Ruane Judicial Center, which opened in November 2011.

Bridge Street runs roughly parallel to the North River and connects the City of Beverly from the north to the City of Salem. To the northeast of the site, Bridge Street intersects with the newly constructed Bridge Street Bypass. The Bridge Street Bypass is separated from the local street network and allows motorists

¹ Traffic impact analysis of potential redevelopment of the City owned parking lot was conducted by HSH Associates and presented in the October 14, 2011 memo to MBTA and AECOM from HSH Associates. Subject: Station & Parking Improvements, Salem Commuter Rail Station, City Lot Development, MBTA Contract No. W92PS02 – Amendment No.3.

MBTA Salem Garage

Figure 1. Site Plan (to be inserted)

MBTA Salem Garage

on the Essex Bridge (Route 1A between Salem and Beverly) direct access between Route 1A and the MBTA Salem Station site.

The following five intersections are evaluated in this study:

- Bridge Street/Route 114 Ramps,
- Bridge Street/MBTA Driveway,
- Bridge Street/Washington Street,
- Federal Street/Washington Street, and
- Bridge Street/Ash Street.

Existing Conditions

Existing Site Access

Bridge Street is classified by MassDOT as an urban arterial west of Washington Street and as a primary arterial east of Washington Street. Bridge Street runs underneath the North Street viaduct and the intersection of Bridge Street/MBTA Driveway is located underneath the North Street northbound ramp overpass. Vehicular access to the Project site is provided at one driveway location at the Bridge Street/MBTA Driveway intersection. Vehicles arriving from North Street (Route 114) or Washington Street need to turn onto Bridge Street to reach the MBTA Driveway.

Existing Roadway and Intersection Conditions

The traffic and pedestrian environment at the five study intersections are described below.

Bridge Street/Route 114 Ramps is a signalized intersection with three approaches. The eastbound Bridge Street approach consists of a shared, 20-foot through/right-turn lane. The driveway for the F.W. Webb Plumbing Supply Company enters Bridge Street immediately to the west of this intersection. The westbound approach of Bridge Street consists of a 9-foot exclusive left-turn lane and a 13-foot through lane. The northbound Route 114 Ramp approach consists of a 13-foot exclusive left-turn lane and a 13-foot exclusive right-turn lane. The northbound lanes of the ramp are separated from the southbound lanes by a 7-foot brick and gravel median. The pavement at this intersection is in good condition, but the pavement markings, especially on Bridge Street are in poor condition. Sidewalks are provided along all approaches to this intersection; the sidewalk on the north side of Bridge Street, however, ends at the intersection. A crosswalk with handicapped ramps and pedestrian signals is provided across the Route 114 approach. A mid-block crosswalk is located on Bridge Street 152 feet to the east of the intersection. This crosswalk does not have handicapped ramps or pedestrian signals. On-street parking is prohibited near this intersection.

Bridge Street/Washington Street is a signalized intersection with three approaches. The Bridge Street eastbound approach consists of two, 11-foot through lanes and an 18-foot, channelized, exclusive right-turn lane. The Bridge Street westbound approach consists of an 11-foot through lane, a 12-foot through lane, and an 11-foot, exclusive left-turn lane. The Washington Street northbound approach consists of two, 12-foot left-turn lanes and a 12-foot right-turn lane. The northbound lanes of Washington Street are separated from the southbound lanes by a 10-foot median composed of a mix of brick and landscaping. Paving and pavement markings at this intersection are in fair condition. Sidewalks are provided along all approaches to this intersection. A crosswalk with handicapped ramps is provided across all three approaches to this intersection. The Washington Street approach and eastbound Bridge Street approach crosswalks meet at a pedestrian refuge island in the southwest corner of the intersection and merge into a single crosswalk that takes pedestrians across the Bridge

Street eastbound right-turn lane. Countdown pedestrian signals are provided for all crosswalks. A loud audible signal also alerts pedestrians to the walk phase. The sound is switched off when the "don't walk" signal begins to flash. On-street parking is prohibited near this intersection.

Bridge Street/MBTA Driveway is an unsignalized intersection with three approaches. The eastbound Bridge Street approach consists of a 9-foot through lane, and an 11-foot exclusive left-turn lane. The westbound Bridge Street approach consists of a 19-foot, shared, through/right-turn lane. The site driveway southbound approach consists of a shared 14-foot left-turn/right-turn lane. Paving and pavement markings at this intersection are in fair condition. Sidewalks are provided along all approaches to this intersection. Handicapped ramps are located on the westbound Bridge Street approach, but are not connected by a crosswalk. On-street parking is prohibited near this intersection.

Bridge Street/Ash Street is an unsignalized intersection with four approaches. The Bridge Street eastbound approach consists of an 11-foot through lane, and an 11-foot through/right-turn lane. The Bridge Street westbound approach consists of an 11-foot through/left-turn lane, an 11-foot through lane, and an 11-foot through/right-turn lane. The stop-controlled Ash Street northbound approach consists of an 11-foot, shared left-turn/right-turn lane. The southbound approach is 10 feet wide and serves as the driveway for an apartment complex. While no signage is present, striping and curb geometry suggest this approach is designed to operate as an exclusive right-turn lane. This approach is stop controlled. Paving and pavement markings are in good condition. Sidewalks are provided along all approaches to this intersection. Crosswalks with handicapped ramps are provided on the Ash Street and driveway approaches. On-street parking is provided along the west side of the Ash Street approach and prohibited on all other approaches.

Federal Street/Washington Street is an unsignalized intersection with three approaches. The westbound approach of Federal Street consists of a 16-foot right-turn lane. To the west of the intersection, Federal Street is one-way westbound. The northbound approach of Washington Street consists of a 9-foot, exclusive left-turn lane, and a 13-foot through lane. The southbound approach of Washington Street consists of a 12-foot through lane, and a 12-foot through/right-turn lane. Paving and pavement markings at this intersection are in good condition. Crosswalks with handicapped ramps are provided on all approaches to this intersection with the exception of Federal Street westbound. Sidewalks are provided along all approaches. MBTA bus stops occupy the curb along the Washington Street southbound approach and the receiving lanes of Washington Street northbound. This stop is served by MBTA Route 468 that only runs during the A.M. peak hours. On-street parking is provided along the Federal Street westbound and Washington Street northbound approaches.

Existing Traffic

Peak period turning movement counts were taken at the study intersections on September 13, 2011. The Year 2011 Existing intersection volumes are shown in **Figure 2** and **Figure 3** for the A.M. and P.M. peak hours, respectively.

Daily traffic volumes on Bridge Street west of the Route 114 ramps were collected on September 13 and 14, 2011 and on the MBTA Driveway a year earlier on September 14, 2010. Based on the automatic traffic recorder (ATR) counts, the average daily volume along Bridge Street is approximately 21,500 vehicles per day. Traffic on Bridge Street peaks at about 2,000 vehicles during the morning peak hour and decreases steadily to about 1,200 vehicles per hour between 9:00 A.M.–1:00 P.M. After 1:00 P.M., volumes rise to about 1,600 vehicles due to after school and commuter activity. From 6:00 P.M.–12:00 A.M., volumes steadily decrease from 1,400 to 200 vehicles per hour.

Figure 2. Existing Conditions (2011) Turning Movement Volumes, A.M. Peak Hour



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Figure 3. Existing Conditions (2011) Turning Movement Volumes, P.M. Peak Hour



MBTA Salem Garage

The existing average daily volume on the MBTA Driveway is about 3,100 vehicles per day. Traffic volumes on the Driveway are the highest, at about 500 vehicles per hour, during the A.M. peak hour. Volumes remain steady at about 50 vehicles per hour between 9:00 A.M.–3:00 P.M. until outbound commuter trains arrive from Boston and volumes peak at about 400 vehicles per hour at 5:00 P.M. and steadily decline thereafter.

Intersection Operations

The criterion for evaluating traffic operations is level of service (LOS), which is determined by assessing average delay incurred by vehicles at intersections and along intersection approaches. The study team calculated average delay and associated level of service at study area intersections using Trafficware's Synchro 6 software, which also evaluates the impact on traffic operations from closely spaced intersections. This software is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 *Highway Capacity Manual* (HCM).

Level of service and delay (in seconds) are determined based on intersection geometry and traffic data for each intersection. **Table 1** summarizes the delay and level of service thresholds for signalized and unsignalized intersections, as defined in the HCM. LOS A defines the most favorable condition, with minimum traffic delay. LOS F represents the worst condition (unacceptable), with significant traffic delay. The threshold at LOS E/LOS F indicates that the intersection, or intersection approach, is theoretically at capacity. LOS D is generally considered acceptable in an urban environment, such as the study area near the Salem Station.

Level of Service	Average Stopped Delay (sec/veh.)			
	Signalized Intersection	Unsignalized Intersection		
A	≤10	≤10		
В	>10 and ≤20	>10 and ≤15		
С	>20 and ≤35	>15 and ≤25		
D	>35 and ≤55 >25 and ≤3			
Е	>55 and ≤80 >35 and ≤50			
F	> 80 > 50			

Table 1. Intersection Level of Service Criteria

The Year 2011 existing level of service results, with current signal phasing and timings, are presented in **Table 2** and **Table 3** for the A.M. and P.M. peak hour, respectively, and discussed below:

During the A.M. peak hour, the Bridge Street/Route 114 intersection operates at overall LOS D, with the eastbound left turns operating at LOS E. All other moves operate at LOS C or better. During the P.M. peak, the intersection operates at overall LOS B, with the eastbound left turns operating at LOS E. All other moves operate at LOS C or better. All other moves operate at LOS C or better.

During the A.M. peak hour, the Bridge Street/Washington Street intersection operates at LOS D, with the westbound Bridge Street left turn operating at LOS F. Volumes are higher during the P.M. peak hour and the intersection operates at overall LOS E, with the westbound Bridge Street left turn operating at LOS F.

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)	
Signalized					
Bridge Street/Route 114 Ramps	D	39.8			
Bridge EB thru/right	Е	70.2	>1.0	#684	
Bridge WB left	С	25.8	0.42	68	
Bridge WB thru	А	5.5	0.47	129	
114 NB left	С	23.7	0.31	63	
114 NB right	В	10.9	0.36	82	
Bridge Street/Washington Street	D	45.2			
Bridge EB thru thru	С	29.7	0.51	252	
Bridge EB right	В	10.7	0.47	125	
Bridge WB left	F	>80.0	>1.0	#435	
Bridge WB thru thru	В	17.5	0.46	222	
Washington NB left left	D	45.0	0.59	157	
Washington NB right	D	35.7	0.64	261	
	Unsigna	llized			
Bridge Street/MBTA Driveway					
Bridge EB left	А	13.5	0.39	46	
Bridge EB thru	А	0.0	0.61	0	
Bridge WB thru/right	А	0.0	0.48	0	
Driveway SB left/right	F	>50.0	>1.0	na	
Federal Street/Washington Street					
Federal WB right	С	17.9	0.37	41	
Washington NB left	В	10.2	0.04	3	
Washington NB thru	А	0.0	0.33	0	
Washington SB thru thru/right	А	0.0	0.27	0	
Bridge Street/Ash Street					
Bridge EB thru thru/right	А	0.0	0.36	0	
Bridge WB left	А	9.9	0.01	0	
Bridge WB thru thru/right	А	0.0	0.43	0	
Ash NB left/thru/right	В	10.4	0.01	0	
Driveway SB right	В	14.3	0.08	7	

Table 2. Existing Conditions (2011) Level of Service, A.M. peak hour

 $\# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95 $^{\rm th}$ percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Table 3.Existing Conditions	(2011) Level of Service, P.M. peak hour
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Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)
	Signal	ized		
Bridge Street/Route 114 Ramps	В	19.3		
Bridge EB thru/right	E	70.2	>1.0	#684
Bridge WB left	С	25.8	0.42	68
Bridge WB thru	А	5.5	0.47	129
114 NB left	С	23.7	0.31	63
114 NB right	В	10.9	0.36	82
Bridge Street/Washington Street	E	76.3		
Bridge EB thru thru	С	29.7	0.51	252
Bridge EB right	В	10.7	0.47	125
Bridge WB left	F	>80.0	>1.0	#435
Bridge WB thru thru	В	17.5	0.46	222
Washington NB left left	D	45.0	0.59	157
Washington NB right	D	35.7	0.64	261
	Unsigne	alized		
Bridge Street/MBTA Driveway				
Bridge EB left	В	11.5	0.12	10
Bridge EB thru	А	0.0	0.52	0
Bridge WB thru/right	А	0.0	0.53	0
Driveway SB left/right	F	>50.0	>1.0	590
Federal Street/Washington Street				
Federal WB right	D	31.1	0.61	95
Washington NB left	А	9.3	0.03	2
Washington NB thru	А	0.0	0.46	0
Washington SB thru thru/right	А	0.0	0.24	0
Bridge Street/Ash Street				
Bridge EB thru thru/right	A	0.0	0.34	0
Bridge WB left	A	9.1	0.02	1
Bridge WB thru thru/right	A	0.01	0.48	0
Ash NB left/thru/right	E	49.6	0.09	7
Driveway SB right	В	14.6	0.07	5

 $# = 95^{th}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95 $^{\rm th}$ percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

At the unsignalized Bridge Street/MBTA Driveway, the driveway operates at LOS F during both the A.M. peak hour and P.M. peak hour. Bridge Street traffic proceeds through this intersection without stopping and, therefore, operates at LOS A.

At the unsignalized Federal Street/Washington Street intersection, the Federal Street right turns are controlled by a stop sign and operate at LOS C during the A.M. peak hour and LOS D during the P.M. peak hour. All other moves operate at LOS B or better.

At the Bridge Street/Ash Street intersection, all moves operate at LOS B or better during the A.M. peak hour. During the P.M. peak hour, the northbound Ash Street approach operates at LOS E, but only processes a few vehicles per hour.

Existing Parking

The Project site currently contains a surface parking lot with 340 spaces for commuter rail passengers. Adjacent to the site, the City operates a parking lot with 123 surface spaces, providing all-day parking, primarily used by commuter rail passengers. There are nine designated accessible parking spaces provided: six in the area adjacent to the train platform and three in the MBTA parcel.

The MBTA currently charges \$4.00 per day for parking and the City charges \$2.00 per day in the adjacent lot. The lower parking fee does cause the City lot to fill up at a faster rate than the MBTA lot, but the fact that all spaces in the City lot are farther from the station platform than those at the MBTA lot seems to temper the fill rate. During weekday observations in September 2010, the City lot was full and the MBTA lot was at 94% capacity at 8:00 A.M. At 3:00 P.M., the City lot remained 100% full and the MBTA lot was 97% full. Observations in August 2011 confirmed similar activity. In the late afternoon, with the arrival of outbound trains from Boston, both parking lots steadily occupancy in both lots decreases between 4:00 P.M. until about 6:30 P.M. When a major sporting event or concert occurs in Boston, some fans park and take the train into Boston. This use generally does not conflict with commuter parking activity, because fans typically arrive late afternoon as commuter rail passengers are exiting the parking lot.

In addition to the MBTA lot and City lot, there are approximately 75 informal parking spaces located along the northern side of Bridge Street between the North Street ramps and Lynn Street. This narrow strip of land, about 800 feet long, is bounded by Bridge Street to the south and railroad tracks to the north. Because these spaces are free, they fill up at a faster rate than either the MBTA lot or City lot. In September 2010, these informal spaces were used by both MBTA commuters and construction workers at the Ruane Judicial Center. As of August 2011, these informal parking spaces were still actively being used by train commuters and construction workers.

During an earlier phase of this project in September 2003, a license plate survey was conducted at the MBTA parking lot to determine the origins of the parked vehicles and the pick-up/drop-off vehicles. This survey found that Salem residents comprise about half of all parkers and generate 59% of the pick-up/drop-off activity. After accounting for Salem residents, the parking areas served primarily commuters from the west, particularly Danvers and Peabody, which accounted for 31% of total parking and pick-up/drop-off activity. Origins from Beverly accounted for only 2% of parkers, primarily because there are five commuter rail stations in Beverly. While this data was collected eight years ago (2003), the pattern of parker origins has likely not changed significantly.

Existing Transit

According to the "2009 Ridership and Service Statistics" report published by the MBTA, 64 inbound and outbound commuter rail trains operate between North Station (Boston) and Salem Station on

weekdays, traveling on one of two commuter rail lines: Newburyport or Rockport. Trains run about once every 15 minutes during peak times and about once every hour during off-peak times. Between Salem and North Station, there are four other station stops including Swampscott, Lynn, River Works, and Chelsea. The travel time from Salem to North Station is about 25–30 minutes for the 17-mile trip.

The MBTA currently operates seven bus routes that serve the Salem Station as summarized in **Table 4**. Bus access to the station site is the same as for other motor vehicles. All buses enter the Project site by turning right from Bridge Street westbound and exit the site by turning right onto Bridge Street westbound.

Route	Description	Rush hour Headway (minutes)
450/ 450W	Salem Depot – Haymarket Station Salem Depot – Wonderland	\sim 30
451	North Beverly – Salem Depot, via Cabot St. or Tozer Rd.	~60
455/ 455W	Salem Depot - Haymarket Station, via Loring Ave, Central Sq., Lynn Salem Depot – Wonderland Station, via Central Sq., Lynn	~60
456	Salem Depot - Wonderland via Central Square, Lynn	~60
459	Salem Depot – Downtown via Logan Airport and Central Sq., Lynn	~60
465	Salem Depot – Liberty Tree Mall via Peabody and Danvers	~60
468	Salem Depot Danvers S. via Peabody	~60

Table 4. MBTA Bus Routes Serving Salem Station

Headway is the time between buses.

Existing Pedestrian and Bicycle Facilities

Pedestrian counts were conducted at study area intersections on September 13, 2011. The Existing A.M. and P.M. peak hour pedestrian volumes are shown in **Figure 4**.

There are currently four pedestrian access routes to the Project site. A sidewalk under the North Street ramp provides access to the southwest at the Bridge Street/MBTA Driveway intersection. There is a staircase to the train platform from the Bridge Street/Washington Street intersection. There is also a handicapped-accessible ramp system west of the Bridge Street/Washington Street intersection. An unpaved walking path connects the informal parking area along Bridge Street (west of the North Street viaduct) to the Project site.

As part of the recent signalization and reconstruction of the Bridge Street/Washington Street intersection, there are new crosswalks and pedestrian signals on each roadway approach.





Bicycle counts were conducted at study area intersections on September 13, 2011. The Existing A.M. and P.M. peak hour volumes are shown in **Figure 5**. Parking for about 35 bicycles is provided by racks in the north section of the site, near the train platform. Passengers are generally permitted to bring bicycles on the MBTA commuter rail in the off-peak direction and during off-peak hours. Bicycles are permitted at all times on weekends. On September 14, 2010, 36 bicycles were parked both in the racks and chained to the fence, indicating that bicycle commuting is common.

Future Conditions

For transportation impact analyses, it is standard practice to evaluate two future conditions: a No-Build Condition (without the proposed project) and a Build Condition (if the project is built). Typically, these conditions are projected to a future date five years from the Existing Conditions year. As such, Year 2016 was designated as the future year for this study.

No-Build conditions incorporate the continued existing uses on the Project site and do not include the new MBTA garage. The Build conditions analysis include the new MBTA garage in place of the existing MBTA lot. It is assumed that the adjacent City owned parking lot operation would be unchanged under No-Build and Build conditions.

As stated previously, MassDOT has completed the first phase of Bridge Street improvements, including 1) the construction of the new Bridge Street Bypass, between the Salem/Beverly Bridge and St. Peters Street, 2) the reconstruction of Bridge Street between St. Peter Street and Washington Street, and 3) the conversion of the existing rotary at Washington Street to signalized intersection. Construction on these sections was completed in 2009. While MassDOT has completed 25% design plans for the second phase of Bridge Street improvements, including the widening of Bridge Street between Flint Street and Washington Street, the future construction schedule of this next phase is unknown. To understand the impact of the planned second phase Bridge Street improvements, the future No-Build conditions and Build conditions have been assessed both without and with the second phase of the Bridge Street widening project.

Because of the poor existing level of service for Driveway traffic at the unsignalized intersection of Bridge Street/MBTA Driveway, it has been assumed that the intersection will be signalized under Year 2016 conditions.

Year 2016 No-Build Conditions

No-Build traffic conditions are independent of the proposed project and include existing traffic and new traffic resulting from general background growth. Based on historical traffic data and projected changes to employment and population², a background growth factor of 1% was applied to produce Year 2016 No-Build volumes. Future No-Build traffic volumes are shown in **Figure 6** and **Figure 7** for the A.M. and P.M. peak hours, respectively.

² "Transportation Improvement Study for Routes 1A, 114 and 107 and other major roadways in Salem", produced by the Central Transportation Planning Staff for the Boston Region Metropolitan Planning Organization, November 2005.

Figure 5. Existing Conditions (2011) Bicycle Volumes, A.M. and P.M. Peak Hour



Figure 6. No-Build Conditions (2016) Turning Movement Volumes, A.M. Peak Hour







Operations without Bridge Street widening

Capacity analysis conducted for conditions without the Bridge Street widening are shown in **Table 5** and **Table 6**. For this analysis, it was assumed that signal phasing and timings remained the same as under existing conditions. Key level of service results are discussed below.

During the A.M. peak hour, the Bridge Street/Route 114 Ramps intersection would worsen from LOS D to LOS E and the eastbound Bridge Street approach would worsen from LOS E to LOS F. During the P.M. peak hour, the intersection would worsen to LOS B from LOS C, but all approaches would operate at LOS D or better.

With signalization, the Bridge Street/MBTA Driveway intersection would operate at LOS B or better during each peak hour.

At the Bridge Street/Washington Street intersection, operation would remain at LOS E, although the northbound left turn from Washington Street onto Bridge Street would worsen from LOS D to LOS F.

At the unsignalized intersection of Federal Street/Washington Street, the westbound Federal Street right turn would operate worsen to LOS E from LOS D, but all remaining approaches would continue to operate at LOS A.

At the Bridge Street/Ash Street intersection, the increased volumes would cause the westbound Bridge Street approach to worsen from LOS A to LOS B, the northbound Ash Street approach to worsen from LOS E to LOS F, and the southbound driveway to worsen from LOS B at LOS C.

Overall, without Bridge Street widening, the study area intersections would operate similar to existing conditions without any major changes to level of service.

Operations with Bridge Street widening

With Bridge Street widening and associated optimization of traffic signals along the Bridge Street corridor, each signalized intersection would experience an improvement of overall level of service as shown in **Table 7** and **Table 8** and summarized below:

The Bridge Street/Route 114 Ramps intersection would operate at overall LOS B during the A.M. and P.M. peak hour.

The Bridge Street/MBTA Driveway intersection would operate at overall LOS A during each peak hour.

The Bridge Street/Washington Street intersection would operate at overall LOS C during the A.M. peak hour and LOS D during the P.M. peak hour.

Operations at the two unsignalized intersections would not be affected by the Bridge Street widening during each peak hour.

With Bridge Street widening and associated changes to signal timings, the signalized intersections would experience a modest decrease in overall service delays.

Table 5.No-Build Conditions (2016) Level of Servicewithout Bridge Street widening, A.M. peak hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)
	Signal	ized		
Bridge Street/Route 114 Ramps	E	60.3		
Bridge EB thru/right	F	108.1	1.12	829
Bridge WB left	С	34.9	0.50	85
Bridge WB thru	А	6.3	0.50	141
114 NB left	С	31.9	0.37	78
114 NB right	В	18.1	0.44	146
Bridge Street/MBTA Driveway	В	15.4		
Bridge EB left	С	24.2	0.67	83
Bridge EB thru thru	А	8.7	0.68	364
Bridge WB_thru thru/right	С	21.1	0.72	#750
Driveway SB left	D	44.8	0.27	62
Driveway SB right	В	10.3	0.32	39
Bridge Street/Washington Street	D	48.5		
Bridge EB thru thru	С	30.2	0.54	267
Bridge EB right	В	11.8	0.50	140
Bridge WB left	F	> 80.0	> 1.00	#459
Bridge WB thru thru	В	17.9	0.48	236
Washington NB left left	D	45.5	0.62	164
Washington NB right	D	36.9	0.67	278
	Unsigno	alized		
Federal Street/Washington Street				
Federal WB right	С	19.2	0.40	47
Washington NB left	В	10.4	0.04	3
Washington NB thru	А	0	0.35	0
Washington SB thru thru/right	A	0	0.29	0
Bridge Street/Ash Street				
Bridge EB thru thru/right	A	0	0.37	0
Bridge WB left	В	10.2	0.01	0
Bridge WB thru thru/right	A	0	0.45	0
Ash NB left/thru/right	В	10.5	0.01	0
Driveway SB right	В	14.8	0.09	8

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Grey Cell shading indicates that LOS has worsened from Existing Conditions.

Bridge Street Widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Table 6.No-Build Conditions (2016) Level of Service
without Bridge Street widening, P.M. peak hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)
	Signal	ized		
Bridge Street/Route 114 Ramps	С	24.7		
Bridge EB thru/right	D	36.3	0.92	#595
Bridge WB left	D	35.2	0.64	125
Bridge WB thru	В	13.7	0.73	250
114 NB left	D	39.6	0.61	96
114 NB right	В	13.1	0.40	95
Bridge Street/MBTA Driveway	A	8.1		
Bridge EB left	А	4.1	0.20	18
Bridge EB thru thru	А	3.3	0.33	89
Bridge WB thru thru/right	В	10.0	0.45	188
Driveway SB left	С	23.6	0.25	40
Driveway SB right	В	15.4	0.49	68
Bridge Street/Washington Street	E	76.8		
Bridge EB thru thru	С	34.8	0.65	273
Bridge EB right	В	14.9	0.43	116
Bridge WB left	F	> 80.0	> 1.00	#49
Bridge WB thru thru	С	20.1	0.54	318
Washington NB left left	F	14.5	1.09	#341
Washington NB right	С	32.2	0.61	212
	Unsigno	alized		
Federal Street/Washington Street				
Federal WB right	E	37.7	0.68	116
Washington NB left	А	9.4	0.03	2
Washington NB thru	А	0	0.48	0
Washington SB thru thru/right	А	0	0.25	0
Bridge Street/Ash Street				
Bridge EB thru thru/right	А	0	0.36	0
Bridge WB left	В	10.1	0.02	1
Bridge WB thru thru/right	А	0	0.51	0
Ash NB left/thru/right	F	58.5	0.11	9
Driveway SB right	С	15.2	0.07	6

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Grey Cell shading indicates that LOS has worsened from Existing Conditions.

Bridge Street Widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Table 7.No-Build Conditions (2016) Level of Service
with Bridge Street widening, A.M. peak hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)
	Signali	zed		
Bridge Street/Route 114 Ramps	В	14.3		
Bridge EB thru/right	В	12.6	0.52	287
Bridge WB left	D	52.2	0.58	134
Bridge WB thru	А	4.3	0.25	107
114 NB left	D	43.0	0.38	102
114 NB right	С	20.7	0.46	138
Bridge Street/MBTA Driveway	A	7.0		
Bridge EB left	В	10.6	0.59	12
Bridge EB thru thru	А	1.0	0.36	22
Bridge WB_thru thru/right	В	10.7	0.37	103
Driveway SB left	D	44.8	0.27	62
Driveway SB right	В	11.9	0.34	44
Bridge Street/Washington Street	С	29.0	—	—
Bridge EB thru thru	С	30.0	0.65	#267
Bridge EB right	А	9.2	0.57	61
Bridge WB left	E	63.5	0.88	#343
Bridge WB thru thru	В	16.1	0.47	218
Washington NB left left	D	52.4	0.75	#174
Washington NB right	С	28.5	0.59	241
	Unsigna	llized		
Federal Street/Washington Street				
Federal WB right	С	19.2	0.40	47
Washington NB left	В	10.4	0.04	3
Washington NB thru	А	0.0	0.35	0
Washington SB thru thru/right	А	0.0	0.29	0
Bridge Street/Ash Street				
Bridge EB thru thru/right	А	0.0	0.37	0
Bridge WB left	В	10.2	0.01	0
Bridge WB thru thru/right	А	0.0	0.45	0
Ash NB left/thru/right	В	10.4	0.01	0
Driveway SB right	В	14.8	0.09	8

 $# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Table 8.No-Build Conditions (2016) Level of Service
with Bridge Street widening, P.M. peak hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)
	Signali	zed		
Bridge Street/Route 114 Ramps	В	11.5	_	_
Bridge EB thru/right	В	13.2	0.52	156
Bridge WB left	С	24.8	0.63	65
Bridge WB thru	А	4.6	0.40	39
114 NB left	С	33.5	0.58	84
114 NB right	А	8.6	0.37	73
Bridge Street/MBTA Driveway	A	6.7	_	_
Bridge EB left	А	2.0	0.19	m4
Bridge EB thru thru	А	2.4	0.33	15
Bridge WB_thru thru/right	А	8.0	0.46	m220
Driveway SB left	С	23.6	0.25	40
Driveway SB right	В	14.3	0.48	65
Bridge Street/Washington Street	D	52.5	—	—
Bridge EB thru thru	D	54.4	0.91	286
Bridge EB right	В	20.0	0.57	111
Bridge WB left	F	>80.0	>1.00	#441
Bridge WB thru thru	С	22.5	0.57	335
Washington NB left left	F	>80.0	>1.00	#367
Washington NB right	С	25.7	0.49	203
	Unsigna	llized		
Federal Street/Washington Street	_	_	_	_
Federal WB right	E	37.7	0.68	116
Washington NB left	А	9.4	0.03	2
Washington NB thru	А	0.0	0.48	0
Washington SB thru thru/right	А	0.0	0.25	0
Bridge Street/Ash Street	—	_	—	—
Bridge EB thru thru/right	A	0.0	0.36	0
Bridge WB left	В	10.1	0.02	1
Bridge WB thru thru/right	A	0.0	0.51	0
Ash NB left/thru/right	F	>50.0	0.11	9
Driveway SB right	С	15.2	0.07	6

 $# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Year 2016 Build Traffic Conditions

For Build Conditions, the net new traffic activity associated with the Project is added to No-Build conditions.

Parking Activity

As shown in the site plan in **Figure 1**, the existing lot will be replaced with a multi-level garage containing 801 parking spaces. Approximately 650 spaces will be designated to commuter rail passengers and approximately 150 spaces designated for parkers associated with the J. Michael Ruane Judicial Center, located on nearby Bridge Street. In total, the new garage will provide an additional 310 on-site parking spaces for commuter rail riders.

It is anticipated that the increased parking capacity will be used by current rail passengers who are unable to find parking at the existing site and choose to 1) park elsewhere, 2) be dropped off, or 3) use some other travel mode to the station, such as walking or biking.

In 2001, the MBTA conducted a ridership survey of North Shore commuters, including passengers at Salem Station. The arrival mode share percentages observed in 2001 (average across all stations) were applied to the current Salem boardings of 2,010 daily passengers to estimate how current passengers are arriving at the Salem Station.

Table 9 shows the number of passengers estimated for each of four mode share groups (as described in the table) and the associated Project site parking demand for the existing lot and future garage. It is anticipated that the additional parking capacity will be used by passengers who currently kiss-and-ride or park elsewhere.

A reduction in the number of kiss-and-ride passengers reduces the number of daily vehicle trips because pick-up/drop-off activity generates twice as many trips, as compared to on-site parking activity. Providing more parking capacity for passengers who currently park elsewhere does not create new vehicle trips in the study area, but does increase the number of trips arriving at the Project site.

Currently, the on-site parking is filled by 8:00 A.M. on a typical weekday. It is possible that with the increased on-site parking capacity, passengers will have the flexibility of arriving later and still being able to find a parking space. If this occurs, it is possible that the number of commuters who take trains after 8:00 A.M. would increase. The MBTA will monitor ridership and evaluate the need for train schedule changes.

In addition to the 650 spaces reserved for MBTA passengers, 150 spaces will be designated for employees and/or visitors to the Ruane Judicial Center. The peak hours of traffic along Bridge Street and at the MBTA Driveway are 7:15-8:15 A.M. and 5:00-6:00 P.M. The Courthouse will be open 8:00 A.M. to 4:30 P.M., with specific courts starting at 8:00 or 8:30 A.M. The courts usually end by 4:30 P.M. During the A.M. peak hour, it has been assumed that about 30 courthouse related vehicles arrive and park in the garage. During the PM peak hour, it was assumed that 75 courthouse related vehicles will depart from the garage.

Passengers by Travel Mode					Vehicles Parked at Peak Accumulation		
Existing			Future			Existing MBTA Lot	Future MBTA Garage
Mode	Share	Passengers	Mode	Share	Passengers	Vehicles	Vehicles
Park at MBTA Lot	20%	408	Continue to park at MBTA Garage	20%	408	340	340
Kiss-and-Ride	14%	281	Continue to kiss-and-ride	10%	207	0	0
			Park at new MBTA Garage	4%	74	0	62
Park elsewhere	30%	603	Continue to park elsewhere	15%	306	0	0
			Park at new MBTA Garage	15%	297	0	248
Use other mode (walk, bus, bike)	36%	718	Continue to use other mode	36%	718	0	0
			Park at new MBTA Garage	0%	0	0	0
Total	100%	2,010	Total	100%	2,010	340	650

Table 9.Mode Share and Parking Demand at MBTA Salem Station

Mode share percentages are based on Project site observations and 2001 MBTA North Share Commuter Rail Survey, including an auto occupancy of 1.2 passengers per vehicle. Assumptions applied to current Salem Station Boston-bound boardings of 2,010 daily passengers.

Traffic Volumes

Based on the travel characteristics of the mode share groups presented in **Table 9**, the associated change in peak hour traffic volumes generated by the new garage was calculated. The larger capacity of the garage will allow more vehicles to park at the MBTA station itself. Some new parking trips will be generated by former kiss-and-ride passengers. A former kiss and ride passenger who switches to parking at the garage will cause a reduction in trip generation because 1) one less vehicle trip exits the site during the morning peak period and 2) one less trip enters the site during the evening peak period.

The cumulative effect on trip generation from the increased parking capacity and change in travel mode is reflected in the future Build traffic volumes shown in **Figure 8** and **Figure 9**, for the A.M. and P.M. peak hours, respectively.

Figure 8. Build Conditions (2016) Turning Movement Volumes, A.M. Peak Hour



Howard/Stein-Hudson Associates, Inc.

Figure 9. Build Conditions (2016) Turning Movement Volumes, P.M. Peak Hour



Operations without Bridge Street widening

Analysis results conducted for Build conditions without the Bridge Street widening project are shown in **Table 10** and **Table 11**. Under Build conditions, optimal signal timings have been programmed into the analysis to minimize overall delay.

With adjustments to signal timings, the overall Bridge Street/Route 114 ramps intersection would operate at LOS B during the A.M. and P.M peak hours. The eastbound Bridge Street approach would improve to LOS B during the A.M. peak hour and LOS C during the P.M peak. The left turns from both Bridge Street westbound and Route 114 ramp northbound would operate at LOS D.

With the increased peak hour traffic generated at the MBTA station site, the Bridge Street/MBTA Driveway would operate at LOS C during the A.M. peak hour and LOS B during the P.M. peak hour. The left turns from eastbound Bridge Street and the southbound Driveway would operate at LOS D during the A.M. peak hour.

With adjustment to the signal timings at the Bridge Street/Washington Street intersection, the overall operation could improve to LOS C during the A.M. peak hour and LOS D during the P.M. peak hour. The Bridge Street westbound left turns and Washington northbound left turns would continue to operate at LOS F.

At the unsignalized intersections, all approaches would continue to operate as under No-Build Conditions.

Operations with Bridge Street widening

With Bridge Street widening and optimal signal timing to minimize overall delay, the resulting level of service are shown in **Table 12** and **Table 13** and summarized below:

At the Bridge Street/Route 114 Ramps intersection, the overall impact from the Bridge Street widening would be minimal. Intersection operation would be at LOS B either with or without the Bridge Street widening, although three individual moves would have slightly lower delays during the A.M. peak hour.

While the Bridge Street widening project would allow the Bridge Street/MBTA Driveway intersection to operate at LOS B during the A.M. peak hour and LOS A during the P.M. peak hour, the operation is acceptable either with or without the widening.

Because the Bridge Street/Washington Street intersection is not directly affected by the Bridge Street widening project, the intersection operation would be the same as without the widening at LOS C during the A.M. peak hour and LOS D during the P.M. peak hour.

During either peak hour, operations at the two unsignalized intersections would not be affected by the Bridge Street widening project.

Table 10.Build Conditions (2016) Level of Service,
without Bridge Street widening, A.M. peak hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)			
Signalized							
Bridge Street/Route 114 Ramps	В	18.7					
Bridge EB thru/right	В	18.7	0.82	742			
Bridge WB left	D	37.5 0.53		m64			
Bridge WB thru	А	6.2 0.41		m155			
114 NB left	D	54.4 0.54		110			
114 NB right	С	27.5 0.69		208			
Bridge Street/MBTA Driveway	С	22.7					
Bridge EB left	D	41.4	0.81	211			
Bridge EB thru	А	5.7	0.75	198			
Bridge WB thru/right	С	32.3	0.95	#607			
Driveway SB left	D	42.6	0.13	37			
Driveway SB right	В	14.6	0.40	29			
Bridge Street/Washington Street	С	30.1					
Bridge EB thru thru	С	30.9	0.64	#278			
Bridge EB right	В	10.8	0.55	133			
Bridge WB left	Е	63.5	0.88	#343			
Bridge WB thru thru	В	16.5	0.49	233			
Washington NB left left	Е	61.0	0.86	#213			
Washington NB right	С	20.9	0.64	116			
Unsignalized							
Federal Street/Washington Street							
Federal WB right	С	21.5	0.44	54			
Washington NB left	В	10.3	0.04	3			
Washington NB thru	А	0.0	0.38	0			
Washington SB thru thru/right	А	0.0 0.28		0			
Bridge Street/Ash Street							
Bridge EB thru thru/right	А	0.0	0.37	0			
Bridge WB left	В	10.1 0.01		0			
Bridge WB thru thru/right	А	0.0	0.47	0			
Ash NB left/thru/right	В	10.4	0.01	0			
Driveway SB right	С	15.2	0.10	8			

 $# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

without Bridge Street widening, P.M. peak hour								
Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)				
Signalized								
Bridge Street/Route 114 Ramps	В	17.2						
Bridge EB thru/right	С	20.9	0.80	#368				
Bridge WB left	D	46.8 0.85		m#161				
Bridge WB thru	Α	4.5 0.71		33				
114 NB left	D	47.6	0.72	#98				
114 NB right	Α	7.9	0.37	67				
Bridge Street/MBTA Driveway	В	16.5						
Bridge EB left	Α	6.4	0.22	m12				
Bridge EB thru	В	13.8	0.84	m#503				
Bridge WB thru/right	С	20.1	0.81	m#606				
Driveway SB left	С	20.8	0.35	61				
Driveway SB right	В	14.0	0.65	77				
Bridge Street/Washington Street	D	51.3						
Bridge EB thru thru	E	55.9	0.95	#330				
Bridge EB right	С	20.7	0.63	144				
Bridge WB left	F	> 80.0	> 1.00	#441				
Bridge WB thru thru	С	22.5	0.56	334				
Washington NB left left	F	91.0	1.04	#363				
Washington NB right	В	16.2	0.53	106				
	Unsigno	llized						
Federal Street/Washington Street								
Federal WB right	E	37.3	0.68	115				
Washington NB left	A	9.6	0.03	2				
Washington NB thru	A	0.0	0.48	0				
Washington SB thru thru/right	А	0.0	0.26	0				
Bridge Street/Ash Street								
Bridge EB thru thru/right	A	0.0	0.37	0				
Bridge WB left	В	10.2	0.02	1				
Bridge WB thru thru/right	A	0.0	0.51	0				
Ash NB left/thru/right	F	62.2	0.11	9				
	-		-					

Build Conditions (2016) Level of Service, Table 11.

 $\# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

С

m = Volume for 95th percentile queue is metered by upstream signal.

Driveway SB right

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

15.1

0.07

6

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Table 12.Build Conditions (2016) Level of Service,
with Bridge Street widening, A.M. peak hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)			
Signalized							
Bridge Street/Route 114 Ramps	В	15.7					
Bridge EB thru/right	В	12.8 0.55		294			
Bridge WB left	D	44.1	0.51	109			
Bridge WB thru	А	5.5	0.25	127			
114 NB left	D	41.2 0.34		102			
114 NB right	С	29.6 0.64		230			
Bridge Street/MBTA Driveway	В	12.5					
Bridge EB left	С	23.2	0.76	146			
Bridge EB thru thru	А	1.1	0.34	55			
Bridge WB thru thru/right	В	19.8	0.54	123			
Driveway SB left	D	43.8	0.15	38			
Driveway SB right	A	4.6	0.15	18			
Bridge Street/Washington Street	С	30.8	—	—			
Bridge EB thru thru	С	30.7	30.7 0.64				
Bridge EB right	A	9.5	0.55	86			
Bridge WB left	E	63.5	0.88	#343			
Bridge WB thru thru	В	16.5	0.49	233			
Washington NB left left	E	61.0	0.86	#213			
Washington NB right	С	28.5	0.64	116			
	Unsigna	llized					
Federal Street/Washington Street							
Federal WB right	С	21.5	0.44	54			
Washington NB left	В	10.3	0.04	3			
Washington NB thru	А	0.0	0.38	0			
Washington SB thru thru/right	А	0.0	0.0 0.28				
Bridge Street/Ash Street	_	_	_	_			
Bridge EB thru thru/right	А	0.0	0.37	0			
Bridge WB left	В	10.1	0.01	0			
Bridge WB thru thru/right	А	0.0	0.47	0			
Ash NB left/thru/right	В	10.3	0.01	0			
Driveway SB right	С	15.2	0.10	8			

 $# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Intersection	LOS	Delay (seconds)	V/C Ratio	95 th percentile queue (feet)			
Signalized							
Bridge Street/Route 114 Ramps	В	12.4					
Bridge EB thru/right	В	14.0	0.55	155			
Bridge WB left	С	28.5	0.76	99			
Bridge WB thru	А	4.8	0.41	20			
114 NB left	С	33.5	0.58	84			
114 NB right	А	8.0	0.35	70			
Bridge Street/MBTA Driveway	A	9.4					
Bridge EB left	А	2.6	0.17	m7			
Bridge EB thru thru	А	3.8	0.37	112			
Bridge WB_thru thru/right	В	11.0	0.54	m225			
Driveway SB left	С	23.9	0.42	66			
Driveway SB right	В	14.9	0.56	100			
Bridge Street/Washington Street	D	52.9					
Bridge EB thru thru	E	58.9	0.95	#276			
Bridge EB right	С	21.1	0.63	129			
Bridge WB left	F	>80.0	>1.00	#441			
Bridge WB thru thru	С	22.5	0.56	334			
Washington NB left left	F	>80.0	>1.00	#363			
Washington NB right	С	25.7	0.49	203			
Unsignalized							
Federal Street/Washington Street							
Federal WB right	E	37.3	0.68	115			
Washington NB left	А	9.6	0.03	2			
Washington NB thru	А	0.0 0.48		0			
Washington SB thru thru/right	А	0.0	0.26	0			
Bridge Street/Ash Street							
Bridge EB thru thru/right	А	0.0	0.37	0			
Bridge WB left	В	10.2 0.02		1			
Bridge WB thru thru/right	А	0.0	0.51	0			
Ash NB left/thru/right	F	>50.0	0.11	9			
Driveway SB right	С	15.1	0.07	6			

Table 13.Build Conditions (2016) Level of Service,
with Bridge Street widening, P.M. peak hour

 $# = 95^{\text{th}}$ percentile volume exceeds capacity. Queue may be longer. Queue shown is maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by upstream signal.

When LOS F is reached, the associated measures lose sensitivity and indicate only that congested conditions exist. As such, the delays, v/c ratios, and queue lengths associated with LOS F should not be strictly interpreted.

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Transit

While the MBTA is constantly monitoring service plans and may alter the commuter rail schedule at Salem station in the future, no change in schedule is anticipated due to the new parking garage.

No bus routings changes are anticipated with the new garage. Buses serving the station will continue to have a bus-only zone and designated bus stops near the station platform.

Pedestrian and Bicycles

The basic pedestrian access routes will not change with the proposed facility, but additional amenities will be added to improve accessibility. Pedestrians destined to the trains and buses from the upper Washington Street level will no longer need to use the existing ramp system; instead they can enter the new garage on an upper from the Bridge Street/Washington Street intersection and use an elevator to reach the train platform and bus stops.

Increased use of bicycles can be encouraged by adding bicycle racks at the platform and providing cover over some or all racks.

Conclusion

A comparative summary of level of service for all conditions presented in this report is shown in **Table 14** and **Table 15** for the A.M. and P.M. peak hours, respectively. The results show that the new Salem commuter rail parking garage, which will allow more commuters to park on-site, will not significantly impact peak hour intersection operations in the study area. The results also show that the second phase of the Bridge Street widening project is not required for the study area intersections to operate acceptably under Year 2016 Build conditions. In summary:

- The intersection of Bridge Street/Route 144 ramps would operate acceptably at LOS B or better under Build conditions, with some individual approaches at LOS D.
- The intersection of Bridge Street/MBTA Driveway should be signalized in the future, as the Driveway currently operates at LOS F during both peak hours. With signalization, the intersection would operate acceptably at LOS C or better, with some individual approaches at LOS D.
- The intersection of Bridge Street/Washington Street would not be affected by the widening project and would operate with overall LOS C and LOS D, during the A.M. peak hour and P.M. peak hour, respectively. At this intersection, however, the westbound Bridge Street left turns and the northbound Washington Street left turns would operate at LOS E during the A.M. peak hour and LOS F during the P.M. peak hour under both No-Build and Build conditions.
- At the Federal Street/Washington Street intersection, the Washington Street moves would operate at LOS A or LOS B. The right turn from Federal Street would operate at LOS C and LOS E during the A.M. and P.M. peak hours, respectively, under either No-Build conditions or Build conditions.
- At the Bridge Street/Ash Street intersection, all vehicles would operate at LOS C or better during each peak hour, with the exception of northbound Ash Street approach during the P.M. peak hour, which only carries a few vehicles per hour.

	Evicting	Witl	hout	With			
	Existing	Bridge Street widening		Bridge Street widening			
Intersection		Year 2016	Year 2016	Year 2016	Year 2016		
		No-Build	Build	No-Build	Build		
	LOS	LOS	LOS	LOS	LOS		
Signalized							
Bridge Street/Route 114 Ramps	D	E	В	В	В		
Bridge EB thru/right	E	F	В	В	В		
Bridge WB left	С	С	D	D	D		
Bridge WB thru	А	А	А	А	А		
114 NB left	С	С	D	D	D		
114 NB right	В	В	С	С	С		
Bridge Street/MBTA Driveway		В	С	A	В		
Bridge EB left		В	D	D	С		
Bridge EB thru thru	unsignalized	В	A	A	A		
Bridge WB thru thru/right		В	С	С	В		
Driveway SB lett		D	D	D	D		
Driveway SB right	_	В	В	В	В		
Bridge Street/Washington Street	D	D	C	C	C		
Bridge EB thru thru							
Bridge EB right	В	B	Б	Б	A		
Bridge WB lell Bridge W/B thru thru	E E	R	E R	E	E		
Washington NB left left		В	F	F	E		
Washington NB right	D	D	L C	L C	C		
		signalized					
Enderal Street Washington Street							
Federal WR right	C	C	C	C	C		
				D D			
	D	D	D	D	Б ^		
Washington INB thru	A	A	A	A	A		
Pides Start (Ada Start	A	A	A	A	A		
Bridge EB thru thru/right	A	A	A	A	A		
Bridge WB left	В	В	В	В	В		
Bridge WB thru thru/right	A	A	A	A	A		
Ash NB lett/thru/right	В	В	В	В	В		
Driveway SB right	В	В	С	С	С		
Bridge Street/MBTA Driveway							
Bridge EB left	A						
Bridge EB thru	A		signo	alized			
Bridge WB thru/right	A						
Driveway SB left/right	F						

Table 14. Level of Service Summary, A.M. peak hour

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.
Table 15. Level of Service Summary, P.M. peak hour

	Existing	Wit	nout	With			
	LAISIII g	Bridge Stre	et widening	Bridge Stre	et widening		
Intersection		Year 2016 No-Build	Year 2016 Build	Year 2016 No-Build	Year 2016 Build		
	LOS	LOS	LOS	LOS	LOS		
	S	ignalized					
Bridge Street/Route 114 Ramps	В	С	В	В	В		
Bridge EB thru/right	E	D	С	В	В		
Bridge WB left	С	D	D	С	С		
Bridge WB thru	А	В	А	А	А		
114 NB left	С	D	D	С	С		
114 NB right	В	В	А	А	А		
Bridge Street/MBTA Driveway		A	В	A	A		
Bridge EB left		А	A	А	А		
Bridge EB thru thru	unsignalized	А	В	A	A		
Bridge WB_thru thru/right		В	С	А	В		
Driveway SB left		С	С	С	С		
Driveway SB right		В	В	В	В		
Bridge Street/Washington Street	E	E	D	D	D		
Bridge EB thru thru	С	С	E	D	E		
Bridge EB right	В	В	С	В	C		
Bridge WB lett	F	F	F	F	F		
Bridge WB thru thru	В	C	C	C	C		
Washington NB left left	D	F	F	F	F		
Washington NB right	D	C	В	C	C		
	Ur	signalized					
Federal Street/Washington Street							
Federal WB right	D	E	E	E	E		
Washington NB left	A	А	A	А	А		
Washington NB thru	А	А	А	А	А		
Washington SB thru thru/right	А	А	А	А	А		
Bridge Street/Ash Street							
Bridge EB thru thru/right	А	А	А	А	А		
Bridge WB left	А	В	В	В	В		
Bridge WB thru thru/right	А	А	А	А	А		
Ash NB left/thru/right	Е	F	F	F	F		
Driveway SB right	В	С	С	С	С		
Bridge Street/MBTA Driveway							
Bridge EB left	B						
Bridge FB thru	A		l	ı ılized	l		
Bridge WB thru/right	A		signe				
Driveway SB left/right	F						

Bridge Street widening refers to the second phase of the reconstruction project, between Flint Street and Washington Street.

Appendix A. Synchro Reports

Existing Conditions

Lane Group EBT EBR WBL WBT NBL NBR ø9
Lane Configurations
Ideal Flow (vphpl) 1900 1900 1900 1900 1900 1900
Lane Width (ft) 11 16 11 11 12 12
Storage Length (ft) 95 0 0 0
Storage Lanes 1 1 2 1
Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 4.0
Leading Detector (ft) 50 50 50 50 50 50
Trailing Detector (ft) $0 0 0 0 0 0 0$
Turning Speed (mph) $9 15 15 9$
Lane Util, Factor 0.95 1.00 1.00 0.95 0.97 1.00
Ert 0.850 0.850
Fit Protected 0.950 0.950
Satd Elow (prot) 3421 1794 1711 3421 3400 1568
Elt Permitted 0.950 0.950
Satd. Flow (perm) 3421 1794 1711 3421 3400 1568
Right Turn on Red Yes No
Satd Flow (RTOR) 281
Headway Factor 1.04 0.85 1.04 1.04 1.00 1.00
Link Speed (mph) 35 35 30
Link Distance (ff) 289 381 277
Travel Time (s) 5.6 7.4 6.3
Volume (vph) 581 338 279 695 317 285
Peak Hour Factor 0.90 0.85 0.92 0.82 0.93 0.83
Heavy Vehicles (%) 2% 2% 2% 2% 3% 3%
Adi Flow (vph) 646 398 303 848 341 343
Lane Group Flow (vph) 646 398 303 848 341 343
Turn Type Prot Prot pt+ov
Protected Phases 2 2 1 6 8 81 9
Permitted Phases
Detector Phases 2 2 1 6 8 81
Minimum Initial (s) 10.0 10.0 8.0 10.0 10.0 4.0
Minimum Split (s) 16.0 16.0 14.0 16.0 16.0 28.0
Total Split (s) 37.0 37.0 18.0 55.0 22.0 40.0 28.0
Total Split (%) 35.2% 35.2% 17.1% 52.4% 21.0% 38.1% 27%
Yellow Time (s) 4.0 4.0 4.0 4.0 2.0
All-Red Time (s) 2.0 2.0 2.0 2.0 1.0
Lead/Lag Lag Lag Lead
Lead-Lag Optimize? Yes Yes
Recall Mode C-Min C-Min None C-Min None None
Act Effct Green (s) 38.8 38.8 14.0 56.8 17.8 35.8
Actuated g/C Ratio 0.37 0.37 0.13 0.54 0.17 0.34
v/c Ratio 0.51 0.47 1.33 0.46 0.59 0.64
Control Delay 29.7 10.7 212.2 17.5 45.0 35.7
Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0
Total Delay 29.7 10.7 212.2 17.5 45.0 35.7
LOS C B F B D D
Approach Delay 22.4 68.8 40.3
Approach LOS C E D
Queue Length 50th (ft) 192 57 ~265 197 109 192

2011 Existing a.m.

\rightarrow \rightarrow \checkmark \leftarrow \checkmark \land

		-	-		-	-		
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Queue Length 95th (ft)	252	125	#435	222	157	261		
Internal Link Dist (ft)	209			301	197			
Turn Bay Length (ft)		95						
Base Capacity (vph)	1265	841	228	1852	583	526		
Starvation Cap Reductn	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0		
Reduced v/c Ratio	0.51	0.47	1.33	0.46	0.58	0.65		

In	Intersection Summary							
A	Area Type: Other							
C	Cycle Length: 105							
Actuated Cycle Length: 105								
0	Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green							
N	Natural Cycle: 90							
C	Control Type: Actuated-Coordinated							
Μ	Maximum v/c Ratio: 1.33							
In	Intersection Signal Delay: 45.2 Intersection LOS: D							
In	Intersection Capacity Utilization 50.6% ICU Level of Service A							
Aı	Analysis Period (min) 15							
~	 Volume exceeds capacity, queue is theoretically infinite. 							
	Queue shown is maximum after two cycles.							
#	# 95th percentile volume exceeds capacity, queue may be longer.							
	Queue shown is maximum after two cycles.							

Splits and Phases: 1: Bridge Street & Washington Street

e 1	★ ø2	₩ ø9	
18 s	37 s	28 s	
← ø6			★ ₽8
55 s			22 s

	-	\rightarrow	- 🖌	+	1	1
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ţ,		*	*	×	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	9	13	13	13
Storage Length (ft)	10	0	200	10	0	100
Storage Lanes		0	1		1	1
Total Lost Time (s)	4.0	4.0	4 0	40	40	4 0
Leading Detector (ft)	50	4.0	50	50	50	4 .0
Trailing Detector (ft)	0		0	0	0	0
Turning Speed (mph)	0	0	15	0	15	0
Long Litil Easter	1 00	1 00	1 00	1 00	1 00	1 00
	1.00	1.00	1.00	1.00	1.00	0.050
Ffl Fit Droto stori	0.983		0.050		0.050	0.850
	0000	<u>^</u>	0.950	1005	0.950	4050
Satd. Flow (prot)	2068	0	1533	1925	1811	1652
FIt Permitted			0.950		0.950	
Satd. Flow (perm)	2068	0	1533	1925	1811	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	11					31
Headway Factor	0.85	0.85	1.14	0.96	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	310	
Travel Time (s)	5.7			7.5	7.0	
Volume (vph)	833	96	100	587	81	211
Peak Hour Eactor	0.92	0.75	0.95	0.93	0.88	0.88
Heavy Vehicles (%)	2%	5%	6%	2%	3%	1%
Adi Flow (vph)	005	128	105	631	070 Q2	240
Lane Group Flow (vph)	1022	120	105	621	92	240
	1055	0	Drot	031	92	240
Proto start Disease	0		PIOL	0	0	ρι+ον
Protected Phases	2		1	6	8	18
Permitted Phases	-			-	-	
Detector Phases	2		1	6	8	18
Minimum Initial (s)	10.0		5.0	10.0	5.0	
Minimum Split (s)	28.0		10.0	16.0	11.0	
Total Split (s)	28.0	0.0	28.0	56.0	14.0	42.0
Total Split (%)	40.0%	0.0%	40.0%	80.0%	20.0%	60.0%
Yellow Time (s)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Ontimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effet Green (c)	26.9			10 2		22.0
Actuated a/C Datia	20.0		9.4	40.2	9.0	22.9
Actuated g/C Ratio	0.40		0.16	0.70	0.16	0.40
V/C Ratio	1.07		0.42	0.47	0.31	0.36
Control Delay	70.2		25.8	5.5	23.7	10.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	70.2		25.8	5.5	23.7	10.9
LOS	E		С	А	С	В
Approach Delay	70.2			8.4	14.5	
Approach LOS	E			А	В	
Queue Length 50th (ft)	~413		31	78	26	43

2011 Existing a.m.

	-	\rightarrow	¥	-	1	1
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 95th (ft)	#684		68	129	63	82
Internal Link Dist (ft)	214			303	230	
Turn Bay Length (ft)			200			100
Base Capacity (vph)	966		511	1443	313	880
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	1.07		0.21	0.44	0.29	0.27
Intersection Summary						
Area Type: C	Other					
Cycle Length: 70						
Actuated Cycle Length:	57.7					
Natural Cycle: 60						
Control Type: Actuated-	Uncoord	dinated				
Maximum v/c Ratio: 1.07	7					

Intersection LOS: D

ICU Level of Service C

Intersection Capacity Utilization 69.7% Analysis Period (min) 15

Intersection Signal Delay: 39.8

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp

f o1	→ ø2	
28 s	28 s	
← ø6		★ ₀8
56 s		14 s

Lanes, Volumes, Timings 3: Federal Street & Washington Street

	≯	-	\mathbf{i}	4	-	*	•	1	1	1	ţ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	ሻ	•			4 16	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.993	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1660	1518	1699	0	0	3419	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1660	1518	1699	0	0	3419	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	127	15	475	0	0	595	22
Confl. Peds. (#/hr)						30	163					163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.79	0.54	0.84	0.92	0.92	0.85	0.61
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%	7%	4%	2%	2%	5%	2%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	161	28	565	0	0	700	36
Lane Group Flow (vph)	0	0	0	0	0	161	28	565	0	0	736	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	44.0%		10	CU Leve	el of Sei	vice A					
Analysis Period (min) 15	Analysis Period (min) 15											

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

	≯	-	\mathbf{F}	4	+	*	•	†	1	1	ţ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		≜ î≽		1	t₽			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.997			0.999			0.865				0.865
Flt Protected				0.950								
Satd. Flow (prot)	0	3412	0	1745	3418	0	0	1589	0	0	0	1644
Flt Permitted				0.950								
Satd. Flow (perm)	0	3412	0	1745	3418	0	0	1589	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	854	12	1	954	2	0	0	2	0	0	20
Confl. Peds. (#/hr)			9	9		59						
Peak Hour Factor	0.67	0.94	0.69	0.25	0.87	0.50	0.92	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	2%	2%	0%	2%	2%	0%
Adj. Flow (vph)	0	909	17	4	1097	4	0	0	4	0	0	36
Lane Group Flow (vph)	0	926	0	4	1101	0	0	4	0	0	0	36
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	zed											
Intersection Capacity Uti	ilization	43.1%		ICU Level of Service A								

Analysis Period (min) 15

	≯	-	-	•	1	1	
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	↑	4		- Y		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	9	16	16	14	14	
Storage Length (ft)	60			0	0	0	
Storage Lanes	1			0	1	0	
Turning Speed (mph)	15			9	15	9	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor							
Frt			0.976		0.900		
Flt Protected	0.950				0.987		
Satd. Flow (prot)	1745	1676	2053	0	1723	0	
Flt Permitted	0.950				0.987		
Satd. Flow (perm)	1745	1676	2053	0	1723	0	
Headway Factor	1.04	1.14	0.85	0.85	0.92	0.92	
Link Speed (mph)		35	35		15		
Link Distance (ft)		383	323		369		
Travel Time (s)		7.5	6.3		16.8		
Volume (vph)	167	877	586	108	42	101	
Confl. Peds. (#/hr)	3			3	3	2	
Peak Hour Factor	0.63	0.85	0.88	0.74	0.91	0.76	
Heavy Vehicles (%)	0%	2%	2%	4%	0%	6%	
Adj. Flow (vph)	265	1032	666	146	46	133	
Lane Group Flow (vph)	265	1032	812	0	179	0	
Sign Control		Free	Free		Stop		
Intersection Summary							
Area Type: C	Other						
Control Type: Unsignalized	zed						
Intersection Capacity U	tilization	65.7%		[(CU Leve	el of Ser	vice C

Analysis Period (min) 15

	۶	-	$\mathbf{\hat{z}}$	4	+	×	1	1	۲	1	Ŧ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	٦	•			A⊅	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	127	15	475	0	0	595	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.79	0.54	0.84	0.92	0.92	0.85	0.61
Hourly flow rate (vph)	0	0	0	0	0	161	28	565	0	0	700	36
Pedestrians		163									30	
Lane Width (ft)		0.0									12.0	
Walking Speed (ft/s)		4.0									4.0	
Percent Blockage		0									2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											277	
pX, platoon unblocked												
vC, conflicting volume	1693	1502	531	971	1520	595	899			565		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1693	1502	531	971	1520	595	899			565		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.2			4.1		
tC, 2 stage (s)	0 5	1.0		0 -	1.0							
t⊢ (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	100	100	100	100	100	63	96			100		
cM capacity (veh/h)	36	116	493	201	113	438	721			1002		
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	161	28	565	467	269							
Volume Left	0	28	0	0	0							
Volume Right	161	0	0	0	36							
cSH	438	721	1700	1700	1700							
Volume to Capacity	0.37	0.04	0.33	0.27	0.16							
Queue Length 95th (ft)	41	3	0	0	0							
Control Delay (s)	17.9	10.2	0.0	0.0	0.0							
Lane LOS	С	В										
Approach Delay (s)	17.9	0.5		0.0								
Approach LOS	С											
Intersection Summary												
Average Delay			2.1									
Intersection Capacity U	tilization		44.0%	[(CU Leve	el of Ser	vice		А			
Analysis Period (min)			15									

	≯	-	\rightarrow	4	+	•	1	1	1	1	ŧ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		A		ሻ	≜ †}			4				7
Sign Control		Free			Free			Stop			Stop	i.
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	854	12	1	954	2	0	0	2	0	0	20
Peak Hour Factor	0.67	0.94	0.69	0.25	0.87	0.50	0.92	0.92	0.50	0.92	0.92	0.56
Hourly flow rate (vph)	0	909	17	4	1097	4	0	0	4	0	0	36
Pedestrians								9			59	
Lane Width (ft)								11.0			12.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								1			5	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		381										
pX, platoon unblocked				0.86			0.86	0.86	0.86	0.86	0.86	
vC, conflicting volume	1160			935			1482	2094	472	1624	2100	609
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1160			764			1400	2109	227	1564	2117	609
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	99	100	100	92
cM capacity (veh/h)	580			734			75	41	669	59	40	421
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	606	320	4	731	370	4	36					
Volume Left	0	0	4	0	0	0	0					
Volume Right	0	17	0	0	4	4	36					
cSH	1700	1700	734	1700	1700	669	421					
Volume to Capacity	0.36	0.19	0.01	0.43	0.22	0.01	0.08					
Queue Length 95th (ft)	0	0	0	0	0	0	7					
Control Delay (s)	0.0	0.0	9.9	0.0	0.0	10.4	14.3					
Lane LOS			A			В	В					
Approach Delay (s)	0.0		0.0			10.4	14.3					
Approach LOS						В	В					
Intersection Summary												
Average Delay			0.3									
Intersection Capacity Ut	ilization		43.1%	I	CU Leve	el of Sei	vice		А			
Analysis Period (min)			15									

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Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	7	↑	¢Î,		Y		
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	167	877	586	108	42	101	
Peak Hour Factor	0.63	0.85	0.88	0.74	0.91	0.76	
Hourly flow rate (vph)	265	1032	666	146	46	133	
Pedestrians		2	3		3		
Lane Width (ft)		10.0	16.0		14.0		
Walking Speed (ft/s)		4.0	4.0		4.0		
Percent Blockage		0	0		0		
Right turn flare (veh)							
Median type					None		
Median storage veh)							
Upstream signal (ft)		383	612				
pX, platoon unblocked	0.81				0.66	0.81	
vC, conflicting volume	815				2307	744	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	771				2541	684	
tC, single (s)	4.1				6.4	6.3	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.4	
p0 queue free %	61				0	63	
cM capacity (veh/h)	688				12	356	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1			
Volume Total	265	1032	812	179			
Volume Left	265	0	0	46			
Volume Right	0	0	146	133			
cSH	688	1700	1700	43			
Volume to Capacity	0.39	0.61	0.48	4.13			
Queue Length 95th (ft)	45	0	0	Err			
Control Delay (s)	13.5	0.0	0.0	Err			
Lane LOS	В			F			
Approach Delay (s)	2.8		0.0	Err			
Approach LOS				F			
Intersection Summary							
Average Delay			784.1				
Intersection Capacity Uti	ilization		65.7%	10	CU Leve	el of Service	е
Analysis Period (min)			15				

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Lane Configurations	**	1	ሻ	**	ካካ	1		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (ft)	0	0	0	0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00		
Frt		0.850				0.850		
Flt Protected			0.950		0.950			
Satd. Flow (prot)	3455	1830	1745	3490	3433	1568		
Flt Permitted			0.950		0.950			
Satd. Flow (perm)	3455	1830	1745	3490	3433	1568		
Right Turn on Red		Yes				No		
Satd. Flow (RTOR)		189						
Headway Factor	1.04	0.85	1.04	1.04	1.00	1.00		
Link Speed (mph)	35			35	30			
Link Distance (ft)	289			381	277			
Travel Time (s)	5.6			7.4	6.3			
Volume (vph)	581	241	309	855	558	242		
Peak Hour Factor	0.80	0.79	0.80	0.91	0.82	0.72		
Heavy Vehicles (%)	1%	0%	0%	0%	2%	3%		
Adj. Flow (vph)	726	305	386	940	680	336		
Lane Group Flow (vph)	726	305	386	940	680	336		
Turn Type		Prot	Prot			pt+ov		
Protected Phases	2	2	1	6	8	81	9	
Permitted Phases								
Detector Phases	2	2	1	6	8	8 1		
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0		4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0		28.0	
Total Split (s)	36.0	36.0	19.0	55.0	22.0	41.0	28.0	
Total Split (%)	34.3%	34.3%	18.1%	52.4%	21.0%	39.0%	27%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Act Effct Green (s)	37.6	37.6	15.0	56.6	18.0	37.0		
Actuated g/C Ratio	0.36	0.36	0.14	0.54	0.17	0.35		
v/c Ratio	0.59	0.39	1.55	0.50	1.15	0.61		
Control Delay	31.9	12.6	299.0	18.2	127.5	33.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	31.9	12.6	299.0	18.2	127.5	33.7		
LOS	С	В	F	В	F	С		
Approach Delay	26.2			99.9	96.5			
Approach LOS	С			F	F			
Queue Length 50th (ft)	225	58	~367	225	~278	184		

2011 Existing p.m.

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EBT	EBR	WBL	WBT	NBL	NBR	ø9				
250	98	#471	286	#339	208					
209			301	197						
	95									
1237	777	249	1881	589	553					
0	0	0	0	0	0					
0	0	0	0	0	0					
0	0	0	0	0	0					
0.59	0.39	1.55	0.50	1.15	0.61					
	EBT 250 209 1237 1237 0 0 0 0 0.59	EBT EBR 250 98 209 95 1237 777 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	EBT EBR WBL 250 98 #471 209 95 1237 1237 777 249 0 0 0 0 0 0 0 0 0 0 0 10 0 0 10 0 0 10 0 0 155	EBT EBR WBL WBT 250 98 #471 286 209 - - 301 95 - - 301 1237 777 249 1881 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	EBTEBRWBLWBTNBL25098#471286#3392093011979518711237777249188158900000000000000000001.150.590.391.550.501.15	EBTEBRWBLWBTNBLNBR25098#471286#339208209	EBT EBR WBL WBT NBL NBR Ø9 250 98 #471 286 #339 208 209 301 197 197 197 95 301 197 1237 777 249 1881 589 553 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.59 0.39 1.55 0.50 1.15 0.61 1	EBT EBR WBL WBT NBL NBR Ø9 250 98 #471 286 #339 208 209 301 197 197 95 301 197 1237 777 249 1881 589 553 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.59 0.39 1.55 0.50 1.15	EBT EBR WBL WBT NBL NBR Ø9 250 98 #471 286 #339 208 209 301 197 301 197 95 95 553 301 301 1237 777 249 1881 589 553 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.59 0.39 1.55 0.50 1.15 0.61	EBT EBR WBL WBT NBL NBR Ø9 250 98 #471 286 #339 208 209 301 197 95 1237 777 249 1881 589 553 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.59 0.39 1.55 0.50 1.15 0.61

In	rsection Summary
Ar	a Type: Other
Cy	e Length: 105
Ac	uated Cycle Length: 105
O	set: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Na	ural Cycle: 110
Co	ntrol Type: Actuated-Coordinated
M	kimum v/c Ratio: 1.55
In	rsection Signal Delay: 76.3 Intersection LOS: E
In	rsection Capacity Utilization 59.1% ICU Level of Service B
Ar	alysis Period (min) 15
~	Volume exceeds capacity, queue is theoretically infinite.
	Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer.
	Queue shown is maximum after two cycles.

Splits and Phases: 1: Bridge Street & Washington Street

* 01	➡ ø2	≸ ∰ ø9	
19 s	36 s	28 s	
← ø6			◆ ₀8
55 s			22 s

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1	2011	K	*	*	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	9	13	13	13
Storage Length (ft)	10	0	200	10	0	100
Storage Lanes		0	1		1	1
Total Lost Time (s)	40	4 0	4 0	40	4 0	4 0
Leading Detector (ft)	50	4.0	50	50	50	50
Trailing Detector (ft)	0		0	0	0	0
Turning Speed (mph)	0	0	15	0	15	0
Long Litil Easter	1 00	1 00	1 00	1 00	1 00	1 00
Ded Pike Factor	1.00	1.00	1.00	1.00	1.00	1.00
	0.095		1.00			0.050
FIL FIL Drotostad	0.900		0.050		0.050	0.000
Fil Prolected	0440	0	0.950	4000	0.950	4050
Sala. Flow (prot)	2116	0	1593	1963	0.050	1652
	0440	-	0.950	1000	0.950	4050
Satd. Flow (perm)	2116	0	1591	1963	1865	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	10					68
Headway Factor	0.85	0.85	1.14	0.96	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	617	62	166	789	111	222
Confl. Peds. (#/hr)		2	2			2
Peak Hour Factor	0.87	0.70	0.87	0.83	0.74	0.86
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%
Adi, Flow (vph)	709	89	191	951	150	258
Lane Group Flow (vph)	798	0	191	951	150	258
Turn Type		•	Prot			nt+ov
Protected Phases	2		1	6	8	1.8
Permitted Phases	2			U	0	10
Detector Phases	2		1	6	g	1 8
Minimum Initial (c)	10.0		5.0	10.0	5.0	10
Minimum Split (c)	20.0		10.0	16.0	11.0	
	20.0	0.0	10.0	10.0	11.0	40.0
Total Split (S)	28.0	0.0	28.0	56.0	14.0	42.0
Total Split (%)	40.0%	0.0%	40.0%	80.0%	20.0%	60.0%
Yellow Time (s)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	24.5		12.0	40.6	9.2	25.3
Actuated g/C Ratio	0.42		0.21	0.70	0.16	0.44
v/c Ratio	0.89		0.58	0.69	0.50	0.34
Control Delay	31.6		27.9	8.3	30.0	8.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	31.6		27 9	8.3	30.0	8.8
	C 1.0		21.5	٥.0	00.0	Δ
Annroach Delay	31.6		0	11.6	16.6	A
Approach Delay	31.0			0.11	10.0	

2011 Existing p.m.

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Approach LOS	С			В	В	
Queue Length 50th (ft)	247		60	154	48	39
Queue Length 95th (ft)	#500		112	209	86	77
Internal Link Dist (ft)	214			303	218	
Turn Bay Length (ft)			200			100
Base Capacity (vph)	901		550	1474	320	924
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.89		0.35	0.65	0.47	0.28
Intersection Summary						

Area Type:	Other								
Cycle Length: 70									
Actuated Cycle L	ength: 57.9								
Natural Cycle: 55	5								
Control Type: Ac	tuated-Uncoordinate	ed							
Maximum v/c Ratio: 0.89									
Intersection Sign	al Delay: 19.3	Intersection LOS: B							
Intersection Capa	acity Utilization 62.1	% ICU Level of Service	В						
Analysis Period (min) 15								
# 95th percenti	le volume exceeds o	capacity, queue may be longer.							
Queue shown	is maximum after tv	vo cycles.							

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp

f o1	→ ø2	
28 s	28 s	
← ø6		* ≁ ₀8
56 s		14 s

Lanes, Volumes, Timings 3: Federal Street & Washington Street

	≯	-	\mathbf{i}	4	-	*	1	1	1	1	ţ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	ሻ	•			4 16	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.999	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	142	15	658	0	0	549	1
Confl. Peds. (#/hr)						4	92					92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.70	0.67	0.84	0.92	0.92	0.90	0.25
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	2%	2%	2%	1%	0%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	203	22	783	0	0	610	4
Lane Group Flow (vph)	0	0	0	0	0	203	22	783	0	0	614	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											_
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	51.0%		10	CU Leve	el of Se	rvice A					
Analysis Period (min) 15	i											

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		≜ î≽		ሻ	A			4				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.998			0.999			0.966				0.865
Flt Protected				0.950				0.964				
Satd. Flow (prot)	0	3449	0	1745	3486	0	0	1710	0	0	0	1644
Flt Permitted				0.950				0.964				
Satd. Flow (perm)	0	3449	0	1745	3486	0	0	1710	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	817	6	3	1147	3	2	0	1	0	0	15
Confl. Peds. (#/hr)			23	23		35						
Peak Hour Factor	0.25	0.94	0.69	0.25	0.93	0.42	0.33	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	869	9	12	1233	7	6	0	2	0	0	27
Lane Group Flow (vph)	0	878	0	12	1240	0	0	8	0	0	0	27
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	zed											
Intersection Capacity Uti	ilization	48.5%]	CU Leve	el of Ser	vice A					

Analysis Period (min) 15

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	ሻ	↑	4		- Y		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	9	16	16	14	14	
Storage Length (ft)	60			0	0	0	
Storage Lanes	1			0	1	0	
Turning Speed (mph)	15			9	15	9	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor							
Frt			0.991		0.896		
Flt Protected	0.950				0.989		
Satd. Flow (prot)	1745	1710	2119	0	1769	0	
Flt Permitted	0.950				0.989		
Satd. Flow (perm)	1745	1710	2119	0	1769	0	
Headway Factor	1.04	1.14	0.85	0.85	0.92	0.92	
Link Speed (mph)		35	35		15		
Link Distance (ft)		383	323		369		
Travel Time (s)		7.5	6.3		16.8		
Volume (vph)	66	773	773	52	49	182	
Confl. Peds. (#/hr)	3			3	1		
Peak Hour Factor	0.87	0.88	0.92	0.90	0.72	0.80	
Heavy Vehicles (%)	0%	0%	0%	11%	0%	2%	
Adj. Flow (vph)	/6	8/8	840	58	68	228	
Lane Group Flow (vph)	76	878	898	0	296	0	
Sign Control		Free	Free		Stop		
Intersection Summary							
Area Type: C	Other						
Control Type: Unsignalia	zed						
Intersection Capacity U	tilization	71.4%		10	CU Leve	el of Ser	vice C

Analysis Period (min) 15

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	ሻ	•			≜ ⊅	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	0	0	142	15	658	0	0	549	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.70	0.67	0.84	0.92	0.92	0.90	0.25
Hourly flow rate (vph)	0	0	0	0	0	203	22	783	0	0	610	4
Pedestrians		92									4	
Lane Width (ft)		0.0									12.0	
Walking Speed (ft/s)		4.0									4.0	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											277	
pX, platoon unblocked												
vC, conflicting volume	1739	1532	399	1133	1534	787	706			783		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1739	1532	399	1133	1534	787	706			783		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	100	100	100	100	100	39	97			100		
cM capacity (veh/h)	21	113	601	155	112	333	862			831		
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2							
Volume Total	203	22	783	407	207							
Volume Left	0	22	0	0	0							
Volume Right	203	0	0	0	4							
cSH	333	862	1700	1700	1700							
Volume to Capacity	0.61	0.03	0.46	0.24	0.12							
Queue Length 95th (ft)	95	2	0	0	0							
Control Delay (s)	31.3	9.3	0.0	0.0	0.0							
Lane LOS	D	А										
Approach Delay (s)	31.3	0.3		0.0								
Approach LOS	D											
Intersection Summary												
Average Delay			4.0									
Intersection Capacity U	tilization		51.0%	[(CU Leve	el of Ser	vice		А			
Analysis Period (min)			15									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		- † 14		ሻ	∱ î≽			4				7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	817	6	3	1147	3	2	0	1	0	0	15
Peak Hour Factor	0.25	0.94	0.69	0.25	0.93	0.42	0.33	0.92	0.50	0.92	0.92	0.56
Hourly flow rate (vph)	0	869	9	12	1233	7	6	0	2	0	0	27
Pedestrians								23			35	
Lane Width (ft)								11.0			12.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								2			3	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		381										
pX, platoon unblocked				0.85			0.85	0.85	0.85	0.85	0.85	
vC, conflicting volume	1275			901			1537	2196	462	1732	2197	655
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1275			704			1454	2231	187	1685	2232	655
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			91	100	100	100	100	93
cM capacity (veh/h)	535			752			69	35	692	49	34	401
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	579	298	12	822	418	8	27					
Volume Left	0	0	12	0	0	6	0					
Volume Right	0	9	0	0	7	2	27					
cSH	1700	1700	752	1700	1700	89	401					
Volume to Capacity	0.34	0.18	0.02	0.48	0.25	0.09	0.07					
Queue Length 95th (ft)	0	0	1	0	0	7	5					
Control Delay (s)	0.0	0.0	9.9	0.0	0.0	49.6	14.6					
Lane LOS			Α			E	В					
Approach Delay (s)	0.0		0.1			49.6	14.6					
Approach LOS						E	В					
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Ut	ilization		48.5%	l	CU Leve	el of Ser	vice		А			
Analysis Period (min)			15									

	۶	-	+	•	1	4	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	↑	¢Î,		Y		
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	66	773	773	52	49	182	
Peak Hour Factor	0.87	0.88	0.92	0.90	0.72	0.80	
Hourly flow rate (vph)	76	878	840	58	68	228	
Pedestrians			1		3		
Lane Width (ft)			16.0		14.0		
Walking Speed (ft/s)			4.0		4.0		
Percent Blockage			0		0		
Right turn flare (veh)							
Median type					None		
Median storage veh)							
Upstream signal (ft)		383	612				
pX, platoon unblocked	0.81				0.73	0.81	
vC, conflicting volume	901				1903	872	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	878				1849	843	
tC, single (s)	4.1				6.4	6.2	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	88				0	23	
cM capacity (veh/h)	631				53	295	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1			
Volume Total	76	878	898	296			
Volume Left	76	0	0	68			
Volume Right	0	0	58	228			
cSH	631	1700	1700	144			
Volume to Capacity	0.12	0.52	0.53	2.05			
Queue Length 95th (ft)	10	0	0	590			
Control Delay (s)	11.5	0.0	0.0	546.6			
Lane LOS	В			F			
Approach Delay (s)	0.9		0.0	546.6			
Approach LOS				F			
Intersection Summary							
Average Delay			75.6				
Intersection Capacity Ut	ilization		71.4%	l.	CU Leve	el of Servic	e
Analysis Period (min)			15				

Year 2016 No-Build, No Bridge Street widening

	-	\mathbf{r}	-	+	1	1		
Lane Group	FBT	FBR	WBI	WBT	NBI	NBR	ø9	
Lane Configurations	**	1	K	**	**	*		-
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	10	4.0	4.0	10	4.0	10		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (ft)	0	0	0	0	0	0		
Turning Speed (mph)	0	Q	15	0	15	Q		
Lane Litil Eactor	0.95	1 00	1 00	0.95	0.97	1 00		
Earle Otil. 1 actor	0.00	0.850	1.00	0.00	0.07	0.850		
Flt Protected		0.000	0.950		0 950	0.000		
Satd Flow (prot)	3421	1794	1711	3421	3400	1568		
Flt Permitted	J+2 I	1734	0.950	J+2 I	0 950	1000		
Satd Flow (perm)	3/01	170/	1711	3/01	3/00	1569		
Right Turn on Pod	J4Z I	V00	1711	J4Z I	5400	No		
Satd Flow (PTOP)		201				INU		
Headway Easter	1.04	201	1.04	1.04	1.00	1.00		
Link Speed (mph)	1.04	0.05	1.04	1.04	1.00	1.00		
Link Opeeu (IIIpII)	610			201	277			
Travel Time (a)	11.0			301	6.2			
Volume (vinh)	611	255	202	7.4	0.0	200		
Pook Hour Factor	0.00	0.95	293	0.02	0.02	0.02		
	0.90	0.00	0.92	0.02	0.93	0.00		
Adi Elow (upb)	270	270	270	270	370	370		
Auj. Flow (Vpfi)	670	410	310	091	300	301		
Lane Group Flow (Vph)	679	418 Drot	318	891	358	301		
Turn Type	0	Prot	Prot	0	0	pt+ov	0	
Protected Phases	2	2	1	6	8	81	9	
Permitted Phases	0	0	4	0	0	0.4		
Detector Phases	2	2	1	6	8	81	4.0	
IVIINIMUM INITIAL (S)	10.0	10.0	8.0	10.0	10.0		4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0	40.0	28.0	
Total Split (s)	37.0	37.0	18.0	55.0	22.0	40.0	28.0	
Total Split (%)	35.2%	35.2%	17.1%	52.4%	21.0%	38.1%	27%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Act Effct Green (s)	38.7	38.7	14.0	56.7	17.9	35.9		
Actuated g/C Ratio	0.37	0.37	0.13	0.54	0.17	0.34		
v/c Ratio	0.54	0.50	1.39	0.48	0.62	0.67		
Control Delay	30.2	11.8	237.9	17.9	45.5	36.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	30.2	11.8	237.9	17.9	45.5	36.9		
LOS	С	В	F	В	D	D		
Approach Delay	23.2			75.8	41.2			
Approach LOS	С			E	D			
Queue Length 50th (ft)	204	68	~286	211	115	205		

2016 No Build a.m. - No widening

EBT	EBR	WBL	WBT	NBL	NBR	ø9				
267	140	#459	236	164	278					
532			301	197						
	95									
1259	838	228	1846	583	526					
0	0	0	0	0	0					
0	0	0	0	0	0					
0	0	0	0	0	0					
0.54	0.50	1.39	0.48	0.61	0.69					
	EBT 267 532 1259 0 0 0 0 0.54	EBT EBR 267 140 532 95 1259 838 0 0 0 0 0 0 0 0 0.534 0.50	EBT EBR WBL 267 140 #459 532 95 1259 838 228 0 0 0 0 0 0 0 0 0 0 0 10 0 0 139	EBTEBRWBLWBT267140#4592365323019518461259838228184600.000000000000000.540.501.390.48	EBTEBRWBLWBTNBL267140#459236164532301197951846583125983822818465830000000000000000000.540.501.390.480.61	EBTEBRWBLWBTNBLNBR267140#4592361642785323011979510712598382281846583526000000000000000000001390.480.610.69	EBTEBRWBLWBTNBLNBRØ9267140#45923616427853230119719795125983822818465835260000000000000000000000000000000.540.501.390.480.610.69	EBTEBRWBLWBTNBLNBRØ9267140#4592361642785323011977959512598382281846583526000000000000000000000000000000.540.501.390.480.610.69	EBTEBRWBLWBTNBLNBRØ9267140#459236164278532301197959595526125983822818465835260000000000000000000000000.540.501.390.480.610.69	EBT EBR WBL WBT NBL NBR Ø9 267 140 #459 236 164 278 532 301 197 - - 95 301 197 - 1259 838 228 1846 583 526 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.54 0.50 1.39 0.48 0.61 0.69

Intersection Summary Area Type: Other Cycle Length: 105 Actuated Cycle Length: 105 Offset: 1 (1%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 90 Control Type: Actuated-Coordinated Maximum v/c Ratio: 1.39 Intersection Signal Delay: 48.5 Intersection LOS: D Intersection Capacity Utilization 52.6% ICU Level of Service A Analysis Period (min) 15 ~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles. # 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

Splits and Phases: 1: Bridge Street & Washington Street

e 1	➡ ø2	#1 ø9	
18 s 🛛 👘	37 s	28 s	
← ø6			↓ _{Ø8}
55 s			22 s

	-	\mathbf{i}	-	-	-	1
Lane Group	EBT	EBR	WBI	WBT	NBI	NBR
Lane Configurations	1	2011	*		*	#
Ideal Flow (vnhnl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	10	11	13	13
Storage Length (ft)		0	0		0	100
Storage Lanes		0	1		1	100
Total Lost Time (s)	10	10	4.0	10	10	10
Leading Detector (ft)	50	4.0	50	50	50	50
Trailing Detector (ft)	0		0	0	0	0
Turning Speed (mph)	0	0	15	0	15	0
Lano I Itil Easter	1.00	9	1.00	1.00	100	1.00
	0.002	1.00	1.00	1.00	1.00	0.050
FIL Filt Drasta ata al	0.983		0.050		0.050	0.850
	4704	-	0.950	1004	0.950	4050
Satd. Flow (prot)	1764	U	1589	1801	1811	1652
Fit Permitted	4	_	0.950	100	0.950	10-5
Satd. Flow (perm)	1764	0	1589	1801	1811	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	11					25
Headway Factor	1.04	1.04	1.09	1.04	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	876	101	105	617	85	222
Peak Hour Factor	0.92	0.75	0.95	0.93	0.88	0.88
Heavy Vehicles (%)	2%	5%	6%	2%	3%	1%
Adj. Flow (vph)	952	135	111	663	97	252
Lane Group Flow (vph)	1087	0	111	663	97	252
Turn Type			Prot			pt+ov
Protected Phases	2		1	6	8	1.8
Permitted Phases	-		•	Ŭ	Ŭ	10
Detector Phases	2		1	6	8	18
Minimum Initial (s)	10.0		5.0	10.0	8.0	10
Minimum Split (s)	28.0		10.0	16.0	14.0	
Tatal Split (a)	20.0	0.0	29.0	TO.0	14.0	42.0
	20.0	0.0	20.U	0.00	14.0	42.0
	40.0%	0.0%	40.0%	80.0%	20.0%	60.0%
reliow Time (s)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Recall Mode	C-Min		None	C-Min	None	
Act Effct Green (s)	38.2		9.8	52.0	10.0	23.8
Actuated g/C Ratio	0.55		0.14	0.74	0.14	0.34
v/c Ratio	1.12		0.50	0.50	0.37	0.44
Control Delay	88.9		34.9	5.2	31.9	18.0
Queue Delav	19.2		0.0	1.1	0.0	0.0
Total Delav	108.1		34.9	6.3	31.9	18.1
LOS	F		C	Α	C	B
Approach Delay	108 1		0	10.4	21 9	
Annroach LOS	F			R	21.0	
Oueue Length 50th (ft)	~553		15	22	28	7/
Queue Length SUth (II)	~553		45	88	38	74

2016 No Build a.m. - No widening

Lane GroupEBTEBRWBLWBTNBLNBRQueue Length 95th (ft)#8298514178117Internal Link Dist (ft)214303218
Queue Length 95th (ft) #829 85 141 78 117 Internal Link Dist (ft) 214 303 218
Internal Link Dist (ft) 214 303 218
Turn Bay Length (ft) 100
Base Capacity (vph) 968 545 1338 259 908
Starvation Cap Reductn 0 0 423 0 0
Spillback Cap Reductn 37 0 0 0 24
Storage Cap Reductn 0 0 0 0 0
Reduced v/c Ratio 1.17 0.20 0.72 0.37 0.29
Intersection Summary
Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 14 (20%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum V/C Ratio: 1.12
Intersection Signal Delay: 60.3 Intersection LOS: E
Analyzia Daried (min) 15
Analysis Fellou (IIIII) 15 Analysis Fellou (IIIII) 15 Analysis Fellou (IIIII) 15
Ouque shown is maximum after two cycles
95th percentile volume exceeds capacity queue may be longer
Queue shown is maximum after two cycles.

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp

√? ∅1	→ ø2	
28 s	28 s	
← ø6		★ ₀8
56 s		14 s

Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	†			A	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.993	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1660	1518	1699	0	0	3419	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1660	1518	1699	0	0	3419	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	133	16	500	0	0	625	23
Confl. Peds. (#/hr)						30	163					163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.79	0.54	0.84	0.92	0.92	0.85	0.61
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%	7%	4%	2%	2%	5%	2%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	168	30	595	0	0	735	38
Lane Group Flow (vph)	0	0	0	0	0	168	30	595	0	0	773	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	45.4%		10	CU Lev	el of Se	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		† 15		ሻ	≜ †}			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.997			0.999			0.865				0.865
Flt Protected				0.950								
Satd. Flow (prot)	0	3412	0	1745	3418	0	0	1589	0	0	0	1644
FIt Permitted				0.950								
Satd. Flow (perm)	0	3412	0	1745	3418	0	0	1589	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	898	13	1	1003	2	0	0	2	0	0	21
Confl. Peds. (#/hr)			9	9		59						
Peak Hour Factor	0.67	0.94	0.69	0.25	0.87	0.50	0.92	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	2%	2%	0%	2%	2%	0%
Adj. Flow (vph)	0	955	19	4	1153	4	0	0	4	0	0	38
Lane Group Flow (vph)	0	974	0	4	1157	0	0	4	0	0	0	38
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	zed											
Intersection Capacity Uti	44.5%		l.	CU Leve	el of Ser	vice A						

Analysis Period (min) 15

$\mathcal{F} \rightarrow \mathcal{F} \leftarrow \mathcal{F} \checkmark$

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	×	٨	ţ,		*	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	7.0	50	50
Trailing Detector (ft)	0	0	0		0	0
Turning Speed (mph)	15	0	0	0	15	0
Lane Litil Easter	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	0.00	1.00	1.00	1.00
Ped Bike Factor			0.99		0.99	0.98
	0.050		0.976		0.050	0.850
Fit Protected	0.950	1000			0.950	
Satd. Flow (prot)	1685	1801	1801	0	1805	1524
Flt Permitted	0.095				0.950	
Satd. Flow (perm)	168	1801	1801	0	1793	1498
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			13			92
Headway Factor	1.09	1.04	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	612		369	
Travel Time (s)		7.5	11.9		16.8	
Volume (vph)	176	922	616	114	44	106
Confl Peds (#/br)	2	522	010	2	2	2
Peak Hour Easter	0.62	0.95	0 99	0.74	0.01	0.76
	0.03	0.00	0.00	0.74	0.91	0.70
	0%	2%	2%	4%	0%	0%
Auj. Flow (vpn)	2/9	1085	700	154	48	139
Lane Group Flow (vph)	279	1085	854	0	48	139
Turn Type	pm+pt					pm+ov
Protected Phases	3	8	4		6	3
Permitted Phases	8					6
Detector Phases	3	8	4		6	3
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	10.0	22.0	22.0		22.0	10.0
Total Split (s)	31.0	73.0	42.0	0.0	27.0	31.0
Total Split (%)	31.0%	73.0%	42.0%	0.0%	27.0%	31.0%
Yellow Time (s)	4.0	4.0	4.0	,0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
	L ead	2.0	1 20		2.0	L ead
Load Lag Optimizo?	Vac		Vac			Vac
	Nerres	Mana	C May		Maria	Nerres
	NORE	INONE			NONE	None
Act Effect Green (s)	86.9	88.5	65.2		9.9	24.4
Actuated g/C Ratio	0.87	0.88	0.65		0.10	0.24
v/c Ratio	0.67	0.68	0.72		0.27	0.32
Control Delay	24.2	6.4	20.0		44.8	10.3
Queue Delay	0.0	2.4	0.1		0.0	0.0
Total Delay	24.2	8.7	20.1		44.8	10.3
LOS	С	А	С		D	В
Approach Delay		11.9	20.1		19.2	
Approach LOS		В	С		В	
Queue Length 50th (ft)	89	226	356		29	22

2016 No Build a.m. - No widening

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Queue Length 95th (ft)	83	364	#750		62	39	
Internal Link Dist (ft)		303	532		289		
Turn Bay Length (ft)							
Base Capacity (vph)	556	1594	1179		415	573	
Starvation Cap Reductn	4	363	0		0	0	
Spillback Cap Reductn	0	0	15		0	3	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.51	0.88	0.73		0.12	0.24	

Intersection Summary							
Area Type: Other							
Cycle Length: 100							
Actuated Cycle Length: 100							
Offset: 24 (24%), Referenced to phase 4:WBT, Sta	rt of Green						
Natural Cycle: 90							
Control Type: Actuated-Coordinated							
Maximum v/c Ratio: 0.72							
Intersection Signal Delay: 15.4	Intersection LOS: B						
Intersection Capacity Utilization 63.0%	ICU Level of Service B						
Analysis Period (min) 15							
# 95th percentile volume exceeds capacity, queue may be longer.							
Queue shown is maximum after two cycles							

snown is maximum after two

Splits and Phases: 5: Bridge Street & MBTA Driveway



Lane Group EBT EBR WBL WBT NBL NBR a9 Lane Configurations ++ +		-	\rightarrow	- 🖌	+	1	1		
Lane Configurations ↑↑ ↓↑	Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Ideal Flow (vphp) 1900 1900 1900 1900 1900 Lane Width (R) 11 16 11 11 12 12 Storage Lanes 1 1 2 1 1000 1000 Storage Lanes 1 1 2 1 1000 1000 1000 Total Lost Time (s) 4.0	Lane Configurations	**	1	5	**	ካካ	1		
Lane Width (ft) 11 11 12 12 12 Storage Length (ft) 95 0 0 0 0 Storage Length (ft) 95 0 0 0 0 Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 4.0 Leading Detector (ft) 50 50 50 50 50 50 Trailing Detector (ft) 0 0 0 0 0 0 0 0 Turning Speed (mph) 9 15 15 9 Lane Util. Factor 0.95 1.00 1.00 0.95 0.97 1.00 Frt 0.850 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Headway Factor 1.04 0.85 1.04 1.04 1.00 1.00 Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Storage Length (t) 95 0 0 0 Storage Lanes 1 1 2 1 Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 Leading Detector (ft) 50 50 50 50 50 Training Detector (ft) 0 0 0 0 0 Training Detector (ft) 0.95 1.00 9.95 0.97 1.00 Frt 0.850 0.950 0.950 0.850 0.850 Fit Protected 0.950 0.930 3433 1568 Fit Protected 0.950 0.950 0.950 Satd. Flow (prort) 3455 1830 1745 3490 3433 1568 Right Tum on Red Yes No No Satd. Flow (RTOR) 183 Headway Factor 1.04 0.85 1.04 1.00 1.00 Link Distance (ft) 611 253 325 899 587 254 Peeak Hour Factor 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% <td>Lane Width (ft)</td> <td>11</td> <td>16</td> <td>11</td> <td>11</td> <td>12</td> <td>12</td> <td></td> <td></td>	Lane Width (ft)	11	16	11	11	12	12		
Storage Laises 1 1 2 1 Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 Leading Detector (ft) 0 0 0 0 0 Trailing Detector (ft) 0 0 0 0 0 Turning Speed (mph) 9 15 15 9 Lane Util. Factor 0.95 1.00 1.00 0.95 0.850 FIt Predicted 0.950 0.950 0.950 5atd. Flow (prot) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satd. Flow (PCR) 183 144 1.00 1.00 1.00 Link Speed (mph) 35 35 30 1 1.04 1.02 361 277 Travel Time (s) 1.1.9 7.4 6.3 254 24 2406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 3	Storage Length (ft)		95	0		0	0		
Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 Leading Detector (ft) 50 50 50 50 50 Trailing Detector (ft) 0 0 0 0 0 Trailing Detector (ft) 0.95 1.00 1.00 0.95 0.97 Lane Util, Factor 0.95 1.00 1.00 0.95 0.850 Fit Protected 0.950 0.950 0.850 0.850 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Right Tum on Red Yes No Satd. Flow (RTOR) 183 Headway Factor 1.04 1.04 1.00 1.00 Link Speed (mph) 35 35 30 30 100 1.00 1.01 1.00 Link Speed (mph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 764 320 406 988 716 353 1.01 1.01 1.01 1.01 1.01 </td <td>Storage Lanes</td> <td></td> <td>1</td> <td>1</td> <td></td> <td>2</td> <td>1</td> <td></td> <td></td>	Storage Lanes		1	1		2	1		
Laeding Detector (ft) 50 50 50 50 50 50 Trailing Detector (ft) 0 0 0 0 0 0 0 Uming Speed (mph) 9 15 15 9 Lane Util. Factor 0.95 1.00 1.00 0.95 0.97 1.00 Frt 0.850 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 Satd. Flow (prem) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satd. Flow (prot) 145 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satd. Flow (RTOR) 183 Headway Factor 1.04 0.85 1.04 1.04 1.00 1.00 Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 400 400 4.0 4.0 2.0 All-Red Time (s) 4.0 4.0 4.0 4.0 2.0 All-Red Time (s) 4.0 4.	Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Trailing Detector (th) 0 <td>Leading Detector (ft)</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td>50</td> <td></td> <td></td>	Leading Detector (ft)	50	50	50	50	50	50		
Turning Speed (mph) 9 15 15 9 Lane Uli, Factor 0.95 1.00 1.00 0.95 0.950 Fit 0.850 0.950 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satd. Flow (RTOR) 183 104 1.04 1.00 1.00 Link Speed (mph) 35 32 35 30 1119 7.4 6.3 Volume (vph) 611 253 325 30 121 141 141 104 100 100 119 7.4 6.3 353 104 142 345 156 156 160 140 160 160 153 119 119 119 174 1635	Trailing Detector (ft)	0	0	0	0	0	0		
Lane Util: Tactor 0.95 1.00 1.00 0.95 0.97 1.00 Fit 0.850 0.850 0.850 0.850 Satd. Flow (port) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (pern) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satd. Flow (RTOR) 183 Headway Factor 1.04 0.85 1.04 1.04 1.00 1.00 Link Distance (ft) 612 381 277 Travel Time (s) 1.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Heavy Vehicles (%) 1% 0% 0% 2% 3% Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 <td>Turning Speed (mph)</td> <td></td> <td>9</td> <td>15</td> <td></td> <td>15</td> <td>9</td> <td></td> <td></td>	Turning Speed (mph)		9	15		15	9		
Frit 0.850 0.950 0.950 Fit Protected 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Right Tum on Red Yes No Satd. Flow (RTOR) 183 No Satd. Flow (RTOR) 183 Headway Factor 1.04 0.85 1.04 1.04 1.00 1.00 1.00 Link Speed (mph) 35 30 Satd. Flow (RTOR) 183 Satd. Flow (Ph) 611 253 325 89 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Satd	Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00		
Fit Protected 0.950 0.950 Satd. Flow (prot) 3455 1830 1745 3490 3433 1568 Fit Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satal. Flow (RTOR) 183 100 1.00 Link Distance (ft) 612 381 277 77 77 Travel Time (s) 11.9 7.4 6.3 0.91 0.82 0.72 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% 3% Lane Group Flow (vph) 764 320 406 988 716 353 Turn Type Prot Prot Prot pt+ov pt+ov Protected Phases 2 2 1 6 8 1 Minimum Initial (s) 10.0 10.0 8.0 10.0 4.0 <td< td=""><td>Frt</td><td>0.00</td><td>0.850</td><td></td><td>0.00</td><td>0.01</td><td>0.850</td><td></td><td></td></td<>	Frt	0.00	0.850		0.00	0.01	0.850		
Stat. Flow (prot) 3455 1830 1745 3490 3433 1568 FIt Permitted 0.950 0.950 0.950 Satd. Flow (perm) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Stat. Flow (RTOR) 183 No Headway Factor 1.04 0.85 1.04 1.04 1.00 1.00 Link Speed (mph) 35 325 320 326 327 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Addition Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 1 1 9 Premitted Phases 2<	Flt Protected		0.000	0.950		0 950	0.000		
Fit Permitted 0.950 0.950 0.950 Satd. Flow (perm) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No 183 No 183 Headway Factor 1.04 0.85 1.04 1.00 1.00 Link Distance (ft) 612 381 277 177 Travel Time (s) 11.9 7.4 6.3 0.72 Peak Hour Factor 0.80 0.79 0.80 0.72 Peak Hour Factor 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Peak Hour Factor 0.80 0.91 0.82 0.72 100 100 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8 1 9 Permitted Phases 2 2 1 6 8 <td>Satd Flow (prot)</td> <td>3455</td> <td>1830</td> <td>1745</td> <td>3490</td> <td>3433</td> <td>1568</td> <td></td> <td></td>	Satd Flow (prot)	3455	1830	1745	3490	3433	1568		
Statl. Flow (perm) 3455 1830 1745 3490 3433 1568 Right Turn on Red Yes No Satd. Flow (RTOR) 183 Headway Factor 1.04 0.85 1.04 1.04 1.00 Link Speed (mph) 35 35 30 Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8 8 1 Minimum Initial (s) 10.0 10.0 10.0 4.0 4.0 <td>Flt Permitted</td> <td>0.00</td> <td></td> <td>0.950</td> <td>5.00</td> <td>0.950</td> <td></td> <td></td> <td></td>	Flt Permitted	0.00		0.950	5.00	0.950			
Right Turn on Red Yes No Satd. Flow (RTOR) 183 Headway Factor 1.04 0.85 1.04 1.00 1.00 Link Speed (mph) 35 33 30 31 32 Link Distance (ft) 612 381 277 7 Travel Time (s) 11.9 7.4 6.3 54 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.91 0.82 0.72 10.82 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Port Prot Prot pt+vv Prot pt+vv Protected Phases 2 2 1 6 8 81 Minimum Split (s) 16.0 16.0 16.0 28.0 10.0 10.0 10.0 10.0 Iotal Split (%	Satd. Flow (perm)	3455	1830	1745	3490	3433	1568		
Satd. Flow (RTOR) 133 Headway Factor 1.04 0.85 1.04 1.00 Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8	Right Turn on Red	0.00	Yes		0.00	0.00	No		
Headway Factor 1.04 0.05 1.04 1.00 1.00 Link Speed (mph) 35 35 30 Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% Add. Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8 81 Minimum Initial (s) 10.0 10.0 10.0 4.0 40 40 Minimum Split (s) 32.4% <t< td=""><td>Satd, Flow (RTOR)</td><td></td><td>183</td><td></td><td></td><td></td><td>110</td><td></td><td></td></t<>	Satd, Flow (RTOR)		183				110		
Inix Speed (mph) 35 35 30 Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Turn Type Prot Prot pt+ov Protected Phases 2 2 1 6 8 1 9 Permitted Phases 2 2 1 6 8 1 9 Detector Phases 2 2 1 6 8 1 9 Total Split (s) 16.0 16.0 16.0 16.0 28.0 20 20 2.0 2.0 2.0 2.0 2.0 2.0 2.0 <td>Headway Factor</td> <td>1 04</td> <td>0.85</td> <td>1 04</td> <td>1 04</td> <td>1 00</td> <td>1 00</td> <td></td> <td></td>	Headway Factor	1 04	0.85	1 04	1 04	1 00	1 00		
Link Distance (ft) 612 381 277 Travel Time (s) 11.9 7.4 6.3 Volume (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8 81 9 Protected Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81<	Link Speed (mph)	35	0.00	1.04	35	30	1.00		
Link Diduite (i) 012 014 211 Travel Time (ii) 011 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8 81 9 Permitted Phases 2 2 1 6 8 81 9 Detector Phases 2 2	Link Distance (ff)	612			381	277			
Notione (vph) 611 253 325 899 587 254 Peak Hour Factor 0.80 0.79 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Detector Phases 2 2 1 6 8 81 Minimum Initial (s) 10.0 10.0 10.0 4.0 4.0 4.0 28.0 Total Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0	Travel Time (s)	11 9			7 4	6.3			
Volume (vpn) 011 2.03 0.20 0.03 0.01 0.80 0.91 0.82 0.72 Heavy Vehicles (%) 1% 0% 0% 0% 2% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Turn Type Prot pt+ov Protected Phases 2 2 1 6 8 81 Permitted Phases 2 2 1 6 8 81 9 Permitted Phases 2 2 1 6 8 81 9 Permitted Phases 2 2 1 6 8 81 Minimum Initial (s) 10.0 10.0 10.0 4.0 4.0 Minimum Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (%) 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0	Volume (vnh)	611	253	325	899	587	254		
Heavy Vehicles (%) 1% 0% 0% 0% 3% Adj. Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Lane Group Flow (vph) 764 320 406 988 716 353 Turn Type Prot Prot pt+ov Protected Phases 2 2 1 6 8 81 9 Permitted Phases 2 2 1 6 8 81 9 Permitted Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81 9 Permitted Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81 9 Detector Phases 2 2 10.0 10.0 4.0 4.0 20 Total Split (s) 34.0 19.0 <td>Peak Hour Factor</td> <td>0.80</td> <td>0.79</td> <td>0.80</td> <td>0.91</td> <td>0.82</td> <td>0.72</td> <td></td> <td></td>	Peak Hour Factor	0.80	0.79	0.80	0.91	0.82	0.72		
Adj. Flow (yph) 1A 0.0 0.0 0.0 0.0 0.0 0.0 Adj. Flow (yph) 764 320 406 988 716 353 Lane Group Flow (yph) 764 320 406 988 716 353 Turn Type Prot Prot pt+ov pt+ov Protected Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81 9 Detector Phases 2 2 1 6 8 81 9 Detector Phases 10.0 10.0 10.0 10.0 4.0 4.0 28.0 76 Total Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (%) 32.4% 32.4% 18.1% 50.5% 22.9%	Heavy Vehicles (%)	1%	0%	0%	0%	2%	3%		
Abj. How (vph) Tot Tot Tot Tot Tot Tot Lane Group Flow (vph) Tot Sto Tot Tot Tot Tot Print Prot Prot Prot pt+ov pt+ov Protected Phases 2 2 1 6 8 8.1 9 Permitted Phases 2 2 1 6 8 8.1 9 Detector Phases 2 2 1 6 8 8.1 9 Minimum Initial (s) 10.0 10.0 8.0 10.0 10.0 4.0 Minimum Split (s) 16.0 16.0 14.0 16.0 28.0 Total Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (s) 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0 4.0 2.0 2.0 2.0 Lead/Lag Lag Lag Lag Lag Lag Lag Lag <	Adi Flow (vph)	764	320	406	988	716	353		
Lance Order Prior (Prof. Prof. Prof	Lane Group Flow (vph)	764	320	406	988	716	353		
The set of th	Turn Type	104	Prot	Prot	000	710	nt+ov		
Permitted Phases Detector Phases Detector Phases Detector Phases 2 2 1 6 8 81 Minimum Initial (s) 10.0 10.0 8.0 10.0 10.0 4.0 Minimum Split (s) 16.0 16.0 14.0 16.0 28.0 Total Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (%) 32.4% 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0 4.0 4.0 2.0 All-Red Time (s) 2.0 2.0 2.0 1.0 2.0 Lead-Lag Lag Lag Lead Lead 2.0 39.0 Act Effet Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 20 <	Protected Phases	2	2	1	6	8	8.1	9	
Detector Phases 2 2 1 6 8 8 1 Minimum Initial (s) 10.0 10.0 10.0 10.0 10.0 4.0 Minimum Split (s) 16.0 16.0 14.0 16.0 16.0 28.0 Total Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (%) 32.4% 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0 4.0 4.0 2.0 All-Red Time (s) 2.0 2.0 2.0 2.0 1.0 Lead/Lag Lag Lag Lead Lead Lead-Lag Optimize? Yes Yes Recall Mode C-Min None C-Min None None Act Effot Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 </td <td>Permitted Phases</td> <td>2</td> <td>2</td> <td></td> <td>U</td> <td>U</td> <td>01</td> <td>Ŭ</td> <td></td>	Permitted Phases	2	2		U	U	01	Ŭ	
Decision 1 micros 1	Detector Phases	2	2	1	6	8	8 1		
Minimum Initial (s) 16.0 16.0 16.0 16.0 16.0 28.0 Minimum Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (s) 32.4% 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0 4.0 4.0 2.0 All-Red Time (s) 2.0 2.0 2.0 1.0 Lead/Lag Lag Lag Lead Lead-Lag Optimize? Yes Yes Yes Recall Mode C-Min C-Min None None Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 1.0 LO	Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0	01	4 0	
Total Split (s) 34.0 34.0 19.0 53.0 24.0 43.0 28.0 Total Split (s) 32.4% 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0 4.0 4.0 2.0 2.0 All-Red Time (s) 2.0 2.0 2.0 2.0 1.0 Lead/Lag Lag Lag Lead Lead Lead-Lag Optimize? Yes Yes Yes Recall Mode C-Min C-Min None C-Min Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 104.5 32.2 Los C B F C	Minimum Split (s)	16.0	16.0	14.0	16.0	16.0		28.0	
Total Split (%) 32.4% 32.4% 18.1% 50.5% 22.9% 41.0% 27% Yellow Time (s) 4.0 4.0 4.0 4.0 2.0 All-Red Time (s) 2.0 2.0 2.0 2.0 1.0 Lead/Lag Lag Lag Lead Lead/Lag Lag Lead-Lag Optimize? Yes Yes Yes Yes Recall Mode C-Min C-Min None None Act Effect Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LoS LOS C B F C	Total Solit (s)	34.0	34.0	19.0	53.0	24.0	43.0	28.0	
Yellow Time (s) 4.0 4.0 4.0 4.0 2.0 All-Red Time (s) 2.0 2.0 2.0 2.0 1.0 Lead/Lag Lag Lag Lead Lead-Lag Optimize? Yes Yes Yes Recall Mode C-Min C-Min None None Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 80.6	Total Split (%)	32.4%	32.4%	18 1%	50.5%	22 9%	41.0%	20.0	
All-Red Time (s) 2.0 2.0 2.0 2.0 2.0 1.0 Lead/Lag Lag Lag Lag Lead Lag Lag Lag Lead-Lag Optimize? Yes Yes Yes Yes Recall Mode C-Min None None Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 Approach LOS F F Oursus Landth FOth C1 205 252 201 100 100 <td>Yellow Time (s)</td> <td>4 0</td> <td>4 0</td> <td>4 0</td> <td>4 0</td> <td>4 0</td> <td>41.070</td> <td>20</td> <td></td>	Yellow Time (s)	4 0	4 0	4 0	4 0	4 0	41.070	20	
Lie Lie Lie Lie Lie Lie Lie Lead/Lag Lag Lag Lead Lead Lie Lie Lead-Lag Optimize? Yes Yes Yes Yes Recall Mode C-Min None None Act Effect Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach LOS C F F C C Approach LOS C F F F 6	All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead-Lag Optimize? Yes Yes Yes Recall Mode C-Min C-Min None None Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 100 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 80.6 Approach LOS C F F C		L ad	L ad	L ead	2.0	2.0		1.0	
Recall Mode C-Min C-Min None C-Min None None Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 80.6 Approach LOS C F F C	Lead-Lag Ontimize?	Ves	Ves	Yes					
Act Effct Green (s) 35.6 35.6 15.0 54.6 20.0 39.0 Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 104.5 32.2 LOS C B F C F C Approach LOS C F F C Outputs Lagrath 50th (ft) 247 71 205 252 201 100	Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Actuated g/C Ratio 0.34 0.34 0.14 0.52 0.19 0.37 v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 80.6 Approach LOS C F F C	Act Effet Green (s)	35.6	35.6	15.0	54.6	20.0	39.0	None	
v/c Ratio 0.65 0.43 1.63 0.54 1.09 0.61 Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 Approach LOS C F F Outpute Length F0th (ft) 247 71 205 252 201 100	Actuated g/C Ratio	0.34	0.34	0.14	0 52	0.10	0.37		
Control Delay 34.8 14.9 332.5 20.1 104.5 32.2 Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 Approach LOS C F F Outputs Lagrath F0th (ft) 247 71 205 252 201 100	v/c Ratio	0.54	0.04	1 63	0.52	1 00	0.57		
Queue Delay 0.0 0.0 0.0 0.0 0.0 0.0 Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach LOS C F F C Outputs Lagrath 50th (ft) 247 71 205 252 201 100	Control Delay	3/ 8	1/ 0	332.5	20.1	104 5	32.2		
Total Delay 34.8 14.9 332.5 20.1 104.5 32.2 LOS C B F C F C Approach Delay 28.9 111.1 80.6 Approach LOS C F F Outputs Langth 50th (ft) 247 71 205 252 201 100		0.0	0.0	0.0	20.1	04.5	0.0		
LOS C B F C F Approach Delay 28.9 111.1 80.6 Approach LOS C F F Outquid Length 50th (ft) 247 71 205 252 201 100	Total Delay	3/ 2	14.0	332.5	20.1	104 5	32.2		
Approach Delay 28.9 111.1 80.6 Approach LOS C F F Outputs Langth 50th (ft) 247 71 205 252 201 100		J4.0	14.9 P	552.5 E	20.1	104.3 E	52.2		
Approach LOS C F F Outpute Length 50th (ft) 247 71 205 252 201 400	Approach Delay	28.0	D	17	111 1	3 08	C		
Approach 200 F F August Longth 50th (#) 247 71 205 252 201 400	Approach LOS	20.9				00.0			
	Oueue Length 50th (ft)	247	71	~205	252	~281	100		

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	-	\rightarrow	-	+	1	1					
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9				
Queue Length 95th (ft)	273	116	#499	318	#341	212					
Internal Link Dist (ft)	532			301	197						
Turn Bay Length (ft)		95									
Base Capacity (vph)	1171	742	249	1815	654	582					
Starvation Cap Reductn	0	0	0	0	0	0					
Spillback Cap Reductn	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0					
Reduced v/c Ratio	0.65	0.43	1.63	0.54	1.09	0.61					
Intersection Summary											
Area Type: O	ther										
Cycle Length: 105											
Actuated Cycle Length:	105										
Offset: 19 (18%), Refere	nced to	phase	2:EBT a	and 6:W	/BT, Sta	art of Gre	en				
Natural Cycle: 120											
Control Type: Actuated-0	Coordin	ated									
Maximum v/c Ratio: 1.63	3										
Intersection Signal Delay	/: 76.8			lr	ntersect	ion LOS	E				
Intersection Capacity Uti	lization	61.6%		10	CU Leve	el of Ser	vice B				
Analysis Period (min) 15											
 Volume exceeds cap 	oacity, c	luene is	theore	tically in	finite.						
Queue shown is max	imum a	fter two	cycles.								
# 95th percentile volume exceeds capacity, queue may be longer.											
Queue shown is maximum after two cycles.											

Splits and Phases: 1: Bridge Street & Washington Street

	-	\rightarrow	4	-	•	1
Lane Group	FRT	FRP	W/RI	W/RT	NRI	NRR
Lane Configurations						
	1900	1900	1900	1900	1900	1900
Lane Width (tt)	11	1300	100	11	1300	1300
Storage Length (ft)	11	0	0	11	0	100
Storage Lanes		0	1		1	100
Total Lost Time (a)	10	4.0	1 0	4.0	1	4.0
Loading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (It)	50		50	50	50	50
Turning Delector (II)	0	0	0	0	0	0
Lang Litil Faster	1.00	4.00	15	4.00	15	1.00
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		1.00			0.050
Frt	0.985		0.050			0.850
Fit Protected	1001	-	0.950	1007	0.950	10=0
Satd. Flow (prot)	1804	0	1652	1837	1865	1652
Fit Permitted			0.950		0.950	10-0
Satd. Flow (perm)	1804	0	1650	1837	1865	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	10					59
Headway Factor	1.04	1.04	1.09	1.04	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	649	65	174	829	117	233
Confl. Peds. (#/hr)		2	2			2
Peak Hour Factor	0.87	0.70	0.87	0.83	0.74	0.86
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%
Adj. Flow (vph)	746	93	200	999	158	271
Lane Group Flow (vph)	839	0	200	999	158	271
Turn Type			Prot		100	pt+ov
Protected Phases	2		1	6	8	1.8
Permitted Phases	2			0	0	10
Detector Phases	2		1	6	Q	1.8
Minimum Initial (a)	10.0		5.0	10.0	5.0	10
Minimum Split (s)	28.0		10.0	16.0	11.0	
Total Split (s)	20.0	0.0	29.0	56.0	14.0	120
Total Split (%)	20.0	0.0	20.0	20.00/	20.00/	42.0
Vollow Time (a)	40.0%	0.0%	40.0%	00.0%	20.0%	00.0%
reliow Time (S)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	0.11			0.1.1		
Recall Mode	C-Min		None	C-Min	None	
Act Effct Green (s)	35.1		13.2	52.3	9.7	26.9
Actuated g/C Ratio	0.50		0.19	0.75	0.14	0.38
v/c Ratio	0.92		0.64	0.73	0.61	0.40
Control Delay	36.3		35.2	9.0	39.6	13.1
Queue Delay	0.0		0.0	4.8	0.0	0.0
Total Delay	36.3		35.2	13.7	39.6	13.1
LOS	D		D	В	D	В
Approach Delay	36.3			17.3	22.9	

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	→	\mathbf{r}	-	-	1	1		
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR		
Approach LOS	D			В	С			
Queue Length 50th (ft)	312		80	183	65	62		
Queue Length 95th (ft)	#596		125	250	96	95		
Internal Link Dist (ft)	214			303	218			
Turn Bay Length (ft)						100		
Base Capacity (vph)	910		566	1373	266	906		
Starvation Cap Reductn	0		0	301	0	0		
Spillback Cap Reductn	0		0	0	0	0		
Storage Cap Reductn	0		0	0	0	0		
Reduced v/c Ratio	0.92		0.35	0.93	0.59	0.30		
Intersection Summary								
Area Type: O	ther							
Cycle Length: 70								
Actuated Cycle Length: 7	70							
Offset: 4 (6%), Referenc	ed to pl	nase 2:	EBT and	d 6:WB1	, Start	of Green		
Natural Cycle: 65								
Control Type: Actuated-0	Coordin	ated						
Maximum v/c Ratio: 0.92	2							
Intersection Signal Delay	/: 24.7			Ir	ntersect	ion LOS: C		
Intersection Capacity Uti	lization	64.7%		IC	CU Leve	el of Service	С	
Analysis Period (min) 15								
# 95th percentile volun	ne exce	eds cap	bacity, c	lueue m	ay be lo	onger.		
Queue shown is max	imum a	fter two	cycles.					

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp

Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	•			≜1 ≱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.999	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	149	16	692	0	0	577	1
Confl. Peds. (#/hr)						4	92					92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.70	0.67	0.84	0.92	0.92	0.90	0.25
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	2%	2%	2%	1%	0%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	213	24	824	0	0	641	4
Lane Group Flow (vph)	0	0	0	0	0	213	24	824	0	0	645	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignalized												
Intersection Capacity Uti	lization	53.2%		10	CU Leve	el of Sei	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		A⊅		ኘ	t₽			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.999			0.966				0.865
Flt Protected				0.950				0.964				
Satd. Flow (prot)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Flt Permitted				0.950				0.964				
Satd. Flow (perm)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	859	6	3	1206	3	2	0	1	0	0	16
Confl. Peds. (#/hr)			23	23		35						
Peak Hour Factor	0.25	0.94	0.69	0.25	0.93	0.42	0.33	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	914	9	12	1297	7	6	0	2	0	0	29
Lane Group Flow (vph)	0	923	0	12	1304	0	0	8	0	0	0	29
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	zed											
Intersection Capacity Uti		ICU Level of Service A										

Analysis Period (min) 15

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Lane Group	FRI	FBT	WRT	WBR	SBI	SBR
Lane Configurations	100		A1.			1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	1300	12	12	12	12
Total Lost Time (s)	4.0	10	10	12	12	10
Leading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0
Trailing Detector (ft)	0	0	50		0	50
Turning Speed (mph)	15	0	0	0	15	0
Long Litil Easter	1 00	0.05	0.05	9	1 00	1 00
Ded Pike Factor	1.00	0.95	1.00	0.95	1.00	1.00
			0.000		1.00	0.050
FIL Flt Drotoctod	0.050		0.990		0.050	0.000
Fit Protected	1695	2400	2512	0	1905	1500
Sato. Flow (prot)	1685	3490	3543	0	1805	1583
	0.154	2400	0540		0.950	1500
Satd. Flow (perm)	273	3490	3543	0	1803	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			14			55
Headway Factor	1.09	1.04	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	612		369	
Travel Time (s)		7.5	11.9		16.8	
Volume (vph)	69	813	812	55	51	191
Confl. Peds. (#/hr)	3			3	1	
Peak Hour Factor	0.87	0.88	0.92	0.90	0.72	0.80
Heavy Vehicles (%)	0%	0%	0%	11%	0%	2%
Adj. Flow (vph)	79	924	883	61	71	239
Lane Group Flow (vph)	79	924	944	0	71	239
Turn Type	pm+pt					pm+ov
Protected Phases	3	8	4		6	3
Permitted Phases	8					6
Detector Phases	3	8	4		6	3
Minimum Initial (s)	4 0	4 0	4 0		4 0	4 0
Minimum Split (s)	10.0	22.0	22.0		22.0	10.0
Total Split (s)	10.0	38.0	28.0	0.0	22.0	10.0
Total Split (%)	16.7%	63 3%	46.7%	0.0%	36.7%	16.7%
Vellow Time (s)	10.7 /0	1 0	/ 0	0.0 /0	/ / 0	/ / 0
All Pod Time (S)	4.0	4.0	4.0		4.0	4.0
	2.0	2.0	2.0		2.0	2.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes	N.I.	Yes		N	Yes
Recall Mode	None	None	C-Max		None	None
Act Effct Green (s)	47.2	48.8	35.2		9.5	16.8
Actuated g/C Ratio	0.79	0.81	0.59		0.16	0.28
v/c Ratio	0.20	0.33	0.45		0.25	0.49
Control Delay	4.1	3.3	10.0		23.6	15.1
Queue Delay	0.0	0.0	0.0		0.0	0.3
Total Delay	4.1	3.3	10.0		23.6	15.4
LOS	А	А	В		С	В
Approach Delay		3.4	10.0		17.3	
Approach LOS		А	В		В	
Queue Length 50th (ft)	7	53	110		23	47

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Lane Group	FBI	FBT	WBT	WBR	SBI	SBR	
Queue Length 95th (ft)	18	89	188	WBI(40	68	
Internal Link Dist (ft)		303	532		289		
Turn Bay Length (ft)							
Base Capacity (vph)	402	2836	2084		542	483	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	112		0	39	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.20	0.33	0.48		0.13	0.54	
Intersection Summary							
Area Type: Of	ther						
Cycle Length: 60							
Actuated Cycle Length: 6	60						
Offset: 32 (53%), Referen	nced to	phase	4:WBT	Start of	f Green		
Natural Cycle: 55							
Control Type: Actuated-C	Coordin	ated					
Maximum v/c Ratio: 0.49							
Intersection Signal Delay	: 8.1			In	ntersecti	ion LOS:	A
Intersection Capacity Util	ization	42.7%		IC	CU Leve	el of Serv	/ice A
Analysis Period (min) 15							

Splits and Phases: 5: Bridge Street & MBTA Parking Lot Driveway

Year 2016 No-Build, With Bridge Street widening

	-	\rightarrow	- 🖌	+	1	1		
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Lane Configurations	**	1	5	**	ካካ	1		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (ft)	0	0	0	0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util Factor	0.95	1 00	1 00	0.95	0.97	1 00		
Frt	0.00	0.850		0.00	0.01	0.850		
Flt Protected		0.000	0.950		0.950	0.000		
Satd Flow (prot)	3421	1794	1711	3421	3400	1568		
Flt Permitted	5721		0.950	5721	0.950	1000		
Satd Flow (perm)	3421	1794	1711	3421	3400	1568		
Right Turn on Red	0- 1 2 1	Vas	17.11	0- 1 2 1	0-400	No		
Satd Flow (RTOR)		266				NU		
Headway Factor	1.04	0.85	1.04	1.04	1.00	1.00		
Link Speed (mph)	35	0.05	1.04	35	30	1.00		
Link Distance (ff)	612			381	277			
Travel Time (c)	11.0			7 4	63			
Volumo (vph)	611	255	203	7.4	222	200		
Poak Hour Eactor	0.00	0.85	293	0.92	0.03	0.83		
	0.90	0.00	0.92	0.02	0.93	0.00		
Adi Flow (upb)	670	Z 70	270	270	250	261		
Auj. Flow (vpl)	670	410	210	091	250	261		
Lane Group Flow (vpn)	0/9	410 Drot	Drot	091	300	30 I		
Turn Type	0	Prot	Prot	0	0	pt+0v	0	
Protected Phases	2	2	1	0	õ	01	9	
Permilled Phases	0	0	1	0	0	0.1		
Detector Phases	10.0	2	1	10.0	8	81	4.0	
Minimum Initial (S)	10.0	10.0	8.0	10.0	10.0		4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0	44.0	28.0	
Total Split (s)	28.0	28.0	26.0	54.0	18.0	44.0	28.0	
Total Split (%)	28.0%	28.0%	26.0%	54.0%	18.0%	44.0%	28%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Lime (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Act Effct Green (s)	30.4	30.4	21.2	55.6	14.0	39.2		
Actuated g/C Ratio	0.30	0.30	0.21	0.56	0.14	0.39		
v/c Ratio	0.65	0.57	0.88	0.47	0.75	0.59		
Control Delay	30.0	9.2	63.5	16.1	52.4	28.5		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	30.0	9.2	63.5	16.1	52.4	28.5		
LOS	С	A	E	В	D	С		
Approach Delay	22.1			28.6	40.4			
Approach LOS	С			С	D			
Queue Length 50th (ft)	223	50	196	193	114	176		

2016 No Build a.m. - With widening

	-	\rightarrow	1	-	1	1	
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9
Queue Length 95th (ft)	#267	61	#343	218	#174	241	
Internal Link Dist (ft)	532			301	197		
Turn Bay Length (ft)		95					
Base Capacity (vph)	1039	730	376	1902	476	627	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.65	0.57	0.85	0.47	0.75	0.58	
Intersection Summary							
Area Type: O	ther						
Cycle Length: 100							
Actuated Cycle Length:	100						
Offset: 1 (1%), Referenc	ed to pl	nase 2:	EBT and	d 6:WB	T, Start	of Green	
Natural Cycle: 90							
Control Type: Actuated-0	Coordin	ated					
Maximum v/c Ratio: 0.88	3						
Intersection Signal Delay	y: 29.0			h	ntersect	ion LOS: (C
Intersection Capacity Uti	lization	52.6%		[(CU Leve	el of Servio	ce A
Analysis Period (min) 15							

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bridge Street & Washington Street



	-	\rightarrow	-	-	- 1	1
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	≜t ⊾		*	**	*	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	10	11	13	13
Storage Length (ft)		0	0		0	100
Storage Lanes		0	1		1	1
Total Lost Time (s)	10	4.0	4.0	10	10	4.0
Leading Detector (ft)	50	4.0	50	50	50	50
Trailing Detector (ft)	0		50	50	50	0
Turning Delector (II)	0	0	15	0	15	0
Long Litil Easter	0.05	9	1 00	0.05	1.00	1 00
	0.95	0.95	1.00	0.95	1.00	1.00
	0.981		0.050		0.050	0.850
Fit Protected	0011	-	0.950	0.10.1	0.950	1050
Satd. Flow (prot)	3344	0	1589	3421	1811	1652
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3344	0	1589	3421	1811	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	21					78
Headway Factor	1.04	1.04	1.09	1.04	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	876	101	105	617	85	222
Peak Hour Factor	0.92	0.75	0.95	0.93	0.88	0.88
Heavy Vehicles (%)	2%	5%	6%	2%	3%	1%
Adi Flow (yph)	052	135	111	663	070	252
Auj. Flow (vpl)	1007	155	111	662	97	252
	1007	0	Drot	003	97	ZOZ
Turri Type	0		PIOL	0	0	ρι+ον
Protected Phases	2		1	6	8	18
Permitted Phases	-			0	0	1.0
Detector Phases	2		1	6	8	18
Minimum Initial (s)	10.0		5.0	10.0	8.0	
Minimum Split (s)	28.0		10.0	16.0	14.0	
Total Split (s)	52.0	0.0	28.0	80.0	20.0	48.0
Total Split (%)	52.0%	0.0%	28.0%	80.0%	20.0%	48.0%
Yellow Time (s)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lao		Lead			
Lead-Lag Ontimize?	Lug		Louu			
Recall Mode	C-Min		None	C-Min	None	
Act Effet Green (a)	61.0		10110		14.0	20.1
Activities of a long the second secon	01.9		12.1	78.0	14.0	30.1
Actuated g/C Ratio	0.62		0.12	0.78	0.14	0.30
v/c Ratio	0.52		0.58	0.25	0.38	0.46
Control Delay	12.6		52.2	4.1	43.0	20.7
Queue Delay	0.0		0.0	0.2	0.0	0.0
Total Delay	12.6		52.2	4.3	43.0	20.7
LOS	В		D	А	D	С
Approach Delay	12.6			11.1	26.9	
Approach LOS	В			В	С	
Queue Length 50th (ft)	191		76	23	56	86

2016 No Build a.m. - With widening

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ane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 95th (ft)	287		134	107	102	138
nternal Link Dist (ft)	214			303	218	
Furn Bay Length (ft)						100
Base Capacity (vph)	2077		381	2668	290	727
Starvation Cap Reductn	0		0	1173	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.52		0.29	0.44	0.33	0.35
ntersection Summary						
Area Type: C	ther					
Cycle Length: 100						
	100					

Actuated Cycle Length: 100 Offset: 84 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 55 Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 14.3 Intersection Capacity Utilization 49.9% Analysis Period (min) 15 Intersection LOS: B

ICU Level of Service A

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp



Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	•			A1⊅	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.993	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1660	1518	1699	0	0	3419	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1660	1518	1699	0	0	3419	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	133	16	500	0	0	625	23
Confl. Peds. (#/hr)						30	163					163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.79	0.54	0.84	0.92	0.92	0.85	0.61
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%	7%	4%	2%	2%	5%	2%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	168	30	595	0	0	735	38
Lane Group Flow (vph)	0	0	0	0	0	168	30	595	0	0	773	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignalized												
Intersection Capacity Uti	lization	45.4%		10	CU Leve	el of Sei	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		tβ		<u> </u>	A ₽			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.997			0.999			0.865				0.865
Flt Protected				0.950								
Satd. Flow (prot)	0	3412	0	1745	3418	0	0	1589	0	0	0	1644
FIt Permitted				0.950								
Satd. Flow (perm)	0	3412	0	1745	3418	0	0	1589	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	898	13	1	1003	2	0	0	2	0	0	21
Confl. Peds. (#/hr)			9	9		59						
Peak Hour Factor	0.67	0.94	0.69	0.25	0.87	0.50	0.92	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	2%	2%	0%	2%	2%	0%
Adj. Flow (vph)	0	955	19	4	1153	4	0	0	4	0	0	38
Lane Group Flow (vph)	0	974	0	4	1157	0	0	4	0	0	0	38
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lizatior	n 44.5%		10	CU Leve	el of Ser	vice A					
Analysis Period (min) 15												

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Lane Group	FBI	FBT	WBT	WBR	SBL	SBR
Lane Configurations	*	**	<u>۸</u> ۴	1.2.1	*	#
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	4 .0	4 .0	50	4.0	4 .0	4 .0
Trailing Detector (ft)	0	0	0		0	0
Turning Speed (mph)	15	0	0	0	15	0
Lane Litil Eactor	1.00	0.05	0.05	0.05	1.00	1 00
Pod Riko Fostor	1.00	0.95	0.90	0.95	0.00	0.00
Feu Dike Faciol			0.99		0.99	0.90
FIL Fit Drotootod	0.050		0.973		0.050	0.650
	0.950	2404	2440	0	0.950	1504
Sald. Flow (prot)	1685	3421	3412	0	1805	1524
	0.168	0404	0440	-	0.950	4.400
Satd. Flow (perm)	298	3421	3412	0	1793	1498
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			30			93
Headway Factor	1.09	1.04	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	612		369	
Travel Time (s)		7.5	11.9		16.8	
Volume (vph)	176	922	616	114	44	106
Confl. Peds. (#/hr)	3			3	3	2
Peak Hour Factor	0.63	0.85	0.88	0.74	0.91	0.76
Heavy Vehicles (%)	0%	2%	2%	4%	0%	6%
Adj. Flow (vph)	279	1085	700	154	48	139
Lane Group Flow (vph)	279	1085	854	0	48	139
Turn Type	pm+pt					pm+ov
Protected Phases	3	8	4		6	3
Permitted Phases	8	J			J	6
Detector Phases	3	8	4		6	3
Minimum Initial (s)	4 0	4 0	40		4 0	4 0
Minimum Split (s)	10.0	22.0	22.0		22.0	10.0
Total Split (s)	31.0	72.0	42.0	0.0	22.0	31.0
	31.0	72.00/	42.0	0.0	27.0	31.00/
Vollow Time (c)	31.0%	13.0%	42.0%	0.0%	21.0%	31.0%
Tellow Time (S)	4.0	4.0	4.0		4.0	4.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Recall Mode	None	None	C-Max		None	None
Act Effct Green (s)	86.9	88.5	67.6		9.9	22.0
Actuated g/C Ratio	0.87	0.88	0.68		0.10	0.22
v/c Ratio	0.59	0.36	0.37		0.27	0.34
Control Delay	10.5	0.8	16.2		44.8	11.9
Queue Delay	0.0	0.1	0.0		0.0	0.0
Total Delay	10.6	0.9	16.2		44.8	11.9
LOS	В	А	В		D	В
Approach Delav		2.9	16.2		20.3	
Approach LOS		A	В		С	
Queue Length 50th (ft)	8	16	87		29	22

2016 No Build a.m. - With widening

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)	12	22	337		62	44
Internal Link Dist (ft)		303	532		289	
Turn Bay Length (ft)						
Base Capacity (vph)	634	3028	2316		415	573
Starvation Cap Reductn	9	841	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.45	0.50	0.37		0.12	0.24

ntersection Summary										
Area Type: Other										
Cycle Length: 100										
Actuated Cycle Length: 100										
Offset: 24 (24%), Referenced to phase 4:WBT, Start of Green										
Natural Cycle: 60	Natural Cycle: 60									
Control Type: Actuated-Coordinated										
Maximum v/c Ratio: 0.59										
Intersection Signal Delay: 9.0	Intersection LOS: A									
Intersection Capacity Utilization 44.3%	ICU Level of Service A									
Analysis Period (min) 15										

Splits and Phases: 5: Bridge Street & MBTA Driveway



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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Lane Configurations	**	1	5	**	ካካ	1		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (ft)	0	0	0	0	0	0		
Turning Speed (mph)	Ŭ	9	15	Ŭ	15	9		
Lane Util Factor	0.95	1 00	1 00	0.95	0.97	1 00		
Frt	0.00	0.850		0.00	0.01	0.850		
Flt Protected		0.000	0 950		0 950	0.000		
Satd Flow (prot)	3455	1830	1745	3490	3433	1568		
Elt Permitted	0400	1000	0.950	0400	0 950	1000		
Satd Flow (perm)	3455	1830	1745	3490	3433	1568		
Right Turn on Red	5-55	Vac	1143	3-30	5-55	No		
Satd Flow (RTOR)		151				NU		
Headway Eactor	1 0/	0.85	1 0/	1 0/	1 00	1 00		
Link Spood (mph)	25	0.05	1.04	25	20	1.00		
Link Speed (mpn)	610			201	277			
	11.0			301	6.2			
	611	050	205	7.4	0.3	054		
Volume (vpn)	011	200	323	0.01	0.00	204		
	0.00	0.79	0.00	0.91	0.02	0.72		
Heavy venicles (%)	1%	0%	0%	0%	Z%	3%		
Adj. Flow (vpr)	764	320	406	988	710	303		
Lane Group Flow (vpn)	764	320	406	988	/16	353		
Turn Type	0	Prot	Prot	0	0	pt+ov	0	
Protected Phases	2	2	1	6	ð	8.1	9	
Permitted Phases	0	0	4	0	0	0.4		
Detector Phases	2	2	1	6	8	81	4.0	
Minimum Initial (s)	10.0	10.0	0.8	10.0	10.0		4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0	50.0	28.0	
Total Split (s)	33.0	33.0	31.0	64.0	28.0	59.0	28.0	
Total Split (%)	27.5%	27.5%	25.8%	53.3%	23.3%	49.2%	23%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Act Effct Green (s)	29.0	29.0	27.0	60.0	24.0	55.0		
Actuated g/C Ratio	0.24	0.24	0.22	0.50	0.20	0.46		
v/c Ratio	0.91	0.57	1.03	0.57	1.04	0.49		
Control Delay	54.4	20.0	100.0	22.5	92.5	25.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	54.4	20.0	100.0	22.5	92.5	25.7		
LOS	D	В	F	С	F	С		
Approach Delay	44.3			45.1	70.4			
Approach LOS	D			D	E			
Queue Length 50th (ft)	312	81	~338	272	~309	187		

2016 No Build p.m. - With widening

	-	$\mathbf{\hat{z}}$	4	+	1	1				
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9			
Queue Length 95th (ft)	286	111	#441	335	#367	203				
Internal Link Dist (ft)	532			301	197					
Turn Bay Length (ft)		95								
Base Capacity (vph)	835	557	393	1745	687	719				
Starvation Cap Reductn	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.91	0.57	1.03	0.57	1.04	0.49				
Intersection Summary										
Area Type: O	ther									
Cycle Length: 120										
Actuated Cycle Length:	120									
Offset: 19 (16%), Refere	nced to	phase	2:EBT a	and 6:W	/BT, Sta	irt of Gre	een			
Natural Cycle: 120	_									
Control Type: Actuated-	Coordin	ated								
Maximum v/c Ratio: 1.04	1						-			
Intersection Signal Delay	y: 52.5			Ir	ntersect	ion LOS	: D			
Intersection Capacity Uti	lization	61.6%		10	CU Leve	el of Ser	vice B			
Analysis Period (min) 15										
 Volume exceeds cap 	oacity, q	ueue is	theore	tically in	finite.					
Queue shown is max	imum a	fter two	cycles.							
# 95th percentile volun	ne exce	eds cap	bacity, c	lueue m	ay be lo	onger.				
Queue shown is max	imum a	fter two	cycles.							

Splits and Phases: 1: Bridge Street & Washington Street

* 01	↓ ø2	Å ≹ ø9	
31 s	33 s	28 s	
← ø6			** @8
64 s			28 s

	-	\rightarrow	- 🖌	-	-	1
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	<u>Å</u> t.	2010	*	**	*	#
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	10	11	13	13
Storage Length (ft)		0	0		0	100
Storage Lanes		0	1		1	100
Total Lost Time (s)	10	4.0	10	10	10	10
Loading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0
Trailing Detector (It)	50		50	50	50	50
Training Detector (It)	0	0	15	0	15	0
Turning Speed (mpn)	0.05	9	100	0.05	100	9
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00			0.050
Frt	0.983		0.050			0.850
Fit Protected		_	0.950		0.950	1055
Satd. Flow (prot)	3422	0	1652	3490	1865	1652
FIt Permitted			0.950		0.950	
Satd. Flow (perm)	3422	0	1650	3490	1865	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	27					100
Headway Factor	1.04	1.04	1.09	1.04	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	649	65	174	829	117	233
Confl. Peds. (#/hr)		2	2			2
Peak Hour Factor	0.87	0.70	0.87	0.83	0.74	0.86
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%
Adi Flow (vph)	746	93	200	999	158	271
Lane Group Flow (vph)	839	0	200	999	158	271
	000	Ŭ	Prot	000	100	nt+ov
Protected Phases	2		1	6	8	1.8
Pormitted Phases	2		1	0	0	10
Detector Decos	2		1	6	0	10
Minimum Initial (a)	10.0		F 0	10.0	0 E 0	10
Minimum Initial (S)	10.0		5.0	10.0	5.0	
	28.0	0.0	10.0	10.0	11.0	24.0
Total Split (s)	29.0	0.0	18.0	47.0	13.0	31.0
Total Split (%)	48.3%	0.0%	30.0%	78.3%	21.7%	51.7%
Yellow Time (s)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Recall Mode	C-Min		None	C-Min	None	
Act Effct Green (s)	27.8		11.5	43.3	8.7	24.2
Actuated g/C Ratio	0.46		0.19	0.72	0.14	0.40
v/c Ratio	0.52		0.63	0.40	0.58	0.37
Control Delay	13.2		24.8	4.6	33.5	8.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	13.2		24.8	4.6	33.5	8.6
LOS	B		C	A	C	A
			-		-	

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	-	\mathbf{r}	4	-	1	1
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Approach LOS	В			А	В	
Queue Length 50th (ft)	106		81	175	54	38
Queue Length 95th (ft)	156		65	39	84	73
Internal Link Dist (ft)	214			303	218	
Turn Bay Length (ft)						100
Base Capacity (vph)	1600		385	2518	280	777
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.52		0.52	0.40	0.56	0.35
Intersection Summary						

Intersection Summary									
Area Type: Other									
Cycle Length: 60									
Actuated Cycle Length: 60									
Offset: 4 (7%), Referenced to phase 2:EBT and 6:WBT, Start of Green									
Natural Cycle: 55	Natural Cycle: 55								
Control Type: Actuated-Coordinated									
Maximum v/c Ratio: 0.63									
Intersection Signal Delay: 11.5	Intersection LOS: B								
Intersection Capacity Utilization 46.6%	ICU Level of Service A								
Analysis Period (min) 15									

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp

* # 01	→ ø2		
18 s	29 \$		
∢ — ø6		* * ø8	
47 s		13 s	

Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	•			≜1 ≱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.999	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	149	16	692	0	0	577	1
Confl. Peds. (#/hr)						4	92					92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.70	0.67	0.84	0.92	0.92	0.90	0.25
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	2%	2%	2%	1%	0%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	213	24	824	0	0	641	4
Lane Group Flow (vph)	0	0	0	0	0	213	24	824	0	0	645	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	53.2%		10	CU Leve	el of Sei	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		A1⊅		ኘ	t₽			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.999			0.966				0.865
Flt Protected				0.950				0.964				
Satd. Flow (prot)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Flt Permitted				0.950				0.964				
Satd. Flow (perm)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	859	6	3	1206	3	2	0	1	0	0	16
Confl. Peds. (#/hr)			23	23		35						
Peak Hour Factor	0.25	0.94	0.69	0.25	0.93	0.42	0.33	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	914	9	12	1297	7	6	0	2	0	0	29
Lane Group Flow (vph)	0	923	0	12	1304	0	0	8	0	0	0	29
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	zed											
Intersection Capacity Uti	ilization	50.1%]	CU Leve	el of Sei	rvice A					

Analysis Period (min) 15

	٦	-	-	•	- \	1
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	×	**	A1		k	#
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	7.0	50	50
Trailing Detector (ft)	0	0	0		0	0
Turning Speed (mph)	15	0	0	0	15	0
Lane Litil Eactor	1.00	0.05	0.05	0.05	1.00	1 00
Pod Riko Eastor	1.00	0.95	1.00	0.95	1.00	1.00
Fed Dike Facioi			0.00		1.00	0.850
Fit Protocted	0.050		0.990		0.050	0.850
	1695	2400	2542	0	1005	1500
Sald. Flow (prot)	0 4 5 4	3490	3543	0	1805	1583
	0.154	0.400	0540	-	0.950	4500
Satd. Flow (perm)	273	3490	3543	0	1803	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			14			55
Headway Factor	1.09	1.04	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	612		369	
Travel Time (s)		7.5	11.9		16.8	
Volume (vph)	69	813	812	55	51	191
Confl. Peds. (#/hr)	3			3	1	
Peak Hour Factor	0.87	0.88	0.92	0.90	0.72	0.80
Heavy Vehicles (%)	0%	0%	0%	11%	0%	2%
Adj. Flow (vph)	79	924	883	61	71	239
Lane Group Flow (vph)	79	924	944	0	71	239
Turn Type	pm+nt					pm+ov
Protected Phases	3	8	4		6	3
Permitted Phases	8	0			0	6
Detector Phases	3	8	Δ		6	2
Minimum Initial (e)	10	4.0	4		10	10
Minimum Split (s)	4.0	4.0	4.0		4.0	4.0
Total Split (s)	10.0	22.0	22.0	0.0	22.0	10.0
Total Split (S)	10.0	38.0	20.0	0.0	22.0	10.0
Total Split (%)	16.7%	03.3%	46.7%	0.0%	36.7%	16.7%
Yellow Lime (s)	4.0	4.0	4.0		4.0	4.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Recall Mode	None	None	C-Max		None	None
Act Effct Green (s)	47.2	48.8	34.6		9.5	17.4
Actuated g/C Ratio	0.79	0.81	0.58		0.16	0.29
v/c Ratio	0.19	0.33	0.46		0.25	0.48
Control Delay	2.0	2.4	8.0		23.6	14.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	2.0	24	8.0		23.6	14.3
	2.0	<u>ک.</u> ج	Δ		20.0	R
Approach Delay	A	22	2 A		16 5	D
Approach LOS		∠.3	0.0		10.5	
Approach LOS	0	A	A 100		B	45
Queue Length 50th (ft)	-2	10	189		23	45

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)	m4	15	m220		40	65
Internal Link Dist (ft)		303	532		289	
Turn Bay Length (ft)						
Base Capacity (vph)	416	2836	2050		542	498
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.19	0.33	0.46		0.13	0.48

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 32 (53%), Referenced to phase 4:WBT, Start	of Green
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 6.7	Intersection LOS: A
Intersection Capacity Utilization 42.7%	ICU Level of Service A
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Bridge Street & MBTA Parking Lot Driveway

	₽ _{ø3}	حــ ø4	
	10 s	28 s	
A = 06	l → ₀8		
22 s	38 s		

Year 2016 Build, No Bridge Street widening

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Lane Configurations	**	1	5	**	ካካ	1		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (ft)	0	0	0	0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00		
Frt	0.00	0.850		0.00	0.01	0.850		
Flt Protected		0.000	0.950		0.950	0.000		
Satd Flow (prot)	3421	1794	1711	3421	3400	1568		
Flt Permitted	0121		0.950	0.21	0.950	1000		
Satd, Flow (perm)	3421	1794	1711	3421	3400	1568		
Right Turn on Red	0721	Yes	., .,	0 12 1	0 100	No		
Satd Flow (RTOR)		260				110		
Headway Factor	1 04	0.85	1 04	1 04	1 00	1 00		
Link Speed (mph)	35	0.00	1.04	35	30	1.00		
Link Distance (ff)	289			381	278			
Travel Time (s)	5.6			7 /	63			
Volume (vnh)	601	3/2	203	770	381	300		
Peak Hour Factor	0.01	0.85	0.92	0.82	0.03	0.83		
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%		
Adi Flow (vph)	668	402	2 /0	030	/10	361		
Lane Group Flow (vph)	668	402	318	030	410	361		
	000	Prot	Prot	303	410	nt+ov		
Protected Phases	2	2	1	6	Q	8 1	0	
Pormitted Phases	2	2	1	0	0	01	9	
Detector Phases	2	2	1	6	Q	Q 1		
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0	01	4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0		28.0	
Total Split (s)	28.0	28.0	26.0	54.0	10.0	44.0	20.0	
Total Split (%)	20.0	20.0	20.0	54.0%	10.0	44.0	20.0	
Vellow Time (s)	20.0 /0	20.070	20.070	1 0	10.0 /0	44.070	20 /0	
All Pod Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (S)	2.0	Load	2.0	2.0	2.0		1.0	
Leau/Lay	Voc	Leau	Lay					
	C Min	C Min	Nono	C Min	Nono		Nono	
Act Effet Creen (a)	20.4	20.4		C-IVIII	14.0	26.0	None	
Act Elici Green (S)	0.20	0.20	0.21	0.56	0.14	0.26		
	0.30	0.50	0.21	0.50	0.14	0.50		
Control Dolov	20.04	10.9	0.00 62 E	0.49 16 F	61.0	20.04		
	30.9	10.0	03.5	0.0	01.0	20.9		
Total Delay	20.0	10.0	0.0	0.0 16 E	61.0	0.0		
	30.9	10.8	03.5	0.01	01.0	20.9		
LUS Approach Delay	22.0	В	E	B 20 4	10 0	C		
Approach LOC	23.3			28.4	42.3			
Approach LOS	407		100	200	100	05		
Queue Length 50th (ft)	197	57	196	208	133	85		

2016 Build a.m. - No widening

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Queue Length 95th (ft)	#278	133	#343	233	#213	116		
Internal Link Dist (ft)	209			301	198			
Turn Bay Length (ft)		95						
Base Capacity (vph)	1039	726	376	1902	476	564		
Starvation Cap Reductn	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0		
Reduced v/c Ratio	0.64	0.55	0.85	0.49	0.86	0.64		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 29 (29%), Referenced to phase 2:EBT and 6	:WBT, Start of Green
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 30.1	Intersection LOS: C
Intersection Capacity Utilization 53.7%	ICU Level of Service A
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue	may be longer.
Queue shown is maximum after two cycles.	



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Lane Group	EBT	EBR	WBI	WBT	NBI	NBR
Lane Configurations	1	LDI	*		*	#
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	9	13	13	13
Storage Length (ft)		0	200	10	0	100
Storage Lanes		0	1		1	1
Total Lost Time (s)	4 0	4 0	4 0	4 0	4 0	4 0
Leading Detector (ft)	50	1.0	50	50	50	50
Trailing Detector (ft)	0		0	0	0	0
Turning Speed (mph)	0	Q	15	0	15	q
Lane Litil Factor	1 00	1 00	1 00	1 00	1 00	1 00
Ent	0.08/	1.00	1.00	1.00	1.00	0.850
Flt Protected	0.304		0.050		0 050	0.000
Sate Flow (prot)	2070	0	1522	1025	1011	1650
Satu. Flow (prot)	2070	U	0.050	1923	0.050	1052
	2070	0	1500	1005	1044	1650
Sald. Flow (perm)	2070	U	1533	1925	1911	1052
Right Turn on Red		Yes				Yes
Sato. Flow (RTOR)	14	0.05		0.00	0.00	141
Headway Factor	0.85	0.85	1.14	0.96	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	928	101	82	603	85	311
Peak Hour Factor	0.92	0.75	0.95	0.93	0.88	0.88
Heavy Vehicles (%)	2%	5%	6%	2%	3%	1%
Adj. Flow (vph)	1009	135	86	648	97	353
Lane Group Flow (vph)	1144	0	86	648	97	353
Turn Type			Prot			pt+ov
Protected Phases	2		1	6	8	18
Permitted Phases						
Detector Phases	2		1	6	8	18
Minimum Initial (s)	10.0		5.0	10.0	8.0	
Minimum Split (s)	28.0		10.0	16.0	14.0	
Total Split (s)	69.0	0.0	17.0	86.0	14.0	31.0
Total Split (%)	69.0%	0.0%	17.0%	86.0%	14.0%	31.0%
Yellow Time (s)	4 0	0.070	3.0	4 0	4 0	2070
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	L ad		Lead	2.0	2.0	
Lead-Lag Ontimize?	Luy		Louu			
Recall Mode	C-Min		None	C-Min	None	
Act Effet Groop (a)	67.5		10 5	82.0	10.0	24 5
Actuated a/C Patio	0 68		0.10	02.0	0.10	0.24.0
No Patio	0.00		0.10	0.02	0.10	0.24
Control Dolou	0.8Z		0.53	0.41	0.54	0.09
Outro Delay	0.0		37.5	4.0	54.4	21.5
Queue Delay	0.2		0.0	1.7	0.0	0.0
Total Delay	18.7		31.5	6.2	54.4	21.5
LUS	B		D	A	D	C
Approach Delay	18.7			9.9	33.3	
Approach LOS	В			A	С	
Queue Length 50th (ft)	473		59	127	60	122

2016 Build a.m. - No widening

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Queue Length 95th (ft)	742		m64	m155	110	208	
Internal Link Dist (ft)	214			303	218		
Turn Bay Length (ft)			200			100	
Base Capacity (vph)	1401		199	1579	181	549	
Starvation Cap Reductn	0		0	721	0	0	
Spillback Cap Reductn	22		0	0	0	1	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.83		0.43	0.76	0.54	0.64	
Intersection Summary							
Area Type: O	ther						
Cycle Length: 100							
Actuated Cycle Length: 1	100						
Offset: 95 (95%), Refere	nced to	phase	2:EBT	and 6:W	/BT, Sta	irt of Gree	en
Natural Cycle: 75							
Control Type: Actuated-0	Coordin	ated					
Maximum v/c Ratio: 0.82	2						
Intersection Signal Delay	/: 18.7			Ir	ntersecti	ion LOS:	В
Intersection Capacity Uti	lization	80.9%		10	CU Leve	el of Serv	rice D
Analysis Period (min) 15							
m Volume for 95th perc	centile o	queue is	s meter	ed by up	ostream	signal.	

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp



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Lane Group	FRI	FRT	WBT	WRR	SBI	SBR
Lane Configurations	100		1		CDL K	*
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Lane Width (ft)	1300	1900	1900	1900	1300	1300
Storage Length (ft)	60	9	10	10	14	0
Storage Lanes	1			0	1	1
Total Lost Time (c)	4.0	10	4.0	4.0	4.0	1
Loading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0
Trailing Detector (II)	50	50	50		50	50
Turning Delector (II)	15	0	0	0	15	0
Lang Litil Easter	100	1.00	1.00	1.00	100	1.00
Lane Ulli. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.99		0.99	0.97
Fr	0.050		0.962		0.050	0.850
Fit Protected	0.950	4070	0000	-	0.950	1005
Satd. Flow (prot)	1/45	1676	2002	0	1925	1625
Fit Permitted	0.080				0.950	
Satd. Flow (perm)	147	1676	2002	0	1912	1580
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			26			91
Headway Factor	1.04	1.14	0.85	0.85	0.92	0.92
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	323		369	
Travel Time (s)		7.5	6.3		16.8	
Volume (vph)	317	922	616	201	21	69
Confl. Peds. (#/hr)	3			3	3	2
Peak Hour Factor	0.63	0.85	0.88	0.74	0.91	0.76
Heavy Vehicles (%)	0%	2%	2%	4%	0%	6%
Adj. Flow (vph)	503	1085	700	272	23	91
Lane Group Flow (vph)	503	1085	972	0	23	91
Turn Type	pm+pt					Perm
Protected Phases	3	8	4		6	
Permitted Phases	8		•			6
Detector Phases	3	8	4		6	6
Minimum Initial (s)	4 0	4 0	4 0		4 0	4 0
Minimum Split (s)	10.0	22.0	22.0		22.0	22.0
Total Split (s)	28.0	78.0	50.0	0.0	22.0	22.0
Total Split (%)	28.0%	78.0%	50.0%	0.0%	22.0	22.0
Yellow Time (s)	10	10.070	/ 0	0.070	1 0	1 0
All Ped Time (s)	4.0	4.0	4.0		4.0	4.0
		2.0	2.0		2.0	2.0
Leau/Lay	Lead		Lag			
	Nene	None	C Max		None	None
	NONE	NONE	C-IVIAX		NONE	None
Act Effect Green (S)	85.2	86.0	50.4		9.1	9.1
Actuated g/C Ratio	0.85	0.86	0.50		0.09	0.09
v/c Ratio	0.81	0.75	0.95		0.13	0.40
Control Delay	35.0	5.2	31.5		42.6	14.6
Queue Delay	6.4	0.5	0.7		0.0	0.0
Total Delay	41.4	5.7	32.3		42.6	14.6
LOS	D	А	С		D	В
Approach Delav		17.0	32.3		20.2	

2016 Build a.m. - No widening

HSH Associates Page 5

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		В	С		С	
Queue Length 50th (ft)	218	141	~469		14	0
Queue Length 95th (ft)	211	198	#607		37	29
Internal Link Dist (ft)		303	243		289	
Turn Bay Length (ft)	60					
Base Capacity (vph)	618	1442	1022		347	359
Starvation Cap Reductn	77	95	7		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.93	0.81	0.96		0.07	0.25

Intersection Summary		
Area Type: Other		
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 20 (20%), Referenced to phase 4:WBT,	Start of Green	
Natural Cycle: 110		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.95		
Intersection Signal Delay: 22.7	Intersection LOS: C	
Intersection Capacity Utilization 76.1%	ICU Level of Service D	
Analysis Period (min) 15		
~ Volume exceeds capacity, queue is theoret	ically infinite.	
Queue shown is maximum after two cycles.		
# 95th percentile volume exceeds capacity, q	ueue may be longer.	
Queue shown is maximum after two oveles		

Queue snown is maximum after two cycles.

Splits and Phases: 5: Bridge Street & MBTA Parking Lot Driveway



	-	\rightarrow	- 🖌	+	- 1	1		
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9	
Lane Configurations	**	1	5	**	ካካ	1		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (ft)	0	0	0	0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util Factor	0.95	1 00	1 00	0.95	0.97	1 00		
Frt	0.00	0.850		0.00	0.01	0.850		
Elt Protected		0.000	0.950		0.950	0.000		
Satd Flow (prot)	3455	1830	1745	3490	3433	1568		
Flt Permitted	0 100	1000	0.950	0 100	0.950	1000		
Satd Flow (perm)	3455	1830	1745	3490	3433	1568		
Right Turn on Red	5455	Vas	11-13	5430	5455	No		
Satd Flow (RTOR)		163				110		
Headway Factor	1.04	0.85	1.04	1.04	1.00	1.00		
Link Speed (mph)	25	0.00	1.04	25	30	1.00		
Link Opeed (mpn)	280			201	277			
Travel Time (c)	209			7 /	6.2			
Volumo (vph)	636	202	225	906	594	254		
Dook Hour Footor	0.00	0.70	0.00	0.01	0.02	0.72		
	1%	0.79	0.00	0.91	0.02	20/		
Adi Elow (vph)	705	250	406	0%	Z 70	252		
Auj. Flow (vpli)	795	250	400	900	712	252		
Larie Group Flow (vpri)	795	Drot	400 Drot	900	112	505 nt+ov		
Turri Type	2	FIUL	1	6	0	ρι+0ν	0	
Protected Phases	2	2	1	0	0	01	9	
Permilled Phases	0	0	4	C	0	0.4		
Delector Phases	10.0	10.0	0.0	10.0	10.0	01	4.0	
Minimum Initial (S)	10.0	10.0	8.0	10.0	10.0		4.0	
Total Split (s)	10.0	10.0	14.0	10.0	10.0	50.0	20.0	
	33.0	33.0	31.0	64.0	28.0	59.0	28.0	
	27.5%	27.5%	25.8%	53.3%	23.3%	49.2%	23%	
Valley, Tires (s)	27.0	27.0	25.0	58.0	22.0		25.0	
	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes	0.0	0.0		0.0	
Venicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
vvalk lime (s)							7.0	
Flash Dont Walk (s)							18.0	
Pedestrian Calls (#/hr)							100	
Act Effct Green (s)	29.0	29.0	27.0	60.0	24.0	51.0		
Actuated g/C Ratio	0.24	0.24	0.22	0.50	0.20	0.42		
v/c Ratio	0.95	0.63	1.03	0.56	1.04	0.53		
Control Delay	55.9	20.7	100.0	22.5	91.0	16.2		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		

2016 Build p.m. - No widening

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9
Total Delay	55.9	20.7	100.0	22.5	91.0	16.2	
LOS	E	С	F	С	F	В	
Approach Delay	44.9			45.1	66.2		
Approach LOS	D			D	E		
Queue Length 50th (ft)	299	107	~338	271	~306	98	
Queue Length 95th (ft)	#330	144	#441	334	#363	106	
Internal Link Dist (ft)	209			301	197		
Turn Bay Length (ft)		95					
Base Capacity (vph)	835	566	393	1745	687	666	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.95	0.63	1.03	0.56	1.04	0.53	
Intersection Summary							
Area Type: O	ther						
Cycle Length: 120							
Actuated Cycle Length:	120						
Offset: 100 (83%), Refer	enced t	to phas	e 2:EBT	and 6:	NBT, St	art of G	ireen
Natural Cycle: 120							
Control Type: Actuated-0	Coordin	ated					
Maximum v/c Ratio: 1.04	1						
Intersection Signal Delay	y: 51.3			Ir	ntersect	ion LOS	5: D
Intersection Capacity Uti	lization	62.2%		10	CU Leve	el of Ser	vice B
Analysis Period (min) 15							
 Volume exceeds cap 	bacity, q	queue is	theoret	tically in	finite.		
Queue shown is max	imum a	fter two	cycles.				
# 95th percentile volun	ne exce	eds ca	bacity, q	lueue m	ay be lo	onger.	
Queue shown is max	imum a	fter two	cycles.				

Splits and Phases: 1: Bridge Street & Washington Street



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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1	Brt	*	*	*	*
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	9	13	13	13
Storage Length (ft)	10	0	200	10	0	100
Storage Lanes		0	1		1	1
Total Lost Time (s)	40	4 0	4 0	40	4 0	4 0
Leading Detector (ft)	50	4.0	50	50	50	50
Trailing Detector (ft)	0		0	0	0	0
Turning Speed (mph)	0	Q	15	0	15	9
Lane Litil Factor	1 00	1 00	1 00	1 00	1 00	1 00
Ped Bike Eactor	1.00	1.00	1.00	1.00	1.00	1.00
	0.085		1.00			0.850
FIL FIL Protoctod	0.905		0.050		0.050	0.000
Satd Elow (prot)	2116	0	1502	1062	1965	1650
Elt Pormitted	2110	0	0.050	1903	0.050	1052
	2140	0	1504	1000	1905	1650
Sald. Flow (perm)	2110	0	1991	1963	1902	1052
Right Turn on Red	4 5	res				Yes
Sato. Flow (RTOR)	15	0.05	4 4 4	0.00	0.00	143
Headway Factor	0.85	0.85	1.14	0.96	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	646	65	231	862	117	227
Confl. Peds. (#/hr)		2	2			2
Peak Hour Factor	0.87	0.70	0.87	0.83	0.74	0.86
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%
Adj. Flow (vph)	743	93	266	1039	158	264
Lane Group Flow (vph)	836	0	266	1039	158	264
Turn Type			Prot			pt+ov
Protected Phases	2		1	6	8	18
Permitted Phases						
Detector Phases	2		1	6	8	18
Minimum Initial (s)	10.0		5.0	10.0	5.0	
Minimum Split (s)	28.0		10.0	16.0	11.0	
Total Split (s)	33.0	0.0	16.0	49.0	11.0	27 0
Total Split (%)	55.0%	0.0%	26.7%	81.7%	18.3%	45.0%
Maximum Green (s)	27.0	0.070	11 0	43.0	5.0	40.070
Vellow Time (s)	27.0		3.0	40	4.0	
All Pod Time (s)	2.0		2.0	2.0	2.0	
	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	0.0		0.0	0.0	0.0	
Venicle Extension (s)	2.0		2.0	2.0	2.0	
Recall Mode	C-Min		None	C-Min	None	
Walk Time (s)	7.0					
Flash Dont Walk (s)	15.0					
Pedestrian Calls (#/hr)	0					
Act Effct Green (s)	29.2		11.8	45.0	7.0	22.8
Actuated g/C Ratio	0.49		0.20	0.75	0.12	0.38
v/c Ratio	0.80		0.85	0.71	0.72	0.37

2016 Build p.m. - No widening
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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Control Delay	20.9		46.8	4.3	47.6	7.9	
Queue Delay	0.0		0.0	0.2	0.0	0.0	
Total Delay	20.9		46.8	4.5	47.6	7.9	
LOS	С		D	Α	D	Α	
Approach Delay	20.9			13.1	22.8		
Approach LOS	С			В	С		
Queue Length 50th (ft)	235		112	23	57	28	
Queue Length 95th (ft)	#368	I	m#161	33	#98	67	
Internal Link Dist (ft)	214			303	218		
Turn Bay Length (ft)			200			100	
Base Capacity (vph)	1039		319	1472	218	721	
Starvation Cap Reductn	0		0	58	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.80		0.83	0.73	0.72	0.37	
Intersection Summary							
Area Type: C	Other						
Cycle Length: 60							
Actuated Cycle Length:	60						
Offset: 26 (43%), Refere	enced to	phase	2:EBT a	and 6:W	BT, Sta	rt of Gre	en
Natural Cycle: 60	<u> </u>						
Control Type: Actuated-	Coordin	ated					
Maximum v/c Ratio: 0.8	5						
Intersection Signal Delay	y: 17.2	07 - 01		In	itersect	ion LOS	: B
Intersection Capacity Ut	ilization	67.7%		IC	CU Leve	el of Ser	vice (
Analysis Period (min) 15)						
# 95th percentile volur	ne exce	eds ca	pacity, c	luene m	ay be lo	onger.	
Queue shown is max	amum a	tter two	cycles.				
m Volume for 95th per	centile	queue i	s meter	ed by up	ostream	signal.	
Splits and Phases: 2:	Bridge	Street &	& Route	114 (No	orth Stre	et) Ram	۱p

f 01	→ ø2	
16 s	33 s	
←		★ 28
49 s		11 s

Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	•			≜1 ≱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.999	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	149	16	689	0	0	607	1
Confl. Peds. (#/hr)						4	92					92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.70	0.67	0.84	0.92	0.92	0.90	0.25
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	2%	2%	2%	1%	0%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	213	24	820	0	0	674	4
Lane Group Flow (vph)	0	0	0	0	0	213	24	820	0	0	678	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	53.0%		[(CU Leve	el of Sei	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		A		ሻ	A			4				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.999			0.966				0.865
Flt Protected				0.950				0.964				
Satd. Flow (prot)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Flt Permitted				0.950				0.964				
Satd. Flow (perm)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	884	6	3	1203	3	2	0	1	0	0	16
Confl. Peds. (#/hr)			23	23		35						
Peak Hour Factor	0.25	0.94	0.69	0.25	0.93	0.42	0.33	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	940	9	12	1294	7	6	0	2	0	0	29
Lane Group Flow (vph)	0	949	0	12	1301	0	0	8	0	0	0	29
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	zed											
Intersection Capacity Ut	ilization	50.0%](CU Leve	el of Ser	vice A					

Analysis Period (min) 15

	≯		-		- \	1
Lane Group	FRI	FRT	WRT	WRR	SRI	SRR
Lane Configurations			1001 1			3
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Lane Width (ft)	1300	001	16	16	1/	1/
Storage Length (ft)	60	9	10	0	0	0
Storage Length (II)	1			0	1	1
Storage Lanes	1	1.0	4.0	1.0	1 0	1
Loading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (II)	50	50	50		50	50
Trailing Delector (II)	15	0	0	0	15	0
Turning Speed (mpn)	15	1 00	1 00	4 00	15	9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00		1.00	0.050
Frt	0.055		0.992		0.0=1	0.850
Fit Protected	0.950				0.950	
Satd. Flow (prot)	1745	1710	2119	0	1925	1689
Flt Permitted	0.143				0.950	
Satd. Flow (perm)	263	1710	2119	0	1923	1689
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			6			215
Headway Factor	1.04	1.14	0.85	0.85	0.92	0.92
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	323		369	
Travel Time (s)		7.5	6.3		16.8	
Volume (vph)	60	813	812	49	106	281
Confl Peds (#/hr)	3	010	012	-3	100	201
Peak Hour Factor	0.87	0.88	0 92	0 90	0 72	0.80
Heavy Vehicles (%)	0.07	0.00	0.92	11%	0.72	2%
Adi Flow (vph)	60	0.0	0 /0	Г /0 БЛ	1/7	2 /0
Auj. Flow (VpH)	60	924	003	04	147	251
Lane Group Flow (vph)	09	924	937	0	147	Derret
Turn Type	pm+pt	0				Perm
Protected Phases	3	8	4		6	-
Permitted Phases	8					6
Detector Phases	3	8	4		6	6
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	10.0	22.0	22.0		22.0	22.0
Total Split (s)	10.0	38.0	28.0	0.0	22.0	22.0
Total Split (%)	16.7%	63.3%	46.7%	0.0%	36.7%	36.7%
Maximum Green (s)	4.0	32.0	22.0		16.0	16.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0
All-Red Time (s)	2.0	2.0	2.0		2 0	2.0
Lead/Lag	Lad	2.0	Lead		2.0	2.0
Lead-Lag Ontimize?	Vac		Vee			
Vehicle Extension (a)	20	20	20		20	3.0
Pecall Mode	S.U	None	C Mox		None	S.U None
	ivone	NONE			NONE	NONE
VValk Time (S)		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		6.0	6.0		6.0	6.0
Pedestrian Calls (#/hr)		0	0		0	0
Act Effct Green (s)	38.8	38.8	32.8		13.2	13.2
Actuated g/C Ratio	0.65	0.65	0.55		0.22	0.22
v/c Ratio	0.22	0.84	0.81		0.35	0.65

2016 Build p.m. - No widening

HSH Associates Page 7

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Control Delay	6.4	13.8	20.1		20.8	14.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	6.4	13.8	20.1		20.8	14.0	
LOS	Α	В	С		С	В	
Approach Delay		13.3	20.1		16.0		
Approach LOS		В	С		В		
Queue Length 50th (ft)	5	82	413		45	42	
Queue Length 95th (ft)	m12 ı	m#503 ı	m#606		61	77	
Internal Link Dist (ft)		303	243		289		
Turn Bay Length (ft)	60						
Base Capacity (vph)	318	1105	1160		578	657	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.22	0.84	0.81		0.25	0.53	
Intersection Summary							
Area Type: Of	ther						
Cycle Length: 60							
Actuated Cycle Length: 6	60						
Offset: 24 (40%), Referen	nced to	o phase	4:WBT	, Start o	of Green		
Natural Cycle: 70							
Control Type: Actuated-C	Coordir	nated					
Maximum v/c Ratio: 0.84							
Intersection Signal Delay	v: 16.5			h	ntersecti	on LOS:	: В
Intersection Capacity Util	lization	69.8%](CU Leve	l of Serv	vice (
Analysis Period (min) 15							
# 95th percentile volum	ne exce	eds ca	oacity, c	lueue m	nay be lo	nger.	
Queue shown is maxi	mum a	ifter two	cycles.				
m Volume for 95th perc	centile	queue i	s meter	ed by u	pstream	signal.	

Splits and Phases: 5: Bridge Street & MBTA Parking Lot Driveway

	← ø4	
	28 s	10 s
~▶ ø6	≁ _{ø8}	
22 s	38 s	

Year 2016 Build, With Bridge Street widening

	-	\mathbf{r}	-	-	1	1		
Lane Group	FBT	FBR	WBI	WBT	NBI	NBR	ø9	ŕ
Lane Configurations	**	#	*	**	**	#	20	-
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	11	11	12	12		
Storage Length (ft)		95	0		0	0		
Storage Lanes		1	1		2	1		
Total Lost Time (s)	10	4.0	4.0	10	10	10		
Leading Detector (ft)	50	50	50	50	50	50		
Trailing Detector (II)	0	0	0	0	0	0		
Turning Speed (mph)	0	0	15	0	15	0		
Lane Litil Eactor	0.05	1 00	1 00	0.05	0.07	1 00		
Ent	0.35	0.850	1.00	0.35	0.37	0.850		
Elt Protoctod		0.000	0.050		0.050	0.000		
Sate Flow (prot)	2421	1704	1711	2/21	2400	1569		
Satu. Flow (prot)	J4Z I	1794	0.050	J42 I	0.050	1000		
Satd Flow (norm)	3/01	1704	1711	3/01	2400	1569		
Dight Turn on Dod	3421	1794 Vac	1711	3421	3400	1000		
Setd Flow (DTOD)		Tes 260				INO		
Salu. Flow (KTUK)	1.0.4	200	1.04	1.04	1.00	1.00		
Link Speed (mph)	1.04	0.85	1.04	1.04	1.00	1.00		
Link Speed (mpn)	35			35	30			
	289			301	2/8			
Travel Time (s)	5.6	0.40	000	7.4	0.3	200		
volume (vpn)	601	342	293	770	381	300		
Peak Hour Factor	0.90	0.85	0.92	0.82	0.93	0.83		
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%		
Adj. Flow (vph)	668	402	318	939	410	361		
Lane Group Flow (vph)	668	402	318	939	410	361		
Turn Type	_	Prot	Prot	-	-	pt+ov	-	
Protected Phases	2	2	1	6	8	81	9	
Permitted Phases								
Detector Phases	2	2	1	6	8	8 1		
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0		4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0		28.0	
Total Split (s)	28.0	28.0	26.0	54.0	18.0	44.0	28.0	
Total Split (%)	28.0%	28.0%	26.0%	54.0%	18.0%	44.0%	28%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Act Effct Green (s)	30.4	30.4	21.2	55.6	14.0	39.2		
Actuated g/C Ratio	0.30	0.30	0.21	0.56	0.14	0.39		
v/c Ratio	0.64	0.55	0.88	0.49	0.86	0.59		
Control Delay	30.7	9.5	63.5	16.5	61.0	28.5		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delav	30.7	9.5	63.5	16.5	61.0	28.5		
LOS	С	A	E	B	E	С		
Approach Delav	22.7		_	28.4	45.8	-		
Approach LOS	C			C	D			
Queue Length 50th (ft)	219	53	196	208	133	176		

2016 Build a.m. - with widening

\rightarrow \rightarrow \checkmark \leftarrow \checkmark \land

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø9		
Queue Length 95th (ft)	#266	86	#343	233	#213	241			
Internal Link Dist (ft)	209			301	198				
Turn Bay Length (ft)		95							
Base Capacity (vph)	1039	726	376	1902	476	627			
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.64	0.55	0.85	0.49	0.86	0.58			

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 17 (17%), Referenced to phase 2:EBT and 6	WBT, Start of Green
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 30.8	Intersection LOS: C
Intersection Capacity Utilization 53.7%	ICU Level of Service A
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue	e may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Bridge Street & Washington Street



Lane Group EBT EBR WBL WBT NBL NBR Lane Configurations
Lane Configurations Image: state
Ideal Flow (vphpl)1900190019001900190019001900Lane Width (ft)11111110111313Storage Length (ft)0000100Storage Lanes01111Total Lost Time (s)4.04.04.04.04.0Leading Detector (ft)50505050Trailing Detector (ft)0000Turning Speed (mph)915159Lane Util. Factor0.950.951.000.950Fit Protected0.9500.9500.950Satd. Flow (prot)3348015893421Satd. Flow (perm)3348015893421
Lane Width (ft)111110111313Storage Length (ft)000100Storage Lanes0111Total Lost Time (s)4.04.04.04.04.0Leading Detector (ft)50505050Trailing Detector (ft)0000Turning Speed (mph)915159Lane Util. Factor0.950.951.000.950Fit Protected0.9500.9500.950Satd. Flow (prot)3348015893421Satd. Flow (perm)3348015893421Satd. Flow (perm)3348015893421
Storage Length (ft) 0 0 0 100 Storage Lanes 0 1 1 1 Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 Leading Detector (ft) 50 50 50 50 50 Trailing Detector (ft) 0 0 0 0 0 Turning Speed (mph) 9 15 15 9 Lane Util. Factor 0.95 0.95 1.00 0.95 0.850 Fit Protected 0.950 0.950 0.950 0.950 1811 1652 Fit Permitted 0.950 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Storage Lanes 0 1 1 1 Total Lost Time (s) 4.0 4.0 4.0 4.0 4.0 4.0 Leading Detector (ft) 50 50 50 50 50 50 Trailing Detector (ft) 0 0 0 0 0 0 Turning Speed (mph) 9 15 15 9 1.00 1.00 Frt 0.95 0.95 1.00 0.95 0.950 0.850 Flt Protected 0.950 0.950 0.950 0.950 0.950 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Flt Permitted 0.950 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Total Lost Time (s) 4.0 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.850 0.850 0.850 0.950 0.950 0.950 0.950 0.950 0.950 0.
Leading Detector (ft) 50 50 50 50 50 Trailing Detector (ft) 0 0 0 0 0 Turning Speed (mph) 9 15 15 9 Lane Util. Factor 0.95 0.95 1.00 0.950 Frt 0.982 0.950 0.950 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Flt Permitted 0.950 0.950 0.950 0.950 0.950
Trailing Detector (ft) 0
Turning Speed (mph) 9 15 15 9 Lane Util. Factor 0.95 0.95 1.00 0.95 1.00 1.00 Frt 0.982 0.950 0.950 0.950 0.950 0.950 Flt Protected 0.950 0.950 0.950 0.950 0.950 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Lane Util. Factor 0.95 0.95 1.00 0.95 1.00 1.00 Frt 0.982 0.950 0.950 0.850 Flt Protected 0.950 0.950 0.950 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Flt Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Carle Guil, Factor 0.95 0.95 1.00 0.95 1.00 1.00 Frt 0.982 0.950 0.850 0.850 0.850 0.850 Flt Protected 0.950 0.950 0.950 0.950 0.950 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Flt Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Fit Protected 0.952 0.850 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Flt Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Fit Protected 0.950 0.950 Satd. Flow (prot) 3348 0 1589 3421 1811 1652 Fit Permitted 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Satal. Flow (prot) 3348 0 1589 3421 1811 1652 Flt Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Fit Permitted 0.950 0.950 Satd. Flow (perm) 3348 0 1589 3421 1811 1652
Sata. Flow (perm) 3348 0 1589 3421 1811 1652
Right Turn on Red Yes Yes Yes
Satd. Flow (RTOR) 20 66
Headway Factor 1.04 1.04 1.09 1.04 0.96 0.96
Link Speed (mph) 35 35 30
Link Distance (ft) 294 383 298
Travel Time (s) 5.7 7.5 6.8
Volume (vph) 928 101 82 603 85 311
Peak Hour Factor 0.92 0.75 0.95 0.93 0.88 0.88
Heavy Vehicles (%) 2% 5% 6% 2% 3% 1%
Adj. Flow (vph) 1009 135 86 648 97 353
Lane Group Flow (vph) 1144 0 86 648 97 353
Turn Type Prot pt+ov
Protected Phases 2 1 6 8 18
Permitted Phases
Detector Phases 2 1 6 8 1 8
Minimum Initial (s) 10.0 5.0 10.0 8.0
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
Total Split (s) 52.0 10.0 10.0 14.0
Total Split (8) 52.0 0.0 20.0 00.0 20.0 40.0 Total Split (9) 52.0% 0.0% 20.0% 20.0% 40.0%
Total Split (%) 52.0% 0.0% 20.0% 60.0% 20.0% 40.0% Vallow Time (a) 4.0 2.0 4.0
Tenow Time (s) 4.0 3.0 4.0 4.0 All Dad Time (a) 2.0
All-Rea Time (s) 2.0 2.0 2.0 2.0
Lead/Lag Lag Lead
Lead-Lag Optimize?
Recall Mode C-Min None C-Min None
Act Effct Green (s) 61.6 10.7 76.4 15.6 30.4
Actuated g/C Ratio 0.62 0.11 0.76 0.16 0.30
v/c Ratio 0.55 0.50 0.25 0.34 0.64
Control Delay 12.8 44.1 5.3 41.2 29.6
Queue Delay 0.0 0.0 0.3 0.0 0.0
Total Delay 12.8 44.1 5.5 41.2 29.6
LOS B D A D C
Approach Delay 12.8 10.1 32.1
Approach LOS B B C

2016 Build a.m. - with widening

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Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Queue Length 95th (ft)	294		109	127	102	230	
Internal Link Dist (ft)	214			303	218		
Turn Bay Length (ft)						100	
Base Capacity (vph)	2072		381	2613	290	751	
Starvation Cap Reductn	0		0	1207	0	0	
Spillback Cap Reductn	0		0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	
Reduced v/c Ratio	0.55		0.23	0.46	0.33	0.47	
Intersection Summary							
Area Type: O	ther						
Cycle Length: 100							
Actuated Cycle Length: 7	100						
Offset: 99 (99%), Refere	nced to	phase	2:EBT a	and 6:W	/BT, Sta	rt of Green	
Natural Cycle: 55							
Control Type: Actuated-0	Coordin	ated					
Maximum v/c Ratio: 0.64	ŀ						
Intersection Signal Delay	/: 15.7			lr	ntersecti	ion LOS: B	
Intersection Capacity Uti	lization	54.8%		10	CU Leve	el of Service	A
Analysis Period (min) 15							

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp



Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	†			≜1 }	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.992	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1660	1518	1699	0	0	3415	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1660	1518	1699	0	0	3415	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			278	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	133	16	548	0	0	612	23
Confl. Peds. (#/hr)						30	163					163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.79	0.54	0.84	0.92	0.92	0.85	0.61
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%	7%	4%	2%	2%	5%	2%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	168	30	652	0	0	720	38
Lane Group Flow (vph)	0	0	0	0	0	168	30	652	0	0	758	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	48.0%		[(CU Leve	el of Se	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		A		1	tβ			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.997						0.865				0.865
Flt Protected				0.950								
Satd. Flow (prot)	0	3412	0	1745	3421	0	0	1589	0	0	0	1644
Flt Permitted				0.950								
Satd. Flow (perm)	0	3412	0	1745	3421	0	0	1589	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	888	13	1	1042	2	0	0	2	0	0	21
Confl. Peds. (#/hr)			9	9		59						
Peak Hour Factor	0.67	0.94	0.69	0.25	0.87	0.50	0.92	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	2%	2%	0%	2%	2%	0%
Adj. Flow (vph)	0	945	19	4	1198	4	0	0	4	0	0	38
Lane Group Flow (vph)	0	964	0	4	1202	0	0	4	0	0	0	38
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	45.5%		[(CU Lev	el of Ser	vice A					

Analysis Period (min) 15

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	ሻ	- † †	≜ ⊅		ሻ	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50		50	50
Trailing Detector (ft)	0	0	0		0	0
Turning Speed (mph)	15			9	15	9
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			0.99		0.99	0.98
Frt			0.958			0.850
Flt Protected	0.950		0.000		0.950	0.000
Satd Flow (prot)	1685	3421	3343	0	1805	1524
Flt Permitted	0 103	0721	00+0	0	0 950	1024
Satd Flow (norm)	182	3/101	3343	0	1702	1/02
Pight Turn on Pod	103	0421	0040	Vac	1793	V00
Sotd Flow (DTOD)			60	res		74
Salu. Flow (KTUK)	1.00	1.04	1.00	1.00	1.00	1 00
Headway Factor	1.09	1.04	1.00	1.00	1.00	1.00
LINK Speed (mph)		35	35		15	
LINK Distance (ft)		383	323		369	
Travel Time (s)		7.5	6.3		16.8	
Volume (vph)	317	922	616	201	21	69
Confl. Peds. (#/hr)	3			3	3	2
Peak Hour Factor	0.63	0.85	0.88	0.74	0.91	0.76
Heavy Vehicles (%)	0%	2%	2%	4%	0%	6%
Adj. Flow (vph)	503	1085	700	272	23	91
Lane Group Flow (vph)	503	1085	972	0	23	91
Turn Type	pm+pt					pm+ov
Protected Phases	3	8	4		6	3
Permitted Phases	8					6
Detector Phases	3	8	4		6	3
Minimum Initial (s)	4 0	4 0	4 0		4 0	4 0
Minimum Split (s)	10.0	22.0	22.0		22.0	10.0
Total Split (s)	20.0	72.0	20.0	0.0	22.0	20.0
Total Split (%)	20.00/	70.0/	20.00/	0.0	22.0	20 00/
	39.0%	10.0%	39.0%	0.0%	22.0%	39.0%
Tellow Time (S)	4.0	4.0	4.0		4.0	4.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Recall Mode	None	None	C-Max		None	None
Act Effct Green (s)	90.4	92.8	53.3		8.7	37.1
Actuated g/C Ratio	0.90	0.93	0.53		0.09	0.37
v/c Ratio	0.76	0.34	0.54		0.15	0.15
Control Delay	22.5	1.1	19.8		43.8	4.6
Queue Delay	0.7	0.0	0.0		0.0	0.0
Total Delay	23.2	1.1	19.8		43.8	4.6
LOS	С	А	В		D	А
Approach Delay		8 1	19.8		12.5	
Approach LOS		Δ	B		B	
Oueue Length 50th (ft)	127	0	104		1/	Q
	121	0	104		14	0

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2016 Build a.m. - with widening

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)	146	55	123		38	18
Internal Link Dist (ft)		303	243		289	
Turn Bay Length (ft)						
Base Capacity (vph)	728	3175	1813		325	674
Starvation Cap Reductn	55	221	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.75	0.37	0.54		0.07	0.14

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 20 (20%), Referenced to phase 4:WBT, Start	of Green
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 12.5	Intersection LOS: B
Intersection Capacity Utilization 54.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Bridge Street & MBTA Parking Lot Driveway

	₽ ø3	4 04	
	39 s	39 s	
A 💊 😼	A @8		
22 s	78 s		

	-	\mathbf{i}	-	-	1	1		
Lane Group	FBT	FBR	WBI	WBT	NBI	NBR	ø9	
Lane Configurations		#	*		**	*	00	
Ideal Flow (vphpl)	1000	1000	1000	1000	1900	1000		
Lane Width (ft)	1300	16	1300	1300	12	12		
Storage Length (ft)		95	0		12	0		
Storage Lanes		1	1		2	1		
Total Lost Time (c)	10	10	1	10	4.0	1		
Loading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0		
Trailing Detector (ft)	50	50	50	50	50	50		
Turning Detector (It)	0	0	15	0	15	0		
Lana Litil Faster	0.05	1 00	1 00	0.05	0.07	1 00		
	0.95	0.950	1.00	0.95	0.97	0.950		
FIL Fit Droto stod		0.650	0.050		0.050	0.650		
Fil Protected	2455	1000	0.950	2400	0.950	1500		
Salu. FIOW (prot)	3499	1830	1/45	3490	3433	1000		
	2455	1000	0.950	2400	0.950	1500		
Satd. Flow (perm)	3455	1830	1745	3490	3433	1568		
Right Turn on Red		Yes				NO		
Sato. Flow (RTOR)	4.0.4	163	4.04	4.0.1	4.00	4.00		
Headway Factor	1.04	0.85	1.04	1.04	1.00	1.00		
LINK Speed (mph)	35			35	30			
Link Distance (ft)	289			381	277			
Travel Time (s)	5.6			7.4	6.3			
Volume (vph)	636	283	325	896	584	254		
Peak Hour Factor	0.80	0.79	0.80	0.91	0.82	0.72		
Heavy Vehicles (%)	1%	0%	0%	0%	2%	3%		
Adj. Flow (vph)	795	358	406	985	712	353		
Lane Group Flow (vph)	795	358	406	985	712	353		
Turn Type		Prot	Prot			pt+ov		
Protected Phases	2	2	1	6	8	8 1	9	
Permitted Phases								
Detector Phases	2	2	1	6	8	8 1		
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0		4.0	
Minimum Split (s)	16.0	16.0	14.0	16.0	16.0		28.0	
Total Split (s)	33.0	33.0	31.0	64.0	28.0	59.0	28.0	
Total Split (%)	27.5%	27.5%	25.8%	53.3%	23.3%	49.2%	23%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		2.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.0	
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Min	C-Min	None	C-Min	None		None	
Act Effet Green (s)	29.0	29.0	27.0	60.0	24.0	55.0	110110	
Actuated a/C Ratio	0.24	0.24	0.22	0.50	0.20	0.46		
v/c Ratio	0.24	0.24	1.02	0.50	1.04	0.40		
Control Delay	58.0	21 1	100.0	0.00 22 F	01.04	25.7		
	0.9	21.1	0.01	22.3	91.0	20.7		
Total Delay	59.0	21.4	100.0	0.0 22 E	01.0	25.7		
	50.9	21.1	100.0	22.5	91.0	25.7		
LUO Approach Deley		C	Г		F 60 0	C		
Approach Delay	47.1			45.1	09.3			
Approach LUS	D	00	0.000	D	E	407		
Queue Length 50th (ft)	330	96	~338	271	~306	187		

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EBT	EBR	WBL	WBT	NBL	NBR	ø9				
#276	129	#441	334	#363	203					
209			301	197						
	95									
835	566	393	1745	687	719					
0	0	0	0	0	0					
0	0	0	0	0	0					
0	0	0	0	0	0					
0.95	0.63	1.03	0.56	1.04	0.49					
	EBT #276 209 8355 00 00 00 0.95	EBT EBR #276 129 209 95 835 566 0 0 0 0 0 0 0 0 0.95 0.63	EBT EBR WBL #276 129 #441 209 95 835 566 393 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1.03	EBT EBR WBL WBT #276 129 #441 334 209	EBT EBR WBL WBT NBL #276 129 #441 334 #363 209 - - 301 197 95 - - 687 835 566 393 1745 687 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.95 0.63 1.03 0.56 1.04	EBTEBRWBLWBTNBLNBR#276129#441334#363203209	EBT EBR WBL WBT NBL NBR Ø9 #276 129 #441 334 #363 203 209 301 197 197 95 301 197 197 835 566 393 1745 687 719 0 0 0 0 0 0 10 0 0 0 0 0 0 10 0 0 0 0 0 0 10 0 0 0 0 0 0 10 0 0 0 0 0 0 10 0 0 0 0 0 0 10 0.95 0.63 1.03 0.56 1.04 0.49	EBT EBR WBL WBT NBL NBR Ø9 #276 129 #441 334 #363 203 209 301 197 - - 95 301 197 - - 835 566 393 1745 687 719 0 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 - - 0 0 0 0 0 - - 0.95 0.63 1.03 0.56 1.04 0.49	EBT EBR WBL WBT NBL NBR Ø9 #276 129 #441 334 #363 203 209 301 197 197 195 95 95 1107 100 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.95 0.63 1.03 0.56 1.04 0.49	EBT EBR WBL WBT NBL NBR Ø9 #276 129 #441 334 #363 203 209 301 197 - - 95 301 197 - - 835 566 393 1745 687 719 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.95 0.63 1.03 0.56 1.04 0.49 -

Int	ersection Summary
Ar	ea Type: Other
Су	cle Length: 120
Ac	tuated Cycle Length: 120
Of	fset: 19 (16%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Na	itural Cycle: 120
Сс	ntrol Type: Actuated-Coordinated
Ma	aximum v/c Ratio: 1.04
Int	ersection Signal Delay: 52.9 Intersection LOS: D
Int	ersection Capacity Utilization 62.2% ICU Level of Service B
An	alysis Period (min) 15
~	Volume exceeds capacity, queue is theoretically infinite.
	Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer.
	Queue shown is maximum after two cycles.

Splits and Phases: 1: Bridge Street & Washington Street

* 01	↓ ø2	Å ≹ ø9	
31 s	33 s	28 s	
← ø6			** @8
64 s			28 s

	-	\mathbf{i}	1	-	-	1
Lane Group	FBT	FBR	WBI	WBT	NBI	NBR
Lane Configurations		LDI	TTDL X		NUC X	*
Ideal Flow (vphpl)	1900	1000	1000	1000	1000	1000
Lane Width (tt)	11	11	10	11	1300	12
Storage Length (ft)	11	0	0	11	0	100
Storage Lanes		0	1		1	100
Total Lost Time (c)	10	4.0	1	10	1	1
Loading Detector (ft)	4.0	4.0	4.0	4.0	4.0	4.0
Trailing Detector (It)	50		50	50	50	50
Turning Speed (mph)	0	0	15	0	15	0
Long Litil Easter	0.05	9	1 00	0.05	1 00	1 00
Lane Ulli. Factor	0.95	0.95	1.00	0.95	1.00	1.00
	1.00		1.00			0.050
FIL Filt Durates (1) (1)	0.983		0.050		0.050	0.850
Fit Protected	0.400		0.950	0.100	0.950	4050
Satd. Flow (prot)	3422	0	1652	3490	1865	1652
FIt Permitted	_		0.950	_	0.950	
Satd. Flow (perm)	3422	0	1650	3490	1865	1652
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	28					101
Headway Factor	1.04	1.04	1.09	1.04	0.96	0.96
Link Speed (mph)	35			35	30	
Link Distance (ft)	294			383	298	
Travel Time (s)	5.7			7.5	6.8	
Volume (vph)	646	65	231	862	117	227
Confl. Peds. (#/hr)		2	2			2
Peak Hour Factor	0.87	0.70	0.87	0.83	0.74	0.86
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%
Adi, Flow (vph)	743	93	266	1039	158	264
Lane Group Flow (vph)	836	0	266	1039	158	264
Turn Type	000	0	Prot	1000	100	nt+ov
Protected Phases	2		1	6	Q	1.8
Permitted Phases	2		1	0	0	10
Potoctor Phonon	2		4	E	0	10
	10.0		EO	10.0	Ö E O	10
Minimum Initial (S)	10.0		5.0	10.0	5.0	
	28.0	0.0	10.0	16.0	11.0	04.0
Total Split (s)	29.0	0.0	18.0	47.0	13.0	31.0
Total Split (%)	48.3%	0.0%	30.0%	78.3%	21.7%	51.7%
Yellow Time (s)	4.0		3.0	4.0	4.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Recall Mode	C-Min		None	C-Min	None	
Act Effct Green (s)	26.5		12.8	43.3	8.7	25.5
Actuated g/C Ratio	0.44		0.21	0.72	0.14	0.42
v/c Ratio	0.55		0.76	0.41	0.58	0.35
Control Delay	14.0		28.5	4.6	33.5	8.0
Queue Delay	0.0		0.0	0.2	0.0	0.0
Total Delay	14.0		28.5	4.8	33.5	8.0
	R		20.0	۰. ۲	00.0	Δ
Approach Delay	14.0		U	A 9.0	17 5	
Approach Delay	14.0			9.0	C. / I	

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	-	\rightarrow	1	-	1	1
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Approach LOS	В			А	В	
Queue Length 50th (ft)	112		103	169	54	34
Queue Length 95th (ft)	155		99	20	84	70
Internal Link Dist (ft)	214			303	218	
Turn Bay Length (ft)						100
Base Capacity (vph)	1529		385	2518	280	778
Starvation Cap Reductn	0		0	688	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.55		0.69	0.57	0.56	0.34
Intersection Summary						

ntersection Summary									
Area Type: Other									
Cycle Length: 60									
Actuated Cycle Length: 60									
Offset: 5 (8%), Referenced to phase 2:EBT and 6:WBT, Start of Green									
Natural Cycle: 55									
Control Type: Actuated-Coordinated									
Maximum v/c Ratio: 0.76									
Intersection Signal Delay: 12.4	Intersection LOS: B								
Intersection Capacity Utilization 49.7%	ICU Level of Service A								
Analysis Period (min) 15									

Splits and Phases: 2: Bridge Street & Route 114 (North Street) Ramp

* # ø1	→ ø2		
18 s	29 \$		
← ø6		** ø8	
47 s		13 s	

Lanes, Volumes, Timings 3: Federal Street & Washington Street

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						1	۲	†			† 12	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	16	9	13	12	12	12	12
Storage Length (ft)	0		0	0		0	60		0	0		0
Storage Lanes	0		0	0		1	1		0	0		0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt						0.865					0.999	
Flt Protected							0.950					
Satd. Flow (prot)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	1644	1533	1732	0	0	3571	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	0.97	1.14	1.10	1.00	1.00	1.00	1.00
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		313			244			280			277	
Travel Time (s)		10.7			8.3			6.4			6.3	
Volume (vph)	0	0	0	0	0	149	16	689	0	0	607	1
Confl. Peds. (#/hr)						4	92					92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.70	0.67	0.84	0.92	0.92	0.90	0.25
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	2%	2%	2%	1%	0%
Parking (#/hr)						0		0	0			
Adj. Flow (vph)	0	0	0	0	0	213	24	820	0	0	674	4
Lane Group Flow (vph)	0	0	0	0	0	213	24	820	0	0	678	0
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	53.0%		[(CU Lev	el of Se	rvice A					
Analysis Period (min) 15												

Lanes, Volumes, Timings 4: Bridge Street & Residential Driveway

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		tβ		<u> </u>	A ₽			\$				1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	12	12	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.999			0.966				0.865
FIt Protected				0.950				0.964				
Satd. Flow (prot)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Flt Permitted				0.950				0.964				
Satd. Flow (perm)	0	3452	0	1745	3486	0	0	1710	0	0	0	1644
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	1.00	1.00
Link Speed (mph)		35			35			15			15	
Link Distance (ft)		381			137			205			180	
Travel Time (s)		7.4			2.7			9.3			8.2	
Volume (vph)	0	884	6	3	1203	3	2	0	1	0	0	16
Confl. Peds. (#/hr)			23	23		35						
Peak Hour Factor	0.25	0.94	0.69	0.25	0.93	0.42	0.33	0.92	0.50	0.92	0.92	0.56
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	940	9	12	1294	7	6	0	2	0	0	29
Lane Group Flow (vph)	0	949	0	12	1301	0	0	8	0	0	0	29
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type: O	ther											
Control Type: Unsignaliz	ed											
Intersection Capacity Uti	lization	50.0%]	CU Leve	el of Ser	vice A					

Analysis Period (min) 15

	٦	-	-	•	- \	1
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	*	**	A 1.		k	#
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	4.0	50	50
Trailing Detector (ft)	0	0	0		0	0
Turning Speed (mph)	15	0	0	Q	15	Q
Lane Litil Eactor	1 00	0.05	0.05	0.05	1 00	1 00
Pod Riko Eastor	1.00	0.95	1.00	0.95	1.00	1.00
			0.001		1.00	0.950
FIL Fit Drotoctod	0.050		0.991		0.050	0.000
Fit Protected	0.950	2400	2540	0	1905	1500
Sato. Flow (prot)	1685	3490	3549	0	1805	1583
	0.154	0400	0540	-	0.950	4500
Satd. Flow (perm)	273	3490	3549	0	1803	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			12			42
Headway Factor	1.09	1.04	1.00	1.00	1.00	1.00
Link Speed (mph)		35	35		15	
Link Distance (ft)		383	323		369	
Travel Time (s)		7.5	6.3		16.8	
Volume (vph)	60	813	812	49	106	281
Confl. Peds. (#/hr)	3			3	1	
Peak Hour Factor	0.87	0.88	0.92	0.90	0.72	0.80
Heavy Vehicles (%)	0%	0%	0%	11%	0%	2%
Adi, Flow (vph)	69	924	883	54	147	351
I ane Group Flow (vph)	69	924	937	0	147	351
Turn Type	nm+nt	02-1	001	0	147	nm+ov
Protected Phases	2	Q	1		6	2
Permitted Phases	0	0	4		0	5
Peteotor Phases	0	0	4		0	0
	3	8	4		6	3
iviinimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	10.0	22.0	22.0		22.0	10.0
Total Split (s)	12.0	38.0	26.0	0.0	22.0	12.0
Total Split (%)	20.0%	63.3%	43.3%	0.0%	36.7%	20.0%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Recall Mode	None	None	C-Max		None	None
Act Effct Green (s)	42.6	43.4	29.2		11.8	22.8
Actuated g/C Ratio	0 71	0.72	0 49		0.20	0.38
v/c Ratio	0.17	0.72	0.40		0.20	0.50
Control Delay	0.17	2.0	11.0		22.0	14.0
	2.0	3.6	11.0		23.9	14.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	2.6	3.8	11.0		23.9	14.9
LUS	A	A	В		C	В
Approach Delay		3.7	11.0		17.5	
Approach LOS		A	В		B	
Queue Lenath 50th (ft)	2	13	194		47	77

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$\mathcal{F} \rightarrow \leftarrow \mathcal{K} \checkmark \checkmark$

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Queue Length 95th (ft)	m7	112	m225		66	100
Internal Link Dist (ft)		303	243		289	
Turn Bay Length (ft)						
Base Capacity (vph)	415	2523	1732		542	628
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.17	0.37	0.54		0.27	0.56

ntersection Summary									
Area Type: Other									
Cycle Length: 60									
Actuated Cycle Length: 60									
Offset: 34 (57%), Referenced to phase 4:WBT, Start of Green									
Natural Cycle: 60									
Control Type: Actuated-Coordinated									
Maximum v/c Ratio: 0.56									
Intersection Signal Delay: 9.4	Intersection LOS: A								
Intersection Capacity Utilization 48.1%	ICU Level of Service A								
Analysis Period (min) 15									

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Bridge Street & MBTA Parking Lot Driveway

	₽ ø3	4	
	12 s	26 s	
A = 06	l → ₀8		
22 s	38 s		





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