Medford Square Priority Roadways Improvement Study

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Abstract

The *Medford Square Priority Roadways Improvement Study* is part of the MPO's series of ongoing studies that address safety, mobility, and access on the Boston region's priority roadways. This report identifies specific issues and concerns in the Medford Square study area; presents an in-depth analysis of multiple transportation-related factors; and recommends potential short- and long-term solutions to the problems, including improvement alternatives.

TABLE OF CONTENTS PAGE

TABLES, FIGURES, APPENDIXES

Tables:

Figures:

Appendixes:

Executive Summary

A critical function of producing the Boston Region MPO's Unified Planning Work Program each federal fiscal year is to seek feedback from local agencies, municipalities, the public, and other stakeholders. The purpose of this outreach is to gather information about specific transportation problems in the Boston region so that projects may be developed to address them, while advancing the transportation system as a whole.

Typically, the research supported by the Boston Region MPO reveals problems that involve bicyclists, pedestrians, traffic congestion, and roadway safety, among others. Concerns exist in virtually all areas of the Boston region, and at all types of locations, including intersections, underpasses, curbsides, street corners, bridges, roundabouts, highways, and parks. Although individual in nature, these issues expose recurring themes in the region, such as high-crash locations, the need for signal retiming for pedestrians, and safe lanes for bicyclists.

The MPO's series of Subregional Priority Roadways studies grew out of the information-gathering process cited above. These studies aim to identify safety, mobility, access, and other transportation-related concerns on a specific area's priority roadways; and to recommend and evaluate potential multimodal solutions to the problems. Each year, the Boston Region MPO chooses a different arterial or collector roadway network for MPO staff to study and analyze, which results in recommendations for short- and long-term improvements for that area.

This report focuses on Medford Square. Selecting a study area in the Boston region is a thorough and exacting process, which is based upon many factors (described in the report). In any large metropolitan region, there are many roadways that need improvement, so it can be a challenge to single out just one. However, because the MPO's Subregional Priority Roadways program is ongoing, the MPO staff can address each problem area methodically, and according to priority and regional needs.

In this report, the reader will encounter myriad descriptive details about the Medford Square study area, including existing conditions, analytic data, and proposed improvements. As with each Priority Roadways study area, this report provides a detailed view of the transportation issues in Medford Square. As distinctive as these issues are to this particular neighborhood, these kinds of issues are also seen in other communities across the region. By addressing these problems systematically, the resulting improvements will help to enhance quality of life, support economic development, and improve air quality.

Chapter 1—Introduction

1.1 STUDY BACKGROUND

During development of the Unified Planning Work Program (UPWP) and the Long-Range Transportation Plan (LRTP), the Boston Region Metropolitan Planning Organization (MPO) gathers feedback from the public, municipalities, the Metropolitan Area Planning Council (MAPC) subregional groups, and the Massachusetts Department of Transportation (MassDOT) to identify transportation problems in the region. In general, these problems involve bicycle and pedestrian accommodation, freight movement, traffic bottlenecks, safety of roadway users, and safe or convenient access for abutters along roadway corridors—problems that can adversely affect the region's quality of life, economic development, and air quality.

Each year, the MPO conducts a study—*Addressing Safety, Mobility, and Access on Subregional Priority Roadways*—to identify roadway segments in the Boston region that are of concern to stakeholders, but which have not been cited in the LRTP regional needs assessment.[1] The *Subregional Priority Roadways* studies focus on arterial or collector roadways and result in recommendations for short- and long-term improvements. Funding for the *Medford Square Priority Roadways Improvement Study* was documented in the federal fiscal year (FFY) 2018 UPWP; and a work program was approved by the MPO on October 19, 2017.[2]

1.2 STUDY OBJECTIVES

The *Medford Square Priority Roadways Improvement Study* focused on safety, mobility, and access, as well as specific concerns related to bicycle and pedestrian transportation, multi-use trail feasibility, and other subjects raised by stakeholders. Objectives are to

- Identify safety, mobility, access, and other transportation-related problems on the study area's priority roadways
- Develop and evaluate potential multimodal—including pedestrian, bicycle, truck, and transit modes—solutions to the problems

1.3 SELECTION PROCEDURE

The MPO selected Medford Square by assessing 25 roadway corridors in the Boston region that were identified as having strong potential for study by various

[1] A work program for *Priority Corridors for LRTP Needs Assessment—FFY 2018* was submitted simultaneously to the Boston Region MPO.

[2] Unified Planning Work Program, Federal Fiscal Year 2018, endorsed by the Boston Region Metropolitan Planning Organization on June 15, 2017.

sources including 1) suggestions heard during outreach for the FFY 2018 UPWP; 2) concerns documented in meeting records from the UPWP outreach process for the past five years; and 3) the MPO's Congestion Management Process (CMP). MPO staff assembled detailed data about these roadways and evaluated them according to the following selection criteria:

- ***Safety Conditions***: The roadway has a high crash rate for its functional class, or a significant number (two or more per mile) of collisions involving pedestrians or bicyclists.
- ***Multimodal Significance****:* The roadway supports transit, bicycle, or pedestrian activity, or accommodates large numbers of heavy vehicles (trucks/buses).
- ***Subregional Priority****:* The roadway carries a significant proportion of subregional vehicle, bicycle, or pedestrian traffic and is essential for the subregion's economic, cultural, or recreational development.
- ***Implementation Potential****:* Roadway improvements are proposed or endorsed by the agency or agencies that administer the roadway and have strong support from stakeholders.
- ***Regional Equity***: The roadway is situated in a subregion that has not been selected for the *Subregional Priority Roadways* study in the past two years[3].

Medford Square contains several high-crash locations that must be improved for the safety and mobility of motor-vehicle and truck drivers, transit riders, bicyclists, and pedestrians. Major roadways in the square carry regional and local traffic, pedestrians, cyclists, and several Massachusetts Bay Transportation Authority (MBTA) bus lines. The City of Medford and MAPC recently completed a comprehensive plan for the area: Medford Square Master Plan. This study would support the plan's goals by analyzing existing transportation conditions and identifying potential improvements and was strongly endorsed by all stakeholders, including the City of Medford, MAPC, and MassDOT.

1.4 STUDY AREA AND DATA COLLECTION

The study covers the area similar to the Medford Square Master Plan prepared by MAPC in August 2017 (with the addition of adjacent Winthrop Street), and focuses on major roadways, such as Salem Street (Route 60), High Street (Route 60/38), Main Street (Route 38), and Mystic Valley Parkway (Route 16). Figure 1 shows the study area and the covered roadway segments, which in aggregate are more than two miles long.

[3] Details of the criteria and rating system may be found in the Central Transportation Planning Staff's technical memorandum "FFY 2018 Addressing Safety, Mobility, and Access on Subregional Priority Roadways: Selection of Study Location," January 18, 2018.

At the request of MPO staff, MassDOT collected traffic volume data and intersection turning-movement counts (including pedestrian and bicycle movements and the percentage of heavy vehicles) for this study. The data were collected in winter 2017, between December 4 and December 9, on both weekend and weekdays. MPO staff also collected information from Medford, MAPC, and MassDOT, including recent transportation, city planning, land-use, and economic studies, and the most recent three-year police crash reports.

1.5 STUDY ADVISORY COMMITTEE MEETINGS

During the course of the study, MPO staff worked closely with an advisory group whose members included representatives of the City of Medford, MAPC, MassDOT, and the Massachusetts Department of Conservation and Recreation (DCR). (See Appendix A for a complete list of advisory committee members.) Two advisory committee meetings were held to guide and support the study.

In the first meeting (February 12, 2018), MPO staff introduced the study, received input about the corridor's issues and concerns, and coordinated data collection. In the second meeting (June 19, 2018), MPO staff reviewed the findings and the proposed improvements with advisory committee members. After the meetings, staff received comments and revised the proposed improvements accordingly.

Chapter 2—Existing Conditions and Issues

2.1 MAJOR ROADWAYS IN THE STUDY AREA

As shown in Figure 1, the study area contains five major roadway segments comprising approximately 2.4 total miles:

- Salem Street (Route 60) from City Hall Mall to Main Street
- High Street (Route 60/38) between Salem Street and Winthrop Street
- Main Street (Route 38) from Salem Street to Mystic Avenue
- Mystic Valley Parkway (Route 16) from Main Street to Winthrop Street
- Winthrop Street from Mystic Valley Parkway to High Street

These roadways contain six signalized intersections, three signalized pedestrian crossings, and a large number of unsignalized intersections and driveways.

The roadway functional classes within the study area include principal arterials (Route 60 and Route 16), minor arterials (Main Street and Clippership Drive), and collectors (Winthrop Street and River Street). All segments are under the jurisdiction of the City of Medford, except Mystic Valley Parkway, which is owned and operated by MassDOT and DCR.

All segments are two-lane roadways except Route 60 (Salem Street and Riverside Avenue), Main Street, and Clippership Drive. At Medford Square, the eastern section of Route 60 divides into Salem Street (westbound, three-lane) and Riverside Avenue (eastbound, two-lane). It rejoins Salem Street through City Hall Mall and continues as a four-lane undivided arterial eastbound. Main Street in the study area also is a four-lane arterial. Clippership Drive is a service road for local businesses and residents and a bypass to Interstate-93 (I-93). It mainly operates as one lane eastbound only.

The average daily traffic volumes range from about 5,000 vehicles per day on Clippership Drive to nearly 30,000 vehicles per day on Salem Street near I-93. Speed limits are 20 miles per hour (mph) on Route 60 and Clippership Drive, 25 mph on Main Street and Winthrop Street, and 30 mph on Mystic Valley Parkway.

Land use within the study area is diverse and includes residential (private residences on High Street and Winthrop Street, condominiums north of Mystic Valley Parkway), commercial (Salem Street and Main Street), municipal (Medford City Hall and Medford Public Library), religious (Grace Episcopal Church and St. Joseph’s Church), and parkland (near Mystic River). Zoning is mostly business or residential, with riverside areas zoned recreational.

2.2 TRANSIT SERVICE

Figure 2 shows the transit services that intersect the study region. Medford Square is served by eight MBTA bus routes: 94, 95, 96, 101, 134, 325/326, 354, and 710; and all eight have a stop near the central intersection area. There is no rail access in the study area but several of the routes provide service to MBTA rail (rapid transit) stations. The Route 325/326 bus also provides express service to Haymarket via I-93. Route 101 has the most ridership among routes and connects the Malden Center Orange Line Station with the Sullivan Square Orange Line Station via Medford Square.

Aside from the Route 325/326 express bus, Medford Square is not the terminal destination for any of the bus routes that travel through the square. The pass-through nature of the routes would make it difficult to consolidate Medford Square bus stops in a central location or to create a transit hub for bus transfers. It may be easier to construct these types of improvements at terminal stations because of the flexibility of local routing and potential schedule adjustments that a location at the end of a route can provide.

2.3 PEDESTRIAN AND BICYCLE FACILITIES

Figure 2 also shows the location of bicycle and pedestrian amenities inside the Medford Square area. Sidewalks exist on both sides of all the study roadways except on the south side of Mystic Valley Parkway and Salem Street between City Hall Mall and the I-93 Rotary.

There are no dedicated bike lanes and most striped shoulders are less than two feet wide. There is, however, a multi-use trail (the Mystic River Reservation Path) that runs along the river. This trail currently ends at Main Street, but there are two plans to continue it eastward to connect to the Mystic Greenways system. The Clippership Connector Multi-Use Path, currently under design, would soon link Medford Square to Wellington Square and east. The South Medford Connector, currently under study, would connect Medford Square to Somerville and Boston.

2.4 ISSUES AND CONCERNS

In the sections that follow, we categorize and summarize the numerous issues and concerns in the study area, as based on discussions with the study advisory committee members.

2.4.1 Traffic Conditions

Congestion issues routinely emerge at several locations within the study area, each with distinct causes.

- ***Route 60 and Route 16*:** These state routes are the only two major east-west regional routes within the Interstate-95 (I-95) beltway north of Boston. Both carry heavy commuter traffic that causes severe congestion, especially near the central intersection where the two routes converge. Traffic conditions associated with the AM and PM peak periods often last more than three hours.
- ***Side streets near Medford Square*:** Many nearby local roads receive large volumes of cut-through traffic. During the AM peak period, southbound traffic often exits I-93 at Roosevelt Circle (Exit 33) or further north to avoid the extensive queues on I-93 southbound. These drivers join traffic coming from Route 28 west of Roosevelt Circle and inundate the streets of Medford's neighborhoods, including Brookside Parkway, Forest Street, Ashland Street, and Governors Avenue.
- ***Route 16 (Mystic Valley Parkway) and Winthrop Street***: These roadways serve large volumes of traffic heading to I-93 via Route 16 (Mystic Valley Parkway). Drivers encounter extensive delays on both streets, especially at the traffic signal where Route 16 meets Winthrop Street. Route 16 eastbound traffic frequently queues from the intersection all the way to the upstream intersection at Auburn Street, and at times, the southbound traffic queue extends to the traffic circle of Route 60 (High Street) and Route 38 (Winthrop Street).
- ***South Street***: Because of congestion at the intersection of Route 16 and Winthrop Street, this road is used frequently as a cut-through path to I-93.
- ***Winthrop Square Traffic Circle***: Traffic is usually congested on all approaches at the Route 60/Route 38 traffic circle. This circle is not capable of handling today's large volumes of traffic in the peak periods.
- ***High Street*:** This portion of Route 60 is very congested during peak periods as it carries both regional and local traffic. The roadway is densely populated with residential and commercial properties and carries a lot of pedestrians on their daily activities. During the AM peak hour, drop-offs at Saint Joseph School are also a major source of delay.
- ***Route 16 Pedestrian Signal*:** The pedestrian crossing signal near the Mystic River Bridge activates automatically and stops the traffic with each cycle (every 1.5 minutes). This setting, established by DCR, is intended as a traffic-calming measure; but the crest of the bridge causes the sight distance for eastbound traffic to be low. Some drivers who are not familiar with this operation might become confused; and running red lights at this location is frequently observed.
- ***Main Street and Mystic Avenue*:** Traffic is frequently congested at this unsignalized intersection. The flashing yellow (Main Street southbound

and Mystic Avenue westbound) and flashing red (Main Street northbound) operation causes queueing and confusion. Faced with long delays, the northbound vehicles frequently dart unsafely into the intersection.

- ***Route 16 Ramps at Main Street*:** The two intersection ramps at Main Street and Route 16 are also operated in a flashing yellow/red mode (the current signal at the on-ramp of Main Street and Route 16 westbound near Cradock Bridge is temporary). The operation causes extensive delays for the Route 16 eastbound off-ramp and South Street traffic. Consequently, many crashes have occurred at this location in recent years.

While many of these problems are simply consequences of regional demand exceeding capacity, poor design of existing facilities is often a contributing factor; so, this study will review any modifications that could improve conditions.

2.4.2 Truck Traffic

Trucks are prohibited from using Route 16 (Mystic Valley Parkway), as it is designated as a parkway. Hence, truck traffic is diverted onto Route 60 (Salem Street/High Street), South Street, and other local streets. Salem Street and High Street are narrow and ill equipped to handle truck traffic; Medford frequently receives complaints of truck traffic and noise from the area of South Street.

2.4.3 Traffic Safety

All of the major intersections—including Route 60/Main Street/Forest Street, Route 16/Main Street, Route 60/Route 38, Main Street/Mystic Avenue—are in the top-five percent of crash locations in the Boston Region MPO area. Vehicles on the flashing-red approaches—such as Main Street northbound at Mystic Avenue and Route 16 eastbound/South Street at Main Street—endure extensive delays and frequently dart into the intersection without waiting for sufficient gaps.

The wide Salem Street Rotary at I-93 Exit 32 encourages fast-moving traffic. Here, vehicles merge and weave at high speeds, causing collisions and endangering pedestrians and cyclists. However, this rotary was not included in the study area because of limited resources.

2.4.4 Pedestrian and Bicycle Accommodations

Figure 2 shows sidewalk coverage in the study area. There are two gaps in the sidewalk network: Mystic Valley Parkway on its south edge between Winthrop Street and the Mystic River Bridge, and Salem Street on its south edge between City Hall Mall and the rotary.

Figure 2 also displays marked crosswalks in the study area, many of which are hard to cross and unsafe, including Salem Street at River Street/Ashland Street (Medford recently installed a flashing warning beacon on Salem Street for approaching vehicles); Salem Street at Main Street; Main Street at the Route 16 ramps; High Street at Governors Avenue; City Library; and Saint Joseph Church. Crossings at the Route 60/Route 38 traffic circle are also long and difficult.

Bicycle facilities are extremely sparse within the study region. No separate bicycle accommodations are present on any of the major roadways in the study area except for Clippership Drive, which was recently reduced to one lane and given a five-foot bicycle shoulder. North of Route 16, cyclists usually need to ride with traffic on High Street and local streets. There are no shared road signage or sharrow markings (sharrows) on these roadways. South of Route 16, cyclists can use the Mystic River Reservation multi-use trial. Although there are plans for the trail to continue east beyond I-93, it currently ends at Main Street, so cyclists need to ride with traffic beyond this point.

Medford is interested in potentially freeing space on the south bank of the Mystic River for recreational use by cyclists and pedestrians. The Route 16 eastbound off-ramp to Main Street is currently closed because of reconstruction on the Cradock Bridge. The City is proposing to close the ramp permanently in order to reduce traffic on Main Street and make room for continuing the Mystic River multi-use trial and a linear river park.

2.4.5 Transit Services

The study area hosts eight bus lines and 22 bus stops, some of which have been cited for causing traffic delays or overlapping a nearby stop. So, the circulation routes and stop locations may be examined for potential consolidation.

It is desirable to have a centrally located transit hub for all of the bus routes to use as a layover. Currently, the MBTA uses a city-owned parking lot for this purpose for a few bus routes. But Medford does not favor this location because it is a bit far from residential and business districts, and usurps the city’s parking spaces. The city suggested performing further studies of a suitable location that can include more bus routes serving the area.

Chapter 3—Roadway Operations Analysis

3.1 DAILY TRAFFIC VOLUMES

Daily traffic volumes are the fundamental metric for analyzing traffic intensity and patterns in a roadway corridor. MassDOT conducted Automatic Traffic Recorder (ATR) traffic counts at a number of locations in the subarea and on adjacent streets during the weekday period of December 4 (Monday) to December 7 (Thursday), 2017. Figure 3 shows daily traffic volumes at these locations. The numbers in the graphic represent average daily directional volumes collected in December 2017. The three tables in the graphic further summarize the data by count locations, directional split, combined volume of both directions, and adjusted annual average daily traffic (AADT).

The December counts show that the subarea witnessed a high volume of daily traffic. The primary direction of travel through the subarea was east-west, with the two major routes (Route 60 and Route 16) each recording large traffic volumes. Route 16 carried 29,000 vehicles per day west of Winthrop Street and 41,000 vehicles per day east of Winthrop Street; Route 60 carried 13,000 vehicles per day west of Main Street (on High Street) and 22,000 vehicles east of Main Street (on Salem Street and Riverside Avenue). North-south traffic also saw relatively large traffic volumes, particularly along Main Street, which carried almost 36,000 vehicles per day before splitting with Mystic Avenue.

3.2 INTERSECTION TRAFFIC, PEDESTRIAN, AND BICYCLE VOLUMES

3.2.1 Traffic Volumes

In addition to daily traffic counts, MassDOT collected turning-movement counts at major intersections in the study corridor, including vehicle movements (by vehicle types), bicycle movements, and pedestrian crossings. These data were collected for weekday traffic during the morning peak period (7:00 AM–10:00 AM) and the evening peak period (3:00 PM–6:00 PM) on Thursday, December 7, 2017. Figure 4 shows the weekday peak-hour traffic and pedestrian volumes at major intersections in the subarea. MPO staff selected 7:00 AM–8:00 AM and 5:00 PM–6:00 PM as the morning and evening peak hours because these were the periods when total volume observed across the subarea was highest.

Weekend turning-movement counts were also conducted during the midday peak period (11:00 AM–2:00 PM) on Saturday, December 9, 2017. Figure 5 shows the weekend peak-hour traffic and pedestrian volumes at major intersections in the subarea. The Saturday peak hour was between 11:15 AM and 12:15 PM, during which the overall volume was about 15 percent and 25 percent less than the weekday morning and evening peak periods, respectively.

3.2.2 Pedestrian Volumes

Staff used turning-movement counts to estimate pedestrian activity in the study area. The central intersection (Salem/High Street at Main Street/Forest Street) recorded the most pedestrian crossings, with 130 in the morning peak hour and more than 200 in both the evening and weekend peak hours (although this figure counts pedestrians multiple times as they cross different approaches). Staff observed more than 100 crossings during the Saturday peak at Governors Avenue, Ashland Street, and Clippership Drive at Riverside Avenue. However, snowfall in the study area during the Saturday counts may have depressed pedestrian volumes somewhat. In addition, pedestrian volumes likely could be much higher in the summer season than were reported in these counts.

3.2.3 Bicycle Volumes

Turning-movement counts also provided a snapshot of bicycle activities in the study area. Figure 6 summarizes the observed on-road bicycle volumes during each three-hour recording interval. On these days, the primary route of cyclist travel was southbound along Main Street, with 25 individuals observed during the morning peak period. Bicycle volumes are heavily affected by seasonal factors; and although it is difficult to predict the exact number that would be present during warmer months, overall usage patterns likely would be similar. We assume, however, that bicycle volumes in the summer are generally higher.

3.2.4 Heavy-Vehicle Volumes

Addressing issues caused by truck traffic was one of the objectives of this study. Because 24-hour classification data from the ATR counts were not available for this study area, staff used turning-movement count data to estimate the percentage of heavy vehicles (trucks and buses, mostly trucks) during the three-hour recording intervals.

Figure 7 shows the percentage of heavy vehicle observed based on turning-movement counts. The counts show high truck volumes traveling east-west using High Street, Salem Street, Riverside Avenue, and ranging from about 6-to-10 percent of total traffic in the morning peak period. In the evening peak period, these roadways carried about 2-to-5 percent of the total traffic's heavy vehicles.

Because trucks often schedule their travel outside of peak hours, the off-peak percentages probably are about the same or higher than in the morning period. This observation aligns with complaints from residents, and in many ways is an expected consequence of banning trucks from the major east-west corridor: Mystic Valley Parkway (Route 16).

3.3 INTERSECTION CAPACITY ANALYSES

Based on the turning-movement counts, MPO staff constructed peak-hour traffic models for the entire subarea and conducted capacity analyses for major intersections by using the Synchro traffic analysis and simulation program.[4] The model set consisted of weekday AM, weekday PM, and Saturday midday peak-hour models, with scenarios that assumed existing conditions and various proposed improvement alternatives.

Capacity analysis for intersections was determined based on criteria from the Highway Capacity Manual (HCM).[5] The HCM defines level of service (LOS) using a qualitative scale from A to F for signalized and unsignalized intersections as a function of the average vehicle control delay.[6] For the intersections in a metropolitan urban area, LOS A, B, and C are considered desirable; LOS D and E are considered acceptable; and LOS F is considered undesirable.

Figure 8 shows results of weekday AM and PM peak-hour capacity analyses for existing conditions at major intersections in the study area. The signalized intersections in the City Hall subarea generally operate between LOS C and LOS D during weekday peak hours. More severe problems are observed on Winthrop Street, where the two intersections (at High Street and at Mystic Valley Parkway) operate at LOS F or E (almost F) during the AM and PM peak hours with extensive delays.

The unsignalized intersections on Main Street are evaluated as LOS F with extensive delays on the stop-controlled approaches (on South Street and on Main Street northbound). The two intersections are equipped with signal heads under flashing red and flashing yellow operation. The outdated signal equipment should be considered for upgrading.

Figure 9 shows results of the Saturday peak-hour capacity analyses at major intersections in the study area. Some of the same problems (such as extensive delays along Winthrop Street and LOS F at unsignalized approaches) may be seen from the PM peak hour analyses, although to a lesser degree because of the smaller Saturday traffic volumes.

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[4] Synchro Version 9.2 was used for the analyses. This software is developed and distributed by Trafficware Ltd. It can perform capacity analysis and traffic simulation (when combined with SimTraffic) for an individual intersection or a series of intersections in a roadway network.

[5] *Highway Capacity Manual 2010*, Transportation Research Board of the National Academies, Washington D.C.

[6] Control delay quantifies the increase in travel time that a vehicle experiences due to a traffic signal or other type of control. It also provides a surrogate measure for driver discomfort and fuel consumption.

Detailed Synchro reports of the existing AM and PM peak hour capacity analyses for major intersections in the study area are included in Appendix B.

3.4 TRAFFIC SIGNAL NEEDS ANALYSIS

MPO staff conducted preliminary analyses of the need for traffic signals at the four unsignalized intersections in the study area that experience operational issues: Main Street at the Route 16 eastbound ramps, Main Street at Mystic Avenue, Winthrop Street at High Street, and High Street at Governors Avenue.

The analysis found that that all four intersections satisfied at least one signal warrant. Main Street at the Route 16 eastbound ramps, Main Street at Mystic Avenue, and Winthrop Street at High Street each satisfied Warrant 1 (eight-hour vehicular volume), Warrant 2 (four hour vehicular volume), Warrant 3 (peak hour vehicular volume), and Warrant 7 (crash history); and High Street at Governors Avenue satisfied Warrants 2 and 3.

Appendix C contains the preliminary analysis of hourly traffic volume breakdowns for each of the applicable signal warrants at these intersections.

Chapter 4—Crash Data Analysis

4.1 CRASH LOCATIONS AND CRASH CLUSTERS

Crash data are an essential resource for identifying safety and operational problems. Analyzing data on the number of crashes and types of collisions that occur at particular locations, and the circumstances under which crashes occur, such as time of day and roadway surface conditions, also helps in developing improvement strategies. For this study, MPO staff collected two datasets:

- MassDOT Registry of Motor Vehicles (RMV) Division crash data for the years 2013 through 2015
- Crash reports from the Medford Police Department for the years 2015 through 2017

Staff used the MassDOT data to examine and identify high-crash locations. Staff used police crash reports to construct collision diagrams and estimate crash rates in order to identify safety and operational problems at the major intersections and in different segments of the corridor.

Figure 10 shows the crash locations and crash clusters in the corridor, based on 2013–2015 MassDOT data.[7] The figure shows that crash clusters are present throughout the entire study area. Six of the clusters are ranked in the top-five percent crash locations in the Boston Region MPO area according to the Equivalent Property Damage Only (EPDO)[8] scale. These clusters (cited below) are eligible to receive funding through MassDOT's Highway Safety Improvement Program (HSIP):

- Main Street at Route 16 Ramps: EPDO value = 148
- Route 16 at Winthrop Street: EPDO value = 94
- Winthrop Street at High Street: EPDO value = 86
- High Street near Governors Avenue: EPDO value = 56
- Main Street at Mystic Avenue: EPDO value = 52
- Main Street at Salem Street and High Street: EPDO value = 47

[7] A crash cluster is identified by mapping a circle with a 25-meter (82-foot) radius from each crash location, and observing where the spheres of two or more crashes overlap.

[8] MassDOT uses EDPO index to rank crash clusters. In the estimation, fatal crashes are weighted by 10, injury crashes by 5, and property damage only and unknown crashes not weighted. The top-five percent clusters in each regional planning agency are HSIP eligible. Based on 2013–2015 MassDOT data, the top-five percent EPDO threshold is 41 for the Boston Region MPO crash clusters.

4.2 CRASH RATES

Crash rate is another essential safety metric. Based on the recent traffic and turning-movement counts, MPO staff estimated both corridor (segment) and intersection crash rates for the major crash locations in the study area. For the corridor crash rate analysis, MPO staff focused on the three high-crash segments cited below:

1. Route 60 (High Street) from Winthrop Street to the west of Main Street: 12.96 crashes per million vehicle miles traveled (MVMT)
2. Route 60 (Salem Street, Riverside Avenue, and City Hall Mall) from Main Street to Clippership Drive: 11.25 crashes per MVMT
3. Main Street from Clippership Drive to Mystic Avenue: 8.48 crashes per MVMT

All three segments had crash rates well above the Massachusetts average for roadways with the same functional class. Based on 2016 MassDOT crash data (queried on June 22, 2018), the statewide average is 3.49 crashes per MVMT for urban principal arterials (applicable to the Route 60 segments); and 3.80 crashes per MVMT for urban minor arterials (applicable to the Main Street segment). Appendix D contains the MassDOT crash rate worksheets, which show full calculations for these three roadway segments. MPO staff also performed crash rate analysis for seven high-crash intersections, two signalized and five unsignalized, in the study area.

Estimated crash rate for signalized intersections:

- Route 60 (Salem/High Street) at Main Street/Forest Street: 1.32 crashes per million entering vehicles (MEV)
- Route 16 (Mystic Valley Parkway) at Winthrop Street: 1.26 crashes per MEV

The average crash rate for signalized intersections in MassDOT District 4 is 0.73 crashes per MEV (updated June 2018, based on 2016 crash data). Both the signalized intersections had a crash rate higher than the district average.

Estimated crash rate for unsignalized intersections:

- Main Street at Route16 Eastbound Ramps: 1.15 crashes per MEV
- Main Street at Route16 Westbound Ramps: 0.31 crashes per MEV
- Main Street at Mystic Avenue: 0.79 crashes per MEV
- High Street at Winthrop Street (Winthrop Square traffic circle): 1.19 crashes per MEV
- High Street at Governors Avenue: 0.64 crashes per MEV

The average crash rate for unsignalized intersections in MassDOT District 4 is 0.57 crashes per MEV. The crash rates on Main Street at Route 16 Westbound Ramps, Main Street at Mystic Avenue, and High Street at Winthrop Street are all much higher than the District 4 average. The crash rate on Main Street at Route 16 Eastbound Ramps is the only location whose crash rate was lower than the District 4 average. This might be an underestimation however, as the Route 16 off-ramp at the intersection had been closed since July 2015 (because of the Cradock Bridge reconstruction). Appendix E provides the crash rate worksheets showing full calculations for the seven intersections.

4.3 PEDESTRIAN AND BICYCLE CRASHES

The study area may be regarded as a high-crash area for pedestrians and bicycles. Twelve crashes, nine involving pedestrians, and three involving cyclists, were recorded in the Medford police 2015–2017 crash data. The majority of the crashes were caused by a vehicle failing to yield to a pedestrian in a marked crosswalk or failing to yield to bicycle while making turns. Appendix F summarizes the location, date, time, severity, and brief description for each of the twelve crashes.

4.4 COLLISION DIAGRAMS AND CRASH STATISTICS

To investigate safety and operational problems further, MPO staff constructed collision diagrams for the entire study area based on the 2015–2017 Medford Police Department crash reports. These reports contain descriptions of how and where the crashes occurred, so useful in constructing collision diagrams.

Appendix G presents the collision diagrams for various locations in the study area. It also contains a series of tables summarizing the crash data used for each location. The summary statistics include crash severity (property damage only, non-fatal injury, fatality, or unknown), collision type (single-vehicle, rear-end, angle, sideswipe, head-on, rear-to-rear, or unknown), pedestrian or bicycle involvement, time of day, pavement conditions, and light conditions.

Collision diagrams are useful in identifying safety and operational problems at major intersections or roadway segments. In the next chapter, we discuss these problems in the context of their proposed improvements.

Chapter 5—Proposed Improvements

Based on the analyses in the previous chapters, MPO staff developed a series of short- and long-term improvements to address safety and operational problems on the roadways in this study. Staff presented the proposed improvements to the study advisory members on June 19 and revised them to address their comments (contained in Appendix H).

The proposed short-term improvements generally can be implemented within two years at a relatively low cost. The long-term improvements are more complicated and cover larger areas, thus require intensive planning and design, and significant funding. The proposed improvements are described below.

5.1 SALEM STREET AND THE ADJACENT CITY HALL SUBAREA

The City Hall subarea is similar to the Medford Square Master Plan. It includes Salem Street, Main Street (until Cradock Bridge), Riverside Avenue, and Clippership Drive, with Salem Street as the mainstay of the area.

5.1.1 Issues and Concerns

One major issue raised in the Master Plan is the circuitous traffic pattern and uneven traffic distribution in the subarea based on the one-way traffic operation on Salem Street, Riverside Avenue, and Clippership Drive. The plan suggested exploring the two-way operation potential of these streets while recognizing that they could create complicated traffic crossing patterns and negatively affect the central intersection (Salem Street/High Street at Main Street/Forest Street and Riverside Avenue). This study developed and evaluated four traffic circulation alternatives that aim to reduce circuitous traffic and maintain acceptable traffic operations at the central intersection, as discussed in Section 5.1.3.

Other issues and concerns in the City Hall subarea section:

- There are considerable traffic volumes on Salem Street during AM and PM peak periods.
- Pedestrian crosswalk markings on Salem Street and on Riverside Avenue near River Street are faded.
- At the central intersection, pedestrian phases operate concurrently with permissible traffic phases. In the phasing plan, pedestrians can only cross Main Street halfway and frequently get trapped in the middle.
- The central intersection has a high crash rate (mostly rear-end and a few sideswipe) because of traffic congestion. In the past-three years, two pedestrian crashes occurred at the corner of Main Street and Riverside

Avenue, and two vehicles collided with cars parked on Main Street at the corner.

- At the intersection of Salem Street and City Hall Mall, traffic is congested on the Salem Street westbound approach and frequently backs up to the I-93 Rotary. The intersection currently operates under pre-timed mode. Field observations indicate that the City Hall Mall approach is not as congested and, at times, its green phase is not utilized completely.
- The intersection of Riverside Avenue and Clippership Drive also operates under pre-timed mode. In the AM peak period, traffic is congested on the Riverside Avenue westbound approach. Field observations indicate that the Clippership Drive approach is not utilized completely in the AM peak period.
- Several MBTA bus routes serve this area with two major stops, one on Salem Street and one on Riverside Avenue. Both stops have no shelters or seating.
- There are no sufficient shoulders or clearly marked shared-road bicycle accommodations on most roadways, except Clippership Drive that generally has a six-foot shoulder for bicycle accommodation.

5.1.2 Proposed Short-Term Improvements

- Regularly maintain crosswalk pavement markings.
- Stripe yield lines (shark teeth) at the crosswalks on Salem Street and on Riverside Avenue near River Street.
- Install “No Turn On Red” on Main Street[9] and modify pedestrian signal phasing at the central intersection to allow pedestrians to cross Main Street entirely without having to wait in the middle (see Appendix I for the signal phasing diagrams of the proposed changes).
- Consider removing parking spaces on Main Street and one space on High Street at the central intersection to expedite traffic movements and reduce blocking pedestrians’ views of traffic.
- Examine the existing signal equipment at Salem Street and City Hall Mall and consider operating it under traffic-actuated mode.

[9] Currently the Main Street approach is right-turn only and controlled by right-turn green and red arrows. Based on Massachusetts “Rules of the Road” (from the Massachusetts Driver manual), the steady red arrow means the same as a steady red circular signal, that is, drivers can make turns to the arrow direction after making a complete stop. Installing a “No Turn On Red” sign would prohibit the turns during red arrow displays and reduce the conflicts between the turning vehicles and crossing pedestrians.

- Consider operating the signal at Riverside Avenue and Clippership Drive under traffic-actuated mode.
- Provide a transit shelter at the bus stop on Salem Street.
- Consider redesigning the bus stop on Riverside Avenue to provide more amenities, such as curb extension and seating, by slightly reducing the bus berthing length from 140 feet to 120 feet (should be sufficient for berthing two 40-foot buses simultaneously).
- Support the Clippership Connector Multi-Use Path proposed by the City of Medford and DCR. The proposed path will link Medford Square and Riverbend Park as part of the Mystic River Greeenways.
- Install sharrows at appropriate distances on the right and left lanes of Salem Street and on the right lane of Riverside Street.

5.1.3 Traffic Circulation Alternatives

Based on the suggestion of the Medford Square Master Plan, this study developed and evaluated four traffic circulation alternatives that aim to reduce circuitous traffic in the City Hall subarea, and to maintain acceptable traffic operations at the central intersection. Figures 11 and 12 show the conceptual diagrams of the four alternatives.

Alternative 1

Alternative 1 maintains the existing traffic flow pattern and focuses on the improvements at the central intersection. Key proposed changes include

- Add a second eastbound through-lane to expedite traffic flow on High Street.
- Utilize curb extensions to shorten pedestrian crossing distances.
- Upgrade traffic signal system and modify signal timing to operate traffic effectively and improve safety and comfort for pedestrians.

The intersection modification can be accomplished using the existing intersection layout.

Alternative 2

The objective of Alternative 2 is to test whether the intersection would still operate acceptably if the connected one-way streets were converted to two-way operation and all entry movements were allowed. Key elements include

- Convert Salem Street, Riverside Avenue, and City Hall Mall to two-way operation.

- Modify the central intersection to allow all movements from all approaches.
- Rearrange the signal phasing at the central intersection, including an exclusive pedestrian phase.

The intersection modification would require removing the traffic island on Forest Street and expanding the intersection (beyond the existing layout) to accommodate additional turning lanes. However, the AM and PM peak hour capacity analysis indicates that the intersection would deteriorate significantly under such a five-approach setting with high traffic volumes on almost all the approaches.

Alternative 3

Alternative 3 is a variation of Alternative 2, intended to reduce crossing traffic by prohibiting some movements. Key elements include

- Convert Salem Street, Riverside Avenue and City Hall Mall to two-way operation.
- Modify the central intersection to allow all movements from all approaches, except Main Street (northbound) through- and left-turn movements.
- Rearrange signal phasing at the central intersection to include pedestrian phases current with prevailing traffic.

Though not as extensive as Alternative 2, Alternative 3 would still require expanding the intersection. Further, the capacity analysis for Alternative 3 indicates that the intersection would not operate at acceptable LOS in the AM and PM peak hours.

Alternative 4

Alternative 4 calls for operating the central intersection similar to a regular four-way intersection by maintaining Riverside Avenue as one-way eastbound only and diverting traffic through Clippership Drive. Key elements include

- Convert Salem Street, City Hall Mall, Clippership Drive, and a part of Riverside Avenue (between River Street and City Hall Mall) to two-way operation.
- Maintain Riverside Avenue eastbound-only operation (from the central intersection to River Street).
- Modify the central intersection to allow all movements from all approaches, except Riverside Avenue.

- Install traffic signal at Clippership Street under the central intersection controller.
- Install traffic signal at Riverside Avenue and City Hall Mall.
- Extend City Hall Mall southward to Clippership Drive.

Although the capacity analyses indicate that, under Alternative 4, the central intersection would operate better than Alternative 2 in the AM and PM peak hours, it still would operate at unacceptable LOS. In general, Alternatives 2, 3, and 4 would reduce circuitous traffic in the subarea, but increase crossing movements at the central intersection. (Please see Appendix J to view the 2040 AM and PM peak hour projected traffic volumes using the four alternatives.)

Staff estimated the 2040 traffic volumes under the different alternatives via three steps. First, the study assumed the No-Build scenario based on completion of the Cradock Bridge project and reopening of the Route 16 westbound off-ramp to Main Street.[10] Second, staff developed a model to estimate traffic flows in the subarea for the four alternatives.[11] Third, staff projected the 2040 traffic volumes for the alternatives by using growth factors estimated from the MPO's transportation model.[12]

Tables 1 and 2 summarize the AM and PM peak hour capacity analysis results (average intersection delay and overall LOS) for all the major intersections in the subarea. Tables 3 and 4 further summarize the capacity analysis results for the major intersections individually by approaches. Appendix K contains Synchro intersection capacity analysis reports for all the major intersections in the 2040 No-Build scenario and the four alternatives.

[10] The no-build scenario basically combines the traffic volumes under the existing conditions (2017) and the approach volumes from the Route 16 off-ramp to Main Street (obtained from the turning movement counts in the Cradock Bridge functional design report).

[11] The subarea model retains the subarea's entry points, that is, Salem Street (west of I-93), Riverside Avenue (east of Clippership Drive), Main Street (south of Clippership Drive), High Street (west of the central intersection), and Forest Street (north of the central intersection), as the trip origins and destinations. Based on the travel time of each possible origin-destination pair, the entry trips were assigned to the subarea network of each alternative repeatedly until the differences of the signed volumes at all intersections are small from iteration to iteration. The model was constructed by utilizing the Excel macro (add-in), SOLVER.

[12] The traffic growth projection is based on the transportation-planning model recently developed for the MPO's Long-Range Transportation Plan. With no major infrastructure changes (such as significant capacity increase on I-93) and no major traffic demand reductions (such as the significant shift from auto to non-auto modes) in the Medford Square vicinity, the model predicts that traffic in the Medford Square area would increase by 0.2 percent in the AM peak period and 0.25 percent in the PM peak period annually from 2017 to 2040.

Overall, Alternative 1 would somewhat improve the central intersection's traffic operation. Alternative 2 would significantly deteriorate the central intersection's traffic operations. Alternative 3 would still deteriorate the central intersection's traffic operations, along with extensive delays. In Alternative 4, the central intersection would still operate at unacceptable LOS and two intersections would be negatively affected by the increased traffic (Main Street at Clippership Drive in the AM peak hour and Salem Street at City Hall Mall in the PM peak hour).

5.1.4 Proposed Long-Term Improvements

The above analyses indicate that only Alternative 1 in the City Hall Subarea would operate acceptably under the projected 2040 traffic conditions. However, these are preliminary planning analyses and further modifications and examination of Alternatives 3 and 4 should be conducted in order to propose substantial redevelopments for the City Hall subarea. Based on the framework of Alternative 1, this study proposes a number of long-term improvements at the following two locations:

Central Intersection in the City Hall Subarea

Figure 13 shows the proposed long-term improvements at the central intersection, which include

- Add a second eastbound through-lane to expedite traffic flow on High Street.
- Utilize curb extensions at the corners of Main Street and Riverside Avenue, Salem Street and Riverside Avenue, and Forest Street and High Street, to shorten pedestrian crossing distances.
- Upgrade traffic signal system and modify signal timing to operate traffic effectively and improve safety and comfort for pedestrians.
- Install "No Turn On Red" signal on Main Street and modify signal phasing to allow Main Street right turns to overlap with Salem Street southbound traffic and to allow pedestrians to cross Main Street entirely (see Appendix I).
- Install additional traffic signal display at the stop line of the Forest Street approach.[13]

[13] The stop line on Forest Street is set back about 65 feet from the intersection in order to allow right-turning trucks from Salem Street. The existing signal display is too far from the drivers stopped on Forest Street and it should be supplemented by a signal near the stop line.

- Remove two on-street parking spaces on Main Street and one space on High Street to expedite traffic movements and to reduce blockage of pedestrians' view of the traffic.

Staff also briefly examined the potential for a modern roundabout at this location, and determined that it is not feasible. The high traffic volume at this location would require a two-lane roundabout, and the existing intersection layout does not provide adequate space for this, which requires an inscribed 180-foot-diameter circle in order to accommodate prevailing truck traffic.[14]

Salem Street at City Hall Mall

The signal system at this intersection should be upgraded to a fully actuated traffic signal with emergency vehicle preemption capabilities. Furthermore, the signal should be designed to coordinate with the central intersection and adapt to traffic conditions at the Salem Street Rotary and I-93 southbound off-ramp.

Bicycle Accommodation on Salem Street and Riverside Avenue

Roadways in this subarea generally have limited right-of-way for adding bicycle lanes. However, there is the potential to replace existing on-street parking lanes on the north side of Salem Street and the south side of Riverside Avenue with separated bicycle lanes, which would improve the safety of cyclists and support the MassDOT Healthy Transportation Policy. Further studies should be conducted to examine the feasibility of this, including any potential impact that reduced parking could have on the adjacent businesses.

5.2 MAIN STREET CORRIDOR

This section covers the Main Street corridor from Cradock Bridge to Mystic Avenue, whose two most concerning intersections are Main Street at Route 16 Ramps and Main Street at Mystic Avenue.

5.2.1 Issues and Concerns

- There is considerable traffic on Main Street during the AM and PM peak periods.
- The intersection of Main Street and Route 16 Ramps is currently unsignalized, with stop controls at the Route 16 westbound off-ramp and South Street (joined by the Route 16 eastbound off-ramp). During peak traffic periods, the stop-controlled approaches are extremely congested.
- The intersection of Main Street and Mystic Avenue currently operates with flashing yellow on Main Street southbound and Mystic Avenue and

[14] *Roundabouts: An Information Guide*, Federal Highway Administration, June 2000.

flashing red on Main Street northbound. During peak periods, vehicles on Main Street northbound endure extensive delays and frequently force themselves into the intersection, which causes potential conflicts with prevailing traffic and sometimes gridlocks the intersection.

- These two intersections have a crash rate much higher than the District 4 average for unsignalized intersections.
- With no traffic signals (with pedestrian phases) and under heavy traffic, pedestrians usually have a difficult time crossing the two intersections.
- Pedestrian crosswalk markings on Main Street are faded.
- There are no sufficient shoulders or clearly marked shared-road bicycle accommodations on Main Street and Mystic Avenue.

5.2.2 Proposed Short-Term Improvements

- Regularly maintain crosswalk pavement markings.
- Install stripe yield lines (shark teeth) in both directions at the crosswalk on Main Street near the police station.
- Consider removing on-street parking[15] in front of the police station and providing at least five-foot shoulders on both sides of Main Street for bicycle accommodation.
- Install striped sharrows at appropriate locations on both streets south of the intersection of Main Street and Mystic Avenue.
- Support development of the South Medford Connector, a multi-use path on the south bank of the Mystic River that would connect to Mystic Greenways (currently under study by the City of Medford and the Mystic River Watershed Association).

5.2.3 Proposed Long-Term Improvements

In the long term, both the intersections of Main Street at Route 16 Ramps and Main Street at Mystic Avenue should be signalized and reconstructed.

Main Street at Route 16 Ramps

Staff developed the following four long-term improvement alternatives based on the suggestions from study advisory members:

[15] The parking is for police business only. It appears that the existing spaces are not fully utilized. If necessary, one or two spaces may be preserved at the south end near Emerson Street.

- **Alternative 1A** — Signalize the two ramp intersections under one controller, with three-phase traffic operations and concurrent pedestrian phases.
- **Alternative 1B** — Signalize the two ramp intersections under one controller, with four-phase traffic operations and concurrent pedestrian phases.[16]
- **Alternative 2** — Close Route 16 Westbound off-ramp and signalize the two intersections under one controller.
- **Alternative 3** — Close Route 16 Eastbound on-ramp and signalize the two intersections under one controller.
- **Alternative 4** — Ground Route 16 and reconstruct the intersection to provide all connections and all movements.

Tables 5 and 6 summarize AM and PM peak hour capacity analysis results for the No-Build[17] and the above alternatives under the projected 2040 traffic conditions. Appendix L presents 2040 AM and PM peak hour traffic projections; and Appendix M provides detailed Synchro capacity analysis reports for the various alternatives.

In general, Alternatives 1A, 1B, 2, and 3 would operate acceptably in the AM and PM peak hours under the projected 2040 traffic conditions. Alternatives 1A and 1B would significantly reduce delays on the Route 16 ramps and consequently improve the overall intersection operation and safety.

Alternative 2, closing the Route 16 westbound off-ramp to Main Street, would further improve the intersection's operations and safety, as traffic using the ramp would be diverted to alternative routes mostly outside the Medford Square area.[18] The closed ramp area can be redeveloped into a linear river park and used as a part of the planned South Medford Connector in the Mystic Greenways system. However, the closure could reduce local access to the developments on Main Street and Mystic Avenue.

[16] The three-phase setting operates traffic in the sequence of 1) both Route 16 ramps, 2) Main Street left turns, and 3) Main Street through and right-turn movements. The four-phase setting operates traffic in the sequence of 1) Route 16 westbound ramp, 2) Main Street southbound, 3) Route 16 eastbound ramp, and 4) Main Street northbound. Both settings operate concurrent pedestrian phases with applicable traffic phases in a way that allows no left-turn traffic conflicts with pedestrians.

[17] The 2040 no-build alternative assumes that (1) the Route 16 westbound off-ramp to Main Street is reopened to traffic and (2) the ramp and the Route 16 westbound off-ramp/South Street remain under the stop controls.

[18] Currently the off-ramp to Main Street is closed because of the Cradock Bridge reconstruction project. It is scheduled to reopen in fall 2018.

Alternative 3, closing the Route 16 westbound on-ramp from Main Street, would also improve operations and safety better than the No-Build alternative. However, it would impact the adjacent intersections of Riverside Avenue at Clippership Drive and Main Street at Mystic Avenue significantly; as the traffic originally using the Route 16 westbound on-ramp to I-93 would need to go through either of the intersections to reach I-93 northbound or I-93 southbound.

The Synchro analysis indicates that Alternative 4 is not feasible based on the projected 2040 traffic conditions, even though the test intersection layout includes four approaching lanes (one left-turn only and three for through- and right-turn movements) on Route 16, and three approaching lanes on Main Street (one left-turn-only and two for through- and right-turn movements).

The alternative, raised at the 2016 Medford economic forum,[19] certainly would open up the area adjacent to the Mystic River and integrate the City Hall and Main Street subareas by removing the elevated Route 16/I-93 connector. In this preliminary planning study, the traffic projection basically assumes that all the trips using the connector would still go through the future at-grade intersection. Further engineering studies, including a regional transportation model refined exclusively for this alternative, should be conducted to determine its benefits and impacts more precisely.

In summary, this study proposes Alternative 1A or 1B for the interchange's long-term improvements. The City of Medford supports further study of Alternative 2 to determine how it might impact regional traffic and local access.

Figure 14 shows the proposed layout of the interchange area under Alternative 1A or 1B, which includes

- Installing traffic signals at the two ramp junctions under one controller.
- Rearranging Main Street travel lanes to provide left-turn bays in both directions.
- Providing five-foot shoulders for bicycle accommodation in both directions.
- Maintaining six-foot sidewalks on both sides for pedestrian accommodation.
- Utilizing curb extensions at the corners of Main Street and Route 16 eastbound ramps.

[19] Shaping Medford: Community Conversations to Guide Our Economic Future, prepared by Mayor Stephanie Burke's Business and Economic Development Committee, July 2016.

- Realigning the Route 16 eastbound off-ramp to South Street and install stop control at the approach.
- Installing sidewalks and a crosswalk on the north side of South Street.

At the design stage, further analyses should be conducted to 1) choose between three- and four-phase traffic operations, 2) reduce right-turn traffic conflicts by allowing pedestrians two-to-three seconds advancement when a pedestrian phase is called, and 3) coordinate the traffic signals at this location with the signal at the adjacent intersection of Main Street at Salem/High Street to expedite traffic flow on Main Street.[20]

Main Street at Mystic Avenue

Staff developed three long-term improvement alternatives for this intersection:

- **Alternative 1** — Reconstruct and signalize the intersection within the existing right-of-way.
- **Alternative 2** — Reconstruct and signalize the intersection, with an additional through-lane on Mystic Avenue within the existing right-of-way.
- **Alternative 3** — Reconstruct and signalize the intersection, with left turns from Mystic Avenue prohibited.

All of the alternatives include an on-call exclusive pedestrian phase in the signal cycles. The new traffic signal also would be equipped with a preemption function for the emergency vehicles at the adjacent Medford Fire Station. It would provide safe and convenient access for the emergency vehicles and significantly improve safety for all users at the intersection during emergency responses.

Table 7 summarizes AM and PM peak hour capacity analysis results for the No-Build and three alternatives under the projected 2040 traffic conditions. Appendix N provides detailed Synchro capacity analysis reports for the different alternatives.

The Synchro capacity analyses indicate that all of the alternatives, especially Alternatives 2 and 3, would significantly improve traffic operations from the No-Build option and would operate acceptably under the projected 2040 traffic conditions. Alternative 3 potentially would reduce cut-through traffic in the south Medford neighborhoods. However, it is considered not suitable, as the

[20] The distance between this location and the adjacent intersection is about 300 feet. Synchro capacity analyses indicated that in the PM peak hour the southbound traffic at this location could potentially spill back into the adjacent intersection during peak traffic surges. The master controller should be located at the adjacent intersection of Main Street at Salem/High Street.

northbound left-turn movement is essential for the adjacent commercial and industrial developments. Further examination of the alternative may be conducted at the design stage.

Staff also briefly examined the potential of a modern roundabout at this location; but determined that it is not feasible because the high volume of traffic would require a two-lane roundabout, for which the existing intersection layout does not contain adequate space. Moreover, the roundabout would not able to provide the signal preemption function that the fire department needs.

This study proposes Alternative 2 for the intersection's long-term development. Figure 15 shows the proposed intersection layout, which includes

- Installing a fully actuated and functional traffic signal system with count-down, assessable pedestrian signals, and preemption capacity.
- Reconstructing the intersection to provide a crosswalk and a right-turn channelization on Main Street northbound.
- Realigning and expand the Mystic Avenue approach (under the existing right-of-way) to a left-turn bay and two through-lanes.
- Installing bicycle boxes on both approaches to Main Street in addition to five-foot shoulders and sharrows for bicycle accommodation.

Bicycle Accommodation on Main Street

As proposed in the short-term improvements, the existing Main Street width is sufficient for striping five-foot shoulders for bicycles on both sides. It is preferable for separated bicycle lanes to be installed in this section. But the separated bicycle lanes would take up more space and may necessitate removing the traffic median, which is helpful for pedestrians. Further studies should be conducted to examine the feasibility and impacts of alternative bicycle accommodations such as striping a "super sharrow"[21] on the curb lanes in this section.

5.3 MYSTIC VALLEY PARKWAY

This section covers Mystic Valley Parkway (Route 16) from Winthrop Street to the crosswalk at Mystic River Path (east of Mystic River), which is owned and operated by DCR. Of greatest concern are the intersection of Mystic Valley Parkway at Winthrop Street and the crosswalk at Mystic River Path.

[21] Initially tested in Oakland, California in 2013, and adopted recently by a number of U.S. cities, a "super sharrow" is a series of sharrows painted on a five-foot-wide green area, or accompanied by white dash lines on both sides down the middle of a travel lane to emphasize its shared usage through the prominent appearance of sharrows.

5.3.1 Issues and Concerns

- Pedestrian crosswalk markings on Mystic Valley Parkway are faded.
- There are no sidewalks on the south side of Mystic Valley Parkway.
- As a major connector to I-93, Mystic Valley Parkway carries heavy traffic volumes almost continuously throughout the daytime hours.
- The intersection of Mystic Valley Parkway at Winthrop Street is very congested during the AM and PM commuting periods. Drivers frequently encounter extensive delays both roadways. Mystic Valley Parkway eastbound traffic often queues from the intersection all the way to the upstream intersection at Auburn Street; and at times, the Winthrop Street southbound traffic queue could extend from the intersection to the Winthrop Square traffic circle.
- The intersection is a HSIP-eligible crash location and has a crash rate much higher than the District 4 average.
- At the crosswalk on Route 16 at Mystic River path, the pedestrian signal activates automatically and stops the traffic in every circle (about every 1.5 minutes). This setting by DCR is intended as a traffic-calming measure. The signal display is small and not very observable from the eastbound direction. It flashes yellow during traffic phases and shows steady red during pedestrian phases. Drivers not familiar with the operation might be confused, especially when no pedestrians are present; and Vehicles running red lights at this location is often observed. Although less frequent, pedestrian violations are also observed, when pedestrians have pushed the signal button but could not wait more than a minute for the traffic cycle to end (or have suspected that the button not working) and enter the crosswalk against prevailing traffic.
- Trucks are prohibited from using Mystic Valley Parkway in Medford. As a result, truck traffic diverts onto Route 60 (Salem Street/High Street), South Street, and other local streets. Medford frequently receives complaints of truck traffic and noise from the adjacent neighborhoods.

5.3.2 Proposed Short-Term Improvements

- Maintain crosswalk pavement markings regularly.
- Consider installing sidewalks on the south side of Mystic Valley Parkway from Winthrop Street to the DCR Mystic River Reservation parking lot.
- At the Winthrop Street intersection, consider restriping the westbound outside lane from right-turn only to through- and right-turn shared (and striping two departure lanes accordingly as far as Daly Road).

- Consider restoring the traffic signal at the crosswalk Route 16/Mystic River Path to its original pedestrian-actuated mode; and providing count-down displays for pedestrians, if it is feasible with the existing signal equipment.
- Relocate the obscured “Pedestrian Crossing Ahead” warning sign on Route 16 eastbound to a more visible location (about 100 feet eastward).

5.3.3 Proposed Long-Term Improvements

In the long term, this study proposes to modify the configuration and upgrade the traffic signal at the intersection of Mystic Valley Parkway and Winthrop Street, install new signal system at the crosswalk on Route 16 at Mystic River Path, and consider allowing trucks on Route 16 east of Winthrop Street to I-93.

Mystic River Parkway (Route 16) at Winthrop Street

Staff developed two long-term improvement alternatives for the intersection:

- **Alternative 1** — Convert the westbound right-turn only lane to through and right-turn shared, add northbound left-turn bay, and upgrade the traffic signal system.
- **Alternative 2** — Same as Alternative 1, and add second eastbound through-lane.

Both alternatives include an on-call exclusive pedestrian phase in the signal cycles. Table 8 summarizes AM and PM peak hour capacity analysis results for the No-Build and the two alternatives under the projected 2040 traffic conditions. Appendix O provides detailed Synchro capacity analysis reports for the different alternatives. The Synchro capacity analyses indicate that both alternatives, especially Alternative 2, would significantly improve traffic operations from the No-Build option and would operate acceptably under the projected 2040 traffic conditions.

Staff also briefly examined the potential of a modern roundabout at this location; and determined that it is not feasible because the high traffic volume would require a two-lane roundabout, for which the existing intersection layout does not provide adequate space.

This study proposes Alternative 1 for the intersection’s long-term redevelopment. Figure 16 shows the proposed intersection layout, which includes the following proposed improvements:

- Reconfigure the intersection to include two westbound through-lanes and a northbound left-turn bay.

- Upgrade traffic signals based on the proposed configuration, with count-down and assessable pedestrian signals.
- Install sidewalks (preferably 10-feet wide) on the south side of Mystic Valley Parkway to the Mystic River Reservation parking lot.
- Upgrade sidewalks to 10-feet wide on the eastside of Winthrop Street and connect it with the multi-use path on the north side of Mystic River.
- Consider adding a curb extension on the north side of the Winthrop Street receiving lane.
- Install sharrows on the curb lane of both Winthrop Street approaches.

Staff proposed Alternative 1 mainly because of the right-of-way consideration. The intersection is under DCR's jurisdiction. Medford suggested that Alternative 2 be implemented instead. Alternative 2 would significantly improve traffic flows on Route 16 (mainly eastbound), but it also may require some land takings along the south side of Mystic Valley Parkway (in the adjacent DCR-owned parks). Both Alternatives 1 and 2 should be further examined at the design stage.

Crosswalk on Route 16 at Mystic River Path

In the long term, this study proposes to install a new signal system at this location. The system should include a sufficient number and size of traffic signal-displays and count-down and accessible pedestrian signals. Medford suggested that the traffic signals function under standard green/yellow/red operation, and the pedestrian signals should be actuated and more responsive (to activate in enough time that the prevailing traffic can safely stop). These options should be considered and further examined at the design stage.

Consider Allowing Trucks on Mystic Valley Parkway east of Winthrop Street to I-93

Currently trucks are prohibited on all the Mystic Valley Parkway sections in Medford. Allowing trucks in this section likely would reduce a large portion of truck traffic on Main Street, High Street and South Street. One key consideration of this proposal is the sustainability of the bridge over the Mystic River. A recent MassDOT bridge inspection report shows that the bridge is functionally obsolete but has no structural deficiencies and requires no weight limits.[22] This study proposes examining this alternative further because it would provide substantial benefits to the Medford Square neighborhoods by alleviating truck traffic.

[22] Staff found no specific descriptions of the obsolete functions. They could be horizontal or vertical alignments not suitable for trucks.

Pedestrian and Bicycle Accommodation

Currently, no sidewalks exist on the south side of the Mystic River Parkway. West of Winthrop Street, pedestrians can use the multi-use path along the parkway in Veterans Memorial Park. East of the Winthrop Street, it is essential to provide sidewalks, preferably 10-feet wide that can occasionally accommodate bicycles, and connect to the DCR parking lot in the Mystic River Reservation.

In addition to the multi-use path just south of the parkway, there is another path in Veterans Memorial Park. It is a gravel path that runs along the park's south edge on the north bank of Mystic River, with a crosswalk on Winthrop Street, which is meant to connect the existing path in the Mystic River Reservation (also running on the north bank on the river). However, the path in the reservation does not directly connect to the crosswalk. There is room in the reservation and the space should be realigned to connect more conveniently with the crosswalk.

This section of Mystic Valley Parkway is also referred to as the Route 16/I-93 Connector. It is not safe for bicycles, as the roadway's prevailing traffic speed is high and the road's shoulders are not wide enough to accommodate bicycles. There are a few multi-use paths, part of the Mystic River Path system, in the parkway vicinity. Cyclists can use the different paths to reach their destinations. However, there is no clear signage showing the locations of the various paths. The City of Medford can work with DCR to review the paths in the Mystic River Path system to identify suitable locations for installing way-finding signage.

5.4 WINTHROP STREET

This section covers Winthrop Street from Mystic Valley Parkway (Route 16) to High Street (Route 60). Because the intersection of Winthrop Street at Mystic Valley Parkway was reviewed previously, the major concern here is the intersection of Winthrop Street at High Street, also known as Winthrop Square.

5.4.1 Issues and Concerns

The City of Medford recently reconstructed the Winthrop Square traffic circle (primarily the corner between Rural Avenue and Winthrop Street) to provide an additional staging area for pedestrians and shorten the crossing distance on High Street and Rural Avenue. The traffic circle was also restriped similar to a single-lane modern roundabout to slow down circulating traffic. However, Winthrop Square still encounters severe traffic congestion in the AM and PM peak periods because of high traffic volumes from the major commuting routes: Route 16, Route 60, and Route 38. The major issues and concerns in this section include

- Traffic congestion exists on all approaches at the Winthrop Square traffic circle during AM and PM peak periods. During extremely congested conditions, traffic could become gridlocked at the intersection.
- The intersection is a HSIP-eligible crash location and has a crash rate much higher than the District 4 average.
- Two pedestrian crashes occurred at the intersection in the past three years.
- The bus stop on High Street westbound is located too close to the reconstructed circle, and a stopped bus could impede other vehicles entering the traffic circle during peak traffic periods.
- No sufficient shoulders or sharrow makings on Winthrop Street for bicycle accommodations.
- From time to time, one or two vehicles are observed to be parked illegally on Winthrop Street southbound.

5.4.2 Proposed Short-Term Improvements

- At the Winthrop Street intersection, relocate the bus stop on High Street westbound further from the traffic circle (at least 50 feet eastward).
- Add sharrows at appropriate locations on Winthrop Street in both directions.
- Continue monitoring pedestrian and bicycle crash conditions at the traffic circle
- Enforce no parking on the southbound approach of Winthrop Street.

5.4.3 Proposed Long-Term Improvements

In the long term, this study suggests reconstructing and signalizing the Winthrop Square traffic circle. The proposed signal includes an exclusive pedestrian-crossing phase to stop traffic on all approaches.

Winthrop Square Traffic Circle Alternatives

- Alternative 1 — Reconstruct and signalize the intersection within the existing right-of-way.
- Alternative 2 — Convert the existing traffic circle into a double-lane modern roundabout.

Table 8 summarizes the AM and PM peak hour capacity analysis results for the No-Build and the two alternatives under the projected 2040 traffic conditions. Appendix P provides detailed Synchro capacity analysis reports for the different

alternatives. The Synchro capacity analyses indicate that Alternative 1 would improve traffic operations significantly from the No-Build option, and would operate acceptably under the projected 2040 traffic conditions.

Alternative 2 would require an extensive right-of-way for the construction of a modern roundabout with an inscribed circle of at least 150 feet in diameter; and its southbound and westbound approaches likely would still endure extensive delays. This alternative is not feasible within the existing right-of-way and the built surroundings.

This study proposes Alternative 1 for the intersection's long-term redevelopment. Figure 17 shows the proposed intersection layout. Key proposed improvements include

- Reconstructing the traffic circle into a four-leg intersection with all turning lanes on all approaches.
- Realigning Rural Avenue to the west of the intersection and maintain its operation as southbound only and under stop control.
- Installing crosswalks on all approaches of the intersection.
- Installing a fully functional traffic-signal system with count-down and accessible pedestrian signals, preemption function, and the ability to coordinate with the Route 16 and Winthrop Street intersection.
- Installing sharrows at appropriate locations on all approaches of the intersection.

5.5 HIGH STREET CORRIDOR

This section covers High Street from the east of Winthrop Square to the west of Main Street. As a part of Route 60, it carries a high volume of regional and local traffic. As Medford Square's historical "main street," this area contains many shops, retail stores, and restaurants; several medium and large condominiums; churches; and the City of Medford's public library. These attractions generate substantial pedestrian activities throughout the day. The corridor is basically a two-lane roadway. With on-street parking on both sides, it has a narrow travel lane about 10-feet wide in each direction. During peak periods, traffic is usually bumper-to-bumper, especially in the peak commuting direction.

5.5.1 Issues and Concerns

- The corridor has a very high crash rate. In the past three years, 56 crashes occurred in this section of High Street, including two pedestrian crashes: one at the crosswalk west of Bradlee Road, and another at the crosswalk east of Governors Avenue.

- More than 70 percent of the 54 vehicle-to-vehicle crashes (39 in total) are related to a parked car or a car in a parking maneuver.
- Eight crosswalks, including one signalized at the city library, exist on this busy section of High Street. Heavily used by pedestrians and frequently traversed by vehicles, their markings tend to fade easily.
- Some crosswalks lack appropriate curb cuts for wheelchairs, such as the eastbound curb on High street at Bradlee Road and Hillside Avenue, and the curbs on both ends of the crosswalk at Grace Episcopal Church. Preferably all the curb cuts should contain a sufficient area of debatable warning surface (truncated domes).
- Allowable on-street parking spaces and signage are not consistent and are confusing at some locations. Vehicles are frequently observed parked on the sides of unmarked curbs near intersections.
- The intersection of High Street at Government Avenue is unsignalized with stop-control on Government Avenue. It is usually congested during peak commuting periods, especially in the morning.
- On the High Street eastbound stretch (between two fire hydrants) inside the Governors Avenue intersection, no clear signage exists to prohibit parking in the stretch and traffic operations are often impeded by cars parked there.
- The single 20-minute loading/10-minute parking space at the corner of High Street and Governors Avenue southbound is not suitable. Cars parked there can reduce visibility of the intersection for drivers and pedestrians, and impede right turns from Governors Avenue.
- There are some signs that appear to be outdated and should be removed, such as the obsolete one-hour parking signs on the sidewalk near the library and the pedestrian-crossing warning signs near St. Joseph Church, which are not compliant with the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD).
- There are no separate lanes or sharrows to accommodate bicycles.

5.5.2 Proposed Short-Term Improvements

- Regularly maintain crosswalk pavement markings.
- Stripe yield lines (shark teeth) at all the unsignalized crosswalks on High Street.
- Examine and fix crosswalk curb cuts that are not compliant with the American with Disabilities Act (ADA).

- Clearly define allowable parking areas and regularly maintain the pavement markings of parking spaces.
- Consider enforcing no-parking zones by painting yellow markings on curbs or pavement.
- Examine and remove outdated and unused roadside signage.
- Prohibit parking on High Street eastbound in the Governors Avenue intersection.
- Remove the single parking/loading space at the corner of High Street and Governors Avenue southbound and designate it on the northbound side.
- Install sharrows at appropriate locations in the corridor.

5.5.3 Proposed Long-Term Improvements

In the long term, the intersection of High Street at Governors Avenue should be considered for signalization in order to reduce traffic delays and improve pedestrian safety. Table 10 summarizes AM and PM peak hour capacity analysis results for the No-Build and the signalization alternatives under the projected 2040 traffic conditions. Appendix Q provides detailed Synchro capacity analysis reports for the two alternatives.

The Synchro capacity analyses indicate that the signalization alternative would significantly improve traffic operations and would operate acceptably under the projected traffic conditions. The proposed signal timing includes an exclusive pedestrian phase and is intended to minimize the westbound traffic queue so as not to interfere with the central intersection at Medford Square.

Staff also briefly reviewed the feasibility of a modern roundabout, and determined that it is not feasible because the intersection layout and its surroundings are too limited for a single-lane roundabout, which would require an inscribed circle between 100-to 130-feet in diameter.

This study proposes examining pedestrian and bicycle accommodation and safety improvements in this corridor. Key long-term improvements include

- Reconstructing and signalize the intersection of High Street at Governor Avenue with count-down and accessible pedestrian signals and preemption function.
- Upgrading existing signal equipment at the library crosswalk to provide count-down displays for pedestrian crossings and install ADA-compliant wheelchair ramps with detectable warning (truncated domes).

- Examining further the potential of removing High Street on-street parking from one side in order to provide separated bicycle accommodations and improve overall traffic flow in the corridor.

5.6 OVERVIEW OF PROPOSED LONG-TERM IMPROVEMENTS UNDER PROJECTED 2040 TRAFFIC CONDITIONS

MPO staff constructed future-year traffic models, projecting to 2040, for the entire study area, based on the roadway layouts with the proposed long-term improvements. Figure 18 shows the weekday AM and PM peak hour intersection capacity of major intersections in the study area under the projected 2040 traffic conditions. With the proposed long-term improvements, all intersections would operate at acceptable LOS during the weekday peak hours.

We have presented Synchro capacity analyses for each of these intersections individually in previous sections of this Chapter. Staff analyzed traffic signal coordination at two adjacent locations: the Medford Square central intersection (as the master control location) and the intersections of Main Street at Route 16 Ramps. The Synchro traffic simulation showed that the coordination facilitated Main Street traffic flow and did not seriously increase queuing on the Route 16 ramps. We summarize the results of this analysis in Figure 18; and Appendix R contains detailed Synchro capacity analysis reports for the two locations.

Chapter 6—Summary and Recommendations

This study performed a series of safety and operations analyses, identified safety and operational problems, and proposed a number of short- and long-term improvements to address the problems in the study area.

The recommended short-term improvements could enhance safety for all users, including pedestrians and cyclists, and improve traffic operations in the study area. With a high benefit-to-cost ratio, these short-term improvements should be considered and implemented as soon as resources are available from highway maintenance or local Chapter 90 funding.

Significantly improving the safety, mobility, and access for all users would require a series of long-term improvements. Based on the existing land uses and transportation conditions, the study area can be divided into the following prospective projects (in order of suggested priority):

- Main Street at Route 16 Ramps
- Main Street at Mystic Avenue
- Central Intersection in Medford Square
- Mystic Valley Parkway Corridor (Route 16 at the crosswalk of Mystic River Path and at Winthrop Street)
- Winthrop Square (High Street at Winthrop Street)
- High Street Corridor (Focusing on Pedestrian and Bicycle Improvements)

This study provides a vision for Medford Square's long-term redevelopment and presents a series of improvements for the corridor that would allow it to operate safely and efficiently for motorists, bicyclists, and pedestrians. The existing conditions and potential solutions for these locations are complex and interrelated. Depending on available and potential resources, and development opportunities, the City of Medford could coordinate all stakeholders to rearrange and reprioritize these projects.

Implementing this vision via the recommended improvements would require significant effort and collaboration on the part of all stakeholders, including the City of Medford, residents, business owners, MassDOT, and DCR. All parties must concur about how the recommendations should be realized in a resourceful and fiscally responsible manner. The City may work with MassDOT District 4 to initiate the project, obtain favorable assessment from MassDOT's Project Review Committee, and identify potential funding sources by coordinating with MassDOT and the Boston Region MPO.

Appendix S contains details about the various steps of MassDOT's project development process, including a schematic timetable. Information about the project development process also may be found on MassDOT's website, at http://www.massdot.state.ma.us/planning/Main/PlanningProcess/ProjectDevelopmentProcess.aspx and at http://www.massdot.state.ma.us/Portals/8/docs/designGuide/CH_2_a.pdf.

MassDOT recently developed an online tool for both states and municipalities to use when initiating roadway projects. The Massachusetts Project Intake Tool (MaPIT) is a web-based application designed to help proponents map, create, and initiate projects with available in-house Geographic Information System (GIS) resources. The tool can be accessed from the geoPass webpage of Massachusetts GIS for Transportation (geoDOT), https://massdothpi.esriemcs.com/mapit.

For an introduction of the tool, please visit http://scoe.transportation.org/wp-content/uploads/sites/11/2017/08/CC1C-MaPIT%E2%80%94MassDOT%E2%80%99s-GIS-driven-Project-Initiation-and-Environmental-Screening-Tool.pdf.

Table 1
Intersection Capacity Analysis: AM Peak Hour
City Hall Subarea

Analysis Period	AM Peak Hour													
Alternative	**2040 No-Build**			**2040 Alternative 1**			**2040 Alternative 2**			**2040 Alternative 3**			**2040 Alternative 4**		
Intersection	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**
Salem St. at City Hall Mall / Oakland St.	1,764	32.8	C	1,764	32.8	C	1,352	26.5	C	1,403	26.8	C	1,478	34.9	C
Salem St. at Ashland St. / River St.	1,817	3.1	A	1,817	3.2	A	1,496	1.6	A	1,486	1.7	A	1,298	3.9	A
Central Intersection	2,842	62.2	E	2,842	54.5	D	2,803	288.0	F	2,834	197.2	F	2,179	105.4	F
Main St. at Clippership Dr.	2,206	0.0	A	2,206	0.0	A	2,206	0.0	A	2,209	0.0	A	2,208	40.2	D
Riverside Ave. at Clippership Dr.	1,108	30.3	C	1,108	30.3	C	1,102	18.6	B	1,103	18.5	B	1,096	56.0	E
Riverside Ave. at City Hall Mall	901	2.3	A	901	2.3	A	699	2.4	A	806	14.0	B	704	18.7	B
Riverside Ave. at River St.	457	1.2	A	457	1.1	A	565	0.1	A	654	0.1	A	255	7.9	A
City Hall Mall at Parking Lot Entrance	740	2.0	A	740	2.0	A	231	5.0	A	349	3.4	A	622	1.9	A
Subarea Average Delay		**82.0**			**75.5**			**256.2**			**186.4**			**133.5**	
Simulation Average Delay		**72.8**			**67.2**			**221.7**			**103.3**			**133.2**	

Notes:
- Subarea/Simulation Average Delay = subarea/simulation total delay (entry volume times intersection average delay) averaged by the total entry volume into the subarea.
- Simulation results are averaged between 20 runs of 10-minute simulations, each with a 10-minute warm-up period.

Table 2
Intersection Capacity Analysis: PM Peak Hour
City Hall Subarea

Analysis Period	PM Peak Hour													
Alternative	**2040 No-Build**			**2040 Alternative 1**			**2040 Alternative 2**			**2040 Alternative 3**			**2040 Alternative 4**		
Intersection	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**	**Entry Volume**	**Average Delay**	**LOS**
Salem St. at City Hall Mall / Oakland St.	2,413	27.7	C	2,413	27.6	C	1,778	17.0	B	1,827	33.0	C	1,926	185.9	F
Salem St. at Ashland St. / River St.	1,973	0.9	A	1,973	0.9	A	1,616	0.2	A	1,579	0.2	A	1,625	1.4	A
Central Intersection	2,913	59.4	E	2,913	56.9	E	2,768	335.0	F	2,863	126.1	F	2,316	134.7	F
Main St. at Clippership Dr.	2,285	0.0	A	2,285	0.0	A	2,288	0.0	A	2,284	0.0	A	2,305	12.4	B
Riverside Ave. at Clippership Dr.	1,661	30.1	C	1,661	29.5	C	1,616	29.2	C	1,696	32.3	C	1,581	150.9	F
Riverside Ave. at City Hall Mall	1,503	4.7	A	1,503	4.7	A	771	4.1	A	1,079	23.7	C	734	20.6	C
Riverside Ave. at River St.	1,037	2.3	A	1,037	1.9	A	609	0.1	A	926	0.1	A	345	8.0	A
City Hall Mall at Parking Lot Entrance	1,220	1.3	A	1,220	1.3	A	265	4.4	A	553	2.5	A	615	1.3	A
Subarea Average Delay		**80.0**			**77.7**			**266.9**			**133.1**			**253.3**	
Simulation Average Delay		**91.8**			**50.3**			**178.6**			**65.4**			**91.5**	

Notes:
- Subarea/Simulation Average Delay = subarea/simulation total delay (entry volume times intersection average delay) averaged by the total entry volume into the subarea.
- Simulation results are averaged between 20 runs of 10-minute simulations, each with a 10-minute warm-up period.

Table 3
Intersection Capacity Analysis: AM Peak Hour
City Hall Subarea

Analysis Period		AM Peak Hour														
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Maintain existing traffic flow pattern • Add second EB through lane at Central Intersection • Modify traffic/pedestrian signal phasing at Central Intersection			**2040 Alternative 2** • Convert Salem St., City Hall Mall, and Riverside Ave. to two-way operation • Allow all movements at Central Intersection			**2040 Alternative 3** • Same as Alternative 2 • Allow right turns only on Main St. at Central Intersection			**2040 Alternative 4** • Convert Salem St., City Hall Mall, and Clippership Dr. to two-way operation • Extend City Hall Mall southward to connect to Clippership Dr. • Signalize Main St./ Clippership Dr. under Central Intersection controller		
Intersection		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Salem St. at City Hall Mall / Oakland St.																
Salem Street	R	D	37.7	#463	D	37.7	#463	C	22.0	#398	C	25.6	#464	C	30.7	#551
	T	D	37.7	#463	D	37.7	#463	C	22.0	#398	C	25.6	#464	C	30.7	#551
	L							C	22.0	#398	C	25.6	#464	C	30.7	#551
City Hall Mall	L	C	30.5	247	C	30.5	247	C	27.7	39	C	31.3	80	E	64.1	#158
	T	C	30.2	96	C	30.2	96	C	27.7	39	C	31.3	80	E	64.1	#158
	R	A	3.7	49	A	3.7	49	C	27.7	39	A	7.8	32	D	36.1	31
Oakland Street	T							D	52.5	#292	D	40.4	#240	E	59.4	#342
	R	C	33.2	210	C	33.2	210	D	52.5	#292	D	40.4	#240	E	59.4	#342
Intersection Average		**C**	**32.8**		**C**	**32.8**		**C**	**26.5**		**C**	**26.8**		**C**	**34.9**	
Central Intersection																
Salem Street	L	E	72.8	#600	E	65.1	#589	F	>180	#1569	F	>180	#1245	F	>180	#887
	BR	C	22.3	447	C	23.7	461	F	166.5	#826	D	43.0	#605	E	58.0	#801
	R	C	22.3	447	C	23.7	461	F	166.5	#826	D	43.0	#605	E	58.0	#801
High Street	L							D	40.4	124	E	55.2	132			
	BL							D	40.4	124	E	55.2	132	E	55.4	123
	T	E	65.7	238	D	41.6	113	D	42.1	171	E	57.0	181	E	65.2	233
	R	F	84.6	#459	E	70.1	#415	C	27.8	279	F	>180	#585	B	10.7	91
Main Street	L							F	>180	#318				F	128.3	#79
	T							F	>180	#318				F	128.3	#79
	R	A	0.5	0	B	13.7	71	F	>180	#318	A	9.0	51	F	132.7	#144
Forest Street	LTR	F	107.8	#452	F	94.9	#441	F	>180	#685	F	>180	#565	F	>180	#621
Intersection Average		**E**	**62.2**		**D**	**54.5**		**F**	**>180**		**F**	**>180**		**F**	**105.4**	
Main St. at Clippership Dr.																
Main Street Northbound	T	A	0.0	0	A	0.0	0	A	0.0	0	A	0.0	0	A	9.2	64
	R	A	0.0	0	A	0.0	0	A	0.0	0	A	0.0	0	A	0.3	0
Main Street Southbound	T	A	0.0	0	A	0.0	0	A	0.0	0	A	0.0	0	E	55.8	m81
	L	A	0.1	0	A	0.1	0	A	0.1	0						
Clippership Drive	LR													C	33.5	193
Intersection Average		**A**	**0.0**		**A**	**0.0**		**A**	**0.0**		**A**	**0.0**		**D**	**40.2**	
Riverside Ave. at Clippership Dr.																
Riverside Avenue Eastbound	LT	B	13.2	148	B	13.2	148	A	6.9	104	A	6.9	107	B	12.0	128
Riverside Avenue Westbound	L													D	51.5	#1060
	TR	D	40.3	#720	D	40.3	#720	B	17.0	#648	B	16.9	#648	D	51.5	#1060
Clippership Drive	LT	B	17.1	76	B	17.1	76	C	31.7	#118	C	31.9	#118	F	103.5	#436
	R	B	17.1	76	B	17.1	76	C	31.7	#118	C	31.9	#118	F	103.5	#436
Intersection Average		**C**	**30.3**		**C**	**30.3**		**B**	**18.6**		**B**	**18.5**		**E**	**56.0**	
Riverside Ave. at City Hall Mall																
Riverside Avenue Eastbound	L	A	7.9	19	A	7.9	19	A	3.3	6	B	12.4		C	24.4	#165
	T	A	0.0	0	A	0.0	0	A	3.3	6	B	12.4		C	24.4	#165
	R													C	24.4	#165
Riverside Avenue Westbound	T							A	0.0	0	C	15.6		B	17.3	91
	R	A	0.0	0	A	0.0	0	A	0.0	0	C	15.6		B	17.3	91
City Hall Mall	L							C	17.0	17	A	9.8		B	11.4	33
	T													B	17.0	#228
	R							C	17.0	17	A	9.8		B	17.0	#228
Intersection Average		**A**	**2.3**		**A**	**2.3**		**A**	**2.4**		**B**	**14.0**		**B**	**18.7**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

Table 4
Intersection Capacity Analysis: PM Peak Hour
City Hall Subarea

Analysis Period		PM Peak Hour													
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Maintain existing traffic flow pattern • Add second EB through lane at Central Intersection • Modify traffic/pedestrian signal phasing at Central Intersection			**2040 Alternative 2** • Convert Salem St., City Hall Mall, and Riverside Ave. to two-way operation • Allow all movements at Central Intersection			**2040 Alternative 3** • Same as Alternative 2 • Allow right turns only on Main St. at Central Intersection			**2040 Alternative 4** • Convert Salem St., City Hall Mall, and Clippership Dr. to two-way operation • Extend City Hall Mall southward to connect to Clippership Dr. • Signalize Main St./ Clippership Dr. under Central Intersection controller		
Intersection		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Salem St. at City Hall Mall / Oakland St.																
Salem Street	R	C	31.3	#661	C	27.3	#666	B	14.8	#522	C	30.4	#734	F	>180	#948
	T	C	31.3	#661	C	27.3	#666	B	14.8	#522	C	30.4	#734	F	>180	#948
	L							B	14.8	#522	C	30.4	#734	F	>180	#948
City Hall Mall	L	D	36.7	#485	D	42.5	#525	F	94.7	#136	E	71.4	#400	D	54.5	#288
	T	D	36.7	#346	D	42.5	#374	F	94.7	#136	E	71.4	#400	D	54.5	#288
	R	A	3.3	170	A	3.0	166	F	94.7	#136	A	8.8	48	A	3.7	3
Oakland Street	T							D	44.4	37	D	35.1	44	B	13.8	23
	R	C	20.2	24	C	22.9	25	D	44.4	37	D	35.1	44	B	13.8	23
Intersection Average		**C**	**27.7**		**C**	**27.6**		**B**	**17.0**		**C**	**33.0**		**F**	**>180**	
Central Intersection																
Salem Street	L	D	37.9	389	C	30.2	371	F	>180	#1182	F	93.4	#788	F	99.4	#606
	BR	E	73.8	#1039	F	85.3	#1056	F	>180	#1060	F	129.1	#1012	F	138.4	#1203
	R	E	73.8	#1039	F	85.3	#1056	F	>180	#1060	F	129.1	#1012	F	138.4	#1203
High Street	L							D	49.5	240	F	>180	#406			
	BL							D	49.5	240	F	>180	#406	E	62.4	217
	T	E	69.1	#401	D	51.5	165	D	42.2	190	E	70.9	#229	E	74.8	#333
	R	A	5.7	19	A	2.8	0	A	9.0	49	B	13.4	52	B	10.4	57
Main Street	L							F	>180	#862				F	160.9	#364
	T							F	>180	#862				F	160.9	#364
	R	A	2.4	0	B	18.4	#281	F	>180	#862	B	11.5	122	F	>180	#520
Forest Street	LTR	F	152.5	#497	F	116.3	#476	F	>180	#665	F	>180	#538	F	>180	#644
Intersection Average		**E**	**59.4**		**E**	**56.9**		**F**	**>180**		**F**	**126.1**		**F**	**134.7**	
Main St. at Clippership Dr.																
Main Street Northbound	T	A	0.0	0	A	0.0	0	A	0.0	0	A	0.0	0	B	14.0	198
	R	A	0.0	0	A	0.0	0	A	0.0	0	A	0.0	0	A	1.3	0
Main Street Southbound	T	A	0.0	0	A	0.0	0	A	0.0	0	A	0.0	0	B	10.1	m33
	L	A	0.2	0	A	0.2	0	A	0.2	0						
Clippership Drive	LR													C	27.2	172
Intersection Average		**A**	**0.0**		**A**	**0.0**		**A**	**0.0**		**A**	**0.0**		**B**	**12.4**	
Riverside Ave. at Clippership Dr.																
Riverside Avenue Eastbound	LT	C	21.0	#311	C	20.4	299	B	15.4	260	B	17.9	289	D	51.6	302
Riverside Avenue Westbound	L													F	130.7	#1124
	TR	C	34.9	#649	C	31.3	#706	C	26.0	#697	C	29.8	#753	F	130.7	#1124
Clippership Drive	LT	C	30.1	#342	C	31.9	#376	D	38.5	#365	D	40.5	#435	F	>180	#1216
	R	C	30.1	#342	C	31.9	#376	D	38.5	#365	D	40.5	#435	F	>180	#1216
Intersection Average		**C**	**30.1**		**C**	**29.5**		**C**	**29.2**		**C**	**32.3**		**F**	**150.9**	
Riverside Ave. at City Hall Mall																
Riverside Avenue Eastbound	L	A	9.5	73	A	9.5	73	A	1.1	2	D	31.4		C	25.1	#188
	T	A	0.0	0	A	0.0	0	A	1.1	2	D	31.4		C	25.1	#188
	R													C	25.1	#188
Riverside Avenue Westbound	T							A	0.0	0	C	17.6		B	16.6	74
	R	A	0.0	0	A	0.0	0	A	0.0	0	C	17.6		B	16.6	74
City Hall Mall	L							C	20.8	49	B	12.2		B	17.9	90
	T													B	19.3	#159
	R							C	20.8	49	B	12.2		B	19.3	#159
Intersection Average		**A**	**4.7**		**A**	**4.7**		**A**	**4.1**		**C**	**23.7**		**C**	**20.6**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

Table 5
Intersection Capacity Analysis: AM Peak Hour
Main Street at Route 16 Ramps

Analysis Period		**AM Peak Hour**															
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1A** • Install two signals under one controller (three-phase operation)			**2040 Alternative 1B** • Install two signals under one controller (four-phase operation)			**2040 Alternative 2** • Close WB off-ramp to Main Street • Install two individual signals under one controller			**2040 Alternative 3** • Close EB on-ramp from Main Street • Install two signals under one controller			**2040 Alternative 4** • Create a street-level intersection at Route 16 and Main Street		
Intersection		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Main St. at Rt. 16 WB Ramps																			
Main Street Northbound	L	A	8.9	17	F	169.9	m#71	E	63.1	m53	E	63.3	m31	F	123.6	#104			
	T	A	0.0	0	B	11.1	m57	A	8.4	m85	B	10.6	m86	A	7.7	109			
Main Street Southbound	T	A	0.0	0	E	76.7	#867	E	76.3	#660	C	31.4	#777	E	78.6	#842			
	R	A	0.0	0	E	76.7	#867	E	76.3	#660	C	31.4	#777	E	78.6	#842			
Rt. 16 WB Off-Ramp	LTR	F	>180	433	D	49.3	224	E	77.6	244				D	38.3	196			
Intersection Average		**E**	**41.4**		**E**	**67.3**		**E**	**66.7**		**C**	**29.0**		**E**	**56.5**				
Main St. at South St. / Rt. 16 EB Ramps																			
Main Street Northbound	T	A	0.0	0	C	29.1	237	C	28.7	265	C	26.8	213	A	8.1	124	A	0.0	0
	R	A	0.0	0	C	29.1	237	C	28.7	265	C	26.8	213						
Main Street Southbound	L	B	10.2	56	D	39.8	m188	E	77.9	m150	E	75.1	m182						
	T	A	0.0	0	C	30.1	m121	D	37.5	m168	E	56.6	m236	D	52.9	m123	A	0.0	0
South Street	L	F	Err	Err	E	77.9	207	E	77.5	238	C	27.7	145	D	37.1	55	F	Err	Err
	T	F	Err	Err	E	77.9	207	E	77.5	238	C	27.7	145						
	R	F	86.5	276	E	77.9	207	E	77.5	238	C	27.7	145	F	113.7	#570	B	12.1	24
Intersection Average		**F**	**>180**		**D**	**40.1**		**D**	**47.1**		**D**	**45.0**		**D**	**50.5**		**F**	**>180**	
Grounded Rt. 16 at Main St.																			
Route 16 Eastbound	L																D	48.0	67
	T																F	>180	#908
	R																F	>180	#908
Route 16 Westbound	L																F	>180	#293
	T																D	47.2	358
	R																D	47.2	358
Main Street Eastbound	L																E	74.7	#90
	T																E	59.1	#373
	R																E	59.1	#373
Main Street Westbound	L																F	>180	#533
	T																F	>180	#1334
	R																F	>180	#1334
Intersection Average																	**F**	**155.3**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

Table 6
Intersection Capacity Analysis: PM Peak Hour
Main Street at Route 16 Ramps

Analysis Period		**PM Peak Hour**															
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1A** • Install two signals under one controller (three-phase operation)			**2040 Alternative 1B** • Install two signals under one controller (four-phase operation)			**2040 Alternative 2** • Close WB off-ramp to Main Street • Install two individual signals under one controller			**2040 Alternative 3** • Close EB on-ramp from Main Street • Install two signals under one controller			**2040 Alternative 4** • Create a street-level intersection at Route 16 and Main Street		
Intersection		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Main St. at Rt. 16 WB Ramps																			
Main Street Northbound	L	B	13.0	61	D	52.5	m155	D	54.2	m155	D	38.5	m114	E	57.6	#239			
	T	A	0.0	0	B	10.9	m128	A	6.5	m92	C	21.9	m244	A	9.7	188			
Main Street Southbound	T	A	0.0	0	F	82.1	#496	D	42.6	#452	B	13.5	#435	F	83.1	#505			
	R	A	0.0	0	F	82.1	#496	D	42.6	#452	B	13.5	#435	F	83.1	#505			
Rt. 16 WB Off-Ramp	LTR	F	Err	Err	D	44.8	#291	D	50.0	#270				D	44.0	#270			
Intersection Average		**F**	**>180**		**D**	**49.7**		**C**	**31.4**		**B**	**19.4**		**D**	**44.2**				
Main St. at South St. / Rt. 16 EB Ramps																			
Main Street Northbound	T	A	0.0	0	C	27.0	#571	D	39.1	#582	D	54.6	#648	B	13.9	348	A	0.0	0
	R	A	0.0	0	C	27.0	#571	D	39.1	#582	D	54.6	#648						
Main Street Southbound	L	A	4.9	13	D	41.1	m42	D	43.9	m38	E	59.3	m54						
	T	A	0.0	0	B	13.4	m108	A	5.9	m102	C	22.1	140	B	14.8	m111	A	0.0	0
South Street	L	F	Err	Err	D	50.2	#358	D	48.7	#358	C	34.4	269	D	51.3	29	F	>180	533
	T	F	Err	Err	D	50.2	#358	D	48.7	#358	C	34.4	269						
	R	C	16.0	42	D	50.2	#358	D	48.7	#358	C	34.4	269	B	17.7	#822	B	10.6	11
Intersection Average		**F**	**>180**		**C**	**28.0**		**C**	**31.2**		**D**	**41.4**		**B**	**18.5**		**F**	**58.5**	
Grounded Rt. 16 at Main St.																			
Route 16 Eastbound	L																F	93.7	#198
	T																F	179.6	#804
	R																F	179.6	#804
Route 16 Westbound	L																F	>180	#276
	T																E	65.7	#447
	R																E	65.7	#447
Main Street Eastbound	L																F	>180	#394
	T																D	51.8	#709
	R																D	51.8	#709
Main Street Westbound	L																F	90.5	#90
	T																F	147.0	#959
	R																F	147.0	#959
Intersection Average																	**F**	**117.1**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

Table 7
Intersection Capacity Analysis: AM/PM Peak Hour
Main Street at Mystic Avenue

Analysis Period		AM Peak Hour												PM Peak Hour								
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Reconstruct and signalize within existing R.O.W.			**2040 Alternative 2** • Same as Alternative 1 • Add a NB through lane			**2040 Alternative 3** • Same as Alternative 2 • Prohibit NB left turns			**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Reconstruct and signalize within existing R.O.W.			**2040 Alternative 2** • Same as Alternative 1 • Add a NB through lane			**2040 Alternative 3** • Same as Alternative 2 • Prohibit NB left turns		
Approach		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Main Street Northbound	L	F	>180	889	E	57.9	#480	E	74.0	#511	C	34.4	#345	F	Err	Err	F	117.2	#517	C	32.0	327	D	40.4	348
	R	F	>180	889	C	33.6	36	D	36.1	37	C	20.8	27	F	Err	Err	D	42.1	16	C	24.9	12	C	28.4	13
Main Street Southbound	T	A	0.0	0	E	58.7	#914	D	45.9	#880	D	41.7	#686	A	0.0	0	C	29.1	359	E	65.0	#495	C	20.6	308
	R	A	0.0	0	E	63.6	#1286	E	63.9	#1286	C	33.8	#930	A	0.0	0	E	56.2	#977	D	49.2	#1145	B	12.6	#597
Mystic Avenue	L	A	3.4	11	F	114.2	#133	F	114.2	#133	B	12.8	129	A	5.4	14	E	67.4	210	E	77.6	#262	C	27.7	#684
	T	A	3.4	11	B	15.2	304	B	10.2	121	B	12.8	129	A	5.4	14	F	87.7	#1525	D	38.0	#659	C	27.7	#684
Intersection Average		**F**	**124.9**		**E**	**55.8**		**D**	**53.6**		**C**	**32.6**		**F**	**>180**		**E**	**73.0**		**D**	**46.3**		**C**	**23.6**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

Table 8
Intersection Capacity Analysis: AM/PM Peak Hour
Route 16 (Mystic Valley Parkway) at Winthrop Street

Analysis Period		AM Peak Hour									PM Peak Hour								
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Convert WB RT-only lane to TH/RT • Add NB LT bay			**2040 Alternative 2** • Same as Alternative 1 • Add a second EB through lane			**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Convert WB RT-only lane to TH/RT • Add NB LT bay			**2040 Alternative 2** • Same as Alternative 1 • Add a second EB through lane		
Approach		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Route 16 Eastbound	TR	F	86.1	#1035	E	79.9	#1047	C	31.4	384	E	76.3	#1070	E	79.7	#1093	C	26.2	365
Route 16 Westbound	T	F	128.1	#1264	C	30.2	#566	D	42.2	#680	F	130.2	#1272	D	43.6	#798	D	47.5	#810
	R	A	8.8	82	C	30.2	#566	D	42.2	#680	B	10.4	116	D	43.6	#798	D	47.5	#810
Winthrop Street Northbound	L	F	159.3	#536	C	28.0	30	C	20.8	27	F	101.0	#534	C	23.6	30	C	22.5	29
	T	F	159.3	#536	E	65.3	#432	E	56.9	#400	F	101.0	#534	F	121.3	#536	F	107.4	#525
	R	B	19.2	188	C	22.6	196	B	19.4	181	C	22.9	168	C	26.8	181	C	25.5	178
Winthrop Street Southbound	L	F	157.5	#646	F	93.6	#532	D	40.3	#442	F	>180	#618	F	152.4	#567	F	150.9	#565
	TR	E	70.6	#885	E	79.4	#959	D	43.5	#857	D	39.1	#571	D	41.1	#639	D	38.0	#605
Intersection Average		**F**	**97.2**		**E**	**59.1**		**D**	**38.6**		**F**	**104.8**		**E**	**70.3**		**E**	**57.9**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formula

Table 9
Intersection Capacity Analysis: AM/PM Peak Hour
Winthrop Square

Analysis Period		**AM Peak Hour**									**PM Peak Hour**								
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Reconstruct and signalize within existing R.O.W.			**2040 Alternative 2** • Converted to two-lane roundabout with extensive land taking			**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Reconstruct and signalize within existing R.O.W.			**2040 Alternative 2** • Converted to two-lane roundabout with extensive land taking		
Approach		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
Winthrop Street Northbound	L	C	19.6	125	F	95.4	#166	B	14.6	100	E	49.4	325	E	65.3	#219	D	27.0	225
	T	C	19.6	125	E	57.4	382	B	14.6	100	E	49.4	325	D	49.3	#432	D	27.0	225
	R	A	6.8	0	D	44.6	88	A	5.7	0	B	10.2	25	C	33.7	103	A	8.0	25
Winthrop Street Southbound	L	F	>180	1025	D	45.7	112	C	17.0	25	F	>180	750	C	27.4	62	A	9.0	0
	T	F	>180	1025	E	76.9	#665	F	110.0	400	F	>180	750	D	54.4	#503	E	48.5	300
	R	F	>180	1025	D	53.9	240	F	110.0	400	F	>180	750	C	33.7	160	E	48.5	300
High Street Eastbound	L	E	37.2	175	C	29.2	35	A	7.7	0	E	45.4	275	D	52.6	#124	A	8.0	25
	T	E	37.2	175	D	35.5	266	C	15.7	75	E	45.4	275	D	36.6	333	B	13.7	75
	R	E	39.8	200	D	43.0	436	C	15.7	75	C	20.4	125	D	44.2	#377	B	13.7	75
High Street Westbound	L	F	>180	1350	C	28.3	194	A	8.1	25	F	>180	1050	C	28.0	113	A	8.3	25
	T	F	>180	1350	E	61.1	#958	F	79.7	550	F	>180	1050	E	55.9	#615	F	65.4	425
	R	F	>180	1350	C	27.8	112	F	79.7	550	F	>180	1050	C	28.3	107	F	65.4	425
Rural Avenue	LTR	F	>180	550	D	26.2	13	F	81.0	275	D	26.0	50	B	14.6	2	B	13.6	25
Intersection Average		**F**	**>180**		**D**	**54.0**		**E**	**50.0**		**F**	**132.4**		**D**	**46.2**		**D**	**30.3**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

Table 10
Intersection Capacity Analysis: AM/PM Peak Hour
High Street at Governors Avenue

Analysis Period		**AM Peak Hour**						**PM Peak Hour**					
Alternative		**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Reconstruct and signalize within existing R.O.W.			**2040 No-Build** • Continue existing operations			**2040 Alternative 1** • Reconstruct and signalize within existing R.O.W.		
Approach		**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**	**LOS**	**Delay**	**95th Queue**
High Street Eastbound	LT	A	1.6	4	C	21.1	373	A	5.2	19	D	36.0	#653
High Street Westbound	TR	A	0.0	0	C	31.9	589	A	0.0	0	B	17.4	596
Governors Avenue	L	F	>180	640	E	68.9	#352	F	127.3	194	E	72.4	81
	R	F	>180	640	D	38.2	76	F	127.3	194	C	24.6	36
Intersection Average		**F**	**96.0**		**C**	**34.4**		**C**	**15.1**		**C**	**27.0**	

Notes:
- LOS = Level of Service; 95th Queue = 95th percentile reported queue length (feet); Delay = average delay per vehicle (seconds)
- Turning movements: L = left turn; R = right turn; T = through traffic
- HCM notes: # = volume exceeds capacity, queue may be longer; m = volume metered by upstream signal; Err = value exceeds constraints of HCM formulas

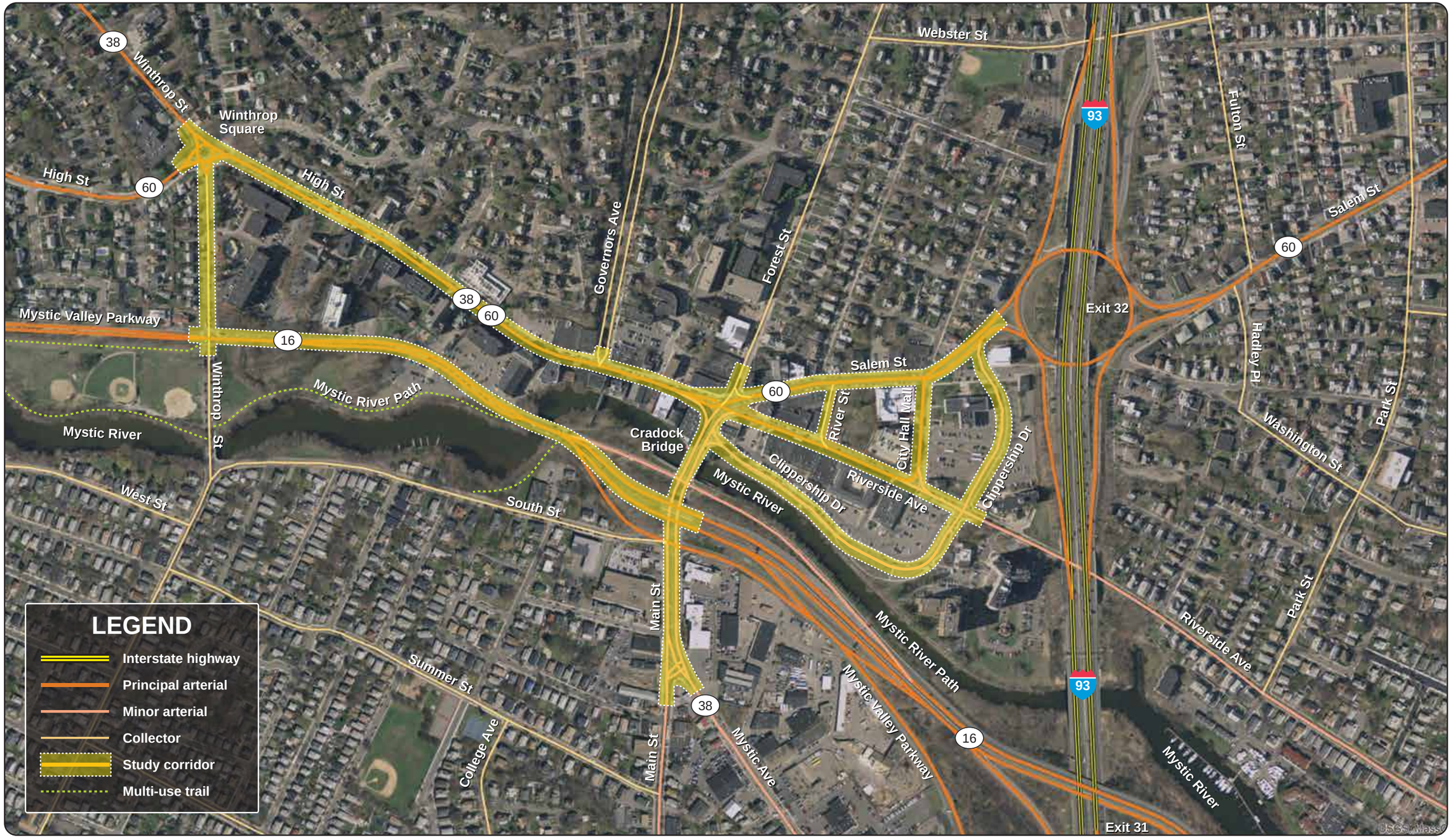

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Figure 1
Study Area Map
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

Route No.	Origin–Destination	AM Rush Hour	Day	PM Rush Hour	Night	Sat.	Sun.
94	Medford Square-Davis Station	20	35	20	40	50	70
95	West Medford-Sullivan Station	25	30	20	60	30	65
96	Medford Square-Harvard Station	20	40	20	40	50	70
101	Malden Station-Sullivan Station	12	30	12	60	35	70
134	North Woburn-Wellington Station	18	30	30	60	30	60
326	West Medford-Haymarket Express	12	—	15	—	—	—
354	Woburn Express-State Street Sta.	25	—	19	—	—	—
710	N. Medford-Wellington Station	60	60	60	—	—	—

Massachusetts Bay Transporatation Authority (MBTA) Bus Routes

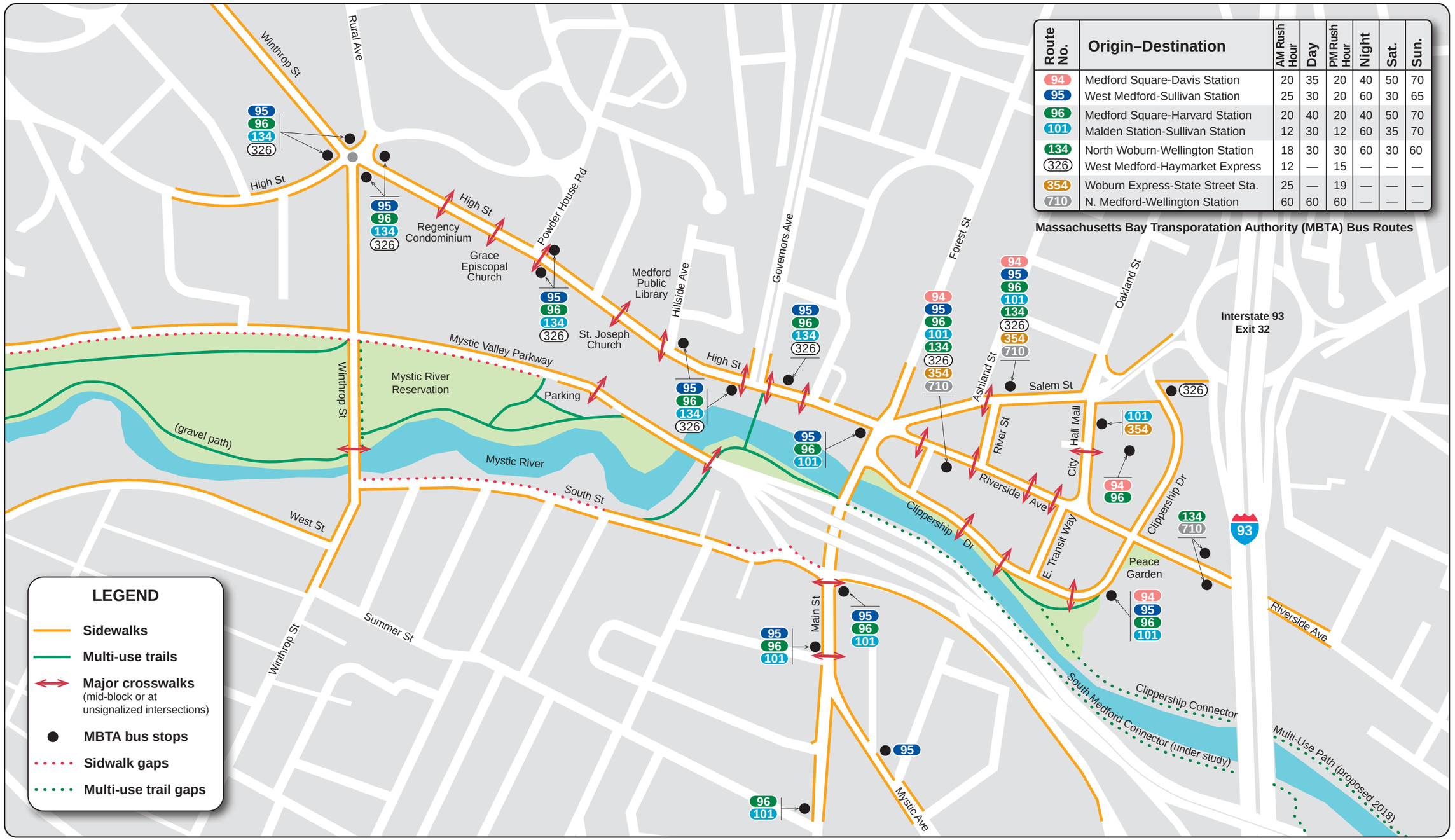

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Figure 2
Transit Service and Pedestrian and Bicycle Facilities
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

LEGEND

- ❶ **Automatic Traffic Recorder Location**
- → **Directional Daily Traffic Volume**

Note: The data were collected in the weekday period of December 4 to 6, 2017. Traffic volumes at locations 12 Eastbound and 17 were estimated from turning movement counts collected on December 7, 2017.

Winthrop Street, Governors Avenue, Forest Street, Main Street, Mystic Avenue, and City Hall Mall

Count Location	❶	❷	❸	❹	❺	❻	❼	❽	❾
Southbound Volume	7,430	11,240	2,040	3,730	13,460	6,240	-	6,600	12,940
Northbound Volume	6190	8,780	2,060	1,430	7,150	9,220	12,890	-	-
Southbound Split	55%	56%	50%	72%	65%	40%	-	100%	100%
Northbound Split	45%	44%	50%	28%	35%	60%	100%	-	-
Combined Volume	13,620	20,020	4,100	5,160	20,610	15,460	12,890	6,600	12,940
Estimated AADT	13,620	20,970	4,310	5,140	21,680	15,370	12,460	6,350	12,600

AADT: Annual Average Daily Traffic

High Street, Salem Street, and Riverside Avenue

Count Location	❿	⓫	⓬	⓭	⓮
Eastbound Volume	8,850	5,620	12,600	6,540	5,150
Westbound Volume	11,840	7,060	15,080	-	7,520
Eastbound Split	42%	44%	46%	100%	41%
Westbound Split	58%	56%	54%	-	59%
Combined Volume	20,380	12,680	27,680	6,540	12,670
Estimated AADT	20,220	12,620	27,400	6,890	13,320

Mystic Valley Parkway with on-and off-ramps and South Street

Count Location	⓯	⓰	⓱	⓲	⓳	⓴	㉑	㉒	㉓
Eastbound Volume	13,190	21,000	-	1,660	6,360	10,560	6,100	8,190	21,300
Westbound Volume	15,370	20,110	5,000	-	-	-	-	-	15,090
Eastbound Split	46%	51%	-	100%	100%	100%	100%	100%	59%
Westbound Split	54%	49%	100%	-	-	-	-	-	41%
Combined Volume	28,560	41,110	5,000	1,660	6,360	10,560	6,100	8,190	36,390
Estimated AADT	27,150	41,900	5,000	1,600	6,620	10,100	5,850	8,540	34,870

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Figure 3
2017 Daily Traffic Volumes
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

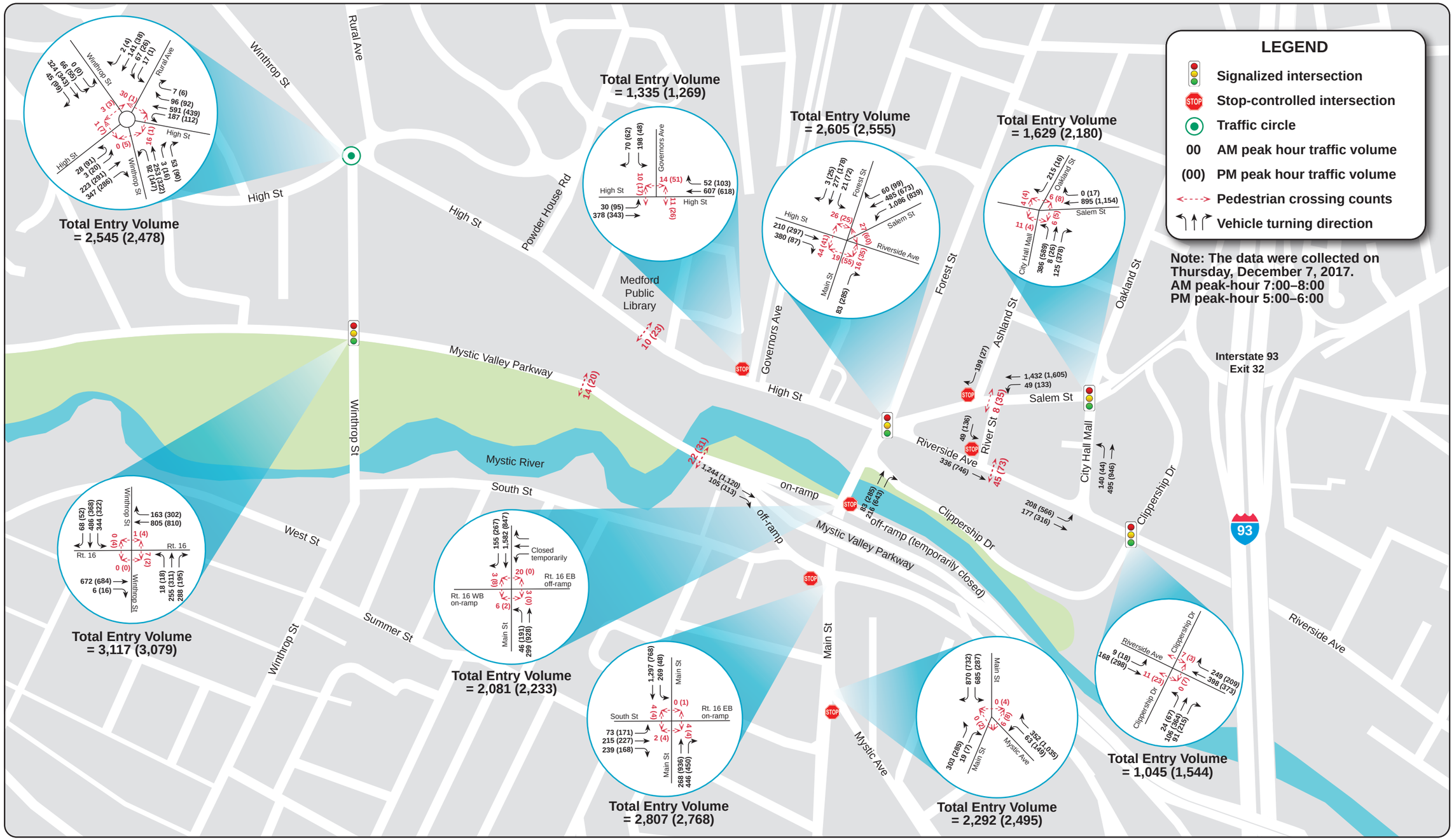

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Figure 4
2017 Weekday Peak Hour Traffic and Pedestrian Volumes at Major Intersections
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

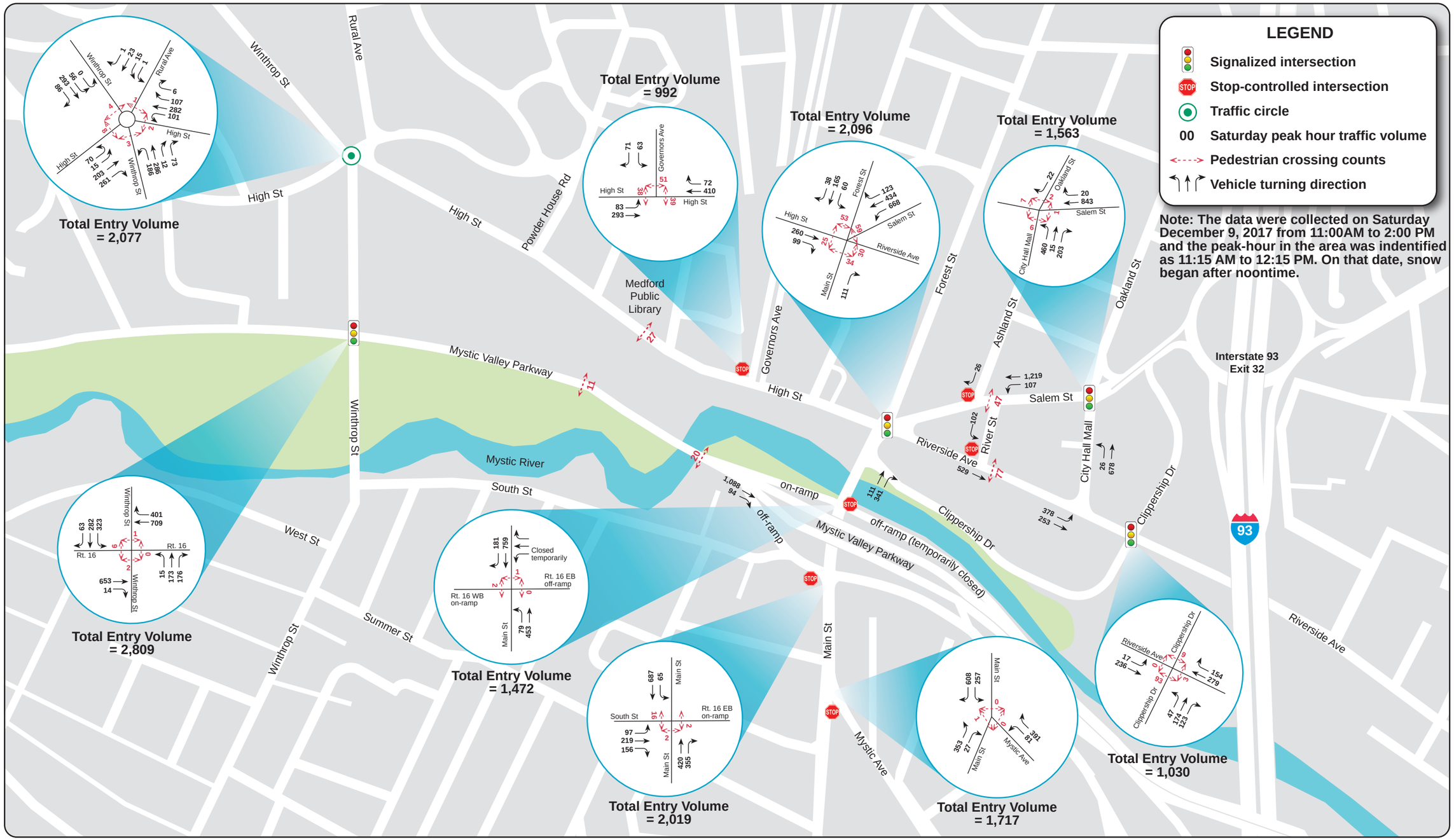

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Figure 5
2017 Saturday Peak Hour Traffic and Pedestrian Volumes at Major Intersections
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

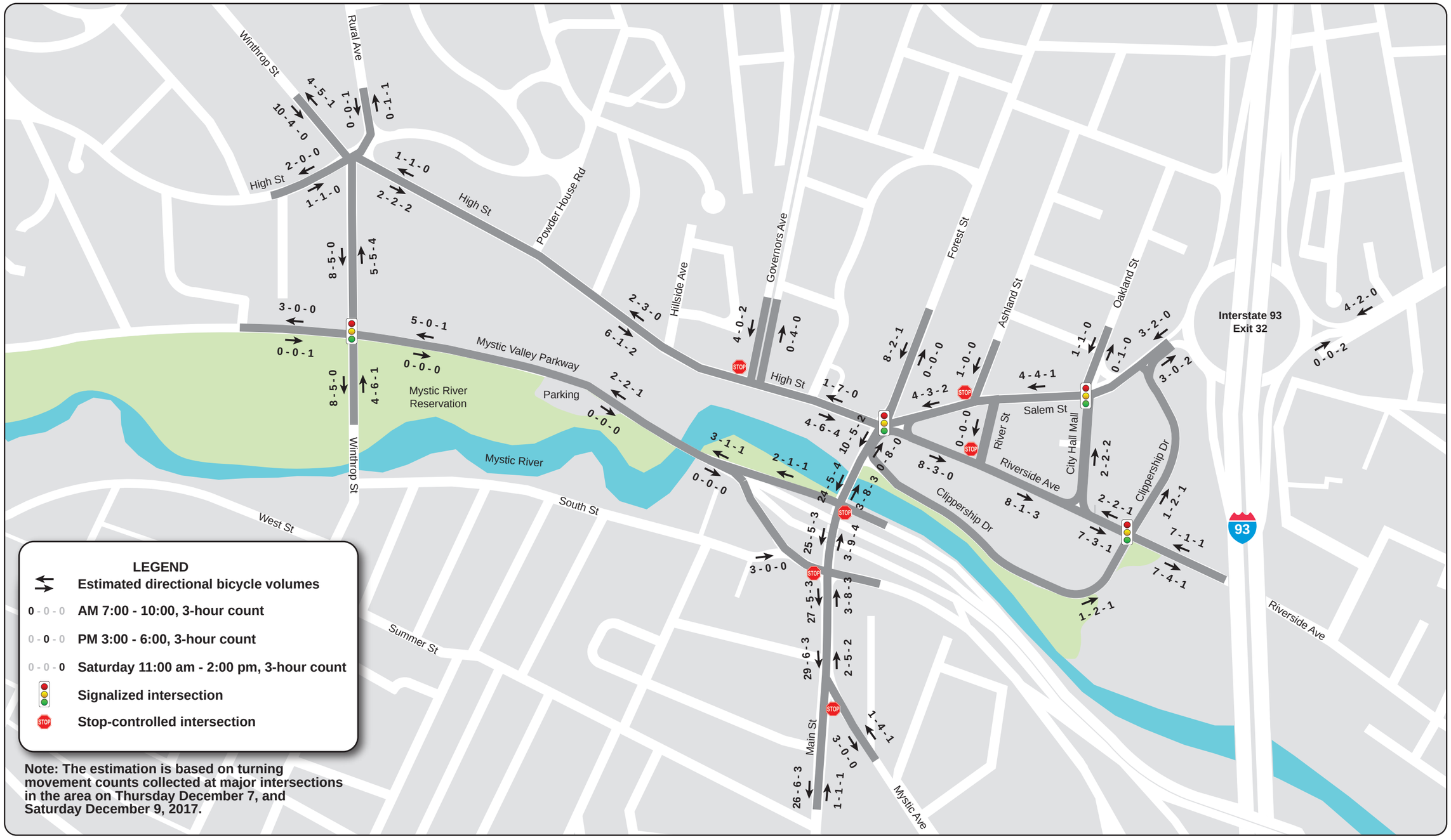

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Figure 6
On-Road Bicycle Volumes during Peak Traffic Periods (2017)
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

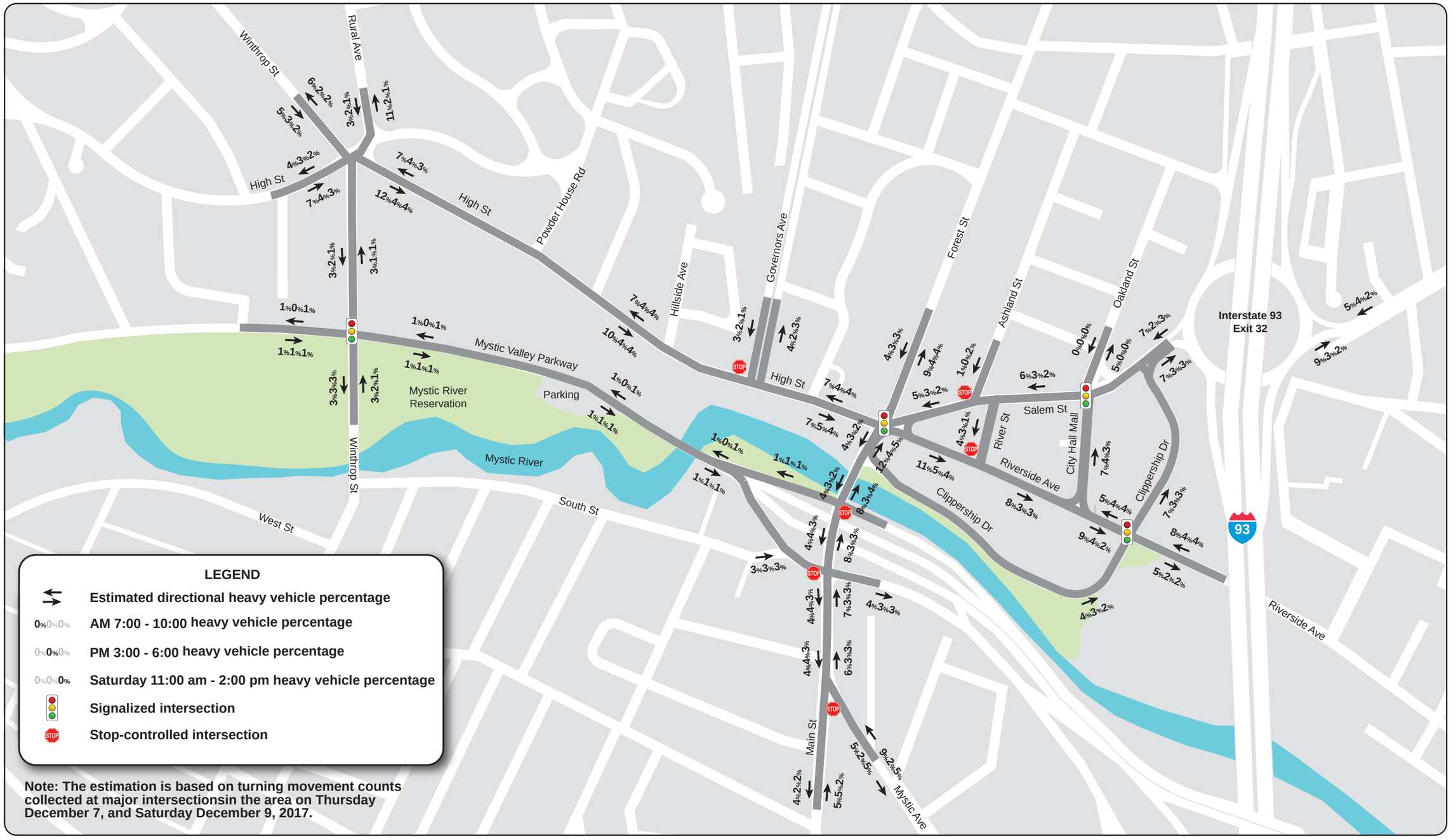

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Figure 7
Roadway Heavy Vehicle Percentage during Peak Traffic Periods (2017)
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

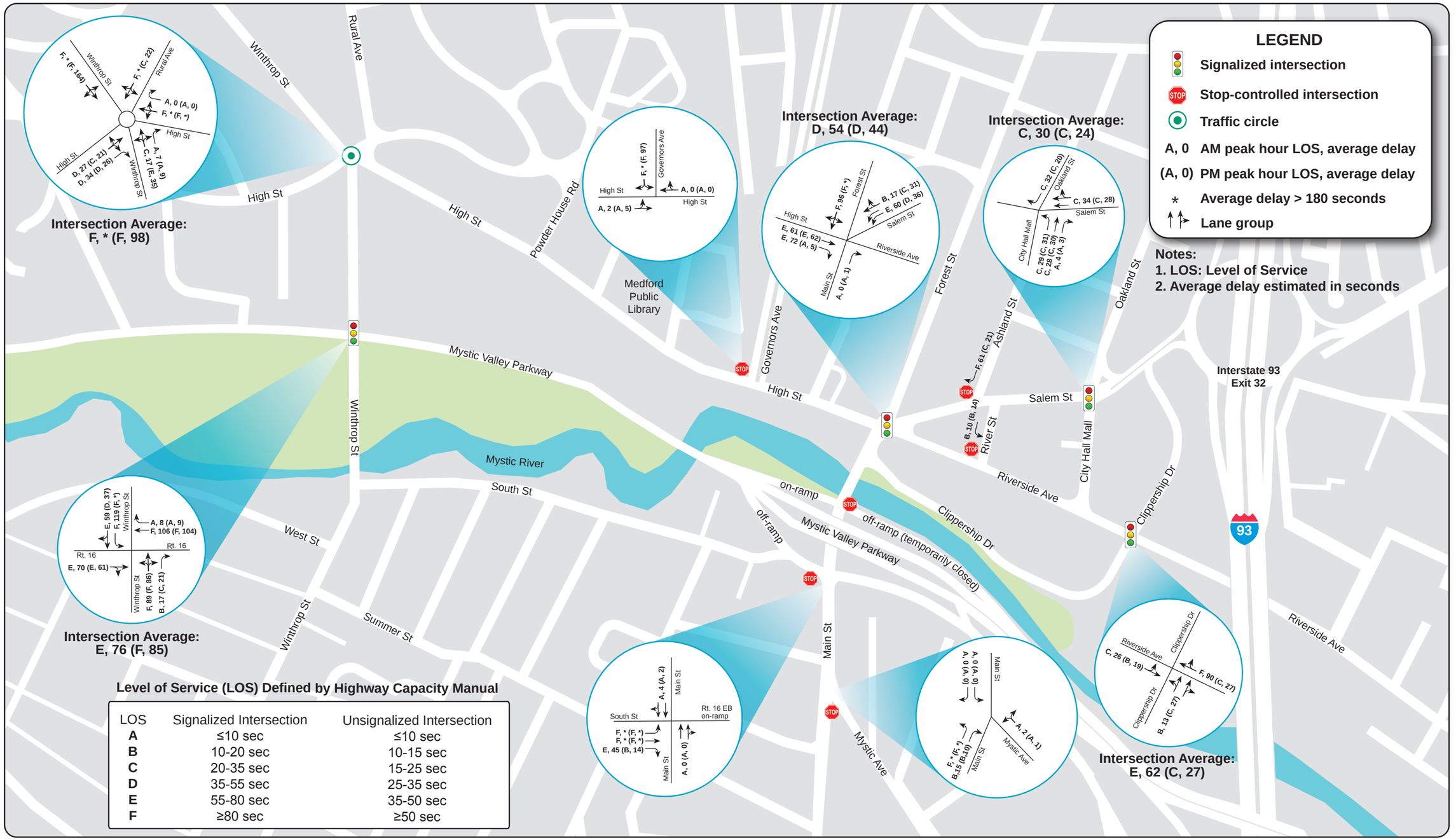

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Figure 8
2017 Weekday Peak Hour Intersection Capacity Analysis
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

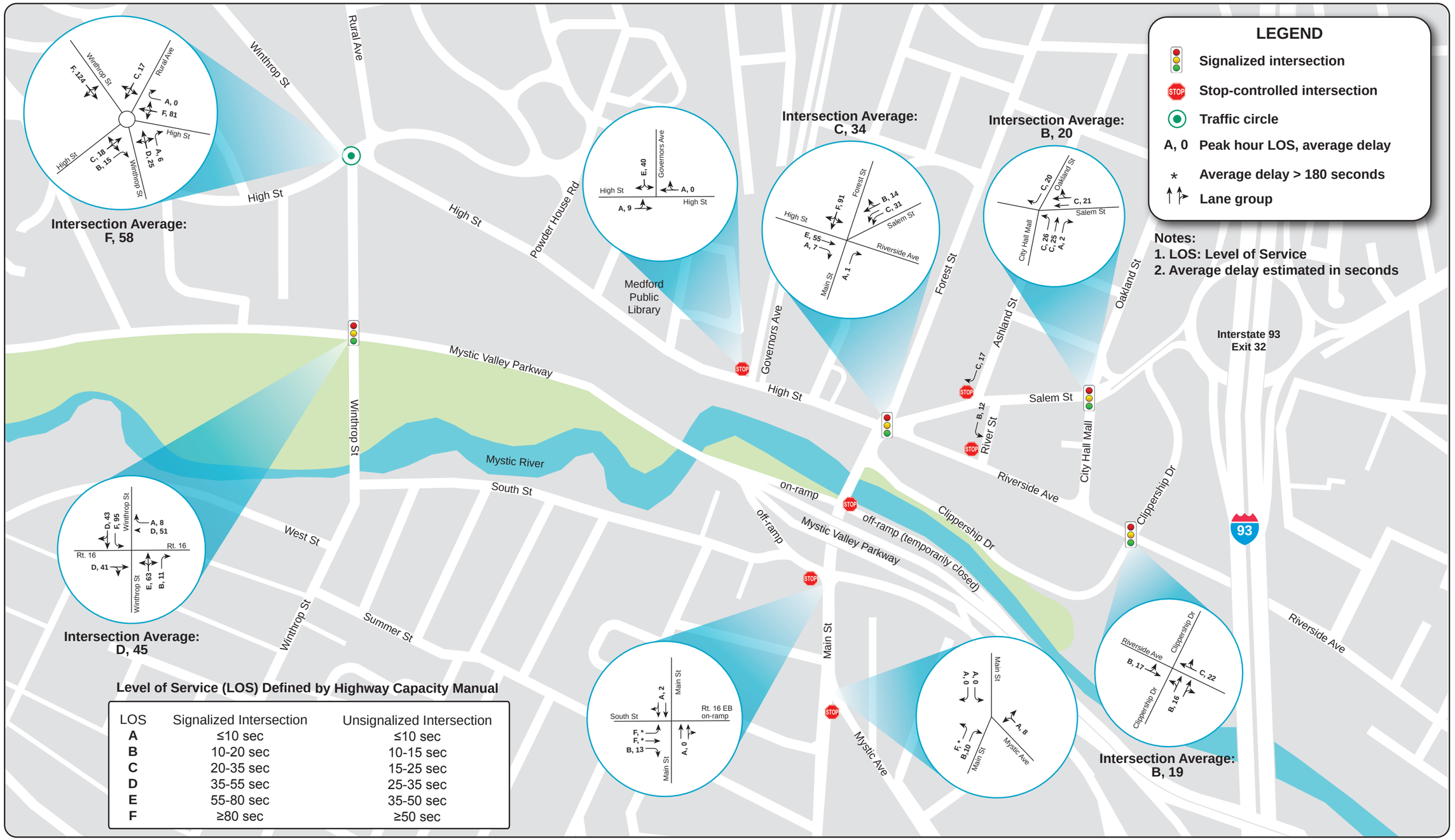

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Figure 9
2017 Saturday Peak Hour Intersection Capacity Analysis
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

*HSIP: Highway Safety Improvement Program

Crash cluster: Using a 25-meter (82-foot) radius from each crash location, a cluster is identified by two or more crashes overlapping one another.

EPDO (Equivalent Property Damage Only): MassDOT uses EPDO index to rank crash clusters. In the estimation, fatal crashes are weighted by 10, injury crashes by 5, and property damage only and unknown crashes not weighted. The top five percent clusters in each regional planning agency are HSIP eligible.

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Figure 10
Crash Locations and Crash Clusters (MassDOT Crash Data 2013-15)
Medford Square Priority Roadways Improvement Study

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Alternative 1

- Maintain existing traffic flow pattern
- Add second EB through lane and modify signal timing at Central Intersection
- Increase curb extensions and improve pedestrian signal phasing at Central Intersection

Alternative 2

- Convert Salem St., Riverside Ave., and City Hall Mall to two-way operation
- Modify Central Intersection to allow all movments from all approaches
- Rearrange Central Intersection signal phasing, including an exclusive pedestrian phase

LEGEND

- Signalized intersection
- Stop-controlled approach
- Lane group

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Figure 11
Traffic Circulation Conceptual Diagrams: City Hall Subarea Alternatives 1 and 2
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

Alternative 3

- Convert Salem St., Riverside Ave., and City Hall Mall to two-way operation
- Modify Central Intersection to allow all movments, except NB though and left turns
- Rearrange Central Intersection signal phasing, including concurrent pedestrian phases

Alternative 4

- Convert Salem St., City Hall Mall, and Clippership Dr. to two-way operation
- Maintain Riverside Ave. EB only operation (from Central Intersection to River St.)
- Modify Central Intersection to allow all movments
- Install traffic signal at Clippership Dr. under the Central Intersection controller
- Install traffic signal at Riverside Ave. and City Hall Mall
- Extend City Hall Mall southward to Clippership Dr.

LEGEND

- Signalized intersection
- Stop-controlled approach
- Lane group

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Figure 12
Traffic Circulation Conceptual Diagrams: City Hall Subarea Alternatives 3 and 4
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

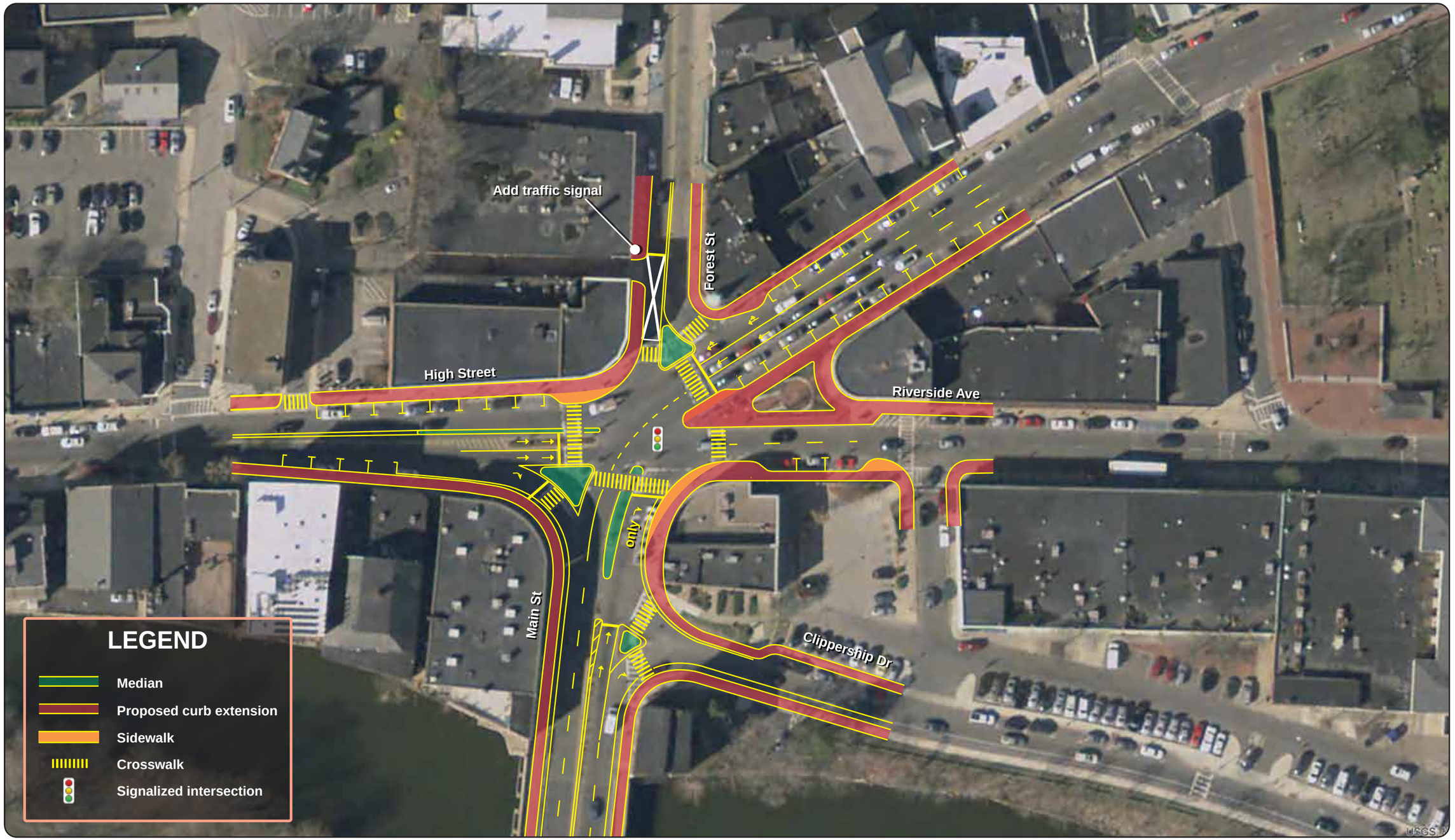

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Figure 13
Proposed Long-term Improvements: Central Intersection in City Hall Subarea
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

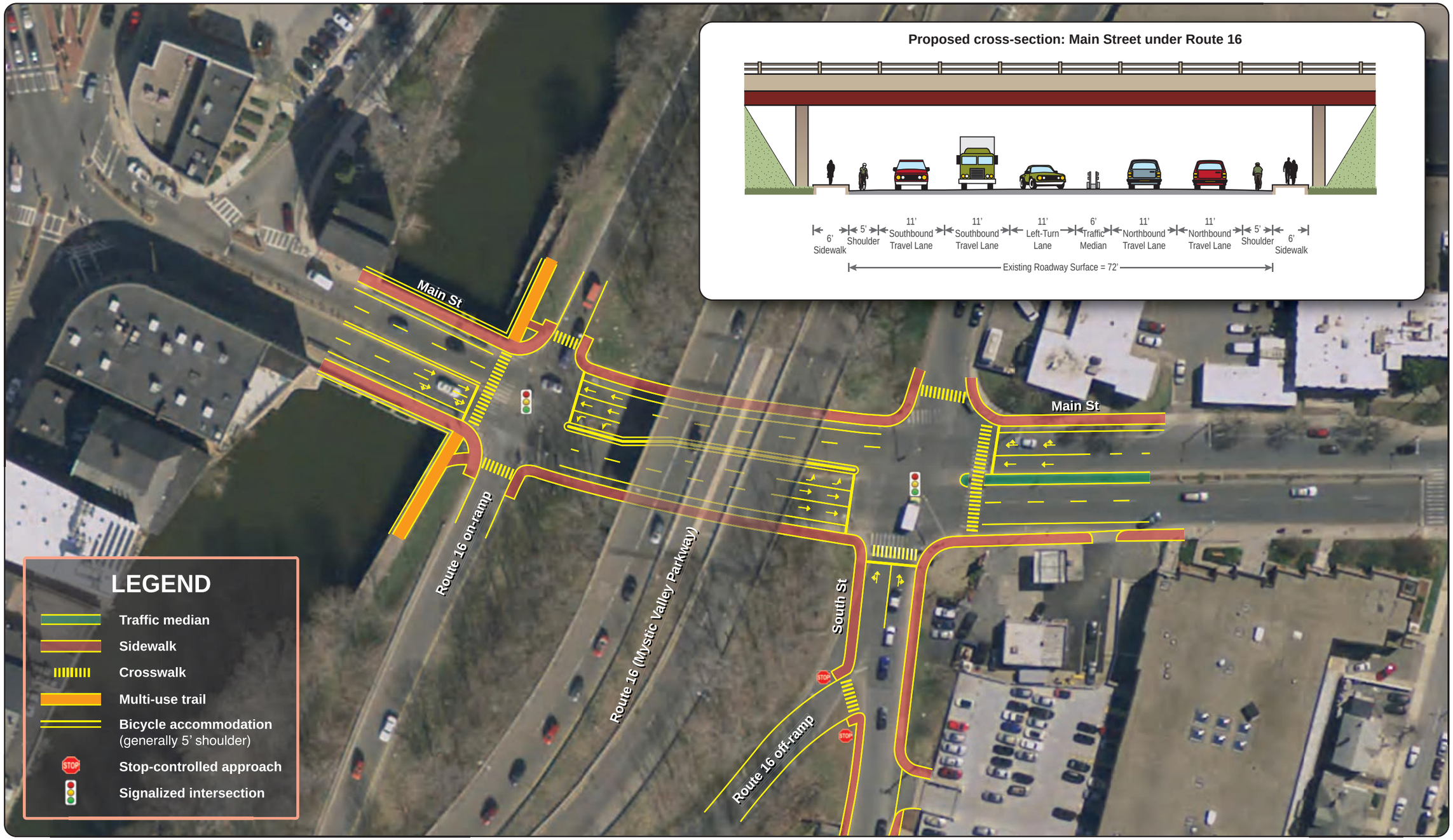

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Figure 14
Proposed Long-term Improvements: Main Street at Route 16 Ramps
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

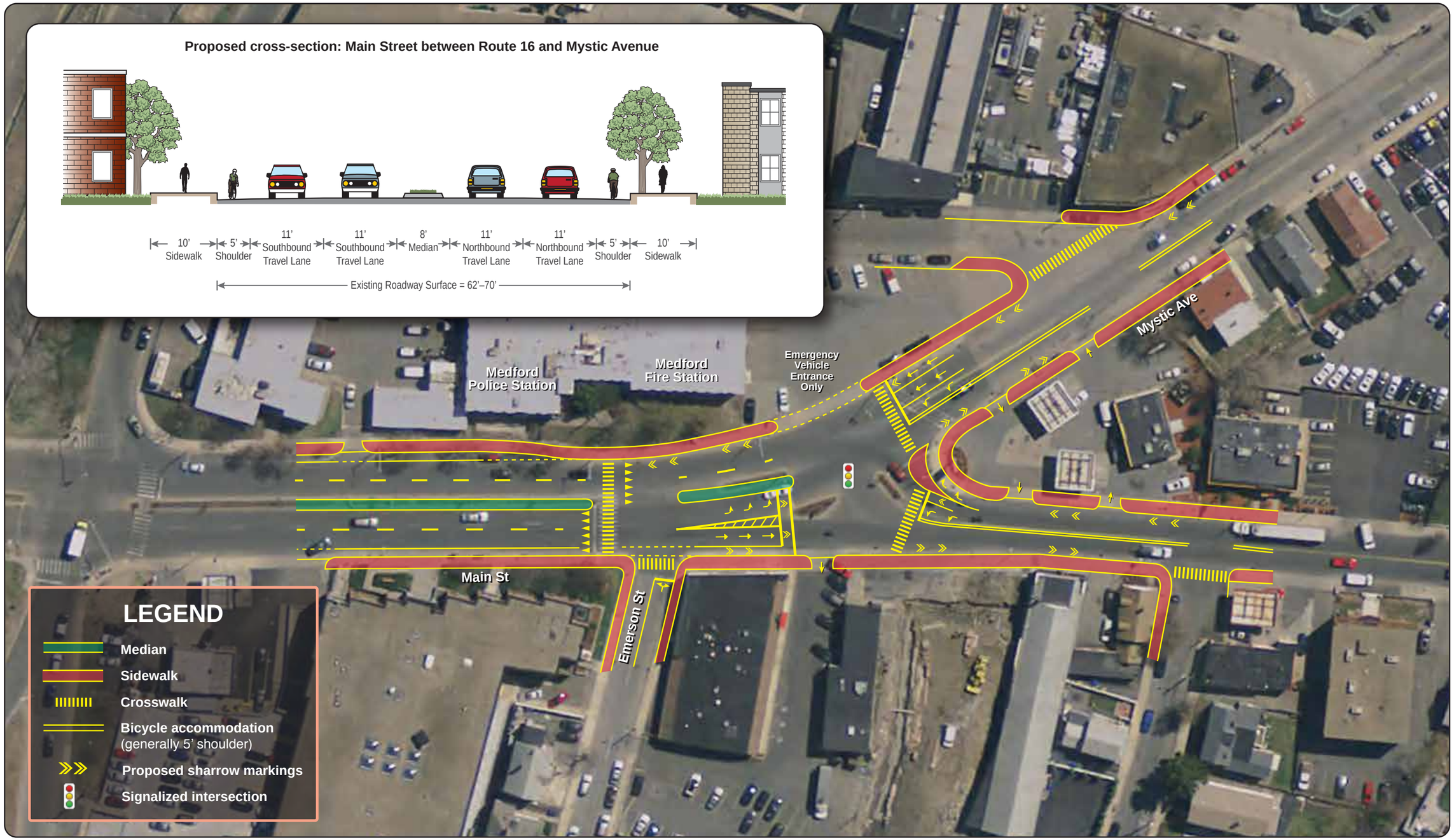

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Figure 15
Proposed Long-term Improvements: Main Street at Mystic Avenue
Medford Square Priority Roadways Improvement Study

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Figure 16
Proposed Long-term Improvements: Mystic Valley Parkway (Route 16) at Winthrop Street
Medford Square Priority Roadways Improvement Study

Addressing Safety,
Mobility, and Access on
Subregional Priority Roadways

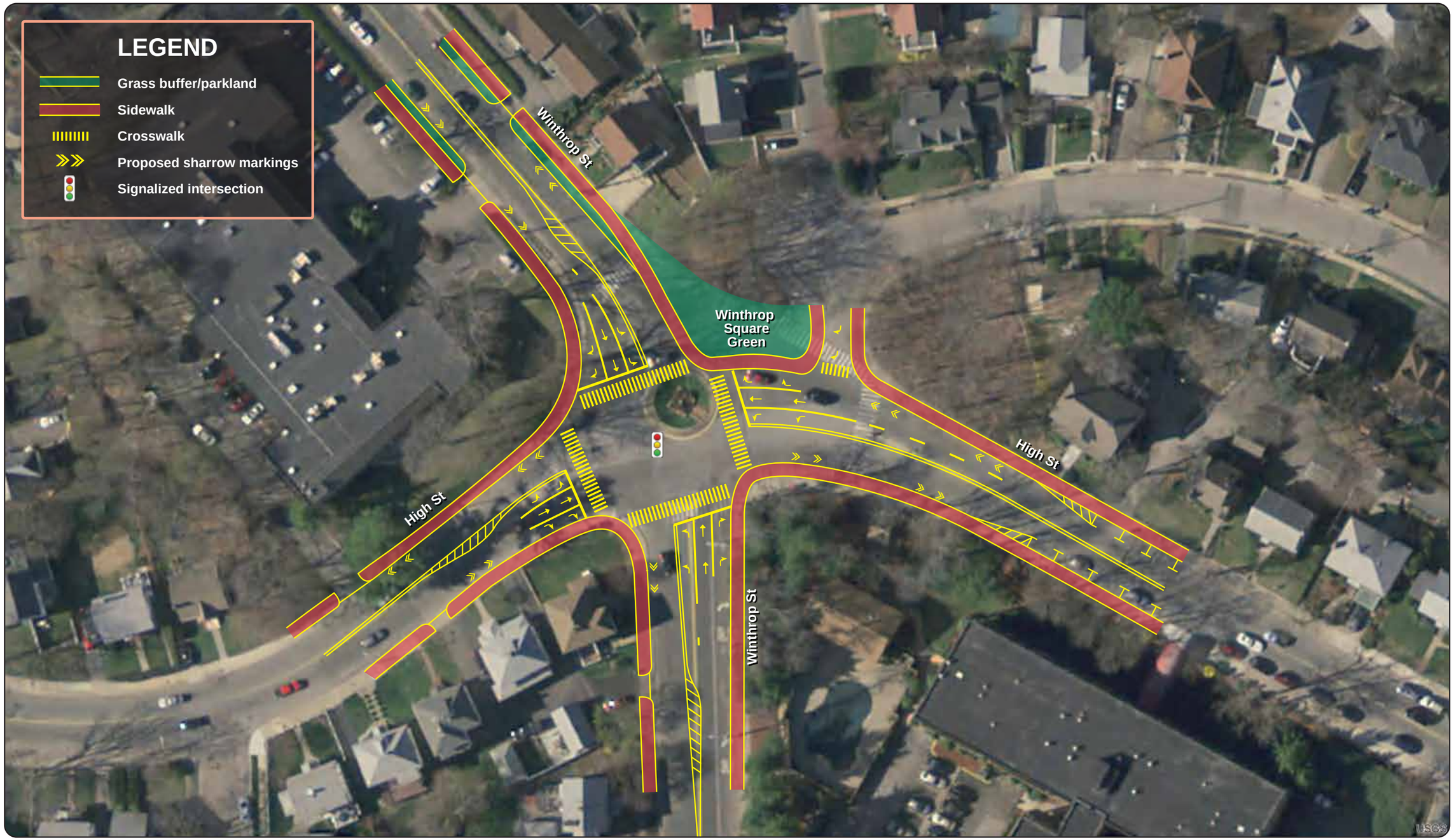

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Figure 17
Proposed Long-term Improvements: High Street at Winthrop Street
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

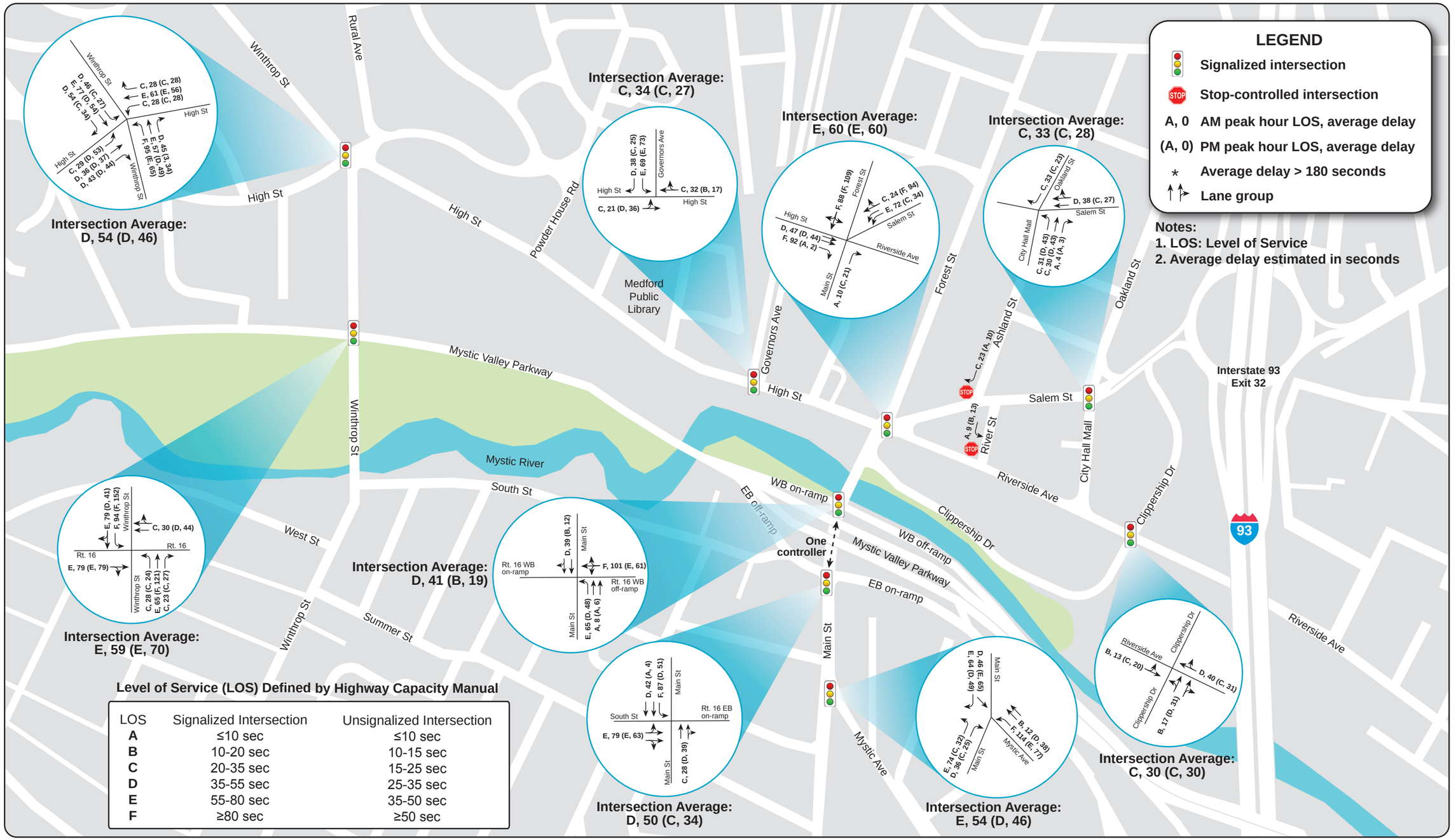

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Figure 18
Projected 2040 Weekday Intersection Capacity Analysis under the Proposed Long-Term Improvements
Medford Square Priority Roadways Improvement Study

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

APPENDIX A

Participants of Study Advisory Meetings
February 12 and June 19, 2018

Study Advisory Members

Medford Square Priority Roadways Improvement Study

February 12 and June 19, 2018

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APPENDIX B

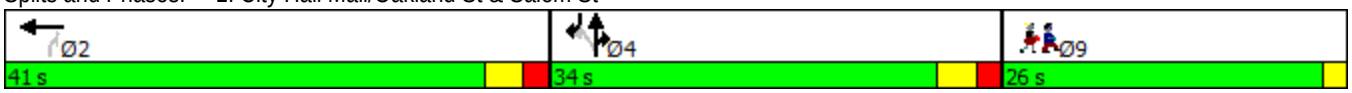
Intersection Capacity Analyses
Weekday AM/PM Peak Hour
2017 Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	895	0	386	8	125	0	0	215
Future Volume (vph)	0	0	0	0	895	0	386	8	125	0	0	215
Satd. Flow (prot)	0	0	0	0	3094	0	1470	1485	1298	0	0	1479
Flt Permitted							0.950	0.956				
Satd. Flow (perm)	0	0	0	0	3094	0	1464	1479	1298	0	0	1479
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)						6	4					4
Peak Hour Factor	0.25	0.25	0.25	0.25	0.77	0.92	0.85	0.40	0.82	0.92	0.25	0.70
Heavy Vehicles (%)	0%	0%	0%	0%	5%	0%	5%	0%	12%	2%	0%	0%
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	0	0	0	0	1162	0	236	238	152	0	0	307
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					41.0		34.0	34.0	34.0			34.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					36.8		29.6	29.6	74.9			29.6
Actuated g/C Ratio					0.43		0.35	0.35	0.88			0.35
v/c Ratio					0.87		0.46	0.46	0.13			0.60
Control Delay					33.8		28.5	28.4	3.6			32.0
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					33.8		28.5	28.4	3.6			32.0
LOS					C		C	C	A			C
Approach Delay					33.8			22.4			32.0	
Approach LOS					C			C			C	
Queue Length 50th (ft)					224		82	83	0			108
Queue Length 95th (ft)					#426		205	84	47			199
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1332		508	512	1138			512
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					0.87		0.46	0.46	0.13			0.60

Intersection Summary	
Cycle Length: 101	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 30.1	Intersection LOS: C
Intersection Capacity Utilization 67.3%	ICU Level of Service C
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

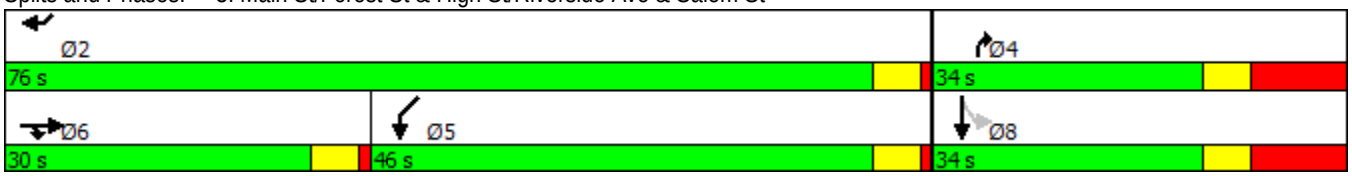
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2
Lane Configurations									
Traffic Volume (vph)	210	380	83	21	277	3	1086	485	60
Future Volume (vph)	210	380	83	21	277	3	1086	485	60
Satd. Flow (prot)	1555	1398	1395	0	1659	0	3060	1346	0
Flt Permitted					0.995		0.950		
Satd. Flow (perm)	1555	1398	1395	0	1653	0	2882	1346	0
Satd. Flow (RTOR)		139	739					89	
Confl. Peds. (#/hr)		19	16	16		26	19	26	41
Peak Hour Factor	0.72	0.90	0.85	0.58	0.95	0.75	0.96	0.84	0.75
Heavy Vehicles (%)	10%	4%	6%	9%	1%	33%	3%	8%	8%
Shared Lane Traffic (%)									
Lane Group Flow (vph)	292	422	98	0	332	0	1131	657	0
Turn Type	NA	Prot	Prot	Perm	NA		Prot	Prot	
Protected Phases	6	6	4		8		5	2	
Permitted Phases				8					
Total Split (s)	30.0	30.0	34.0	34.0	34.0		46.0	76.0	
Total Lost Time (s)	5.0	5.0	12.0		12.0		5.0	5.0	
Act Effct Green (s)	25.0	25.0	22.0		22.0		41.0	71.0	
Actuated g/C Ratio	0.23	0.23	0.20		0.20		0.37	0.65	
v/c Ratio	0.83	0.99	0.11		1.01		0.99	0.73	
Control Delay	61.0	71.5	0.3		95.9		59.8	17.0	
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	61.0	71.5	0.3		95.9		59.8	17.0	
LOS	E	E	A		F		E	B	
Approach Delay	67.2				95.9		44.1		
Approach LOS	E				F		D		
Queue Length 50th (ft)	197	214	0		~238		404	248	
Queue Length 95th (ft)	226	#424	0		#424		#555	339	
Internal Link Dist (ft)	490				1749		402		
Turn Bay Length (ft)		60							
Base Capacity (vph)	353	425	870		330		1140	900	
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	0.83	0.99	0.11		1.01		0.99	0.73	

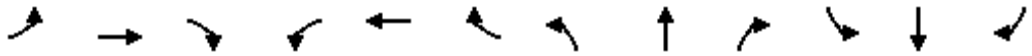
Intersection Summary			
Cycle Length: 110			
Actuated Cycle Length: 110			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.01			
Intersection Signal Delay: 54.1		Intersection LOS: D	
Intersection Capacity Utilization 92.1%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 129, 224, 201			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



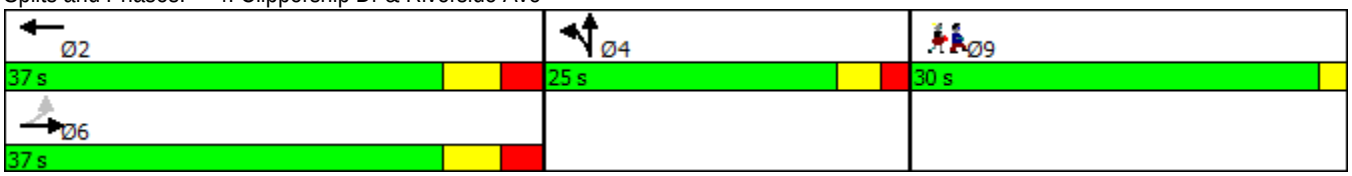


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	168	0	0	398	249	24	106	91	0	0	0
Future Volume (vph)	9	168	0	0	398	249	24	106	91	0	0	0
Satd. Flow (prot)	0	1498	0	0	1550	0	0	2702	0	0	0	0
Flt Permitted		0.583						0.994				
Satd. Flow (perm)	0	877	0	0	1550	0	0	2701	0	0	0	0
Satd. Flow (RTOR)					36			120				
Confl. Peds. (#/hr)	6					6	1		2			
Peak Hour Factor	0.45	0.76	0.25	0.25	0.80	0.81	0.67	0.85	0.76	0.92	0.25	0.25
Heavy Vehicles (%)	88%	7%	0%	0%	4%	4%	29%	9%	7%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	805	0	0	281	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	37.0	37.0			37.0		25.0	25.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		30.6			30.6			20.4				
Actuated g/C Ratio		0.45			0.45			0.30				
v/c Ratio		0.61			1.11			0.31				
Control Delay		25.6			90.1			12.8				
Queue Delay		0.0			0.0			0.0				
Total Delay		25.6			90.1			12.8				
LOS		C			F			B				
Approach Delay		25.6			90.1			12.8				
Approach LOS		C			F			B				
Queue Length 50th (ft)		60			~332			22				
Queue Length 95th (ft)		#187			#714			70				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		398			724			902				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.61			1.11			0.31				

Intersection Summary	
Cycle Length: 92	
Actuated Cycle Length: 67.4	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 1.11	
Intersection Signal Delay: 62.0	Intersection LOS: E
Intersection Capacity Utilization 57.8%	ICU Level of Service B
Analysis Period (min) 15	
Description: 9, 10, 12	

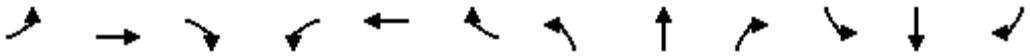
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



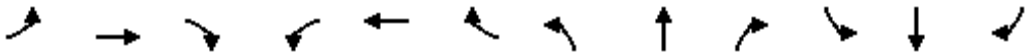
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	46	299	0	0	1582	155
Future Volume (vph)	0	0	0	0	0	0	46	299	0	0	1582	155
Satd. Flow (prot)	0	0	0	0	1919	0	0	2985	0	0	3111	0
Flt Permitted								0.993				
Satd. Flow (perm)	0	0	0	0	1919	0	0	2985	0	0	3111	0
Confl. Peds. (#/hr)				2			3					3
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.88	0.88	0.92	0.92	0.97	0.73
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	2%	9%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	0	392	0	0	1843	0
Sign Control		Stop			Stop			Free			Free	

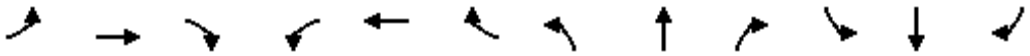
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 57.4%		ICU Level of Service B	
Analysis Period (min) 15			
Description: 29, 10, 3			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	0	46	299	0	0	1582	155
Future Volume (Veh/h)	0	0	0	0	0	0	46	299	0	0	1582	155
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.88	0.88	0.92	0.92	0.97	0.73
Hourly flow rate (vph)	0	0	0	0	0	0	52	340	0	0	1631	212
Pedestrians		8						6			20	
Lane Width (ft)		0.0						12.0			12.0	
Walking Speed (ft/s)		3.5						3.5			3.5	
Percent Blockage		0						1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											378	
pX, platoon unblocked												
vC, conflicting volume	2039	2189	936	1266	2295	190	1851			340		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2039	2189	936	1266	2295	190	1851			340		
tC, single (s)	7.5	6.5	6.9	7.6	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	84			100		
cM capacity (veh/h)	28	38	269	108	33	810	324			1216		

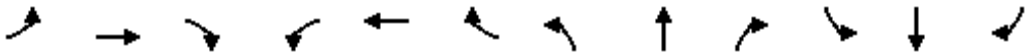
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	165	227	1087	756
Volume Left	0	52	0	0	0
Volume Right	0	0	0	0	212
cSH	1700	324	1700	1700	1700
Volume to Capacity	0.00	0.16	0.13	0.64	0.44
Queue Length 95th (ft)	0	14	0	0	0
Control Delay (s)	0.0	7.9	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	0.0	3.3		0.0	
Approach LOS	A				

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	57.4%	ICU Level of Service		B
Analysis Period (min)	15			
Description: 29, 10, 3				



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	215	239	0	0	0	0	268	446	269	1297	0
Future Volume (vph)	73	215	239	0	0	0	0	268	446	269	1297	0
Satd. Flow (prot)	1547	1676	1425	0	0	0	0	2761	0	0	3132	0
Flt Permitted	0.950										0.991	
Satd. Flow (perm)	1547	1676	1425	0	0	0	0	2761	0	0	3132	0
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.93	0.25
Heavy Vehicles (%)	5%	2%	2%	0%	0%	0%	2%	10%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	88	247	310	0	0	0	0	809	0	0	1719	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 95.6%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 6, 9, 4			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	215	239	0	0	0	0	268	446	269	1297	0
Future Volume (Veh/h)	73	215	239	0	0	0	0	268	446	269	1297	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.93	0.25
Hourly flow rate (vph)	88	247	310	0	0	0	0	319	490	324	1395	0
Pedestrians					4			2				
Lane Width (ft)					0.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											634	
pX, platoon unblocked												
vC, conflicting volume	2202	2856	700	2349	2611	408	1395			813		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2202	2856	700	2349	2611	408	1395			813		
tC, single (s)	7.6	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	19	0	100	100	100			60		
cM capacity (veh/h)	16	10	381	0	15	598	486			810		

Direction, Lane #	EB 1	EB 2	EB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	88	247	310	213	596	789	930
Volume Left	88	0	0	0	0	324	0
Volume Right	0	0	310	0	490	0	0
cSH	16	10	381	1700	1700	810	1700
Volume to Capacity	5.38	24.77	0.81	0.13	0.35	0.40	0.55
Queue Length 95th (ft)	Err	Err	180	0	0	48	0
Control Delay (s)	Err	Err	44.6	0.0	0.0	9.1	0.0
Lane LOS	F	F	E			A	
Approach Delay (s)	5214.7			0.0		4.2	
Approach LOS	F						

Intersection Summary				
Average Delay	1062.3			
Intersection Capacity Utilization	95.6%	ICU Level of Service	F	
Analysis Period (min)	15			
Description: 6, 9, 4				

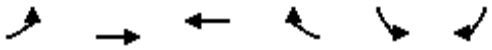
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	63	352	685	870	303	19
Future Volume (vph)	63	352	685	870	303	19
Satd. Flow (prot)	0	1517	1676	1411	1562	1264
Flt Permitted		0.991			0.950	
Satd. Flow (perm)	0	1517	1676	1411	1562	1264
Confl. Peds. (#/hr)				6		6
Peak Hour Factor	0.68	0.88	0.94	0.90	0.88	0.79
Heavy Vehicles (%)	19%	10%	2%	3%	4%	15%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	493	729	967	344	24
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 93.2%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 6, 14, 1			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	63	352	685	870	303	19
Future Volume (Veh/h)	63	352	685	870	303	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.68	0.88	0.94	0.90	0.88	0.79
Hourly flow rate (vph)	93	400	729	967	344	24
Pedestrians		6			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		3.5			3.5	
Percent Blockage		1			1	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			1173			
pX, platoon unblocked						
vC, conflicting volume	735				1321	741
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	735				1321	741
tC, single (s)	4.3				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.4				3.5	3.4
p0 queue free %	88				0	94
cM capacity (veh/h)	793				150	391

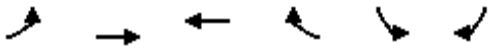
Direction, Lane #	NB 1	SB 1	SB 2	NE 1
Volume Total	493	729	967	368
Volume Left	93	0	0	344
Volume Right	0	0	967	24
cSH	793	1700	1700	157
Volume to Capacity	0.12	0.43	0.57	2.35
Queue Length 95th (ft)	10	0	0	773
Control Delay (s)	3.2	0.0	0.0	673.8
Lane LOS	A			F
Approach Delay (s)	3.2	0.0		673.8
Approach LOS				F

Intersection Summary			
Average Delay	97.6		
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
Description: 6, 14, 1			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	30	378	607	52	198	70
Future Volume (vph)	30	378	607	52	198	70
Satd. Flow (prot)	0	1570	1609	0	1562	0
Flt Permitted		0.996			0.967	
Satd. Flow (perm)	0	1570	1609	0	1562	0
Confl. Peds. (#/hr)	14			14	11	10
Peak Hour Factor	0.75	0.91	0.80	0.72	0.88	0.67
Heavy Vehicles (%)	3%	9%	5%	5%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	455	831	0	329	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 73.5%		ICU Level of Service D	
Analysis Period (min) 15			
Description: 35, 94, 128			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	378	607	52	198	70
Future Volume (Veh/h)	30	378	607	52	198	70
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.91	0.80	0.72	0.88	0.67
Hourly flow rate (vph)	40	415	759	72	225	104
Pedestrians		10	11		14	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		1	1		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		665	570			
pX, platoon unblocked						
vC, conflicting volume	845				1315	819
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	845				1315	819
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				0	72
cM capacity (veh/h)	777				162	367

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	455	831	329
Volume Left	40	0	225
Volume Right	0	72	104
cSH	777	1700	197
Volume to Capacity	0.05	0.49	1.67
Queue Length 95th (ft)	4	0	552
Control Delay (s)	1.5	0.0	365.5
Lane LOS	A		F
Approach Delay (s)	1.5	0.0	365.5
Approach LOS			F

Intersection Summary			
Average Delay	74.9		
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		
Description: 35, 94, 128			

Lane Group	WBL2	WBL	WBR	WBR2	NBL2	NBL	NBR	NBR2	SEL	SER	SER2	NEL
Lane Configurations												
Traffic Volume (vph)	187	591	96	7	92	253	3	53	66	324	45	28
Future Volume (vph)	187	591	96	7	92	253	3	53	66	324	45	28
Satd. Flow (prot)	0	1545	0	0	0	1550	0	1367	1435	0	0	0
Flt Permitted		0.959				0.954			0.991			
Satd. Flow (perm)	0	1545	0	0	0	1550	0	1367	1435	0	0	0
Confl. Peds. (#/hr)		1	3		1	3		16	16		1	3
Peak Hour Factor	0.90	0.91	0.77	0.44	0.79	0.89	0.38	0.83	0.72	0.87	0.75	0.70
Heavy Vehicles (%)	1%	3%	14%	14%	7%	4%	0%	1%	19%	2%	2%	7%
Shared Lane Traffic (%)								10%				
Lane Group Flow (vph)	0	998	0	0	0	414	0	58	524	0	0	0
Sign Control		Yield				Yield			Yield			

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 163.9%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	NET	NER	NER2	SWL2	SWL	SWT	SWR
Lane Configurations							
Traffic Volume (vph)	3	223	347	17	67	141	2
Future Volume (vph)	3	223	347	17	67	141	2
Satd. Flow (prot)	1304	0	1367	0	0	1552	0
Flt Permitted	0.994					0.982	
Satd. Flow (perm)	1304	0	1367	0	0	1552	0
Confl. Peds. (#/hr)		16		16			3
Peak Hour Factor	0.38	0.82	0.96	0.61	0.70	0.69	0.50
Heavy Vehicles (%)	0%	9%	1%	88%	2%	0%	0%
Shared Lane Traffic (%)			10%				
Lane Group Flow (vph)	356	0	325	0	0	332	0
Sign Control	Yield					Yield	

Intersection Summary

Movement	WBL2	WBL	WBR	WBR2	NBL2	NBL	NBR	NBR2	SEL	SER	SER2	NEL
Right Turn Channelized				MOYes								
Traffic Volume (veh/h)	187	591	96	7	92	253	3	53	66	324	45	28
Future Volume (veh/h)	187	591	96	7	92	253	3	53	66	324	45	28
Peak Hour Factor	0.90	0.91	0.77	0.44	0.79	0.89	0.38	0.83	0.72	0.87	0.75	0.70
Hourly flow rate (vph)	208	649	125	16	116	284	8	64	92	372	60	40
Approach Volume (veh/h)		982				472			524			
Crossing Volume (veh/h)		456				440			1301#			
High Capacity (veh/h)		967				979			485			
High v/c (veh/h)		1.02				0.48			1.08			
Low Capacity (veh/h)		784				795			366			
Low v/c (veh/h)		1.25				0.59			1.43			

Intersection Summary				
Maximum v/c High	1.08			
Maximum v/c Low	1.43			
Intersection Capacity Utilization	163.9%	ICU Level of Service		H
# Crossing flow exceeds 1200, method is not applicable				
Description: 50, 17, 14				

Movement	NET	NER	NER2	SWL2	SWL	SWT	SWR
Right Turn Channelized							
Traffic Volume (veh/h)	3	223	347	17	67	141	2
Future Volume (veh/h)	3	223	347	17	67	141	2
Peak Hour Factor	0.38	0.82	0.96	0.61	0.70	0.69	0.50
Hourly flow rate (vph)	8	272	361	28	96	204	4
Approach Volume (veh/h)	681					332	
Crossing Volume (veh/h)	796					1422#	
High Capacity (veh/h)	735					439	
High v/c (veh/h)	0.93					0.76	
Low Capacity (veh/h)	580					327	
Low v/c (veh/h)	1.17					1.01	

Intersection Summary

Intersection	
Intersection Delay, s/veh	189.5
Intersection LOS	F

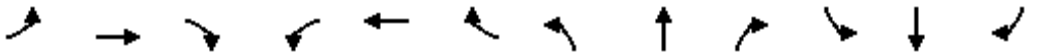
Approach	WB	NB	SE	NE
Entry Lanes	1	2	1	2
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	998	472	524	681
Demand Flow Rate, veh/h	1038	492	549	712
Vehicles Circulating, veh/h	478	509	1357	849
Vehicles Exiting, veh/h	523	1052	485	1057
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	16	0	3	1
Ped Cap Adj	0.998	1.000	1.000	1.000
Approach Delay, s/veh	229.0	15.5	443.2	30.8
Approach LOS	F	C	F	D

Lane	Left	Bypass	Left	Right	Left	Left	Right
Designated Moves	LR	R	LTR	R	LR	LTR	R
Assumed Moves	LR	R	LT	R	LR	LTR	R
RT Channelized		Free					
Lane Util	1.000		0.852	0.148	1.000	0.471	0.529
Critical Headway, s	5.193		5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	1020	18	419	73	549	335	377
Cap Entry Lane, veh/h	701	2171	679	679	291	483	483
Entry HV Adj Factor	0.963	0.877	0.954	0.986	0.954	0.955	0.957
Flow Entry, veh/h	982	16	400	72	524	320	361
Cap Entry, veh/h	673	1900	648	670	278	462	463
V/C Ratio	1.459	0.008	0.617	0.107	1.887	0.693	0.780
Control Delay, s/veh	232.7	0.0	17.2	6.6	443.2	27.1	34.1
LOS	F	A	C	A	F	D	D
95th %tile Queue, veh	47	0	4	0	36	5	7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	1
Adj Approach Flow, veh/h	332
Demand Flow Rate, veh/h	359
Vehicles Circulating, veh/h	1483
Vehicles Exiting, veh/h	16
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	1
Ped Cap Adj	1.000
Approach Delay, s/veh	243.0
Approach LOS	F

Lane	Left
Designated Moves	LTR
Assumed Moves	LTR
RT Channelized	
Lane Util	1.000
Critical Headway, s	5.193
Entry Flow, veh/h	359
Cap Entry Lane, veh/h	256
Entry HV Adj Factor	0.925
Flow Entry, veh/h	332
Cap Entry, veh/h	237
V/C Ratio	1.400
Control Delay, s/veh	243.0
LOS	F
95th %tile Queue, veh	19



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Future Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Satd. Flow (prot)	0	1701	0	0	1710	1411	0	1614	1454	1608	1636	0
Flt Permitted								0.747		0.308		
Satd. Flow (perm)	0	1701	*1	0	1710	1381	0	1210	1402	519	1636	0
Satd. Flow (RTOR)		1				132			247		8	
Confl. Peds. (#/hr)	1					1			7	7		
Peak Hour Factor	0.92	0.86	0.50	0.92	0.91	0.85	0.90	0.90	0.87	0.90	0.91	0.68
Heavy Vehicles (%)	0%	0%	12%	0%	0%	3%	0%	6%	0%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	797	0	0	885	192	0	303	343	382	634	0
Turn Type		NA			NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		6			2			4		3	8	
Permitted Phases						2	4		4	8		
Total Split (s)		56.0			56.0	56.0	34.0	34.0	34.0	16.0	50.0	
Total Lost Time (s)		6.0			6.0	6.0		6.0	6.0	4.0	6.0	
Act Effct Green (s)		50.3			50.3	50.3		28.1	28.1	46.2	44.2	
Actuated g/C Ratio		0.46			0.46	0.46		0.25	0.25	0.42	0.40	
v/c Ratio		1.03			1.14	0.27		0.98	0.63	1.14	0.96	
Control Delay		70.3			106.1	8.3		89.3	17.2	118.7	59.4	
Queue Delay		0.0			0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		70.3			106.1	8.3		89.3	17.2	118.7	59.4	
LOS		E			F	A		F	B	F	E	
Approach Delay		70.3			88.7			51.0			81.7	
Approach LOS		E			F			D			F	
Queue Length 50th (ft)		521			~683	22		202	52	~217	397	
Queue Length 95th (ft)		#968			#1187	75		#473	166	#603	#828	
Internal Link Dist (ft)		2116			926			482			737	
Turn Bay Length (ft)						300			125			
Base Capacity (vph)		776			779	701		308	542	336	661	
Starvation Cap Reductn		0			0	0		0	0	0	0	
Spillback Cap Reductn		0			0	0		0	0	0	0	
Storage Cap Reductn		0			0	0		0	0	0	0	
Reduced v/c Ratio		1.03			1.14	0.27		0.98	0.63	1.14	0.96	

Intersection Summary	
Cycle Length: 127	
Actuated Cycle Length: 110.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.14	
Intersection Signal Delay: 75.7	Intersection LOS: E
Intersection Capacity Utilization 111.1%	ICU Level of Service H
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

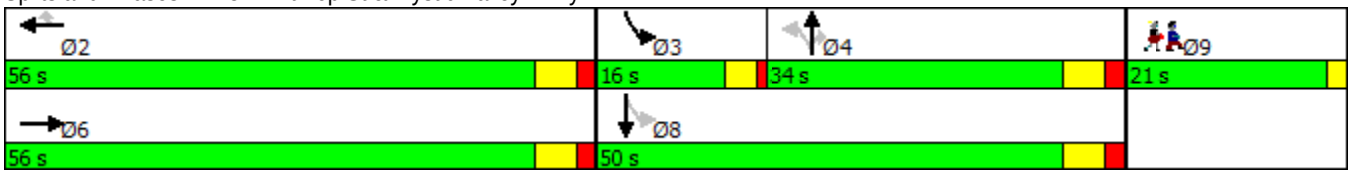
95th percentile volume exceeds capacity, queue may be longer.

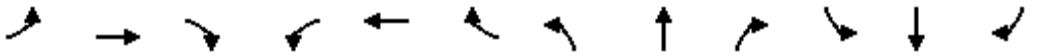
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Queue shown is maximum after two cycles.

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy



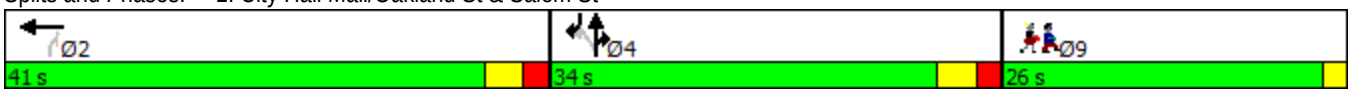


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1154	17	589	26	378	0	0	16
Future Volume (vph)	0	0	0	0	1154	17	589	26	378	0	0	16
Satd. Flow (prot)	0	0	0	0	3209	0	1484	1501	1411	0	0	1479
Flt Permitted							0.950	0.957				
Satd. Flow (perm)	0	0	0	0	3209	0	1478	1495	1411	0	0	1479
Satd. Flow (RTOR)					2							
Confl. Peds. (#/hr)						8	4					4
Peak Hour Factor	0.25	0.25	0.25	0.25	0.95	0.85	0.86	0.72	0.80	0.92	0.25	0.67
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	4%	0%	3%	2%	0%	0%
Shared Lane Traffic (%)							47%					
Lane Group Flow (vph)	0	0	0	0	1235	0	363	358	473	0	0	24
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					41.0		34.0	34.0	34.0			34.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					36.5		29.4	29.4	75.3			29.4
Actuated g/C Ratio					0.46		0.37	0.37	0.94			0.37
v/c Ratio					0.84		0.67	0.65	0.36			0.04
Control Delay					27.9		31.1	30.3	3.1			20.2
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					27.9		31.1	30.3	3.1			20.2
LOS					C		C	C	A			C
Approach Delay					27.9			19.8			20.3	
Approach LOS					C			B			C	
Queue Length 50th (ft)					242		141	137	0			7
Queue Length 95th (ft)					#606		#370	256	157			23
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1462		542	548	1324			542
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					0.84		0.67	0.65	0.36			0.04

Intersection Summary	
Cycle Length: 101	
Actuated Cycle Length: 80.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 23.8	Intersection LOS: C
Intersection Capacity Utilization 70.8%	ICU Level of Service C
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

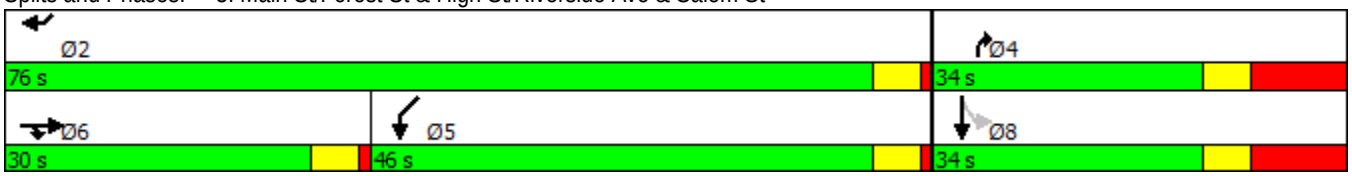
Intersection Summary

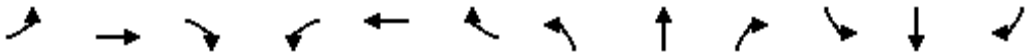
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2
Lane Configurations									
Traffic Volume (vph)	297	87	285	72	178	25	839	673	99
Future Volume (vph)	297	87	285	72	178	25	839	673	99
Satd. Flow (prot)	1660	1398	1450	0	1605	0	3120	1411	0
Flt Permitted					0.985		0.950		
Satd. Flow (perm)	1660	1398	1450	0	1574	0	2596	1411	0
Satd. Flow (RTOR)		139	711					89	
Confl. Peds. (#/hr)		55	35	35		25	55	25	44
Peak Hour Factor	0.93	0.78	0.85	0.69	0.89	0.52	0.94	0.90	0.88
Heavy Vehicles (%)	3%	4%	2%	2%	2%	0%	1%	3%	3%
Shared Lane Traffic (%)									
Lane Group Flow (vph)	319	112	335	0	352	0	893	861	0
Turn Type	NA	Prot	Prot	Perm	NA		Prot	Prot	
Protected Phases	6	6	4		8		5	2	
Permitted Phases				8					
Total Split (s)	30.0	30.0	34.0	34.0	34.0		46.0	76.0	
Total Lost Time (s)	5.0	5.0	12.0		12.0		5.0	5.0	
Act Effct Green (s)	25.0	25.0	22.0		22.0		41.0	71.0	
Actuated g/C Ratio	0.23	0.23	0.20		0.20		0.37	0.65	
v/c Ratio	0.85	0.26	0.39		1.12		0.77	0.91	
Control Delay	62.0	4.9	1.3		128.8		35.7	31.2	
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	62.0	4.9	1.3		128.8		35.7	31.2	
LOS	E	A	A		F		D	C	
Approach Delay	47.1				128.8		33.5		
Approach LOS	D				F		C		
Queue Length 50th (ft)	217	0	0		~287		281	444	
Queue Length 95th (ft)	#367	15	0		#462		360	#791	
Internal Link Dist (ft)	490				1749		402		
Turn Bay Length (ft)		60							
Base Capacity (vph)	377	425	858		314		1162	942	
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	0.85	0.26	0.39		1.12		0.77	0.91	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 43.5	Intersection LOS: D
Intersection Capacity Utilization 86.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 129, 224, 201	

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



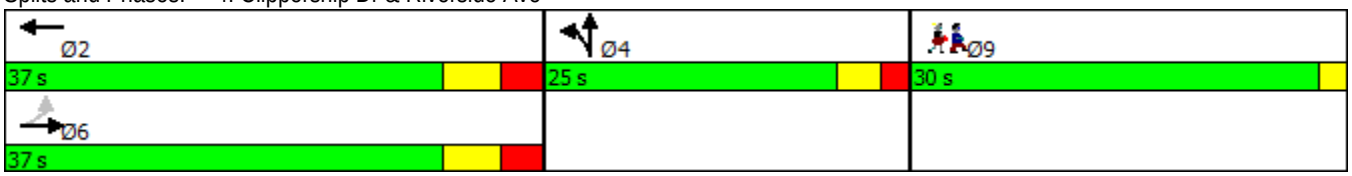


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	298	0	0	373	209	67	364	215	0	0	0
Future Volume (vph)	18	298	0	0	373	209	67	364	215	0	0	0
Satd. Flow (prot)	0	1668	0	0	1586	0	0	2947	0	0	0	0
Flt Permitted		0.875						0.994				
Satd. Flow (perm)	0	1466	0	0	1586	0	0	2947	0	0	0	0
Satd. Flow (RTOR)					34			106				
Confl. Peds. (#/hr)	3					3			7			
Peak Hour Factor	0.75	0.97	0.25	0.25	0.95	0.92	0.80	0.91	0.80	0.92	0.25	0.25
Heavy Vehicles (%)	16%	1%	0%	0%	2%	2%	13%	1%	1%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	331	0	0	620	0	0	753	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	37.0	37.0			37.0		25.0	25.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		30.6			30.6			20.4				
Actuated g/C Ratio		0.45			0.45			0.30				
v/c Ratio		0.50			0.84			0.78				
Control Delay		18.7			30.2			26.9				
Queue Delay		0.0			0.0			0.0				
Total Delay		18.7			30.2			26.9				
LOS		B			C			C				
Approach Delay		18.7			30.2			26.9				
Approach LOS		B			C			C				
Queue Length 50th (ft)		77			172			107				
Queue Length 95th (ft)		254			#600			#300				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		666			739			966				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.50			0.84			0.78				

Intersection Summary	
Cycle Length: 92	
Actuated Cycle Length: 67.4	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 26.5	Intersection LOS: C
Intersection Capacity Utilization 67.3%	ICU Level of Service C
Analysis Period (min) 15	
Description: 9, 10, 12	

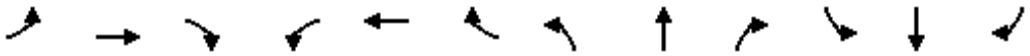
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



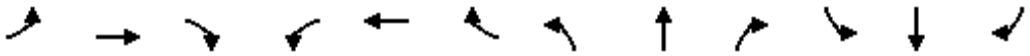
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	191	928	0	0	847	267
Future Volume (vph)	0	0	0	0	0	0	191	928	0	0	847	267
Satd. Flow (prot)	0	0	0	0	1919	0	0	3166	0	0	3082	0
Flt Permitted								0.990				
Satd. Flow (perm)	0	0	0	0	1919	0	0	3166	0	0	3082	0
Confl. Peds. (#/hr)				2			8					8
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.80	0.94	0.92	0.92	0.93	0.90
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	0%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	0	1226	0	0	1208	0
Sign Control		Stop			Stop			Free			Free	

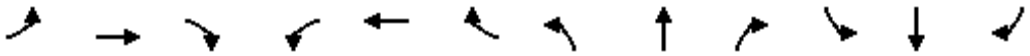
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 77.0%		ICU Level of Service D	
Analysis Period (min) 15			
Description: 29, 10, 3			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	0	191	928	0	0	847	267
Future Volume (Veh/h)	0	0	0	0	0	0	191	928	0	0	847	267
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.80	0.94	0.92	0.92	0.93	0.90
Hourly flow rate (vph)	0	0	0	0	0	0	239	987	0	0	911	297
Pedestrians		8						2				
Lane Width (ft)		0.0						12.0				
Walking Speed (ft/s)		3.5						3.5				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											378	
pX, platoon unblocked												
vC, conflicting volume	2039	2532	614	1922	2681	494	1216			987		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2039	2532	614	1922	2681	494	1216			987		
tC, single (s)	7.5	6.5	6.9	7.6	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	59			100		
cM capacity (veh/h)	22	16	439	27	13	527	581			696		

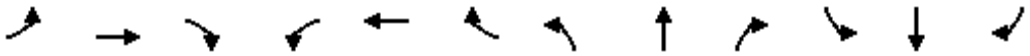
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	568	658	607	601
Volume Left	0	239	0	0	0
Volume Right	0	0	0	0	297
cSH	1700	581	1700	1700	1700
Volume to Capacity	0.00	0.41	0.39	0.36	0.35
Queue Length 95th (ft)	0	50	0	0	0
Control Delay (s)	0.0	11.1	0.0	0.0	0.0
Lane LOS	A	B			
Approach Delay (s)	0.0	5.1		0.0	
Approach LOS	A				

Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	77.0%	ICU Level of Service	D	
Analysis Period (min)	15			
Description: 29, 10, 3				



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	227	168	0	0	0	0	936	450	48	768	0
Future Volume (vph)	171	227	168	0	0	0	0	936	450	48	768	0
Satd. Flow (prot)	1562	1660	1425	0	0	0	0	3026	0	0	3147	0
Flt Permitted	0.950										0.997	
Satd. Flow (perm)	1562	1660	1425	0	0	0	0	3026	0	0	3147	0
Confl. Peds. (#/hr)	1		4						4	4		
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.93	0.25
Heavy Vehicles (%)	4%	3%	2%	0%	0%	0%	2%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	209	267	177	0	0	0	0	1474	0	0	886	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 83.6%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 6, 9, 4			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	171	227	168	0	0	0	0	936	450	48	768	0
Future Volume (Veh/h)	171	227	168	0	0	0	0	936	450	48	768	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.93	0.25
Hourly flow rate (vph)	209	267	177	0	0	0	0	985	489	60	826	0
Pedestrians					4			4			1	
Lane Width (ft)					0.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											634	
pX, platoon unblocked												
vC, conflicting volume	1440	2424	417	2081	2180	742	826			1478		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1440	2424	417	2081	2180	742	826			1478		
tC, single (s)	7.6	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	70	0	100	100	100			87		
cM capacity (veh/h)	82	27	582	0	41	362	800			452		

Direction, Lane #	EB 1	EB 2	EB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	209	267	177	657	817	335	551
Volume Left	209	0	0	0	0	60	0
Volume Right	0	0	177	0	489	0	0
cSH	82	27	582	1700	1700	452	1700
Volume to Capacity	2.54	9.83	0.30	0.39	0.48	0.13	0.32
Queue Length 95th (ft)	495	Err	32	0	0	11	0
Control Delay (s)	806.8	Err	13.9	0.0	0.0	4.4	0.0
Lane LOS	F	F	B			A	
Approach Delay (s)	4350.4			0.0		1.7	
Approach LOS	F						

Intersection Summary				
Average Delay	943.3			
Intersection Capacity Utilization	83.6%	ICU Level of Service	E	
Analysis Period (min)	15			
Description: 6, 9, 4				

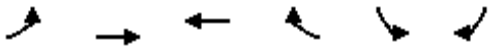
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	149	1035	287	732	285	7
Future Volume (vph)	149	1035	287	732	285	7
Satd. Flow (prot)	0	1681	1660	1439	1562	1275
Flt Permitted		0.993			0.950	
Satd. Flow (perm)	0	1681	1660	1439	1562	1275
Confl. Peds. (#/hr)	2			8	4	8
Peak Hour Factor	0.83	0.90	0.89	0.93	0.87	0.44
Heavy Vehicles (%)	1%	1%	3%	1%	4%	14%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1330	322	787	328	16
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 127.5%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 6, 14, 1			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	149	1035	287	732	285	7
Future Volume (Veh/h)	149	1035	287	732	285	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.90	0.89	0.93	0.87	0.44
Hourly flow rate (vph)	180	1150	322	787	328	16
Pedestrians		8	4		8	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		1	0		1	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			1173			
pX, platoon unblocked						
vC, conflicting volume	330				1844	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	330				1844	338
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	85				0	98
cM capacity (veh/h)	1226				69	667

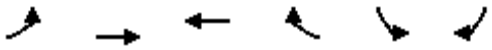
Direction, Lane #	NB 1	SB 1	SB 2	NE 1
Volume Total	1330	322	787	344
Volume Left	180	0	0	328
Volume Right	0	0	787	16
cSH	1226	1700	1700	72
Volume to Capacity	0.15	0.19	0.46	4.80
Queue Length 95th (ft)	13	0	0	Err
Control Delay (s)	4.5	0.0	0.0	Err
Lane LOS	A			F
Approach Delay (s)	4.5	0.0		Err
Approach LOS				F

Intersection Summary			
Average Delay	1238.1		
Intersection Capacity Utilization	127.5%	ICU Level of Service	H
Analysis Period (min)	15		
Description: 6, 14, 1			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	343	618	103	48	62
Future Volume (vph)	95	343	618	103	48	62
Satd. Flow (prot)	0	1631	1628	0	1512	0
Flt Permitted		0.987			0.978	
Satd. Flow (perm)	0	1631	1628	0	1512	0
Confl. Peds. (#/hr)	51			51	26	17
Peak Hour Factor	0.68	0.90	0.93	0.86	0.71	0.74
Heavy Vehicles (%)	2%	4%	3%	2%	4%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	521	785	0	152	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 89.9%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 35, 94, 128			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	95	343	618	103	48	62
Future Volume (Veh/h)	95	343	618	103	48	62
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.68	0.90	0.93	0.86	0.71	0.74
Hourly flow rate (vph)	140	381	665	120	68	84
Pedestrians		17	26		51	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		2	2		5	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		665	570			
pX, platoon unblocked					0.97	
vC, conflicting volume	836				1463	793
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	836				1462	793
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				34	77
cM capacity (veh/h)	759				103	365

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	521	785	152
Volume Left	140	0	68
Volume Right	0	120	84
cSH	759	1700	171
Volume to Capacity	0.18	0.46	0.89
Queue Length 95th (ft)	17	0	162
Control Delay (s)	4.8	0.0	96.8
Lane LOS	A		F
Approach Delay (s)	4.8	0.0	96.8
Approach LOS			F

Intersection Summary			
Average Delay	11.8		
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		
Description: 35, 94, 128			

Lane Group	WBL2	WBL	WBR	WBR2	NBL2	NBL	NBR	NBR2	SEL	SER	SER2	NEL
Lane Configurations												
Traffic Volume (vph)	112	439	92	6	147	322	16	90	55	343	99	91
Future Volume (vph)	112	439	92	6	147	322	16	90	55	343	99	91
Satd. Flow (prot)	0	1576	0	0	0	1612	0	1367	1470	0	0	0
Flt Permitted		0.960				0.956			0.994			
Satd. Flow (perm)	0	1576	0	0	0	1612	0	1367	1470	0	0	0
Confl. Peds. (#/hr)	5	7	3		7	3		1	1	5	7	3
Peak Hour Factor	0.88	0.86	0.82	0.75	0.92	0.83	0.57	0.59	0.81	0.86	0.92	0.84
Heavy Vehicles (%)	1%	2%	3%	0%	1%	0%	0%	1%	10%	1%	0%	1%
Shared Lane Traffic (%)								10%				
Lane Group Flow (vph)	0	757	0	0	0	591	0	138	575	0	0	0
Sign Control		Yield				Yield			Yield			

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 156.9%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	NET	NER	NER2	SWL2	SWL	SWT	SWR
Lane Configurations							
Traffic Volume (vph)	20	291	286	1	26	38	4
Future Volume (vph)	20	291	286	1	26	38	4
Satd. Flow (prot)	1400	0	1354	0	0	1654	0
Flt Permitted	0.990					0.984	
Satd. Flow (perm)	1400	0	1354	0	0	1654	0
Confl. Peds. (#/hr)		1	5	1	5		3
Peak Hour Factor	0.62	0.86	0.84	0.25	0.93	0.73	0.33
Heavy Vehicles (%)	0%	3%	2%	0%	0%	0%	0%
Shared Lane Traffic (%)			10%				
Lane Group Flow (vph)	512	0	306	0	0	96	0
Sign Control	Yield					Yield	

Intersection Summary

Movement	WBL2	WBL	WBR	WBR2	NBL2	NBL	NBR	NBR2	SEL	SER	SER2	NEL
Right Turn Channelized				MOYes								
Traffic Volume (veh/h)	112	439	92	6	147	322	16	90	55	343	99	91
Future Volume (veh/h)	112	439	92	6	147	322	16	90	55	343	99	91
Peak Hour Factor	0.88	0.86	0.82	0.75	0.92	0.83	0.57	0.59	0.81	0.86	0.92	0.84
Hourly flow rate (vph)	127	510	112	8	160	388	28	153	68	399	108	108
Approach Volume (veh/h)		749				729			575			
Crossing Volume (veh/h)		716				550			881			
High Capacity (veh/h)		785				897			686			
High v/c (veh/h)		0.95				0.81			0.84			
Low Capacity (veh/h)		623				722			538			
Low v/c (veh/h)		1.20				1.01			1.07			

Intersection Summary				
Maximum v/c High	0.97			
Maximum v/c Low	1.21			
Intersection Capacity Utilization	156.9%	ICU Level of Service		H
# Crossing flow exceeds 1200, method is not applicable				
Description: 50, 17, 14				

Movement	NET	NER	NER2	SWL2	SWL	SWT	SWR
Right Turn Channelized							
Traffic Volume (veh/h)	20	291	286	1	26	38	4
Future Volume (veh/h)	20	291	286	1	26	38	4
Peak Hour Factor	0.62	0.86	0.84	0.25	0.93	0.73	0.33
Hourly flow rate (vph)	32	338	340	4	28	52	12
Approach Volume (veh/h)	818					96	
Crossing Volume (veh/h)	626					1405#	
High Capacity (veh/h)	844					445	
High v/c (veh/h)	0.97					0.22	
Low Capacity (veh/h)	675					333	
Low v/c (veh/h)	1.21					0.29	

Intersection Summary

Intersection	
Intersection Delay, s/veh	97.8
Intersection LOS	F

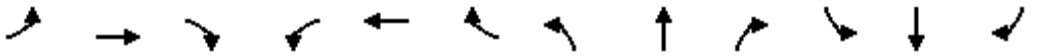
Approach	WB	NB	SE	NE
Entry Lanes	1	2	1	2
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	757	729	575	818
Demand Flow Rate, veh/h	771	733	586	836
Vehicles Circulating, veh/h	719	568	894	638
Vehicles Exiting, veh/h	582	906	624	842
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	1	5	3	7
Ped Cap Adj	1.000	0.997	1.000	0.997
Approach Delay, s/veh	204.5	28.7	163.6	23.4
Approach LOS	F	D	F	C

Lane	Left	Bypass	Left	Right	Left	Left	Right
Designated Moves	LR	R	LTR	R	LR	LTR	R
Assumed Moves	LR	R	LT	R	LR	LTR	R
RT Channelized		Free					
Lane Util	1.000		0.750	0.250	1.000	0.470	0.530
Critical Headway, s	5.193		5.193	5.193	5.193	5.193	5.193
Entry Flow, veh/h	763	8	550	183	586	393	443
Cap Entry Lane, veh/h	551	1900	640	640	462	597	597
Entry HV Adj Factor	0.981	1.000	0.997	0.989	0.981	0.978	0.979
Flow Entry, veh/h	749	8	548	181	575	384	434
Cap Entry, veh/h	540	1900	637	632	453	582	582
V/C Ratio	1.386	0.004	0.861	0.287	1.268	0.660	0.744
Control Delay, s/veh	206.7	0.0	35.0	9.4	163.6	20.7	25.7
LOS	F	A	E	A	F	C	D
95th %tile Queue, veh	34	0	10	1	24	5	6

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	1
Adj Approach Flow, veh/h	96
Demand Flow Rate, veh/h	96
Vehicles Circulating, veh/h	1422
Vehicles Exiting, veh/h	60
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	1
Ped Cap Adj	1.000
Approach Delay, s/veh	22.0
Approach LOS	C

Lane	Left
Designated Moves	LTR
Assumed Moves	LTR
RT Channelized	
Lane Util	1.000
Critical Headway, s	5.193
Entry Flow, veh/h	96
Cap Entry Lane, veh/h	273
Entry HV Adj Factor	1.000
Flow Entry, veh/h	96
Cap Entry, veh/h	273
V/C Ratio	0.352
Control Delay, s/veh	22.0
LOS	C
95th %tile Queue, veh	2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Future Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Satd. Flow (prot)	0	1700	0	0	1710	1454	0	1690	1425	1624	1640	0
Flt Permitted								0.960		0.147		
Satd. Flow (perm)	0	1700	*1	0	1710	1417	0	1626	1390	251	1640	0
Satd. Flow (RTOR)		2				274			112		7	
Confl. Peds. (#/hr)	1					4	4		2	2		4
Peak Hour Factor	0.92	0.92	0.67	0.92	0.92	0.76	0.90	0.79	0.92	0.85	0.87	0.81
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	0%	1%	2%	0%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	767	0	0	880	397	0	414	212	380	487	0
Turn Type		NA			NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		6			2			4		3	8	
Permitted Phases						2	4		4	8		
Total Split (s)		56.0			56.0	56.0	34.0	34.0	34.0	16.0	50.0	
Total Lost Time (s)		6.0			6.0	6.0		6.0	6.0	4.0	6.0	
Act Effct Green (s)		50.3			50.3	50.3		28.1	28.1	46.2	44.2	
Actuated g/C Ratio		0.46			0.46	0.46		0.25	0.25	0.42	0.40	
v/c Ratio		0.99			1.13	0.50		1.00	0.48	1.49	0.74	
Control Delay		60.6			103.7	9.4		85.9	21.5	263.6	36.8	
Queue Delay		0.0			0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		60.6			103.7	9.4		85.9	21.5	263.6	36.8	
LOS		E			F	A		F	C	F	D	
Approach Delay		60.6			74.4			64.1			136.2	
Approach LOS		E			E			E			F	
Queue Length 50th (ft)		484			~676	47		278	54	~295	265	
Queue Length 95th (ft)		#986			#1178	98		#494	155	#559	#519	
Internal Link Dist (ft)		2116			926			482			737	
Turn Bay Length (ft)						300			125			
Base Capacity (vph)		776			779	795		415	438	255	662	
Starvation Cap Reductn		0			0	0		0	0	0	0	
Spillback Cap Reductn		0			0	0		0	0	0	0	
Storage Cap Reductn		0			0	0		0	0	0	0	
Reduced v/c Ratio		0.99			1.13	0.50		1.00	0.48	1.49	0.74	

Intersection Summary	
Cycle Length: 127	
Actuated Cycle Length: 110.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.49	
Intersection Signal Delay: 84.7	Intersection LOS: F
Intersection Capacity Utilization 106.7%	ICU Level of Service G
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

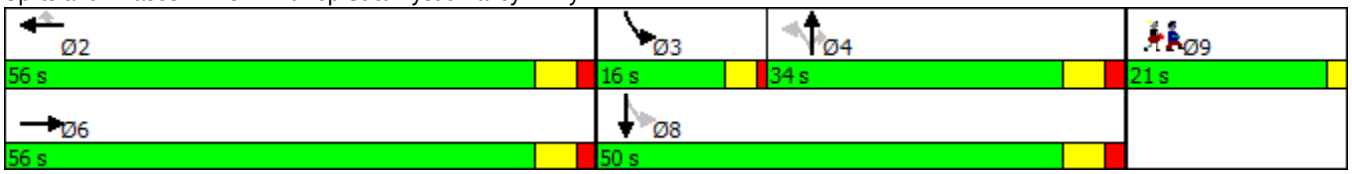
95th percentile volume exceeds capacity, queue may be longer.

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Queue shown is maximum after two cycles.

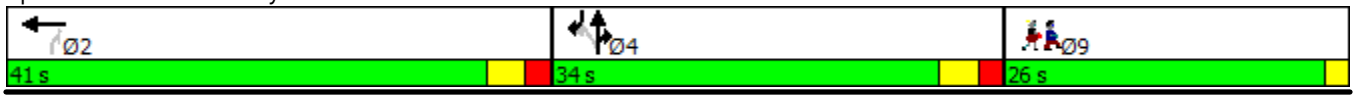
Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	843	20	460	15	203	0	0	22
Future Volume (vph)	0	0	0	0	843	20	460	15	203	0	0	22
Satd. Flow (prot)	0	0	0	0	3169	0	1513	1527	1398	0	0	1479
Flt Permitted							0.950	0.957				
Satd. Flow (perm)	0	0	0	0	3169	0	1502	1517	1398	0	0	1479
Satd. Flow (RTOR)					3							
Confl. Peds. (#/hr)						2	7					7
Peak Hour Factor	0.25	0.25	0.25	0.25	0.95	0.71	0.90	0.54	0.92	0.92	0.25	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%	2%	0%	4%	2%	0%	0%
Shared Lane Traffic (%)							47%					
Lane Group Flow (vph)	0	0	0	0	915	0	271	268	221	0	0	24
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					41.0		34.0	34.0	34.0			34.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					36.5		29.4	29.4	75.3			29.4
Actuated g/C Ratio					0.46		0.37	0.37	0.94			0.37
v/c Ratio					0.63		0.49	0.48	0.17			0.04
Control Delay					20.8		25.5	25.2	2.2			20.2
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					20.8		25.5	25.2	2.2			20.2
LOS					C		C	C	A			C
Approach Delay					20.8			18.6			20.2	
Approach LOS					C			B			C	
Queue Length 50th (ft)					154		96	94	0			7
Queue Length 95th (ft)					357		254	131	75			31
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1444		550	556	1312			542
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					0.63		0.49	0.48	0.17			0.04

Intersection Summary	
Cycle Length: 101	
Actuated Cycle Length: 80.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 19.8	Intersection LOS: B
Intersection Capacity Utilization 57.0%	ICU Level of Service B
Analysis Period (min) 15	
Description: 21, 13, 14	

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

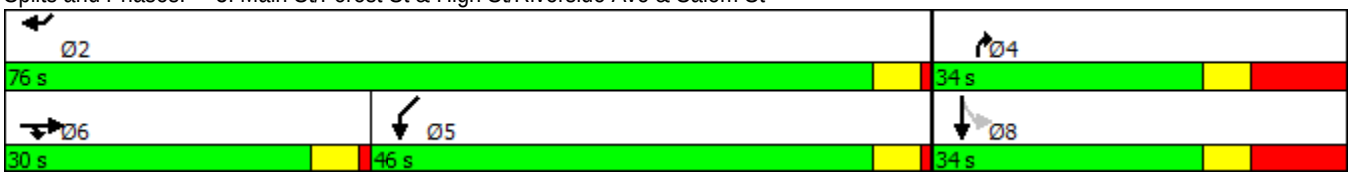
Intersection Summary

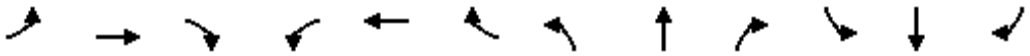
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2
Lane Configurations									
Traffic Volume (vph)	260	99	111	60	165	38	668	434	123
Future Volume (vph)	260	99	111	60	165	38	668	434	123
Satd. Flow (prot)	1644	1384	1479	0	1589	0	3120	1398	0
Flt Permitted					0.989		0.950		
Satd. Flow (perm)	1644	1384	1479	0	1570	0	2796	1398	0
Satd. Flow (RTOR)		139	730					89	
Confl. Peds. (#/hr)		34	30	30		25	34	25	53
Peak Hour Factor	0.90	0.75	0.62	0.88	0.86	0.79	0.93	0.94	0.88
Heavy Vehicles (%)	4%	5%	0%	0%	3%	5%	1%	4%	4%
Shared Lane Traffic (%)									
Lane Group Flow (vph)	289	132	179	0	308	0	718	602	0
Turn Type	NA	Prot	Prot	Perm	NA		Prot	Prot	
Protected Phases	6	6	4		8		5	2	
Permitted Phases				8					
Total Split (s)	30.0	30.0	34.0	34.0	34.0		46.0	76.0	
Total Lost Time (s)	5.0	5.0	12.0		12.0		5.0	5.0	
Act Effct Green (s)	25.0	25.0	22.0		22.0		41.0	71.0	
Actuated g/C Ratio	0.23	0.23	0.20		0.20		0.37	0.65	
v/c Ratio	0.77	0.31	0.20		0.98		0.62	0.65	
Control Delay	55.3	7.4	0.5		91.1		31.0	13.7	
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	55.3	7.4	0.5		91.1		31.0	13.7	
LOS	E	A	A		F		C	B	
Approach Delay	40.3				91.1		23.1		
Approach LOS	D				F		C		
Queue Length 50th (ft)	192	0	0		218		210	200	
Queue Length 95th (ft)	#320	23	0		#368		273	319	
Internal Link Dist (ft)	490				1749		402		
Turn Bay Length (ft)		60							
Base Capacity (vph)	373	421	879		314		1162	933	
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	0.77	0.31	0.20		0.98		0.62	0.65	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 33.9	Intersection LOS: C
Intersection Capacity Utilization 77.6%	ICU Level of Service D
Analysis Period (min) 15	
Description: 129, 224, 201	

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



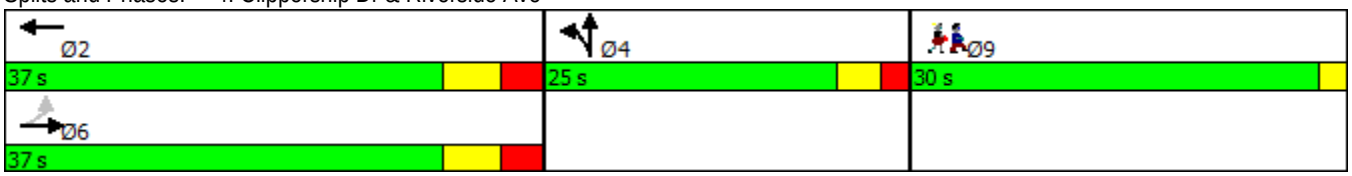


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	236	0	0	279	154	47	174	123	0	0	0
Future Volume (vph)	17	236	0	0	279	154	47	174	123	0	0	0
Satd. Flow (prot)	0	1673	0	0	1585	0	0	2936	0	0	0	0
Flt Permitted		0.937						0.992				
Satd. Flow (perm)	0	1573	0	0	1585	0	0	2936	0	0	0	0
Satd. Flow (RTOR)					32			105				
Confl. Peds. (#/hr)	9					9			3			
Peak Hour Factor	0.71	0.91	0.25	0.25	0.87	0.86	0.78	0.93	0.90	0.92	0.25	0.25
Heavy Vehicles (%)	0%	2%	0%	0%	2%	2%	12%	2%	0%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	283	0	0	500	0	0	384	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	37.0	37.0			37.0		25.0	25.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		30.6			30.6			20.4				
Actuated g/C Ratio		0.45			0.45			0.30				
v/c Ratio		0.40			0.68			0.40				
Control Delay		16.7			22.1			16.0				
Queue Delay		0.0			0.0			0.0				
Total Delay		16.7			22.1			16.0				
LOS		B			C			B				
Approach Delay		16.7			22.1			16.0				
Approach LOS		B			C			B				
Queue Length 50th (ft)		62			122			38				
Queue Length 95th (ft)		206			#416			104				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		715			737			963				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.40			0.68			0.40				

Intersection Summary	
Cycle Length: 92	
Actuated Cycle Length: 67.4	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 18.8	Intersection LOS: B
Intersection Capacity Utilization 50.7%	ICU Level of Service A
Analysis Period (min) 15	
Description: 9, 10, 12	

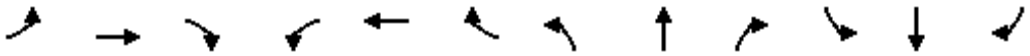
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



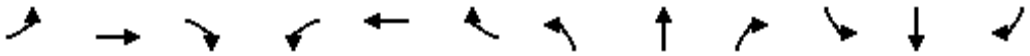
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	79	453	0	0	759	181
Future Volume (vph)	0	0	0	0	0	0	79	453	0	0	759	181
Satd. Flow (prot)	0	0	0	0	1919	0	0	3165	0	0	3080	0
Flt Permitted								0.992				
Satd. Flow (perm)	0	0	0	0	1919	0	0	3165	0	0	3080	0
Confl. Peds. (#/hr)				2			2					2
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.76	0.89	0.92	0.92	0.91	0.89
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	1%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	0	613	0	0	1037	0
Sign Control		Stop			Stop			Free			Free	

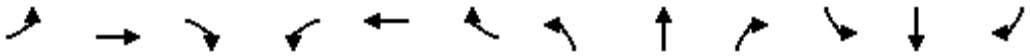
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 52.9%		ICU Level of Service A	
Analysis Period (min) 15			
Description: 29, 10, 3			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	0	79	453	0	0	759	181
Future Volume (Veh/h)	0	0	0	0	0	0	79	453	0	0	759	181
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.76	0.89	0.92	0.92	0.91	0.89
Hourly flow rate (vph)	0	0	0	0	0	0	104	509	0	0	834	203
Pedestrians		8						2				
Lane Width (ft)		0.0						12.0				
Walking Speed (ft/s)		3.5						3.5				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											378	
pX, platoon unblocked												
vC, conflicting volume	1406	1660	528	1136	1762	254	1045			509		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1406	1660	528	1136	1762	254	1045			509		
tC, single (s)	7.5	6.5	6.9	7.6	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	84			100		
cM capacity (veh/h)	87	81	499	136	71	751	667			1052		

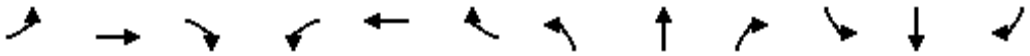
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	274	339	556	481
Volume Left	0	104	0	0	0
Volume Right	0	0	0	0	203
cSH	1700	667	1700	1700	1700
Volume to Capacity	0.00	0.16	0.20	0.33	0.28
Queue Length 95th (ft)	0	14	0	0	0
Control Delay (s)	0.0	5.5	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	0.0	2.5		0.0	
Approach LOS	A				

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	52.9%	ICU Level of Service		A
Analysis Period (min)	15			
Description: 29, 10, 3				



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	219	156	0	0	0	0	420	355	65	687	0
Future Volume (vph)	97	219	156	0	0	0	0	420	355	65	687	0
Satd. Flow (prot)	1608	1676	1425	0	0	0	0	2934	0	0	3157	0
Flt Permitted	0.950										0.995	
Satd. Flow (perm)	1608	1676	1425	0	0	0	0	2934	0	0	3157	0
Confl. Peds. (#/hr)			2						2	2		
Peak Hour Factor	0.84	0.91	0.93	0.25	0.25	0.25	0.92	0.89	0.85	0.74	0.88	0.25
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%	2%	3%	3%	6%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	241	168	0	0	0	0	890	0	0	869	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 71.7%		ICU Level of Service C	
Analysis Period (min) 15			
Description: 6, 9, 4			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	97	219	156	0	0	0	0	420	355	65	687	0
Future Volume (Veh/h)	97	219	156	0	0	0	0	420	355	65	687	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.91	0.93	0.25	0.25	0.25	0.92	0.89	0.85	0.74	0.88	0.25
Hourly flow rate (vph)	115	241	168	0	0	0	0	472	418	88	781	0
Pedestrians					2			2				
Lane Width (ft)					0.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											634	
pX, platoon unblocked												
vC, conflicting volume	1193	1849	392	1540	1640	447	781			892		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1193	1849	392	1540	1640	447	781			892		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	12	0	72	0	100	100	100			88		
cM capacity (veh/h)	130	65	605	0	89	564	832			731		

Direction, Lane #	EB 1	EB 2	EB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	115	241	168	315	575	348	521
Volume Left	115	0	0	0	0	88	0
Volume Right	0	0	168	0	418	0	0
cSH	130	65	605	1700	1700	731	1700
Volume to Capacity	0.88	3.72	0.28	0.19	0.34	0.12	0.31
Queue Length 95th (ft)	142	Err	28	0	0	10	0
Control Delay (s)	114.2	Err	13.2	0.0	0.0	3.8	0.0
Lane LOS	F	F	B			A	
Approach Delay (s)	4628.1			0.0		1.5	
Approach LOS	F						

Intersection Summary				
Average Delay	1062.8			
Intersection Capacity Utilization	71.7%	ICU Level of Service	C	
Analysis Period (min)	15			
Description: 6, 9, 4				

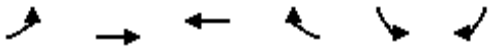
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	81	391	257	608	353	27
Future Volume (vph)	81	391	257	608	353	27
Satd. Flow (prot)	0	1644	1629	1439	1608	1358
Flt Permitted		0.992			0.950	
Satd. Flow (perm)	0	1644	1629	1439	1608	1358
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.84	0.83	0.86	0.96	0.94	0.84
Heavy Vehicles (%)	4%	3%	5%	1%	1%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	567	299	633	376	32
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 76.3%		ICU Level of Service D	
Analysis Period (min) 15			
Description: 6, 14, 1			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	81	391	257	608	353	27
Future Volume (Veh/h)	81	391	257	608	353	27
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.83	0.86	0.96	0.94	0.84
Hourly flow rate (vph)	96	471	299	633	376	32
Pedestrians		1			1	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		3.5			3.5	
Percent Blockage		0			0	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			1173			
pX, platoon unblocked						
vC, conflicting volume	300				963	301
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	300				963	301
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	92				0	96
cM capacity (veh/h)	1249				263	726

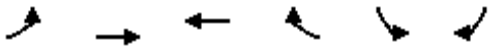
Direction, Lane #	NB 1	SB 1	SB 2	NE 1
Volume Total	567	299	633	408
Volume Left	96	0	0	376
Volume Right	0	0	633	32
cSH	1249	1700	1700	277
Volume to Capacity	0.08	0.18	0.37	1.47
Queue Length 95th (ft)	6	0	0	576
Control Delay (s)	2.1	0.0	0.0	266.2
Lane LOS	A			F
Approach Delay (s)	2.1	0.0		266.2
Approach LOS				F

Intersection Summary			
Average Delay	57.6		
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		
Description: 6, 14, 1			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	83	293	410	72	63	71
Future Volume (vph)	83	293	410	72	63	71
Satd. Flow (prot)	0	1624	1601	0	1544	0
Flt Permitted		0.988			0.977	
Satd. Flow (perm)	0	1624	1601	0	1544	0
Confl. Peds. (#/hr)	51			51	39	38
Peak Hour Factor	0.83	0.92	0.87	0.75	0.75	0.77
Heavy Vehicles (%)	1%	5%	5%	1%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	418	567	0	176	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 74.2%	ICU Level of Service D
Analysis Period (min) 15	
Description: 35, 94, 128	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	83	293	410	72	63	71
Future Volume (Veh/h)	83	293	410	72	63	71
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.92	0.87	0.75	0.75	0.77
Hourly flow rate (vph)	100	318	471	96	84	92
Pedestrians		38	39		51	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		4	4		5	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		665	570			
pX, platoon unblocked						
vC, conflicting volume	618				1127	608
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	618				1127	608
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	89				55	80
cM capacity (veh/h)	920				186	456

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	418	567	176
Volume Left	100	0	84
Volume Right	0	96	92
cSH	920	1700	270
Volume to Capacity	0.11	0.33	0.65
Queue Length 95th (ft)	9	0	104
Control Delay (s)	3.2	0.0	40.3
Lane LOS	A		E
Approach Delay (s)	3.2	0.0	40.3
Approach LOS			E

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
Description: 35, 94, 128			

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	70	15	203	261	101	282	107	6	186	286	12	73
Future Volume (vph)	70	15	203	261	101	282	107	6	186	286	12	73
Satd. Flow (prot)	0	0	1537	1367	0	1582	0	0	0	1674	1442	0
Flt Permitted			0.985			0.989				0.979		
Satd. Flow (perm)	0	0	1537	1367	0	1582	0	0	0	1674	1442	0
Confl. Peds. (#/hr)	4	3		3	3		4		4			2
Peak Hour Factor	0.83	0.54	0.92	0.91	0.81	0.92	0.84	0.75	0.76	0.84	0.60	0.96
Heavy Vehicles (%)	2%	6%	3%	1%	1%	4%	5%	0%	0%	0%	0%	1%
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	362	258	0	567	0	0	0	585	96	0
Sign Control			Yield			Yield				Yield		

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 129.4%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Lane Configurations							
Traffic Volume (vph)	56	293	86	1	15	23	1
Future Volume (vph)	56	293	86	1	15	23	1
Satd. Flow (prot)	0	1631	0	0	1457	0	0
Flt Permitted		0.994			0.981		
Satd. Flow (perm)	0	1631	0	0	1457	0	0
Confl. Peds. (#/hr)	2		4	2	3	4	4
Peak Hour Factor	0.82	0.70	0.69	0.25	0.62	0.57	0.25
Heavy Vehicles (%)	10%	0%	1%	100%	0%	0%	0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	612	0	0	72	0	0
Sign Control		Yield			Stop		

Intersection Summary

Movement	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Right Turn Channelized								MOYes				
Traffic Volume (veh/h)	70	15	203	261	101	282	107	6	186	286	12	73
Future Volume (veh/h)	70	15	203	261	101	282	107	6	186	286	12	73
Peak Hour Factor	0.83	0.54	0.92	0.91	0.81	0.92	0.84	0.75	0.76	0.84	0.60	0.96
Hourly flow rate (vph)	84	28	221	287	125	307	127	8	245	340	20	76
Approach Volume (veh/h)			620			559				681		
Crossing Volume (veh/h)			640			717				405		
High Capacity (veh/h)			834			784				1007		
High v/c (veh/h)			0.74			0.71				0.68		
Low Capacity (veh/h)			667			623				820		
Low v/c (veh/h)			0.93			0.90				0.83		

Intersection Summary				
Maximum v/c High	0.80			
Maximum v/c Low	1.01			
Intersection Capacity Utilization	129.4%	ICU Level of Service		H
# Crossing flow exceeds 1200, method is not applicable				
Description: 50, 17, 14				

Movement	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Right Turn Channelized							
Traffic Volume (veh/h)	56	293	86	1	15	23	1
Future Volume (veh/h)	56	293	86	1	15	23	1
Peak Hour Factor	0.82	0.70	0.69	0.25	0.62	0.57	0.25
Hourly flow rate (vph)	68	419	125	4	24	40	4
Approach Volume (veh/h)		612			72		
Crossing Volume (veh/h)		745			1228#		
High Capacity (veh/h)		766			516		
High v/c (veh/h)		0.80			0.14		
Low Capacity (veh/h)		607			392		
Low v/c (veh/h)		1.01			0.18		

Intersection Summary

Intersection	
Intersection Delay, s/veh	57.9
Intersection LOS	F

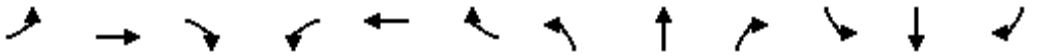
Approach	EB	WB	NB	SB
Entry Lanes	2	1	2	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	620	567	681	612
Demand Flow Rate, veh/h	634	586	682	620
Vehicles Circulating, veh/h	652	721	427	762
Vehicles Exiting, veh/h	730	388	859	563
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	4	2	3	4
Ped Cap Adj	0.998	1.000	0.998	0.999
Approach Delay, s/veh	16.3	80.3	22.4	123.9
Approach LOS	C	F	C	F

Lane	Left	Right	Left	Bypass	Left	Right	Left
Designated Moves	LT	R	LTR	R	LT	R	LTR
Assumed Moves	LT	R	LTR	R	LT	R	LTR
RT Channelized				Free			
Lane Util	0.543	0.457	1.000		0.858	0.142	1.000
Critical Headway, s	5.193	5.193	5.193		5.193	5.193	5.193
Entry Flow, veh/h	344	290	578	8	585	97	620
Cap Entry Lane, veh/h	589	589	549	1901	737	737	527
Entry HV Adj Factor	0.970	0.990	0.967	1.000	1.000	0.990	0.987
Flow Entry, veh/h	334	287	559	8	585	96	612
Cap Entry, veh/h	570	582	531	1900	736	728	520
V/C Ratio	0.585	0.493	1.052	0.004	0.795	0.132	1.176
Control Delay, s/veh	17.8	14.5	81.4	0.0	25.0	6.4	123.9
LOS	C	B	F	A	D	A	F
95th %tile Queue, veh	4	3	16	0	8	0	22

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	1
Adj Approach Flow, veh/h	72
Demand Flow Rate, veh/h	76
Vehicles Circulating, veh/h	1249
Vehicles Exiting, veh/h	50
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	16
Ped Cap Adj	1.000
Approach Delay, s/veh	16.5
Approach LOS	C

Lane	Left
Designated Moves	LR
Assumed Moves	LR
RT Channelized	
Lane Util	1.000
Critical Headway, s	5.193
Entry Flow, veh/h	76
Cap Entry Lane, veh/h	324
Entry HV Adj Factor	0.947
Flow Entry, veh/h	72
Cap Entry, veh/h	307
V/C Ratio	0.235
Control Delay, s/veh	16.5
LOS	C
95th %tile Queue, veh	1



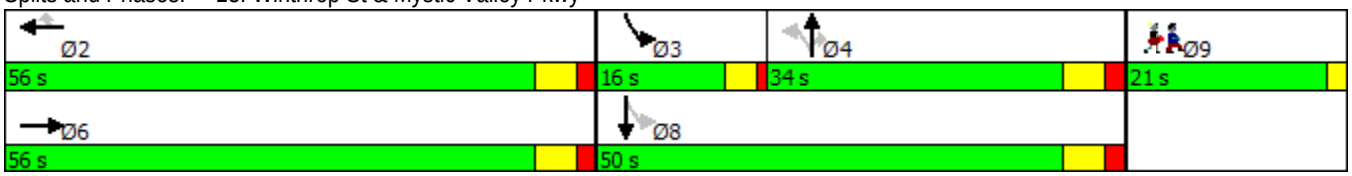
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	653	14	0	709	401	15	173	176	323	282	63
Future Volume (vph)	0	653	14	0	709	401	15	173	176	323	282	63
Satd. Flow (prot)	0	1699	0	0	1710	1454	0	1685	1454	1624	1629	0
Flt Permitted								0.901		0.332		
Satd. Flow (perm)	0	1699	*1	0	1710	1423	0	1525	1454	568	1629	0
Satd. Flow (RTOR)		1				360			171		9	
Confl. Peds. (#/hr)	1		2	2		1	9					9
Peak Hour Factor	0.92	0.97	0.70	0.92	0.93	0.89	0.54	0.82	0.94	0.94	0.77	0.83
Heavy Vehicles (%)	0%	0%	7%	0%	0%	0%	0%	1%	0%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	693	0	0	762	451	0	239	187	344	442	0
Turn Type		NA			NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		6			2			4		3	8	
Permitted Phases						2	4		4	8		
Total Split (s)		56.0			56.0	56.0	34.0	34.0	34.0	16.0	50.0	
Total Lost Time (s)		6.0			6.0	6.0		6.0	6.0	4.0	6.0	
Act Effct Green (s)		51.1			51.1	51.1		21.1	21.1	39.5	37.4	
Actuated g/C Ratio		0.47			0.47	0.47		0.20	0.20	0.37	0.35	
v/c Ratio		0.86			0.94	0.52		0.80	0.44	1.05	0.77	
Control Delay		41.0			50.6	7.9		62.9	11.3	95.4	42.5	
Queue Delay		0.0			0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		41.0			50.6	7.9		62.9	11.3	95.4	42.5	
LOS		D			D	A		E	B	F	D	
Approach Delay		41.0			34.8			40.3			65.7	
Approach LOS		D			C			D			E	
Queue Length 50th (ft)		345			406	29		142	8	164	231	
Queue Length 95th (ft)		#854			#970	145		248	75	#502	359	
Internal Link Dist (ft)		2116			926			482			724	
Turn Bay Length (ft)						300			125			
Base Capacity (vph)		804			809	863		404	510	327	683	
Starvation Cap Reductn		0			0	0		0	0	0	0	
Spillback Cap Reductn		0			0	0		0	0	0	0	
Storage Cap Reductn		0			0	0		0	0	0	0	
Reduced v/c Ratio		0.86			0.94	0.52		0.59	0.37	1.05	0.65	

Intersection Summary	
Cycle Length: 127	
Actuated Cycle Length: 107.9	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 44.7	Intersection LOS: D
Intersection Capacity Utilization 88.4%	ICU Level of Service E
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

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

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

APPENDIX C

Preliminary Traffic-Signal Warrants Analyses

Main Street at Route 16 Ramps

Main Street at Mystic Avenue

High Street at Winthrop Street

High Street at Governors Avenue

Table 1
Summary of Hourly Volumes and Warrant Analyses
Main Street at Route 16 Eastbound Ramps, Medford

Hourly period starting	Major Street		Minor Street	Warrants Satisfied			
	Main Street / Mystic Ave		South Street	Warrant 1	Warrant 2	Warrant 3	Warrant 7
	NB Volume	SB Volume	EB Volume				
6:00	499	1,415	357	✓	✓	✓	6 correct-able crash(es) per year between 2015 and 2017
7:00	862	1,778	569	✓	✓	✓	
8:00	987	1,938	626	✓	✓	✓	
9:00	810	1,676	497	✓	✓	✓	
10:00	909	1,132	399	✓	✓	✓	
11:00	957	967	430	✓	✓	✓	
12:00	993	993	450	✓	✓	✓	
13:00	1,034	990	465	✓	✓	✓	
14:00	1,047	1,057	535	✓	✓	✓	
15:00	1,337	1,175	537	✓	✓	✓	
16:00	1,465	1,245	632	✓	✓	✓	
17:00	1,608	1,363	673	✓	✓	✓	
18:00	1,131	1,081	518	✓	✓	✓	
19:00	734	788	355	✓	✓	✓	
				MET	**MET**	**MET**	**MET**

Notes:
• ATR counts were conducted over a four-day period between 11am Monday 12/4/17 and 10am Thursday 12/7/17.

Table 2
Summary of Hourly Volumes and Warrant Analyses
Main Street at Mystic Avenue, Medford

Hourly period starting	Major Street		Minor Street	Warrants Satisfied			
	Main Street / Mystic Ave		Main Street				
	NB Volume	SB Volume	EB Volume	Warrant 1	Warrant 2	Warrant 3	Warrant 7
6:00	242	1,415	257	✓	✓	✓	5 correct-able crash(es) per year between 2015 and 2017
7:00	476	1,778	386	✓	✓	✓	
8:00	529	1,938	458	✓	✓	✓	
9:00	397	1,676	413	✓	✓	✓	
10:00	499	1,132	410	✓	✓	✓	
11:00	549	967	408	✓	✓	✓	
12:00	520	993	473	✓	✓	✓	
13:00	541	990	493	✓	✓	✓	
14:00	574	1,057	473	✓	✓	✓	
15:00	814	1,175	523	✓	✓	✓	
16:00	1,018	1,245	447	✓	✓	✓	
17:00	1,171	1,363	437	✓	✓	✓	
18:00	652	1,081	479	✓	✓	✓	
19:00	355	788	379	✓	✓	✓	
				MET	**MET**	**MET**	**MET**

Notes:
• ATR counts were conducted over a four-day period between 11am Monday 12/4/17 and 10am Thursday 12/7/17.

Table 3
Summary of Hourly Volumes and Warrant Analyses
Winthrop Street at High Street, Medford

Hourly period starting	Major Street		Minor Street		Warrants Satisfied			
	Winthrop Street		High Street					
	NB Volume	SB Volume	EB Volume	WB Volume	Warrant 1	Warrant 2	Warrant 3	Warrant 7
6:00	280	602	365	507	✓	✓	✓	16 correct-able crash(es) per year between 2015 and 2017
7:00	502	516	642	480	✓	✓	✓	
8:00	491	475	597	384	✓	✓	✓	
9:00	398	551	534	437	✓	✓	✓	
10:00	426	476	439	381	✓	✓	✓	
11:00	473	436	431	371	✓	✓	✓	
12:00	485	389	452	378	✓	✓	✓	
13:00	507	386	484	368	✓	✓	✓	
14:00	579	528	507	428	✓	✓	✓	
15:00	658	485	614	439	✓	✓	✓	
16:00	682	489	648	476	✓	✓	✓	
17:00	748	527	619	502	✓	✓	✓	
18:00	646	465	546	456	✓	✓	✓	
19:00	501	253	452	396	✓	✓	✓	
					MET	**MET**	**MET**	**MET**

Notes:
• ATR counts were conducted over a four-day period between 11am Monday 12/4/17 and 10am Thursday 12/7/17.

Table 4
Summary of Hourly Volumes and Warrant Analyses
High Street at Governors Avenue, Medford

Hourly period starting	Major Street		Minor Street	Warrants Satisfied			
	High Street		Governors Ave	Warrant 1	Warrant 2	Warrant 3	Warrant 7
	EB Volume	WB Volume	SB Volume				
6:00	225	507	259		✓		1 correct-able crash(es) per year between 2015 and 2017
7:00	373	480	276	✓	✓	✓	
8:00	340	384	220		✓		
9:00	331	437	218	✓	✓		
10:00	303	381	116				
11:00	314	371	92				
12:00	325	378	91				
13:00	326	368	103				
14:00	366	428	92				
15:00	386	439	93				
16:00	390	476	89				
17:00	401	502	100				
18:00	369	456	78				
19:00	305	396	58				
				NOT MET	**MET**	**MET**	**NOT MET**

Notes:

• ATR counts were conducted over a four-day period between 11am Monday 12/4/17 and 10am Thursday 12/7/17.

APPENDIX D

Corridor Crash-Rate Worksheets

SEGMENT CRASH RATE WORKSHEET

CITY/TOWN : Medford COUNT DATE : 12/4–12/7/2017

DISTRICT : 4

~ SEGMENT DATA ~

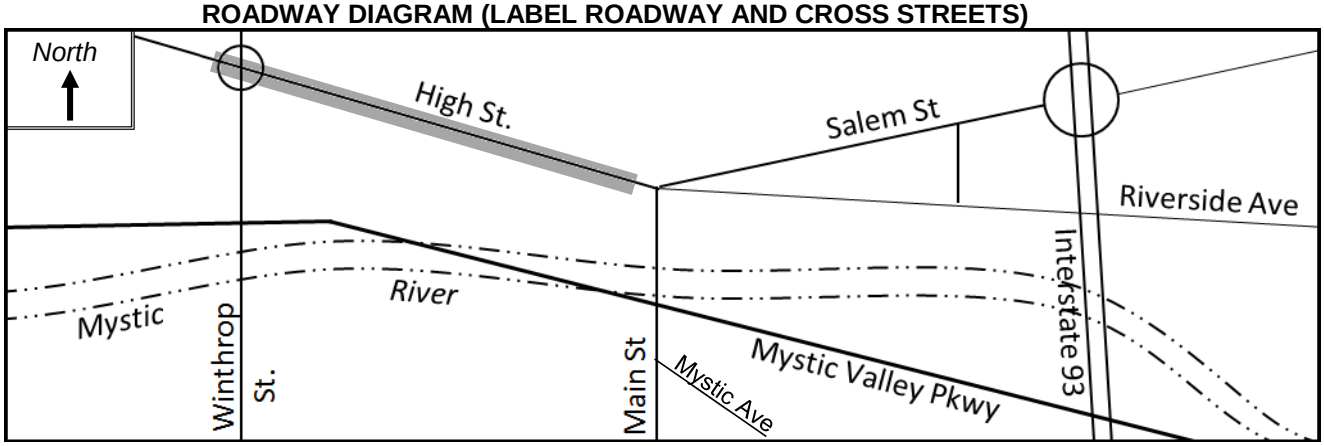
ROADWAY NAME: High Street (Route 60)

START POINT: Winthrop Street

END POINT: Main Street

FUNCTIONAL CLASSIFICATION OF ROADWAY: Principal Arterial - Other

ROADWAY DIAGRAM (LABEL ROADWAY AND CROSS STREETS)



AVERAGE DAILY TRAFFIC

SEGMENT LENGTH IN MILES (**L**):	**0.48**
AVERAGE DAILY TRAFFIC VOLUME (**V**):	12,680

TOTAL # OF CRASHES:	144	# OF YEARS :	5	AVERAGE # OF CRASHES PER YEAR (**A**) :	**28.80**

CRASH RATE CALCULATION : **12.96**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(L * V * 365)}$$

Comments : 2016 State Average for Urban Principal Arterial - Other = 3.49

Project Title & Date: Medford Square Priority Roadways Study

SEGMENT CRASH RATE WORKSHEET

CITY/TOWN : Medford COUNT DATE : 12/4–12/7/2017

DISTRICT : 4

~ SEGMENT DATA ~

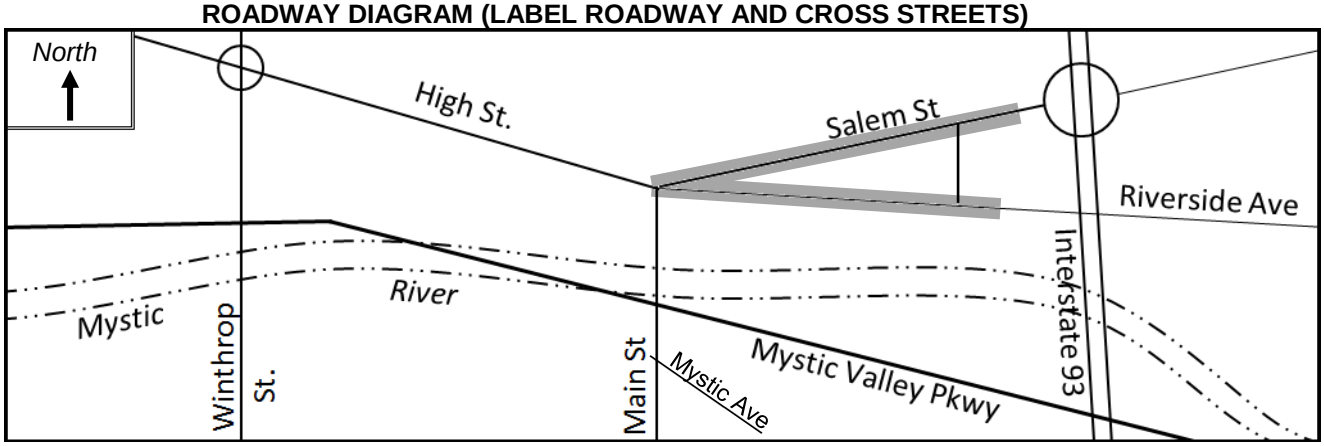
ROADWAY NAME: Route 60 (Salem Street eastbound, Riverside Ave westbound)

START POINT: Main Street

END POINT: I-93 rotary

FUNCTIONAL CLASSIFICATION OF ROADWAY: Principal Arterial - Other

ROADWAY DIAGRAM (LABEL ROADWAY AND CROSS STREETS)



AVERAGE DAILY TRAFFIC

SEGMENT LENGTH IN MILES (**L**):	**0.25**
AVERAGE DAILY TRAFFIC VOLUME (**V**):	21,620

TOTAL # OF CRASHES:	111	# OF YEARS :	5	AVERAGE # OF CRASHES PER YEAR (**A**) :	**22.20**

CRASH RATE CALCULATION : **11.25**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(L * V * 365)}$$

Comments : 2016 State Average for Urban Principal Arterial - Other = 3.49

Project Title & Date: Medford Square Priority Roadways Study

SEGMENT CRASH RATE WORKSHEET

CITY/TOWN : Medford COUNT DATE : 12/4–12/7/2017

DISTRICT : 4

~ SEGMENT DATA ~

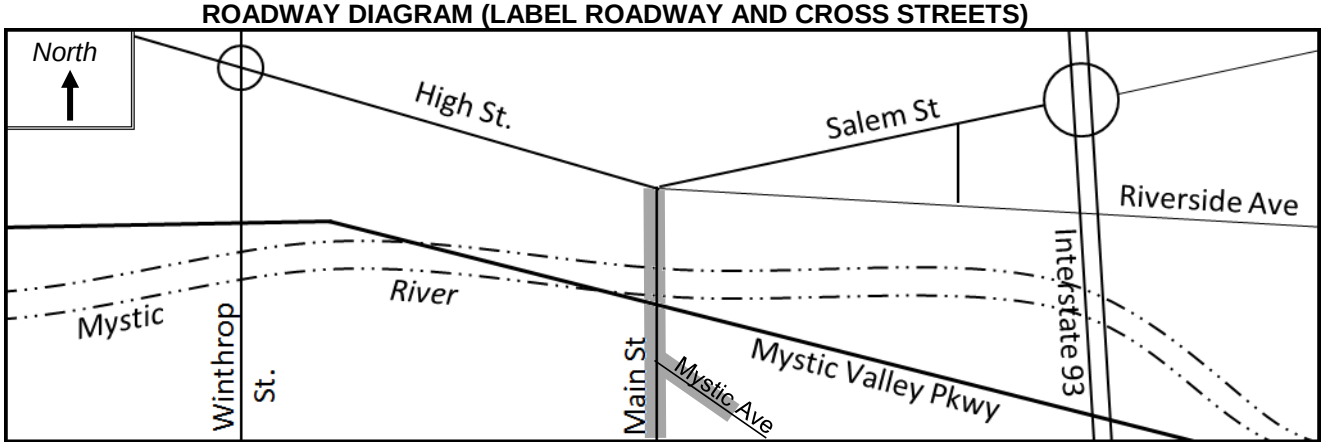
ROADWAY NAME: Main Street

START POINT: Salem Street/High Street

END POINT: Mystic Ave

FUNCTIONAL CLASSIFICATION OF ROADWAY: Minor Arterial

ROADWAY DIAGRAM (LABEL ROADWAY AND CROSS STREETS)



AVERAGE DAILY TRAFFIC

SEGMENT LENGTH IN MILES (**L**):	**0.24**
AVERAGE DAILY TRAFFIC VOLUME (**V**):	36,060

TOTAL # OF CRASHES:	134	# OF YEARS :	5	AVERAGE # OF CRASHES PER YEAR (**A**) :	**26.80**

CRASH RATE CALCULATION : **8.48**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(L * V * 365)}$$

Comments : 2016 State Average for Urban Minor Arterial = 3.8

Project Title & Date: Medford Square Priority Roadways Study

APPENDIX E

Intersection Crash-Rate Worksheets

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

DISTRICT : 4 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

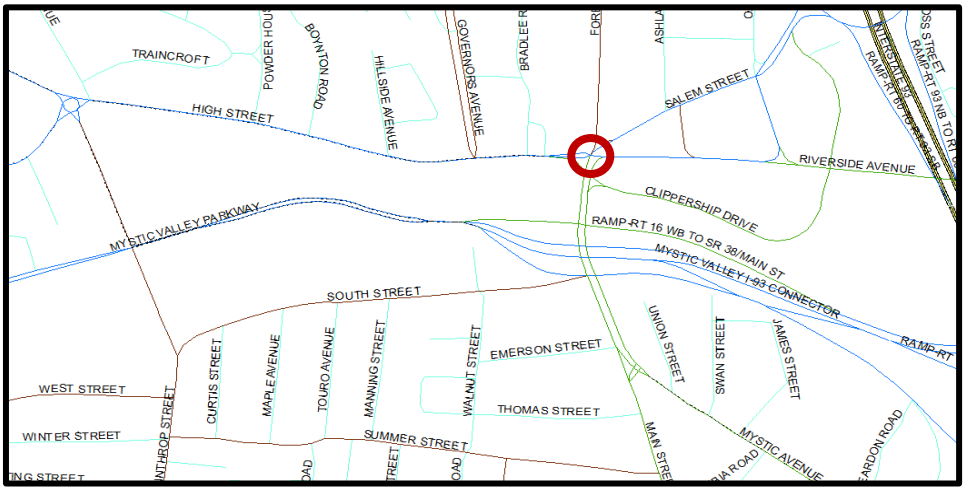
MAJOR STREET : Route 60 (Salem Street, High Street)

MINOR STREET(S) : Forest Street

Main Street

Riverside Street

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	SW	EB	SB	NW		
PEAK HOURLY VOLUMES (AM/PM) :	1,626	487	288	73		2,474

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **27,489**

TOTAL # OF CRASHES : 66

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **13.20**

CRASH RATE CALCULATION : **1.32**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for signalized intersections = 0.73

Project Title & Date: Medford Square Priority Roadways Improvement Study

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

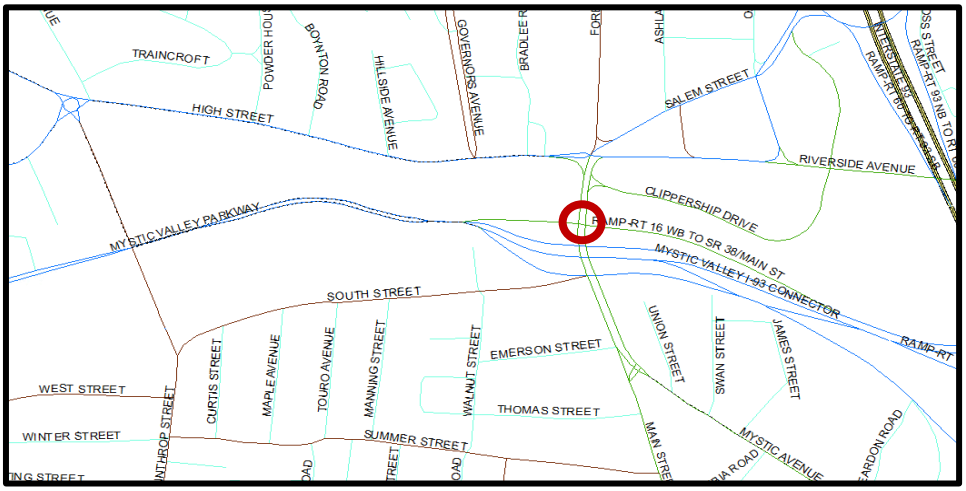
DISTRICT : 4 | UNSIGNALIZED : X | SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Main Street

MINOR STREET(S) : Ramps from Route 16 (Mystic Valley Parkway)

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	733	1,426	250			**2,408**

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **26,756**

TOTAL # OF CRASHES : 12

OF YEARS : 4

AVERAGE # OF CRASHES PER YEAR (**A**) : **3.00**

CRASH RATE CALCULATION : **0.31**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for unsignalized intersections = 0.57

Project Title & Date: Medford Square Priority Roadways Improvement Study

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

DISTRICT : 4 | UNSIGNALIZED : X | SIGNALIZED :

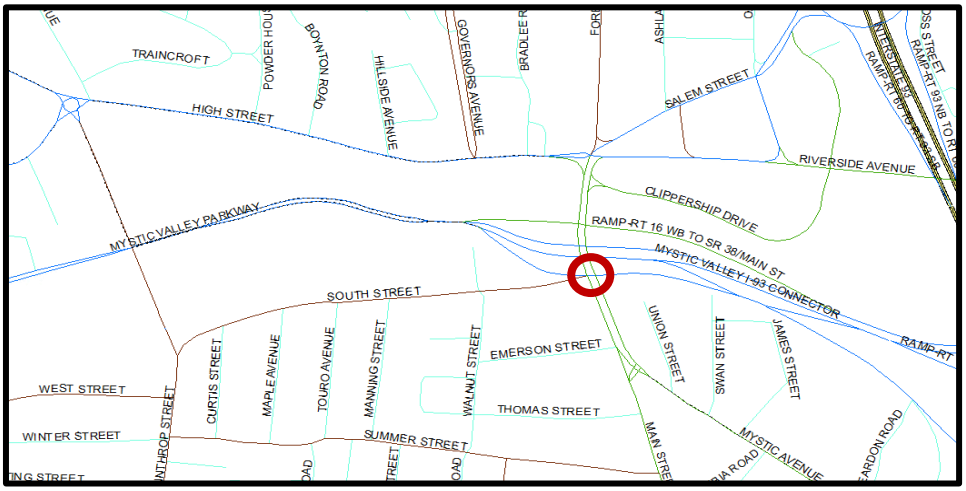
~ INTERSECTION DATA ~

MAJOR STREET : Main Street

MINOR STREET(S) : South Street

Ramp to Route 16 EB (Mystic Valley Parkway)

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB			
PEAK HOURLY VOLUMES (AM/PM) :	1,051	1,200	547			**2,797**

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **31,072**

TOTAL # OF CRASHES : 65

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **13.00**

CRASH RATE CALCULATION : **1.15**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for unsignalized intersections = 0.57

Project Title & Date: Medford Square Priority Roadways Improvement Study

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

DISTRICT : 4 | UNSIGNALIZED : X | SIGNALIZED :

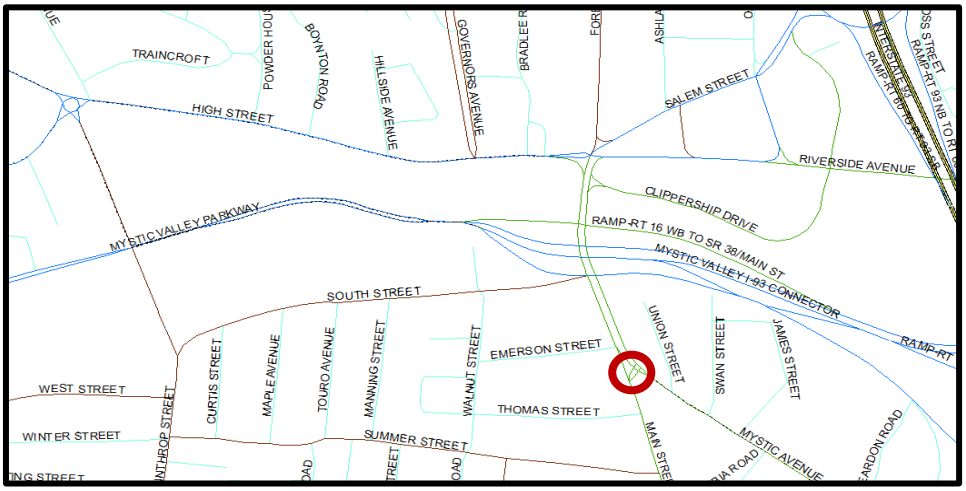
~ INTERSECTION DATA ~

MAJOR STREET : Main Street

MINOR STREET(S) : Mystic Avenue

Emerson Street

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	NW	EB		
PEAK HOURLY VOLUMES (AM/PM) :	307	1,246	800	97		2,450

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **27,217**

TOTAL # OF CRASHES : 39

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **7.80**

CRASH RATE CALCULATION : **0.79**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for unsignalized intersections = 0.57

Project Title & Date: Medford Square Priority Roadways Improvement Study

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

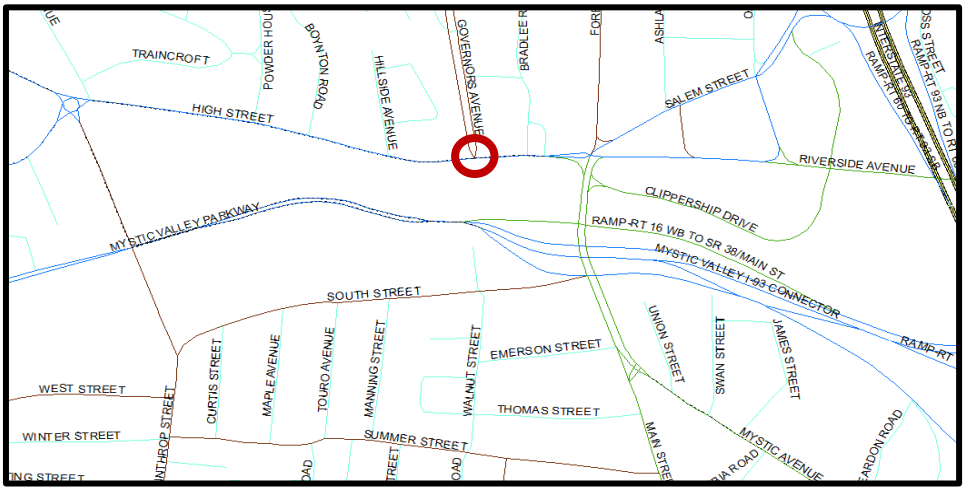
DISTRICT : 4 | UNSIGNALIZED : X | SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Route 60 (High Street)

MINOR STREET(S) : Governors Avenue

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	SB			
PEAK HOURLY VOLUMES (AM/PM) :	423	691	194			**1,307**

" K " FACTOR : **0.090** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **14,522**

TOTAL # OF CRASHES : 17 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **3.40**

CRASH RATE CALCULATION : **0.64**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for unsignalized intersections = 0.57

Project Title & Date: Medford Square Priority Roadways Improvement Study

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

DISTRICT : 4 | UNSIGNALIZED : X | SIGNALIZED :

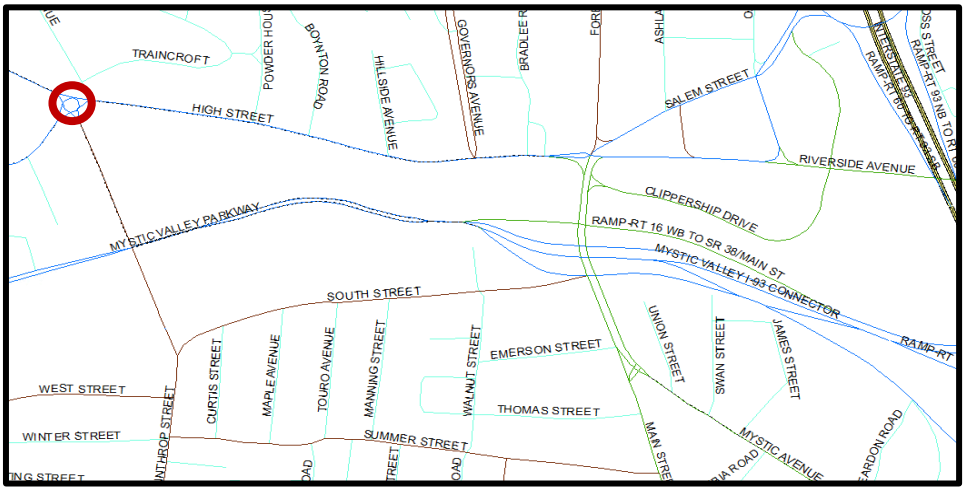
~ INTERSECTION DATA ~

MAJOR STREET : Winthrop Street

MINOR STREET(S) : High Street (Route 60)

Rural Avenue

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB	SW	
PEAK HOURLY VOLUMES (AM/PM) :	499	467	645	769	148	**2,527**

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **28,078**

TOTAL # OF CRASHES : 61

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **12.20**

CRASH RATE CALCULATION : **1.19**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for unsignalized intersections = 0.57

Project Title & Date: Medford Square Priority Roadways Improvement Study

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Medford | COUNT DATE : 12/4–12/7/2017

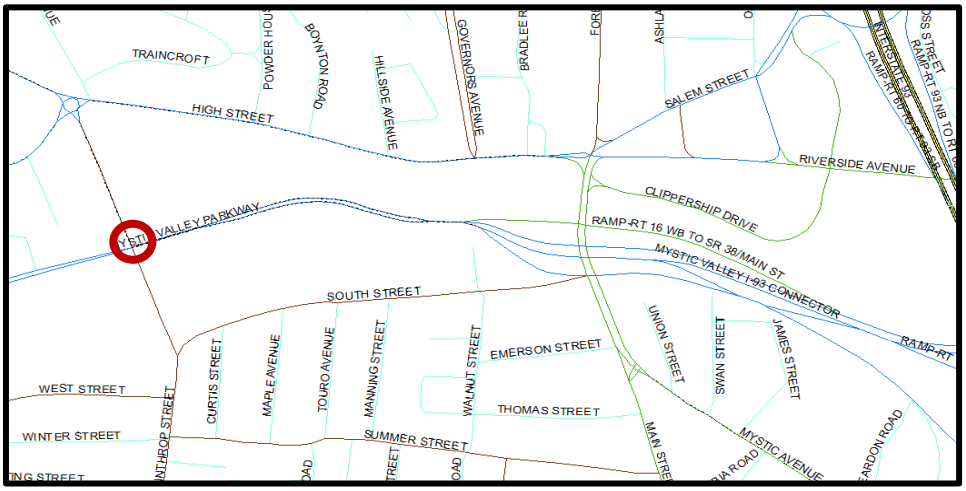
DISTRICT : 4 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Route 16 (Mystic Valley Parkway)

MINOR STREET(S) : Winthrop Street

INTERSECTION DIAGRAM



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	548	821	693	1,040		3,101

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **34,456**

TOTAL # OF CRASHES : 79

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **15.80**

CRASH RATE CALCULATION : **1.26**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : 2016 District 4 average for signalized intersections = 0.73

Project Title & Date: Medford Square Priority Roadways Improvement Study

APPENDIX F

Summary of Pedestrian and Bicycle Crashes
Medford Police Crash Reports 2015–2017

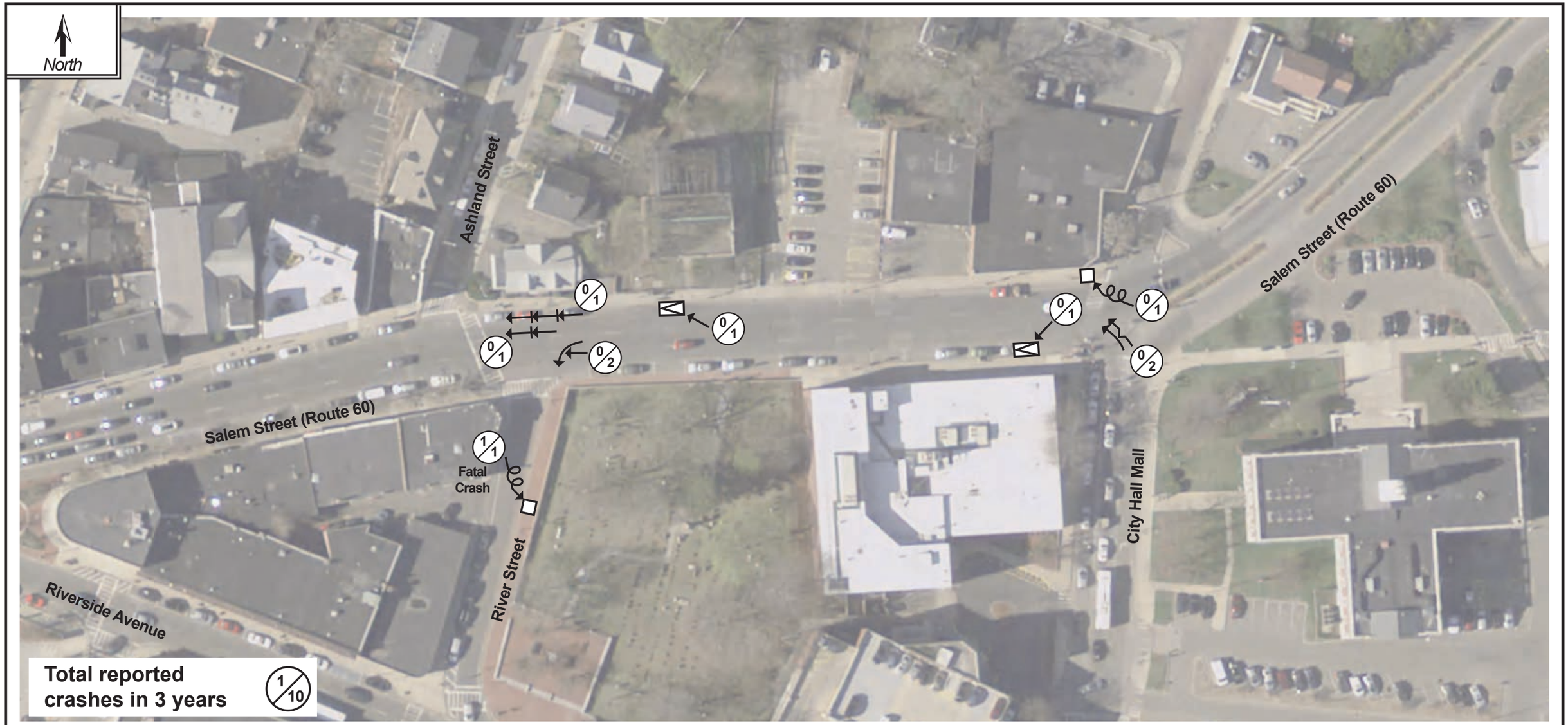
Summary of Pedestrian and Bicycle Crashes
Medford Police Crash Reports 2015–2017

Location	Date/Time	Type	Injury	Description
Salem Street at High Street	12/11/2015 9:45 AM	Pedestrian	Injury	Pedestrian in wheelchair struck while crossing Riverside Ave crosswalk
Salem Street at High Street	7/27/2016 10:53 PM	Pedestrian	Injury	Pedestrian struck in Main Street crosswalk by vehicle travelling wrong direction
High Street at Governors Ave	10/11/2017 9:15 PM	Pedestrian	Not injured	Pedestrian stuck in High Street crosswalk
High Street at Governors Ave	7/8/2015 3:30 PM	Pedestrian	Injury	Pedestrian stuck in High Street crosswalk; vehicle fled scene
Salem St near Dunkin Donuts	12/21/2016 5:52 PM	Pedestrian	Injury	Pedestrian walked behind parallel parking vehicle and was stuck
Winthrop Square traffic circle	5/12/2016 4:14 PM	Pedestrian	Injury	Pedestrian struck in High Street eastbound crosswalk
Winthrop Square traffic circle	9/6/2016 2:55 PM	Pedestrian	Injury	Pedestrian struck in Winthrop Street crosswalk
Winthrop Square traffic circle	1/6/2017 5:08 PM	Pedestrian	Injury	Pedestrian struck in Rural Ave crosswalk
Route 16 eastbound near St. Joseph's	9/5/2014 7:39 PM	Bicycle	Fatal	Cyclist fatally struck by SUV that fled the scene
Main Street at South Street	5/12/2015 4:40 PM	Bicycle	Not injured	Cyclist in Main Street crosswalk stuck by vehicle making a right-turn from South Street
Main Street at South Street	7/13/2015 1:16 PM	Bicycle	Injury	Cyclist in the southbound travel lane of Main Street struck by vehicle turning out of South Street
South Street at Walnut Street	11/8/2017 2:34 PM	Pedestrian	Injury	Pedestrian struck in crosswalk while crossing South Street; multiple bones broken. Both pedestrian and driver distracted by phones

APPENDIX G

Collision Diagrams and Crash Statistics
Major Intersections and Segments in the Study Area

Figure 1
Collision Diagram: Salem Street at City Hall Mall and at River Street
Medford Police Reports: January 2015–December 2017



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

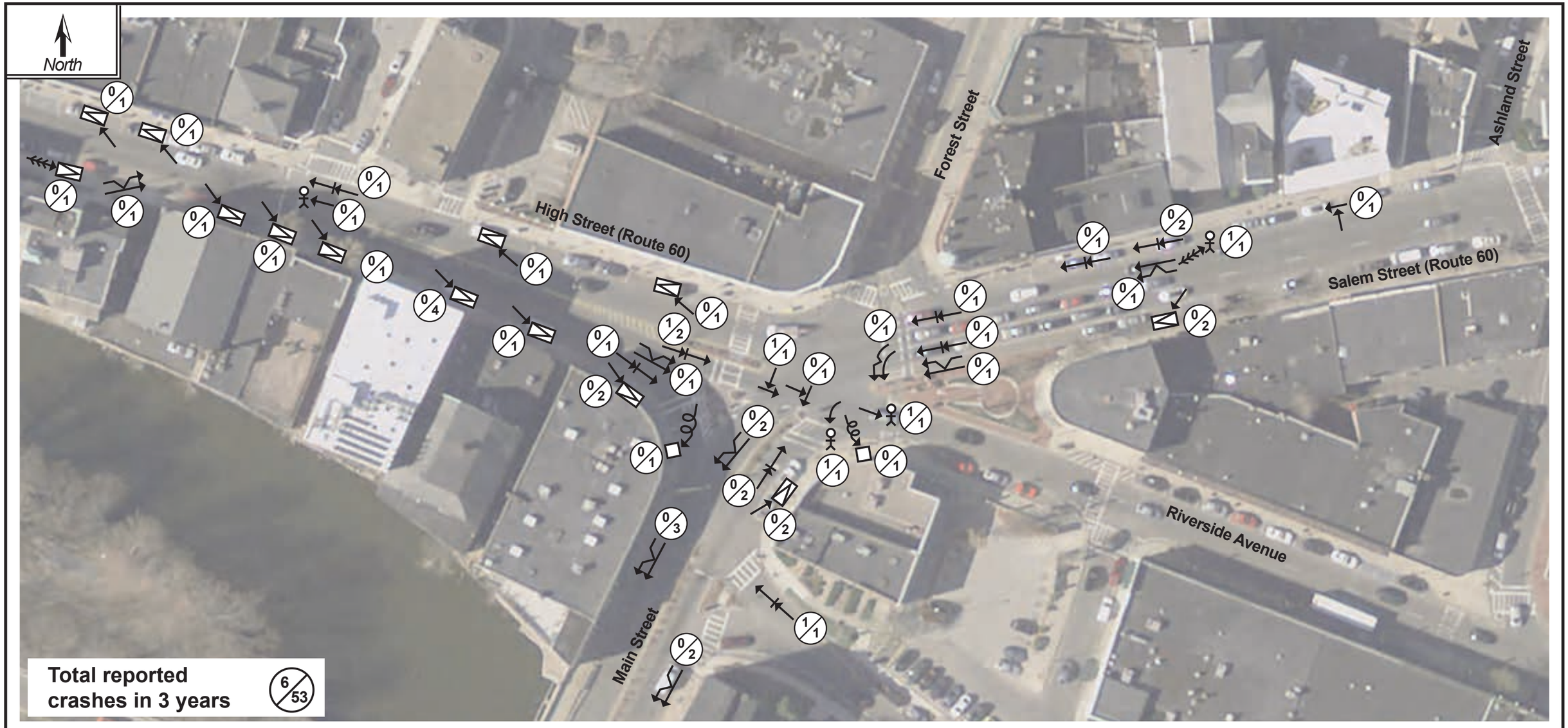
SEVERITY

A/B

A Number of Injury Crashes

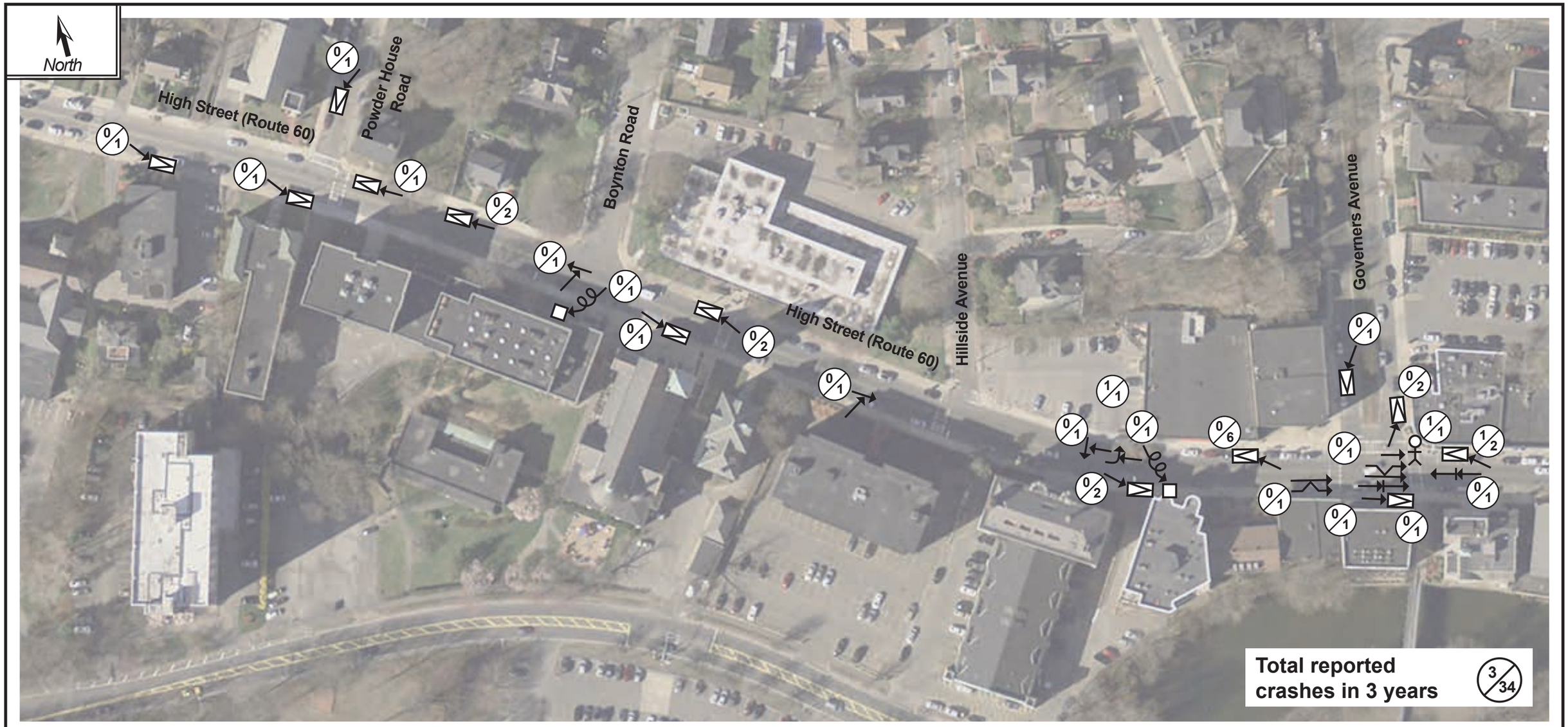
B Total Number of Crashes

Figure 2
Collision Diagram: Salem Street at High Street and Main Street
Medford Police Reports: January 2015–December 2017



SYMBOLS			TYPES OF CRASH		SEVERITY	
Moving Vehicle	Parked Vehicle		Head On	Sideswipe	A/B	
Backing Vehicle	Fixed Object		Angle	Out of Control	A	Number of Injury Crashes
Non-Involved Vehicle	Bicycle		Rear End		B	Total Number of Crashes
Pedestiran	Animal					

Figure 3
Collision Diagram: High Street between Salem Street and Winthrop Street
Medford Police Reports: January 2015–December 2017



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

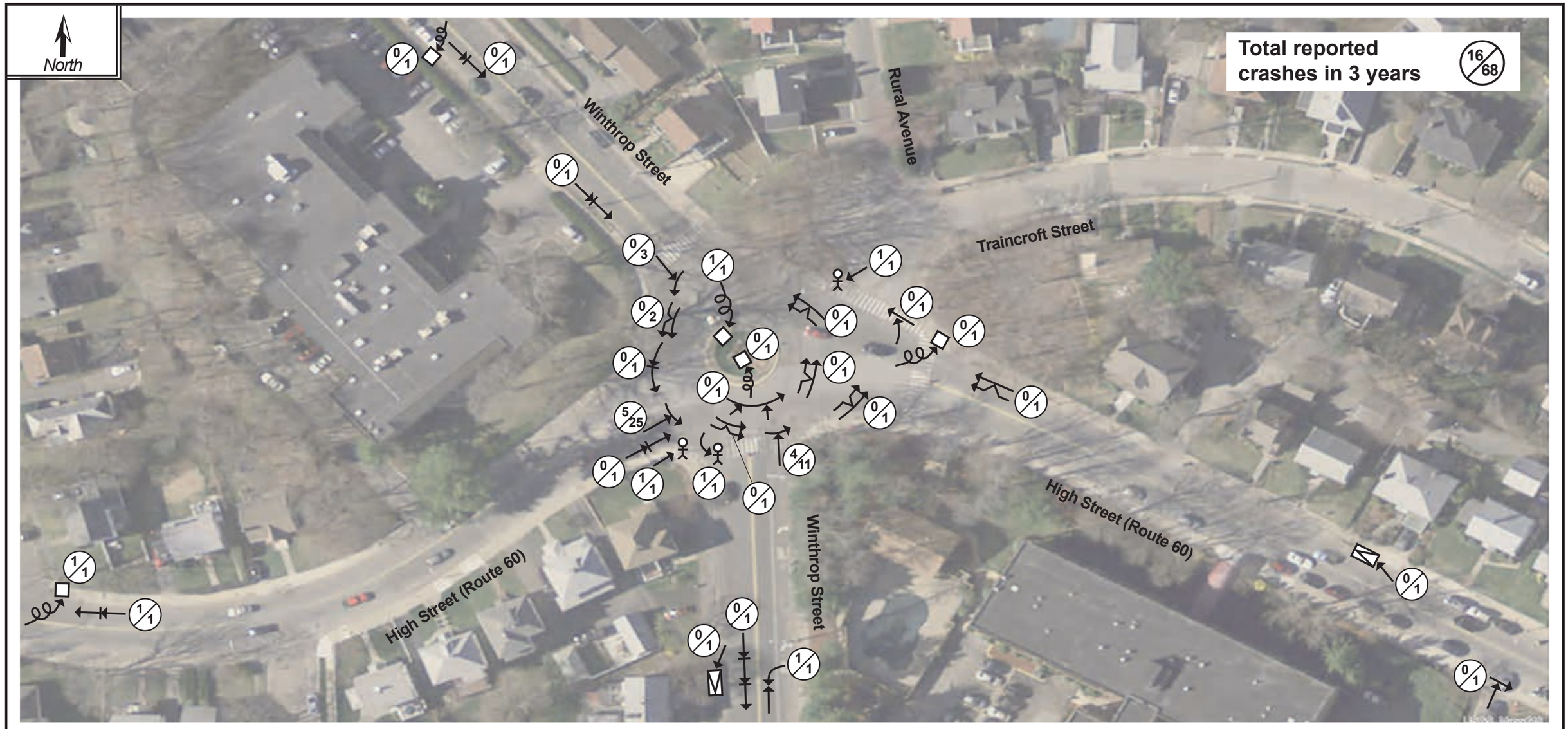
- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

SEVERITY

A/B

- A Number of Injury Crashes
- B Total Number of Crashes

Figure 4
Collision Diagram: High Street at Winthrop Street and Rural Avenue
Medford Police Reports: January 2015–December 2017



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

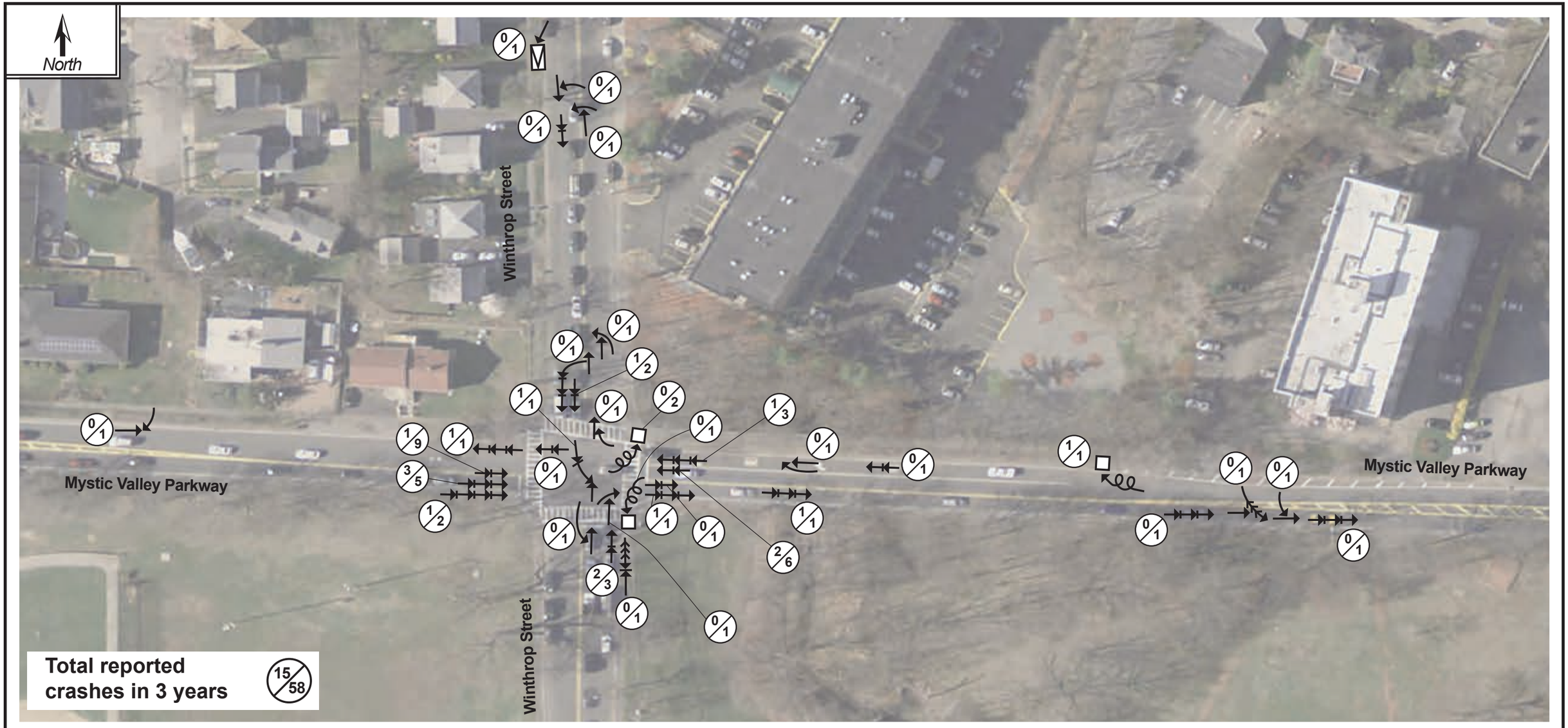
SEVERITY

A/B

A Number of Injury Crashes

B Total Number of Crashes

Figure 5
Collision Diagram: Mystic Valley Parkway at Winthrop Street
MassDOT Crash Data: January 2013–December 2015 and Medford Police Reports: January 2015–December 2017



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

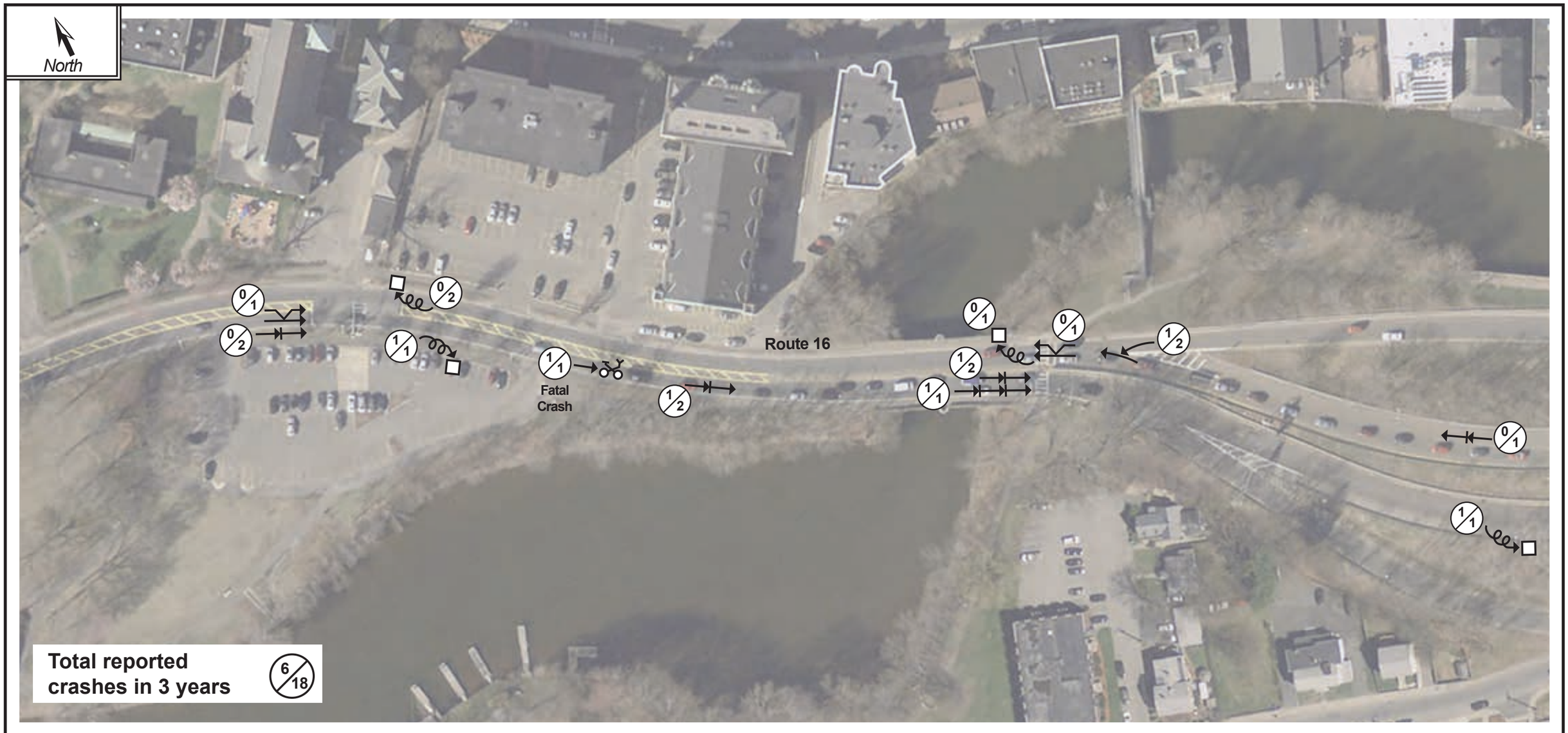
SEVERITY

A/B

A Number of Injury Crashes

B Total Number of Crashes

Figure 6
Collision Diagram: Mystic Valley Parkway between Winthrop Street and Main Street
MassDOT Crash Data: January 2013–December 2015



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

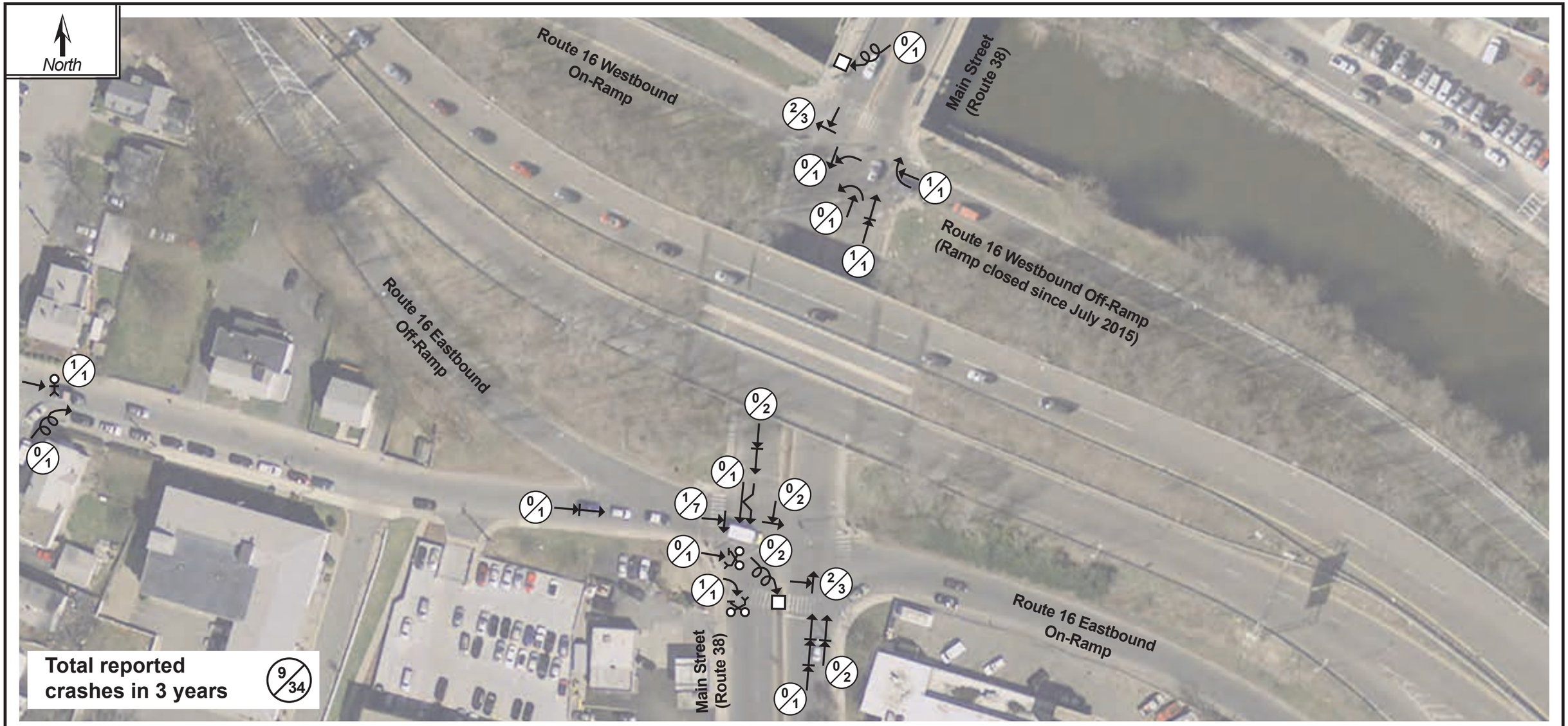
SEVERITY

A/B

A Number of Injury Crashes

B Total Number of Crashes

Figure 7
Collision Diagram: Main Street at Route 16 Ramps
Medford Police Reports: January 2015–December 2017



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

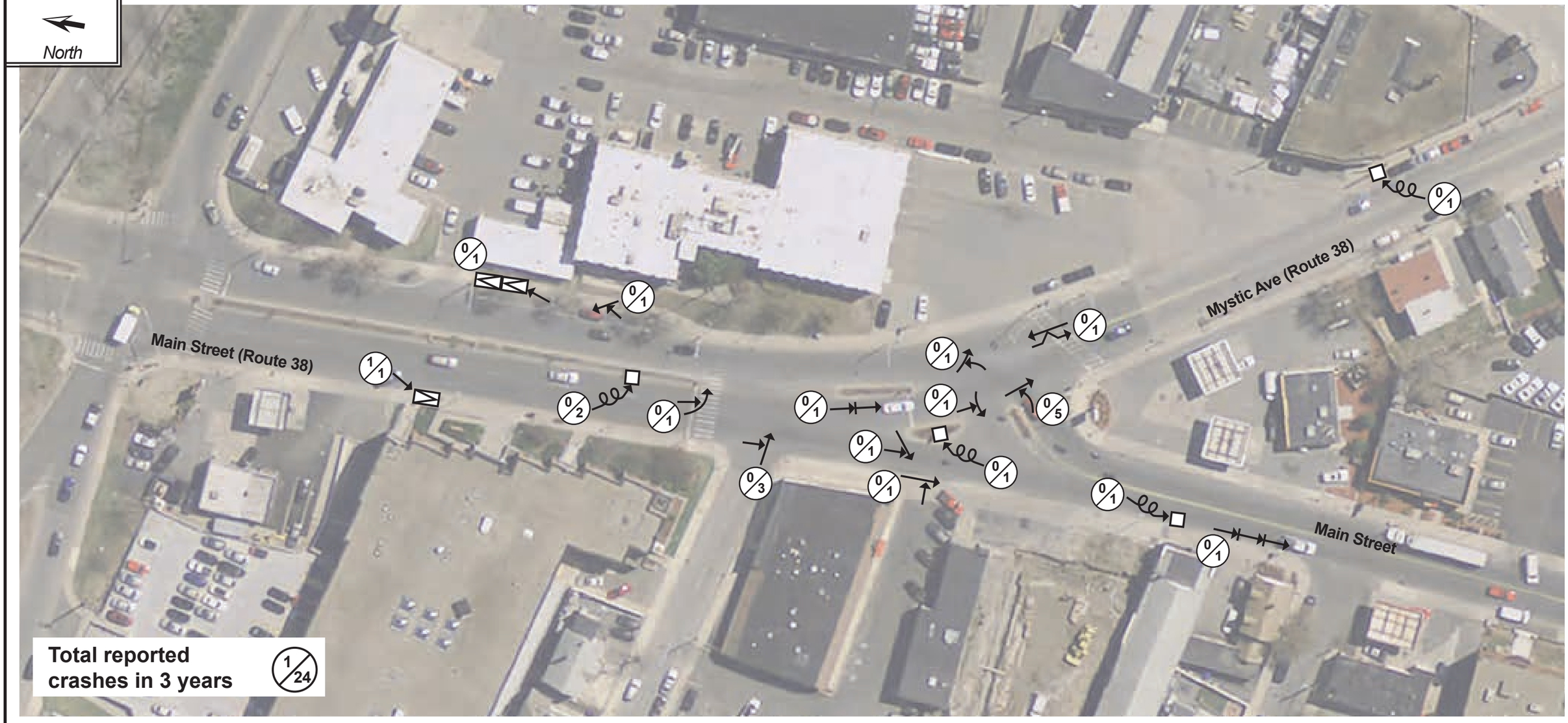
SEVERITY

A/B

A — Number of Injury Crashes

B — Total Number of Crashes

Figure 8
Collision Diagram: Main Street at Mystic Avenue
Medford Police Reports: January 2015–December 2017



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Non-Involved Vehicle
- Pedestiran
- Parked Vehicle
- Fixed Object
- Bicycle
- Animal

TYPES OF CRASH

- Head On
- Angle
- Rear End
- Sideswipe
- Out of Control

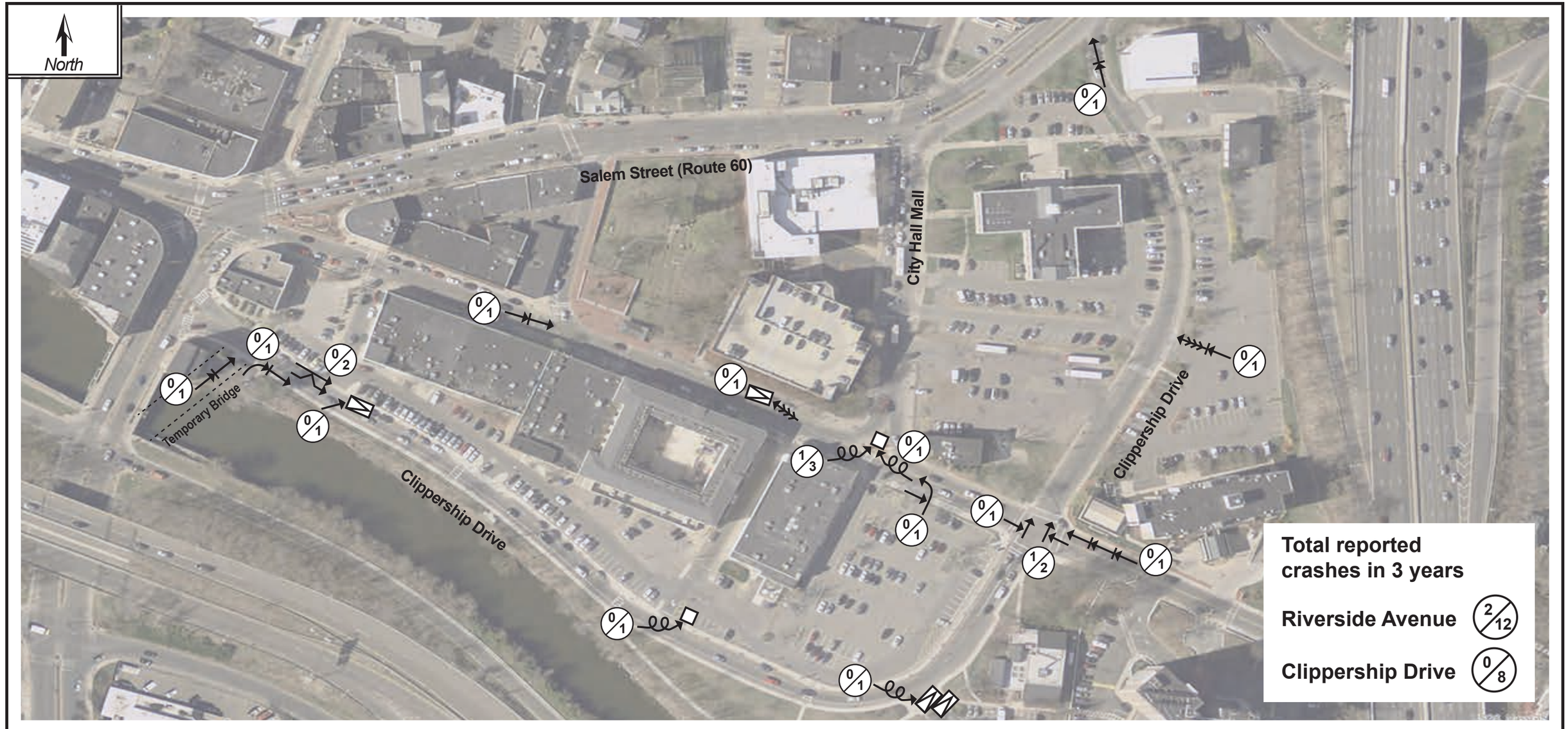
SEVERITY

A/B

A — Number of Injury Crashes

B — Total Number of Crashes

Figure 9
Collision Diagram: Riverside Avenue and Clippership Drive
Medford Police Reports: January 2015–December 2017



SYMBOLS	TYPES OF CRASH	SEVERITY
Moving Vehicle	Head On	A/B
Backing Vehicle	Angle	A Number of Injury Crashes
Non-Involved Vehicle	Rear End	B Total Number of Crashes
Pedestiran	Sideswipe	
Parked Vehicle	Out of Control	
Fixed Object		
Bicycle		
Animal		

Table 1
Crash Statistics: Salem St at City Hall Mall and River St
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		4	3	3	10	3.3
Severity	Property damage only	3	3	0	6	2.0
	Non-Injury	0	0	0	0	0.0
	Non-fatal injury	0	0	0	0	0.0
	Fatality	1	0	0	1	0.3
Collision type	Single vehicle	2	0	1	2	0.7
	Rear-end	0	1	1	2	0.7
	Angle	1	1	0	3	1.0
	Sideswipe	1	1	1	3	1.0
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		0	0	0	0	0.0
Involved cyclists(s)		0	0	0	0	0.0
Occurred during weekday peak periods*		1	1	1	3	1.0
Wet or icy pavement conditions		0	3	1	4	1.3
Dark conditions (lit or unlit)		0	1	0	1	0.3

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 2
Crash Statistics: Salem St at High St and Main St
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		21	18	14	53	17.7
Severity	Property damage only	18	16	12	46	15.3
	Non-Injury	0	0	1	1	0.3
	Non-fatal injury	3	2	1	6	2.0
	Fatality	0	0	0	0	0.0
Collision type	Single vehicle	7	8	6	21	7.0
	Rear-end	6	5	2	13	4.3
	Angle	3	1	1	5	1.7
	Sideswipe	5	4	5	14	4.7
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		1	2	1	4	1.3
Involved cyclists(s)		0	0	0	0	0.0
Occurred during weekday peak periods*		2	5	5	12	4.0
Wet or icy pavement conditions		1	2	4	7	2.3
Dark conditions (lit or unlit)		5	5	6	16	5.3

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 3
Crash Statistics: High St at Salem St and Winthrop St
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		13	13	8	34	11.3
Severity	Property damage only	11	12	8	31	10.3
	Non-Injury	0	0	0	0	0.0
	Non-fatal injury	2	1	0	3	1.0
	Fatality	0	0	0	0	0.0
Collision type	Single vehicle	9	9	6	24	8.0
	Rear-end	1	0	1	2	0.7
	Angle	3	3	0	6	2.0
	Sideswipe	0	1	1	2	0.7
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		1	0	0	1	0.3
Involved cyclists(s)		0	0	0	0	0.0
Occurred during weekday peak periods*		3	4	1	8	2.7
Wet or icy pavement conditions		0	3	2	5	1.7
Dark conditions (lit or unlit)		0	5	2	7	2.3

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 4

Crash Statistics: High St at Winthrop St and Rural Ave
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		18	26	24	68	22.7
Severity	Property damage only	16	16	20	52	17.3
	Non-Injury	0	0	0	0	0.0
	Non-fatal injury	2	10	4	16	5.3
	Fatality	0	0	0	0	0.0
Collision type	Single vehicle	1	7	2	10	3.3
	Rear-end	4	1	1	6	2.0
	Angle	10	17	16	43	14.3
	Sideswipe	3	1	4	8	2.7
	Head-on	0	0	1	1	0.3
Involved pedestrian(s)		0	2	1	3	1.0
Involved cyclists(s)		0	0	0	0	0.0
Occurred during weekday peak periods*		9	9	12	30	10.0
Wet or icy pavement conditions		5	12	5	22	7.3
Dark conditions (lit or unlit)		7	98	11	116	38.7

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 5
Crash Statistics: Mystic Valley Parkway at Winthrop Street
Medford Police Reports: MassDOT Crash Data 2013-15 and Medford Police Reports 2015-17

Statistics Period and Data Sources*		2013 MassDOT	2014 MassDOT	2015 MassDOT	2015 MPD	2016 MPD	2017 MPD	3-Yr. Total	Annual Avg.
Total number of crashes		11	15	18	4	4	6	58	19.3
Severity	Property damage only	8	9	15	3	3	5	43	14.3
	Non-Injury	0	0	0	0	0	0	0	0.0
	Non-fatal injury	3	6	3	1	1	1	15	5.0
	Fatality	0	0	0	0	0	0	0	0.0
Collision type	Single vehicle	0	1	3	0	0	0	4	1.3
	Rear-end	10	13	10	3	2	3	41	13.7
	Angle	1	0	3	1	1	2	8	2.7
	Sideswipe	0	0	1	0	1	1	3	1.0
	Head-on	0	1	1	0	0	0	2	0.7
Involved pedestrian(s)		0	0	0	0	0	0	0	0.0
Involved cyclists(s)		0	0	0	0	0	0	0	0.0
Occurred during weekday peak periods**		4	3	5	2	2	1	17	5.7
Wet or icy pavement conditions		2	3	8	1	0	1	15	5.0
Dark conditions (lit or unlit)		1	8	6	1	2	2	20	6.7

*The data are from two sources: MassDOT Crash Data contains most of the crashes at the intersection and on the Mystic Valley Parkway approaches and Medford Police Department reports covers the crashes on the Winthrop Street approaches.

**Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 6
Crash Statistics: Mystic Valley Parkway between Winthrop Street and Main Street
Medford Police Reports: January 2015 – December 2017

Statistics Period		2013	2014	2015	3-Yr. Total	Annual Avg.
Total number of crashes		5	6	7	18	6.0
Severity	Property damage only	4	2	6	12	4.0
	Non-Injury	0	0	0	0	0.0
	Non-fatal injury	1	3	1	5	1.7
	Fatality	0	1	0	1	0.3
Collision type	Single vehicle	2	2	2	6	2.0
	Rear-end	3	3	4	10	3.3
	Angle	0	0	1	1	0.3
	Sideswipe	0	1	0	1	0.3
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		0	0	0	0	0.0
Involved cyclists(s)		0	1	0	1	0.3
Occurred during weekday peak periods*		2	1	1	4	1.3
Wet or icy pavement conditions		2	0	1	3	1.0
Dark conditions (lit or unlit)		2	3	3	8	2.7

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 7
Crash Statistics: Main Street at Route 16 Ramps
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		23	7	4	34	11.3
Severity	Property damage only	14	7	3	24	8.0
	Non-Injury	1	0	0	1	0.3
	Non-fatal injury	8	0	1	9	3.0
	Fatality	0	0	0	0	0.0
Collision type	Single vehicle	3	3	1	7	2.3
	Rear-end	4	0	3	7	2.3
	Angle	16	3	0	19	6.3
	Sideswipe	0	1	0	1	0.3
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		1	0	0	1	0.3
Involved cyclists(s)		1	0	0	1	0.3
Occurred during weekday peak periods*		8	2	2	12	4.0
Wet or icy pavement conditions		4	2	0	6	2.0
Dark conditions (lit or unlit)		1	2	0	3	1.0

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 8
Crash Data Summary: Main Street at Mystic Avenue
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		7	8	9	24	8.0
Severity	Property damage only	6	8	9	23	7.7
	Non-Injury	0	0	0	0	0.0
	Non-fatal injury	1	0	0	1	0.3
	Fatality	0	0	0	0	0.0
Collision type	Single vehicle	1	2	3	6	2.0
	Rear-end	4	0	0	4	1.3
	Angle	2	6	5	13	4.3
	Sideswipe	0	0	1	1	0.3
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		0	0	0	0	0.0
Involved cyclists(s)		0	0	0	0	0.0
Occurred during weekday peak periods*		1	2	6	9	3.0
Wet or icy pavement conditions		1	2	3	6	2.0
Dark conditions (lit or unlit)		1	5	4	10	3.3

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

Table 9

Crash Statistics: Riverside Avenue and Clippership Drive
Medford Police Reports: January 2015 – December 2017

Statistics Period		2015	2016	2017	3-Yr. Total	Annual Avg.
Total number of crashes		9	3	8	20	6.7
Severity	Property damage only	7	3	8	18	6.0
	Non-Injury	0	0	0	0	0.0
	Non-fatal injury	2	0	0	2	0.7
	Fatality	0	0	0	0	0.0
Collision type	Single vehicle	6	0	3	9	3.0
	Rear-end	0	2	3	5	1.7
	Angle	3	0	1	4	1.3
	Sideswipe	0	1	1	2	0.7
	Head-on	0	0	0	0	0.0
Involved pedestrian(s)		0	0	0	0	0.0
Involved cyclists(s)		0	0	0	0	0.0
Occurred during weekday peak periods*		5	0	3	8	2.7
Wet or icy pavement conditions		4	1	0	5	1.7
Dark conditions (lit or unlit)		5	0	2	7	2.3

*Peak periods are defined as 7:00-10:00 AM and 3:30-6:30 PM.

APPENDIX H

Comments on Draft Proposed Improvements Presented June 19, 2018

City of Medford

Medford Bicycle Advisory Commission

MassDOT District 4

MassDOT Office of Transportation Planning

City of Medford
Engineering Division
City Hall – Room 300
85 George P. Hassett Drive
Medford, MA 02155

MEMORANDUM

TO: Lauren DiLorenzo, OCD Director

FROM: Todd Blake, Transportation Engineer

SUBJECT: **Medford Square Priority Roadways Improvement Study**

DATE: July 20, 2018

I have reviewed Central Transportation Planning Staff's (CTPS) study and offer the following comments for your use. CTPS did a great job considering the limited time frame and limited scope.

- Please note that any traffic improvements (other than maintenance) would have to be approved by the City's Traffic Commission. Additional approvals will be required for any State-owned roadway or ramp.
- Please include a sentence regarding the pros/cons for bicycle and pedestrian accommodations under each prop. alt.
- Please note if prop. traffic signals require vehicle detection.

Figure 1:
- Consider labelling and indicating the direction for travel for Roland G. Pothier Way & East Transit Way; these connections are included in the Synchro files

Figure 2:
- Consider labeling all non-signalized crosswalks crossing the major streets.
- The crosswalk crossing Riverside Ave. at River St. is on the west side, there is another crosswalk east of River St.
- The shared use dirt path along the north side of the Mystic River is not shown.

Figures 3-9:
- Consider adding "2017" or "Existing" to the title of the figure
- The notes have a typo; December 7, 2018 should be December 7, 2017.

Horizon of improvements
- 0-5 years may be more appropriate/reasonable
- >5 or >10 years may be more appropriate/reasonable

Salem Street at City Hall Subarea

- Alt. 1 - Consider revising the language regarding pedestrian phasing to be more descriptive

Winthrop Street:

- High Street at Winthrop Street
  - Jurisdiction issues will need to be considered when coordinating with Rte. 16 at Winthrop St
  - Consider shorter crossings distances instead of some of the very short left or right turn lanes.
  - Consider bicycle lanes instead some of the very short left or right turn lanes.
  - Some studies suggest that roundabouts are safer than traffic signals, therefore, consider analyzing the roundabout using SIDRA (instead of SYNCHRO) – it may show less of a LOS difference between options

Main Street Corridor:

- Main Street and Route 16 Ramps
  - All options to signalize these two intersections would likely improve safety for all road users. Interconnection must be provided. A closed loop system is preferable with the master controller located in Medford Sq.
  - Alt. 1A or 1B appear to be acceptable
  - The City supports further study of Alternative 2
  - Pedestrian phasing (exclusive, concurrent, or none) should be included in the text when describing the alts.

- Main Street and Mystic Avenue
  - Consider bicycle accommodations as well as vehicle and pedestrian accommodations.
  - Consider reducing the crossing distances of existing pedestrian crossings.
  - All options appear to include an exclusive pedestrian phase. Please describe this improvement in the report.

Mystic Valley Parkway:

- Please mention that Mystic Valley Parkway (Route 16) is a State (DCR) owned and operated roadway.
- Consider mentioning the entire corridor; the pavement may be underutilized with long stretches of hatched areas.

- Route 16 at Winthrop Street
  - Consider providing a figure for Alt. 2 so readers can visual the difference between alts.
  - For Alt.2, the word "would" should be revised to "may". Rte. 16 (west of the study area) has a similar road width to Rte. 16 in the study area. The extra lanes required for Alt. 2 may be just a restriping effort and may not require extra ROW/and takings.
  - Alt. 2 produces the best average delay, LOS, and queues in both peak hours; it should be the preferred alt.
  - Consider adding curb extensions on the north side of Winthrop Street receiving lane.
  - All 3 alts. include an exclusive pedestrian phase.
  - It is unclear what bicycle accommodations are provided for each alternative.

- Consider Allowing Trucks on Route 16 (east of Winthrop St. to I-93)
  - Further study and evaluation of this alternative is warranted to alleviate truck traffic on High St. and South St.
  - Please mention other exceptions to the rule regarding DCR roadways being restricted to truck (heavy vehicle) traffic. It is my understanding that Route 16, between Route 2 and Massachusetts Ave. allows truck traffic.

High Street:

- The Library crosswalk signal equipment should be upgraded. However, the timing is adequate given this crossing is highly used by vulnerable populations. Studies have shown that elderly and schoolchildren require more time to cross than the average 3.5 ft/sec which is typical of most crosswalks.
- Sharrows should be a recommended short-term improvement (per Bicycle Infrastructure Master Plan).

- High Street at Governors Avenue
  - We should consider signalization, however, the queues for the WB traffic should be monitored to not interfere with the Medford Sq. traffic signal.
  - According to the analyses, the pref. alt. includes the addition of a 100-foot right turn lane on Governor's Ave. This would require losing approx. 5 parking spaces (incl. 2 accessible spaces and a loading zone).
  - Signalization includes an exclusive pedestrian phase which should be noted.

Proposed Implementation Priorities:

- Add a recommendation to request a ramp study from MassDOT to examine the implications of closing the Route 16 WB off-ramp

From: patbibbins
Sent: Friday, July 20, 2018 1:38 PM
To: cwang@ctps.org; mabbott@ctps.org
Cc: Todd Blake; Medford Bike Commission
Subject: Medford Square Draft Traffic Study

The Medford Bicycle Advisory Commission has had the opportunity to review the draft study and have prepared the comments below for your consideration.

We're very excited to see this process move forward, and should you have any questions or need clarification on anything please let me know.

—Patrick Bibbins
Chairperson, Medford Bicycle Advisory Commission
671-680-5683

GENERAL COMMENTS:

- Bicycle and pedestrian flow and safety appear to be a lower priority than motorized vehicles in this document. We recommend amending the Study to include alternatives analyses for bicycle flow and safety. Alternatives for bicycles might include contra-flow scenarios and separated facilities to simplify and improve lawful movement throughout Medford Square.
- Many of the intersections in the selected alternatives have single lane travel transitioning into multiple lanes for turning and queueing and how bicycle travel is intended at these locations is sometimes unclear. Each transition is unique, and solutions for bicycle accommodation will likely be specific to each scenario, but solutions might include "bike boxes" for bicycle queueing, transitions from bike lanes to sharrows or "super-sharrows" being placed at entrances to lanes.
- We recommend the Study be amended to include, for each alternative, the impacts to bicycle and pedestrian movements. These should be documented and considered when selecting recommended alternatives.
- We feel that the use of curb extensions, or "bump-outs", throughout the Study area would be of benefit to bicyclists as well as pedestrians.

MAIN SQUARE INTERSECTION (High, Forest, Salem, Riverside & Main)

- The Study does not include looking at a traffic circle (or other innovative approach). The Study should be amended to include looking at a traffic circle, or other innovative approach to Medford's major downtown intersection
- Clarify what is meant by “no Turn on Red” on Main Street.
- What are the impacts to bike and pedestrian movements on recommended alternative?
- It appears that Alternative #1 does not propose improvements to pedestrian or bicycle flows. Improvements to pedestrian and bicycle flow should be considered a priority.
- Consider exclusive bicycle signals and infrastructure at two movement locations: Main Street to Forest Street directly through intersection (to eliminate forcing a bicycle to loop all the way around the square); and taking a left onto Forest from High Street (to eliminate the loop around Medford Square).

MAIN STREET CORRIDOR

- Short Term: include actuated signal at both crosswalks on Main Street. The existing crosswalks can be unusable at times due to traffic volume.
- Clarify the intent to recommend bike lanes on Main Street. Shoulders are different than bike lanes. Shoulders appear to be drawn in the alternative. When approaching intersections with multiple turning and through lanes, the bike lane should stop before the intersection allowing a transition space for maneuvering to the desired lane, or the bike lane should go to a place dedicated for bike queueing (bike box) at the front of the queue. If the bike lane is to end, sharrows (or super sharrows) should be placed at the beginning of each turning and through lane.
- Clarify 4 phase for signaling.
- Consider improvements that will reduce right-turn pedestrian conflict in crosswalk (current issue).
- Consider putting the main Medford Square intersection on the same controller as the signals in the Main Street corridor.

MYSTIC and MAIN STREET

- There appears to be a bike lane going southbound that does not accommodate a left onto Mystic for a bike. A bicycle lane may not be the best solution at this location.

MYSTIC VALLEY PARKWAY

- The Pedestrian signal on the bridge. Change the operation to be green/yellow/red instead of flashing yellow to red.
- The connectivity of the newly installed multi-use path across Winthrop Street is poor. Consider a dedicated raised crossing set back from intersection for the multi-use path. Install appropriate way finding for the path system through this intersection.
- What is the rational for recommending Alternative one (1)? Land transfers and potential road widening that Alternative two (2) may require has benefits that are significant and should be considered.

WINTHROP STREET

- Clarify there are adequate sharrows. Sharrows should be added to all lanes approaching the rotary.
- Alt 1: Does the queue at Mystic Valley Parkway impact the performance of Alt 1? Was this queue considered in the analysis? If not, it should be considered.
- Alt 1 is a full reconstruction so the following should be considered: more robust bicycle infrastructure; Bike “boxes” (green waiting zones); dedicated through and turning lanes for bikes. Protected and separated cycle-tracks, etc. A full reconstruction is an opportunity to take full advantage of multi-modal and Compete Street design.

HIGH STREET

- Consider removing parking from one side to accommodate bike lanes. In lieu of that, sharrows and signal should be installed.

Chen-Yuan Wang

From: Raphael, Connie J. (DOT)
Sent: Friday, July 6, 2018 3:54 PM
To: Chen-Yuan Wang
Subject: FW: Medford Square improvement Study

HI Chen-Yuan,

Here are some comments on the Medford Square study. I will be out of the office the beginning of next week. If you have any questions please call or e-mail Sara Timoner.
Thanks

Connie

From: Timoner, Sara (DOT)
Sent: Friday, July 6, 2018 3:49 PM
To: Raphael, Connie J. (DOT) <Connie.Raphael@dot.state.ma.us>
Subject: Medford Square improvement Study

Hi Connie,

I finished reviewing the Summary of Findings from the Medford Square Priority Roadway Improvement Study and have the following comments:

- Most intersections are City or DCR owned and operations would not affect DOT roadways.
- Signal timing changes proposed for the Main Street intersections with 'Central Intersection'/Medford Square, the Rt 16 Eastbound and Westbound Ramps, and Main Street at Mystic, should include coordination between these four intersections.
- Based on the capacity analysis table, installing a signal at the Main Street/Westbound Ramps intersection will result in queueing into the Medford Square Central Intersection under all alternatives.
- Based on the capacity analysis table, reconstructing the signal at the Main Street/Mystic Ave intersection to put southbound traffic on Main Street under stop control will result in queueing into the Main Street/Westbound Ramps intersection under all alternatives.
- Proposed signal timings along the corridor will need to be adjusted once the Rt 16 EB off-ramp is reopened.

Thanks,
Sara

Sara L. Timoner|Traffic Engineer|MassDOT|Highway Division|District 4
519 Appleton Street|Arlington, MA 02476|p.(781)641-8435|f.(781)646-5115|www.mass.gov/massdot

Chen-Yuan Wang

From: Gascon, Cassandra (DOT)
Sent: Thursday, July 5, 2018 8:37 AM
To: Chen-Yuan Wang
Subject: RE: Medford Square Study Meeting 6/19/2018 Follow-up

Hi Chen,

Please see OTP's comments below regarding this study:

- For the central intersection, can opportunities to better facilitate south to north movements by vehicles/bicyclists/pedestrians be explored? This may alleviate congestion from intersections to the east as vehicles are allowed to directly proceed through the intersection to continue north. More clearly, bicyclists would have a clear path of travel through the area and, if the stop line on Salem Street is pulled back, a crosswalk could extend straight across the street instead of requiring a refuge island.
- The sharrows that are shown on some of the renderings are not a sufficient bicycle accommodation unless all other accommodations would be ruled out because of ROW issues. Opportunities for stronger bicycle accommodations should be explored.

Please let me know if you have any questions regarding these comments.

Thanks,
Cassandra

Cassandra Gascon Bligh
Transportation Program Planner
Office of Transportation Planning
Massachusetts Department of Transportation
10 Park Plaza I Suite 4150 I Boston, MA 02116
857-368-8852 I cassandra.gascon@dot.state.ma.us

From: Chen-Yuan Wang [mailto:cwang@ctps.org]
Sent: Wednesday, June 20, 2018 11:39 AM
To: Timoner, Sara (DOT); Raphael, Connie J. (DOT); Clark, Michael (DOT); Gascon, Cassandra (DOT); Sutton, Peter (DOT); Soroka, Val (DCR); Fiala, Josh; mcasey@mapc.org; Clodagh Stoker-Long; Lauren DiLorenzo; Cassandra Koutalidis; Todd Blake; Stephanie M Burke; Mark Abbott; Benjamin Erban; Mark Shea; Bruce Kulik; Sacco, Leo A. Jr.; Steven Randazzo; Frank Gilberti; Brian Kerins; ewhalen@medfordpolice.com
Subject: Medford Square Study Meeting 6/19/2018 Follow-up

Dear Study Advisory Members,

Thank you for participating our meeting yesterday. We got many helpful inputs for this study. Per our discussions, attached please find three files:

1) Synchro analysis reports, including the projected volumes used for the City Subarea alternatives and the Main St/Route 16 Ramps alternatives
2) Updated summary of findings and proposed improvements and Synchro analysis tables (a couple changes in the tables from the first draft we sent on 6/15)

3) Turning Movement Counts used in the study (for your interest in further examination of pedestrian, bicycle, and heavy vehicle counts)

Again, thank you for your participation and inputs. Let us know if you need more information or have any questions. Please send us your comments on the study analyses and proposed improvements by July 9, so we can include them in the draft report.

Best Regards, Chen-Yuan Wang

Chen-Yuan Wang | Chief Transportation Planner
CENTRAL TRANSPORTATION PLANNING STAFF
857.702.3698 | cwang@ctps.org
www.ctps.org/bostonmpo

APPENDIX I

Proposed Short- and Long-Term Pedestrian Signal Phasing Improvements
Medford Square Central Intersection

Proposed Pedestrian Signal Phasing Changes at Central Intersection

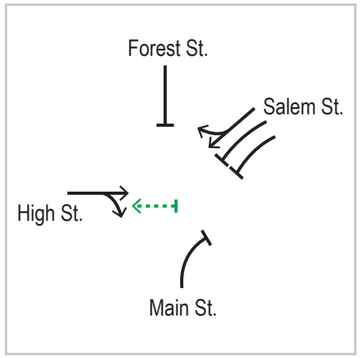
Existing Setting

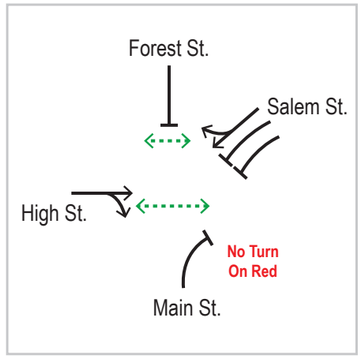
Proposed Setting

Short-Term: Existing Signal Equipment

Long-Term: Updated Signal Equipment

Phase 1





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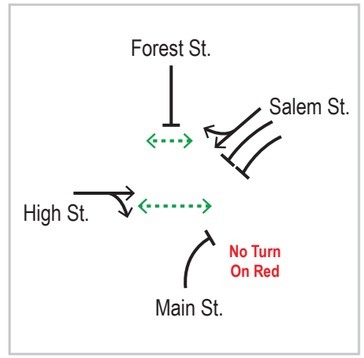

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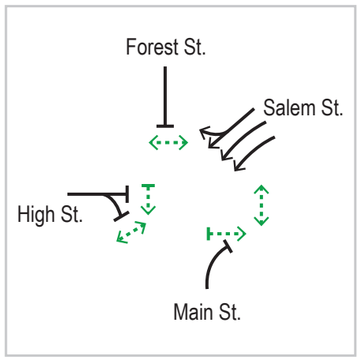

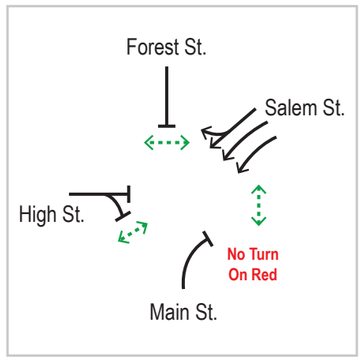

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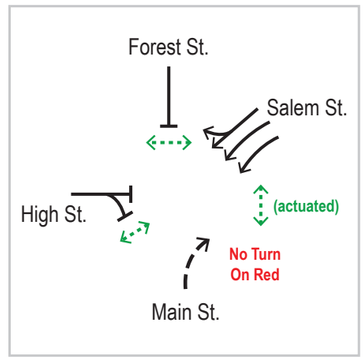

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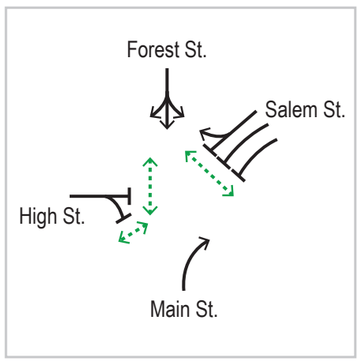

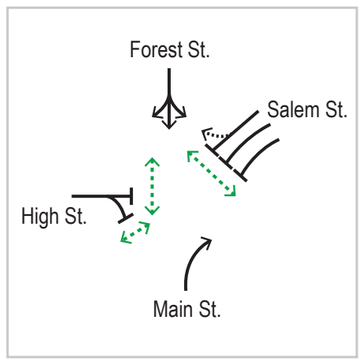

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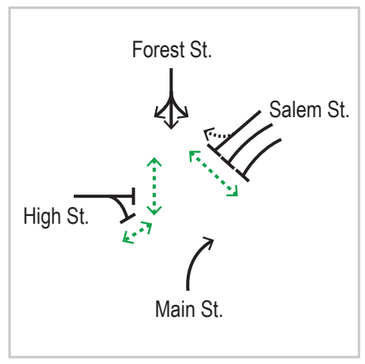
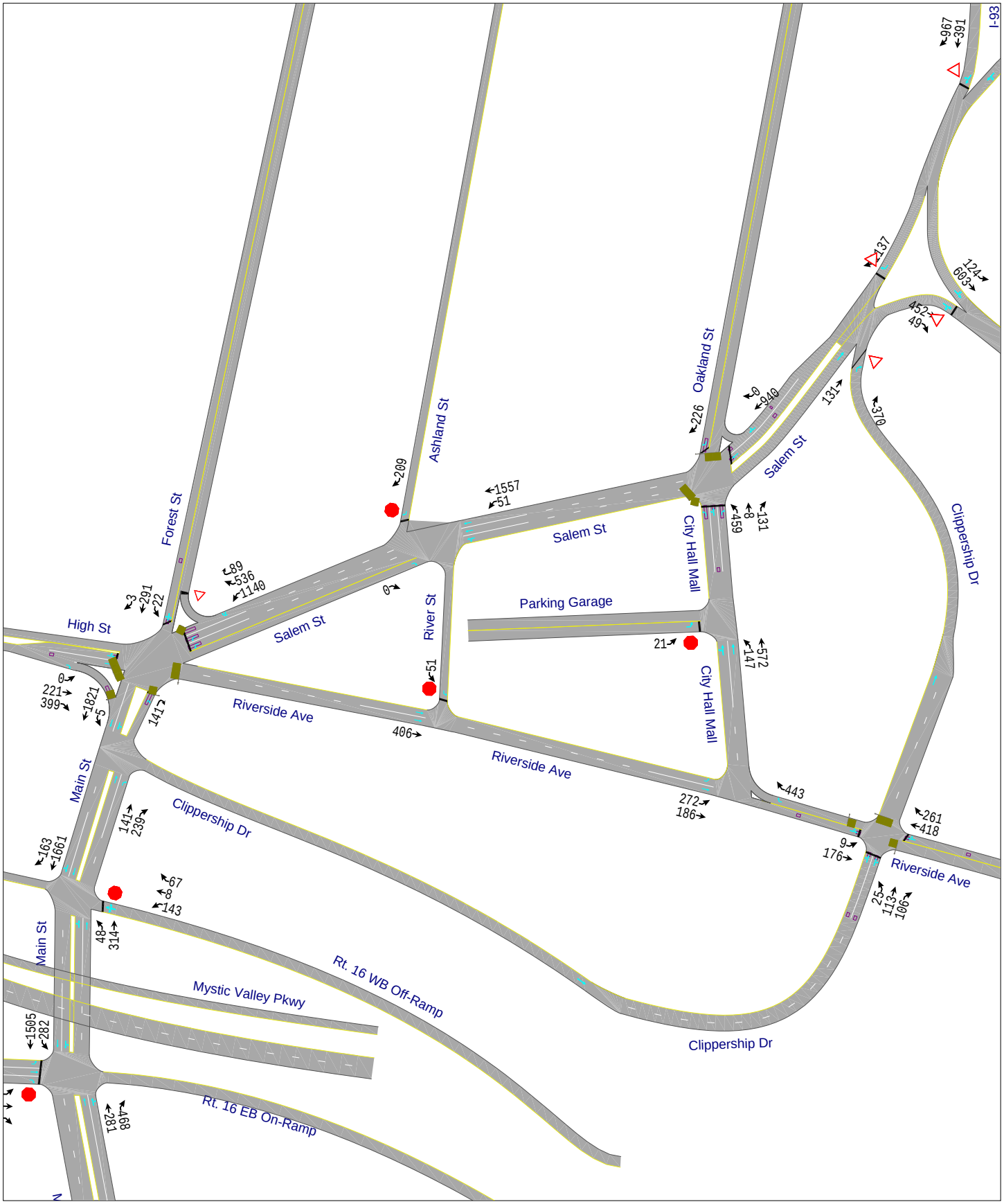


APPENDIX J

City Hall Subarea Traffic Circulation Alternatives
2040 Traffic Volume Projections (AM/PM Peak Hour)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Oakland St
Salem St
Forest St
High St
River St
City Hall Mall
Parking Garage
Riverside Ave
Clippership Dr
Main St
Mystic Valley Pkwy
Rt. 16 WB Off-Ramp
Rt. 16 EB On-Ramp
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124
693
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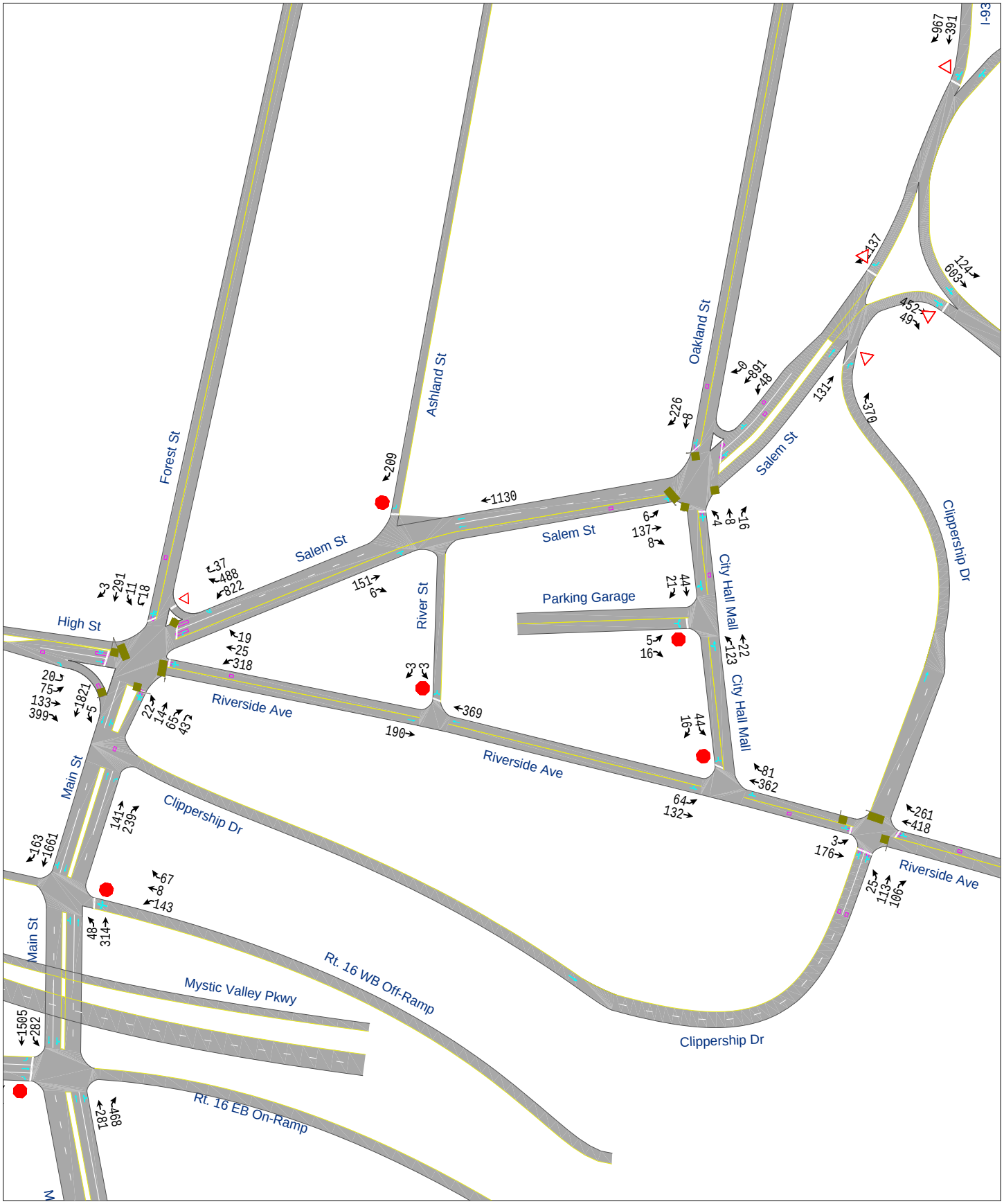
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Riverside Ave
Riverside Ave
Riverside Ave
Main St
Main St
Mystic Valley Pkwy
Rt. 16 WB Off-Ramp
Rt. 16 EB On-Ramp
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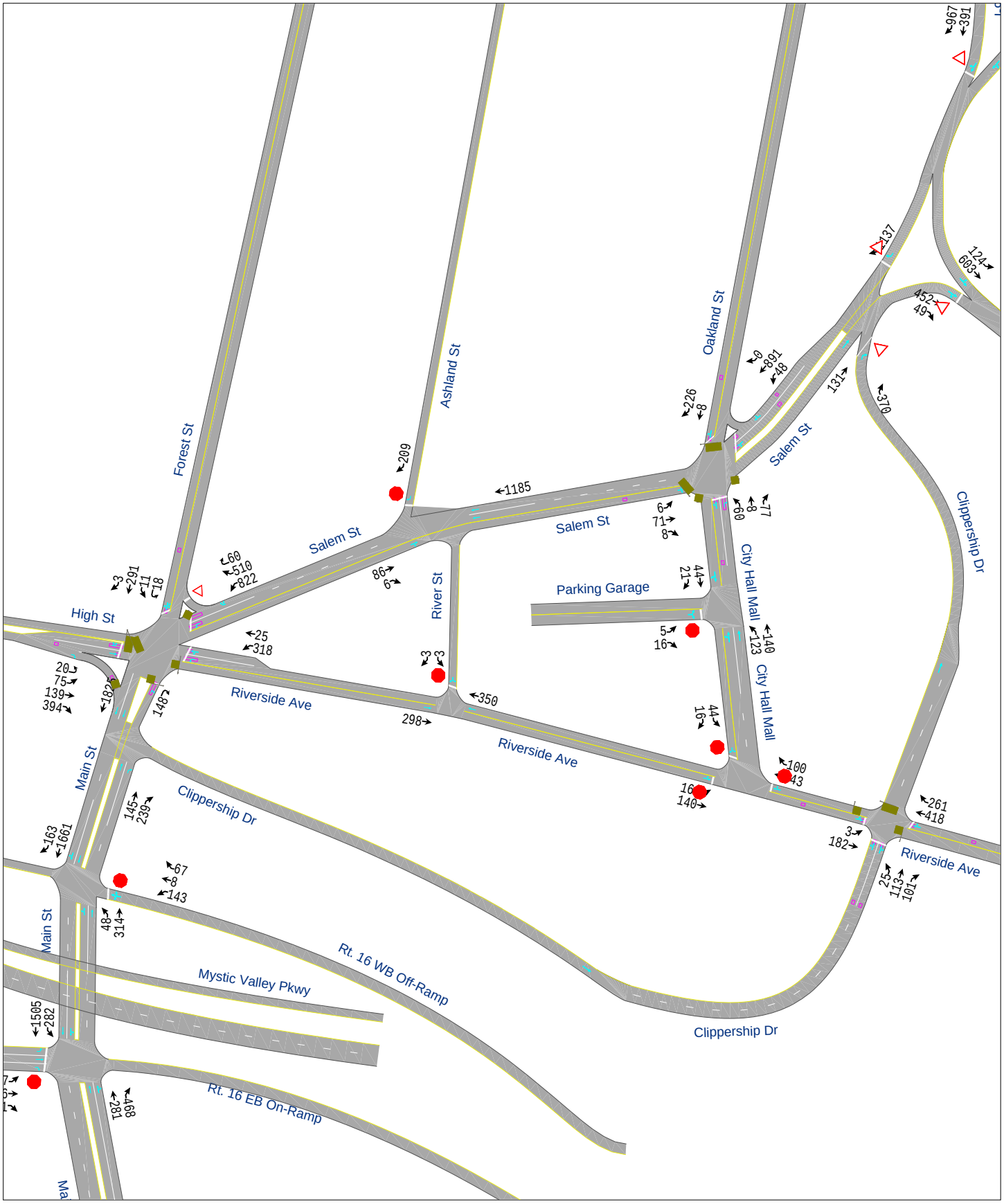
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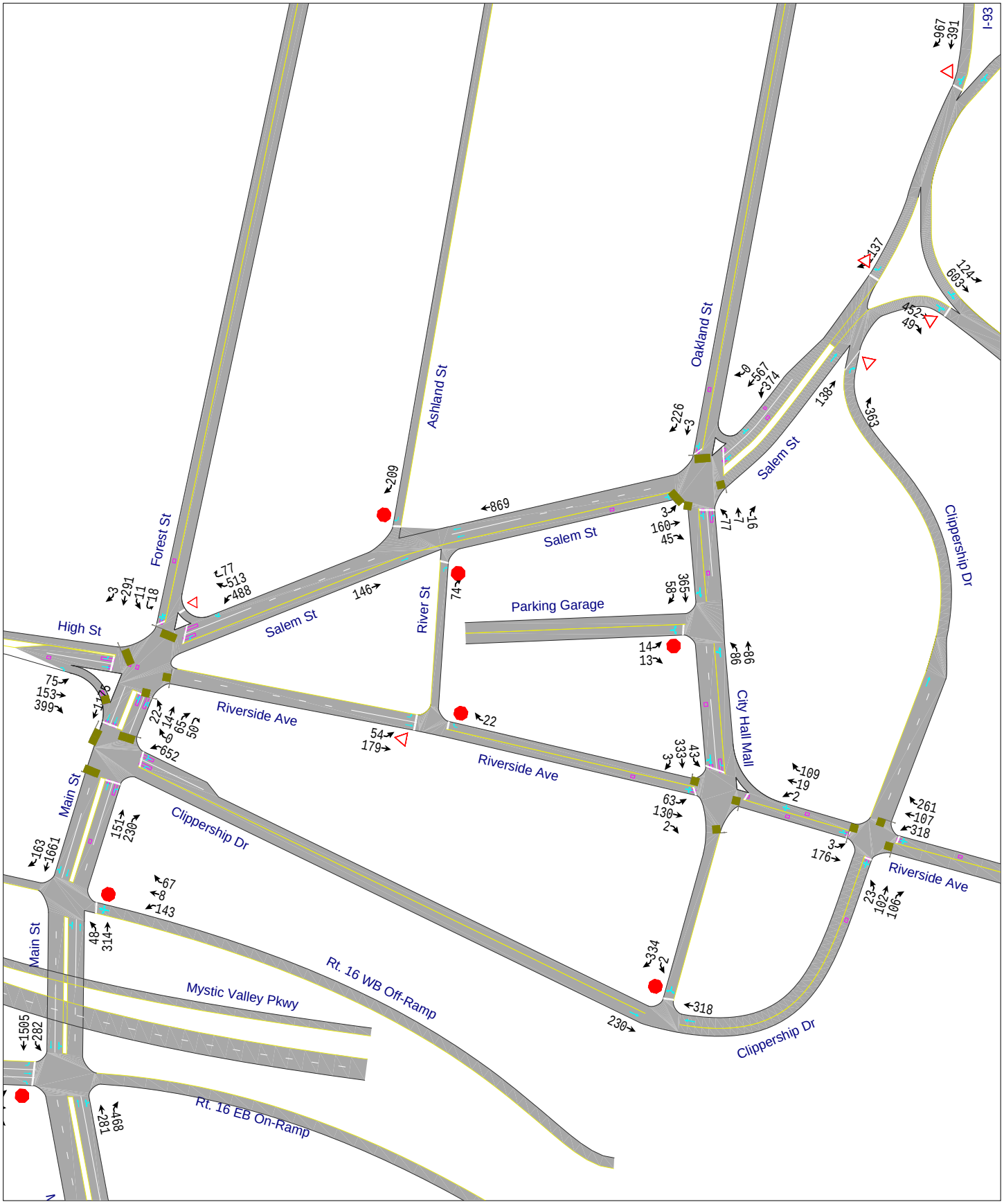
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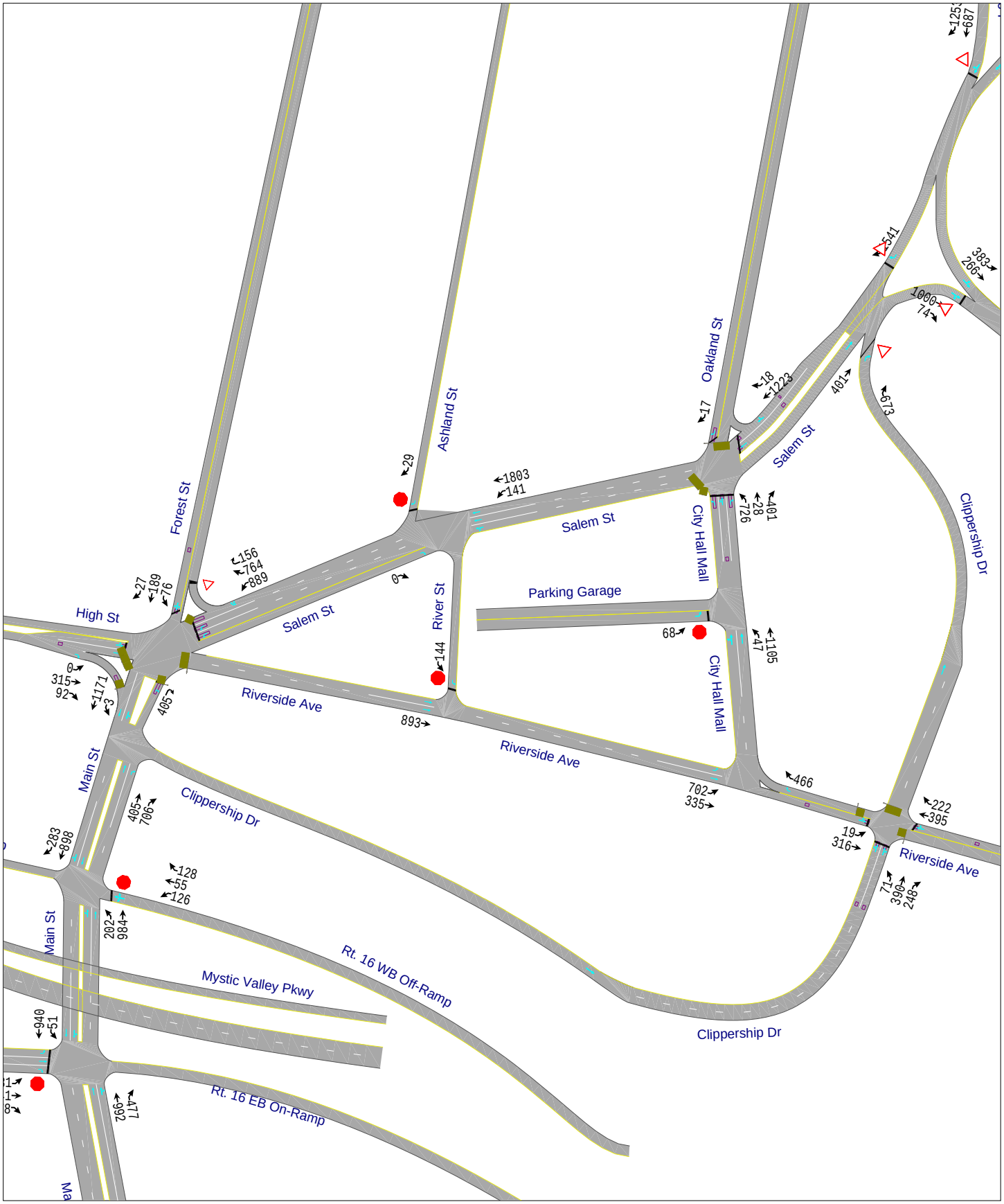
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Oakland St
Salem St
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Salem St
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City Hall Mall
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Clippership Dr
Clippership Dr
High St
River St
Parking Garage
Riverside Ave
Riverside Ave
Riverside Ave
Main St
Main St
Mystic Valley Pkwy
Rt. 16 WB Off-Ramp
Rt. 16 EB On-Ramp
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764
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189
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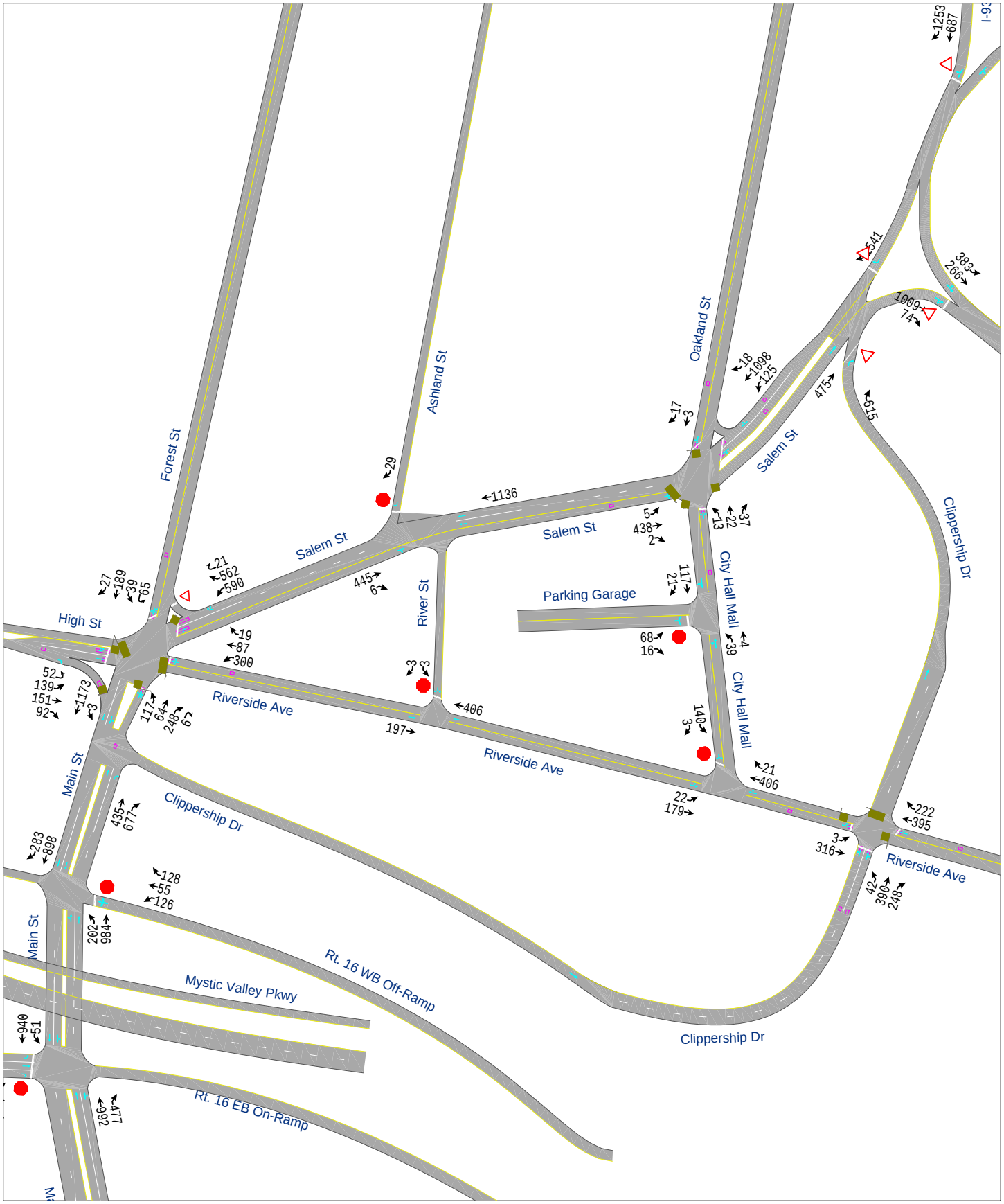
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City Hall Mall
Clippership Dr
Clippership Dr
Clippership Dr
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Riverside Ave
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Mystic Valley Pkwy
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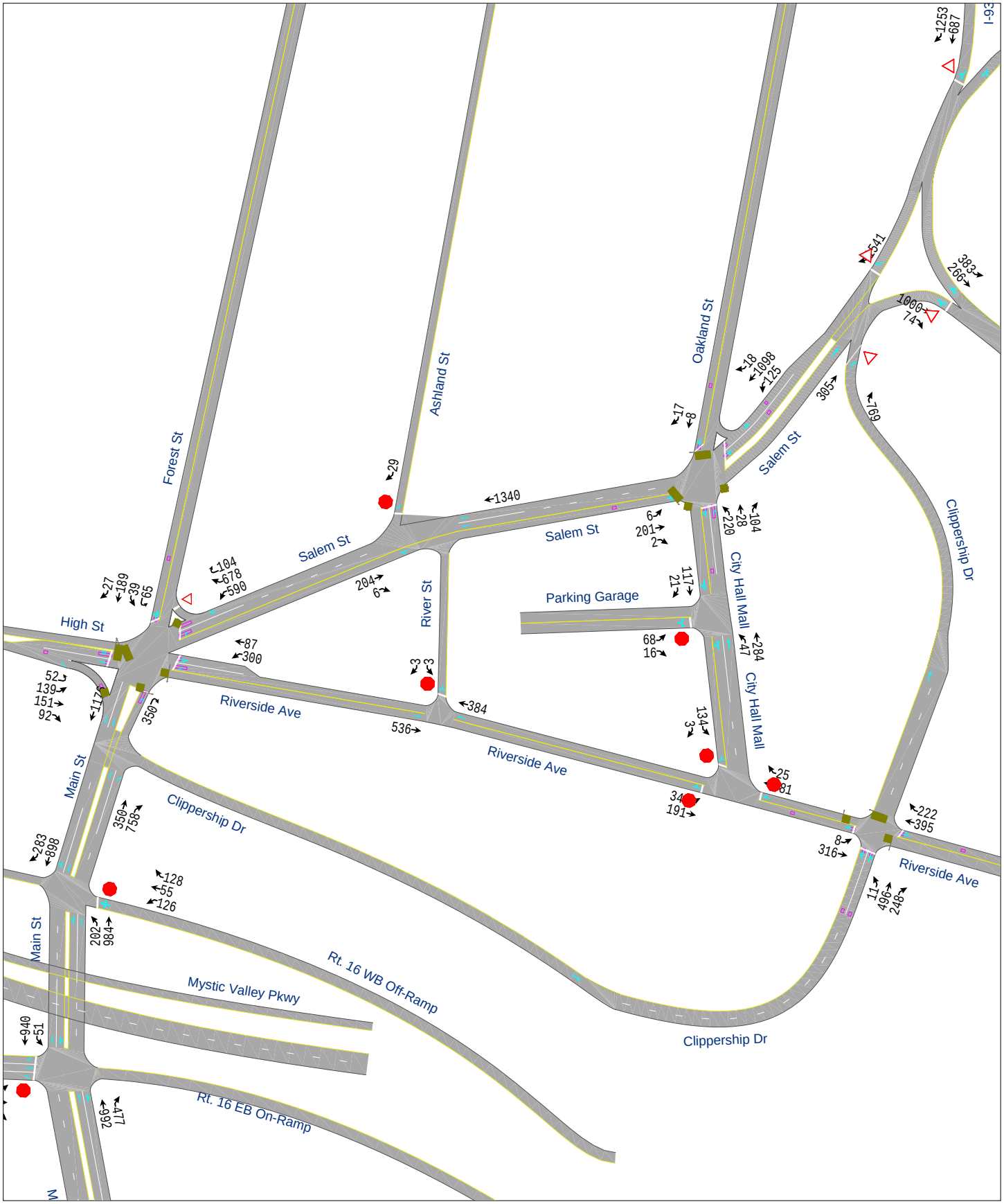
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Clippership Dr
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Mystic Valley Pkwy
Rt. 16 EB On-Ramp
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65
104
678
590
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87
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3
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139
151
92
117
350
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134
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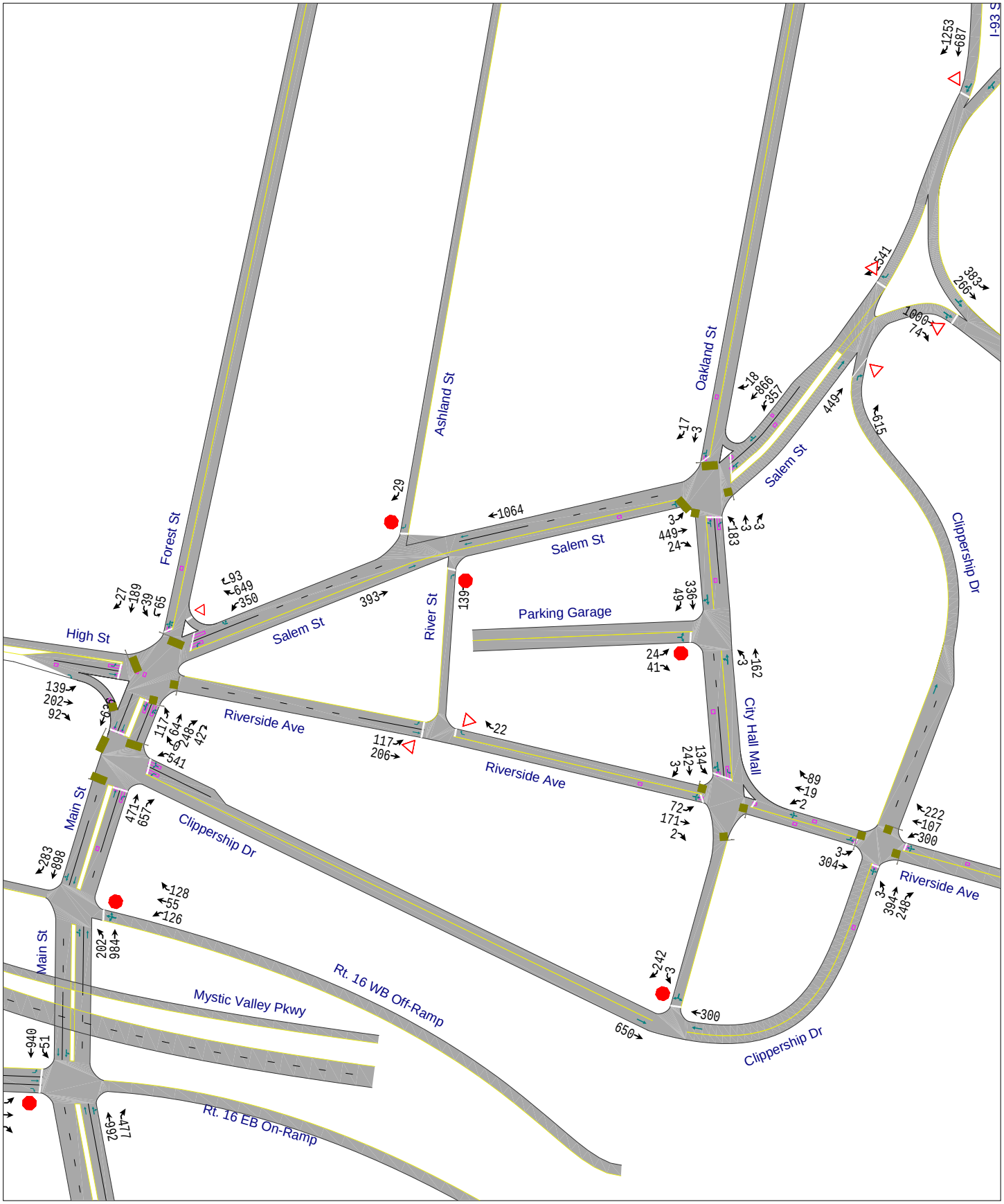
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Parking Garage
Riverside Ave
Riverside Ave
Riverside Ave
City Hall Mall
Clippership Dr
Clippership Dr
Clippership Dr
Main St
Main St
Mystic Valley Pkwy
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Rt. 16 EB On-Ramp
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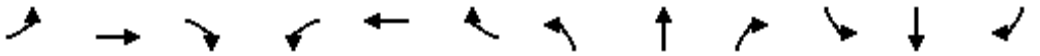
APPENDIX K

City Hall Subarea Traffic Circulation Alternatives
2040 AM/PM Peak Hour Intersection Capacity Analyses

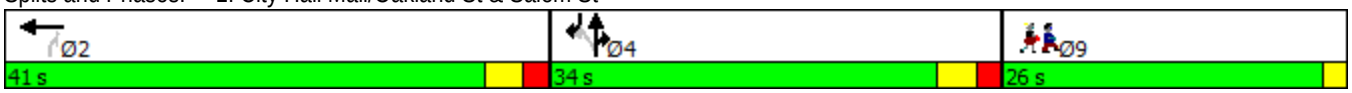


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	895	0	437	8	125	0	0	215
Future Volume (vph)	0	0	0	0	895	0	437	8	125	0	0	215
Satd. Flow (prot)	0	0	0	0	3094	0	1470	1484	1298	0	0	1479
Flt Permitted							0.950	0.956				
Satd. Flow (perm)	0	0	0	0	3094	0	1464	1479	1298	0	0	1479
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)						6	4					4
Peak Hour Factor	0.25	0.25	0.25	0.25	0.77	0.92	0.86	0.40	0.82	0.92	0.25	0.70
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	0%	0%	5%	2%	5%	0%	12%	2%	0%	0%
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	0	0	0	0	1220	0	278	277	160	0	0	323
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					41.0		34.0	34.0	34.0			34.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					36.8		29.6	29.6	74.9			29.6
Actuated g/C Ratio					0.43		0.35	0.35	0.88			0.35
v/c Ratio					0.92		0.55	0.54	0.14			0.63
Control Delay					37.7		30.5	30.2	3.7			33.2
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					37.7		30.5	30.2	3.7			33.2
LOS					D		C	C	A			C
Approach Delay					37.7			24.4			33.2	
Approach LOS					D			C			C	
Queue Length 50th (ft)					242		100	100	0			115
Queue Length 95th (ft)					#463		247	96	49			210
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1332		508	512	1138			512
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					0.92		0.55	0.54	0.14			0.63

Intersection Summary	
Cycle Length: 101	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 32.8	Intersection LOS: C
Intersection Capacity Utilization 71.7%	ICU Level of Service C
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

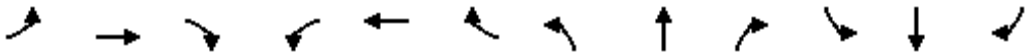
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2
Lane Configurations									
Traffic Volume (vph)	210	380	134	21	277	3	1086	510	85
Future Volume (vph)	210	380	134	21	277	3	1086	510	85
Satd. Flow (prot)	1555	1398	1422	0	1659	0	3060	1360	0
Flt Permitted					0.995		0.950		
Satd. Flow (perm)	1555	1398	1422	0	1654	0	2882	1360	0
Satd. Flow (RTOR)		139	734					89	
Confl. Peds. (#/hr)		19	16	16		26	19	26	41
Peak Hour Factor	0.72	0.90	0.90	0.58	0.95	0.75	0.96	0.84	0.81
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	10%	4%	4%	9%	1%	33%	3%	7%	6%
Shared Lane Traffic (%)									
Lane Group Flow (vph)	306	443	156	0	348	0	1188	748	0
Turn Type	NA	Prot	Prot	Perm	NA		Prot	Prot	
Protected Phases	6	6	4		8		5	2	
Permitted Phases				8					
Total Split (s)	30.0	30.0	34.0	34.0	34.0		46.0	76.0	
Total Lost Time (s)	5.0	5.0	12.0		12.0		5.0	5.0	
Act Effct Green (s)	25.0	25.0	22.0		22.0		41.0	71.0	
Actuated g/C Ratio	0.23	0.23	0.20		0.20		0.37	0.65	
v/c Ratio	0.87	1.04	0.18		1.05		1.04	0.82	
Control Delay	65.7	84.6	0.5		107.8		72.8	22.3	
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	65.7	84.6	0.5		107.8		72.8	22.3	
LOS	E	F	A		F		E	C	
Approach Delay	76.9				107.8		53.3		
Approach LOS	E				F		D		
Queue Length 50th (ft)	209	~258	0		~269		~469	328	
Queue Length 95th (ft)	238	#459	0		#452		#600	447	
Internal Link Dist (ft)	490				1749		402		
Turn Bay Length (ft)		60							
Base Capacity (vph)	353	425	871		330		1140	909	
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	0.87	1.04	0.18		1.05		1.04	0.82	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 62.2	Intersection LOS: E
Intersection Capacity Utilization 94.7%	ICU Level of Service F
Analysis Period (min) 15	
Description: 129, 224, 201	

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St

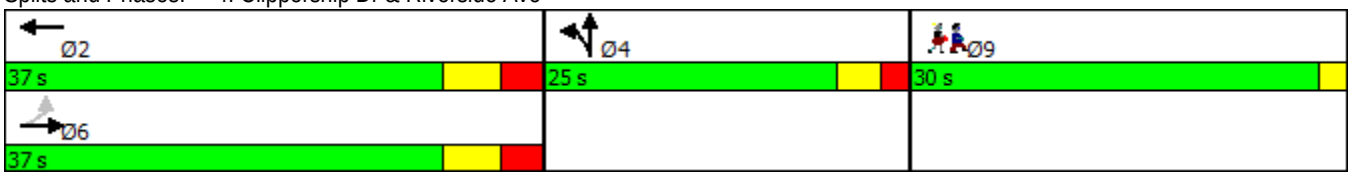


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	168	0	0	398	249	24	108	101	0	0	0
Future Volume (vph)	9	168	0	0	398	249	24	108	101	0	0	0
Satd. Flow (prot)	0	1498	0	0	1548	0	0	2695	0	0	0	0
Flt Permitted		0.830						0.994				
Satd. Flow (perm)	0	1248	0	0	1548	0	0	2694	0	0	0	0
Satd. Flow (RTOR)					36			136				
Confl. Peds. (#/hr)	6					6	1		2			
Peak Hour Factor	0.45	0.76	0.25	0.25	0.80	0.81	0.67	0.86	0.78	0.92	0.25	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	88%	7%	0%	0%	4%	4%	29%	9%	7%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	253	0	0	845	0	0	306	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	37.0	37.0			37.0		25.0	25.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		32.2			32.2			9.5				
Actuated g/C Ratio		0.56			0.56			0.16				
v/c Ratio		0.36			0.96			0.55				
Control Delay		13.2			40.3			17.1				
Queue Delay		0.0			0.0			0.0				
Total Delay		13.2			40.3			17.1				
LOS		B			D			B				
Approach Delay		13.2			40.3			17.1				
Approach LOS		B			D			B				
Queue Length 50th (ft)		32			178			24				
Queue Length 95th (ft)		148			#720			76				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		694			878			1058				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.36			0.96			0.29				

Intersection Summary	
Cycle Length: 92	
Actuated Cycle Length: 57.9	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 30.3	Intersection LOS: C
Intersection Capacity Utilization 60.6%	ICU Level of Service B
Analysis Period (min) 15	
Description: 9, 10, 12	

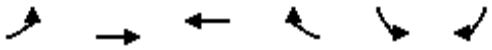
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



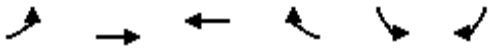
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	259	177	0	422	0	0
Future Volume (vph)	259	177	0	422	0	0
Satd. Flow (prot)	1504	1541	0	1409	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1504	1541	0	1409	0	0
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.84	0.74	0.25	0.81	0.92	0.25
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	8%	11%	0%	5%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	324	251	0	547	0	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 54.3%		ICU Level of Service A	
Analysis Period (min) 15			
Description: 18, 46, 28			



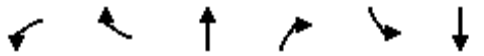
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	259	177	0	422	0	0
Future Volume (Veh/h)	259	177	0	422	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.74	0.25	0.81	0.92	0.25
Hourly flow rate (vph)	324	251	0	547	0	0
Pedestrians					4	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		887	226			
pX, platoon unblocked						
vC, conflicting volume	4				903	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4				903	4
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	79				100	100
cM capacity (veh/h)	1579				245	1085

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	324	251	547
Volume Left	324	0	0
Volume Right	0	0	547
cSH	1579	1700	1700
Volume to Capacity	0.21	0.15	0.32
Queue Length 95th (ft)	19	0	0
Control Delay (s)	7.9	0.0	0.0
Lane LOS	A		
Approach Delay (s)	4.4		0.0
Approach LOS			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		
Description: 18, 46, 28			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	134	228	5	1734
Future Volume (vph)	0	0	134	228	5	1734
Satd. Flow (prot)	0	0	1644	1321	0	3154
Flt Permitted						
Satd. Flow (perm)	0	0	1644	1321	0	3154
Peak Hour Factor	0.92	0.25	0.90	0.87	0.97	0.97
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	0%	4%	10%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	156	275	0	1882
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 79.2%		ICU Level of Service D	
Analysis Period (min) 15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	134	228	5	1734
Future Volume (Veh/h)	0	0	134	228	5	1734
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.25	0.90	0.87	0.97	0.97
Hourly flow rate (vph)	0	0	156	275	5	1877
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						140
pX, platoon unblocked						
vC, conflicting volume	1104	156			431	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1104	156			431	
tC, single (s)	6.8	6.9			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	204	868			1118	

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	156	275	631	1251
Volume Left	0	0	5	0
Volume Right	0	275	0	0
cSH	1700	1700	1118	1700
Volume to Capacity	0.09	0.16	0.00	0.74
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.1	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.0	
Approach LOS				

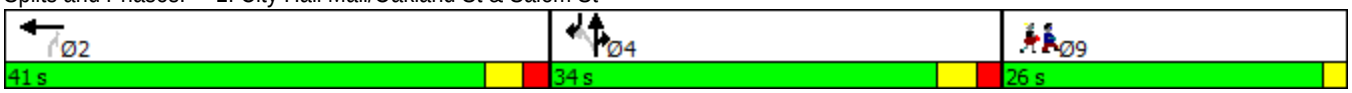
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	895	0	437	8	125	0	0	215
Future Volume (vph)	0	0	0	0	895	0	437	8	125	0	0	215
Satd. Flow (prot)	0	0	0	0	3094	0	1470	1484	1298	0	0	1479
Flt Permitted							0.950	0.956				
Satd. Flow (perm)	0	0	0	0	3094	0	1464	1479	1298	0	0	1479
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)						6	4					4
Peak Hour Factor	0.25	0.25	0.25	0.25	0.77	0.92	0.86	0.40	0.82	0.92	0.25	0.70
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	0%	0%	5%	0%	5%	0%	12%	2%	0%	0%
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	0	0	0	0	1220	0	278	277	160	0	0	323
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					41.0		34.0	34.0	34.0			34.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					36.8		29.6	29.6	74.9			29.6
Actuated g/C Ratio					0.43		0.35	0.35	0.88			0.35
v/c Ratio					0.92		0.55	0.54	0.14			0.63
Control Delay					37.7		30.5	30.2	3.7			33.2
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					37.7		30.5	30.2	3.7			33.2
LOS					D		C	C	A			C
Approach Delay					37.7			24.4			33.2	
Approach LOS					D			C			C	
Queue Length 50th (ft)					242		100	100	0			115
Queue Length 95th (ft)					#463		247	96	49			210
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1332		508	512	1138			512
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					0.92		0.55	0.54	0.14			0.63

Intersection Summary	
Cycle Length: 101	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 32.8	Intersection LOS: C
Intersection Capacity Utilization 71.7%	ICU Level of Service C
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

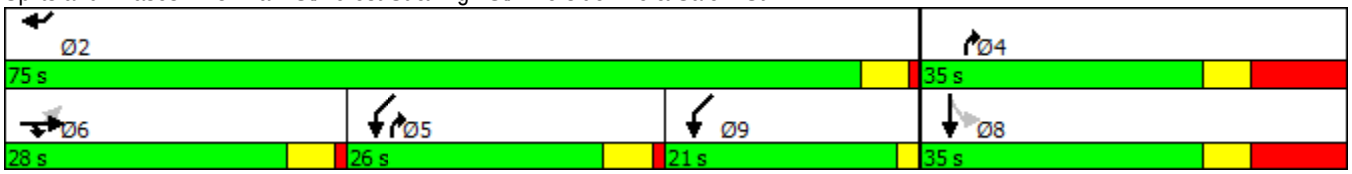
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2	Ø4	Ø5	Ø9
Lane Configurations												
Traffic Volume (vph)	210	380	134	21	277	3	1086	510	85			
Future Volume (vph)	210	380	134	21	277	3	1086	510	85			
Satd. Flow (prot)	2954	1398	1422	0	1659	0	3060	1360	0			
Flt Permitted					0.995		0.950					
Satd. Flow (perm)	2954	1398	1422	0	1654	0	2900	1360	0			
Satd. Flow (RTOR)		188						89				
Confl. Peds. (#/hr)		19	16	16		26	19	26	41			
Peak Hour Factor	0.72	0.90	0.90	0.58	0.95	0.75	0.96	0.84	0.81			
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%			
Heavy Vehicles (%)	10%	4%	4%	9%	1%	33%	3%	7%	6%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	306	443	156	0	348	0	1188	748	0			
Turn Type	NA	Prot	custom	Perm	NA		Prot	Prot				
Protected Phases	6	6	4 5		8		5 9	2		4	5	9
Permitted Phases				8								
Total Split (s)	28.0	28.0		35.0	35.0			75.0		35.0	26.0	21.0
Total Lost Time (s)	5.0	5.0			12.0			5.0				
Act Effct Green (s)	23.0	23.0	50.2		23.0		42.0	70.0				
Actuated g/C Ratio	0.21	0.21	0.46		0.21		0.38	0.64				
v/c Ratio	0.50	1.00	0.24		1.01		1.02	0.83				
Control Delay	41.6	70.1	13.7		94.9		65.1	23.7				
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0				
Total Delay	41.6	70.1	13.7		94.9		65.1	23.7				
LOS	D	E	B		F		E	C				
Approach Delay	58.4				94.9		49.1					
Approach LOS	E				F		D					
Queue Length 50th (ft)	101	~201	42		~250		~443	338				
Queue Length 95th (ft)	113	#415	71		#441		#589	461				
Internal Link Dist (ft)	490				1749		402					
Turn Bay Length (ft)		60										
Base Capacity (vph)	617	441	648		345		1168	897				
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	0.50	1.00	0.24		1.01		1.02	0.83				

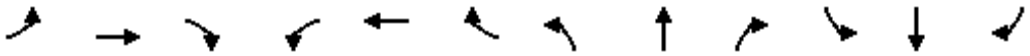
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 54.5	Intersection LOS: D
Intersection Capacity Utilization 91.2%	ICU Level of Service F
Analysis Period (min) 15	
Description: 129, 224, 201	

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



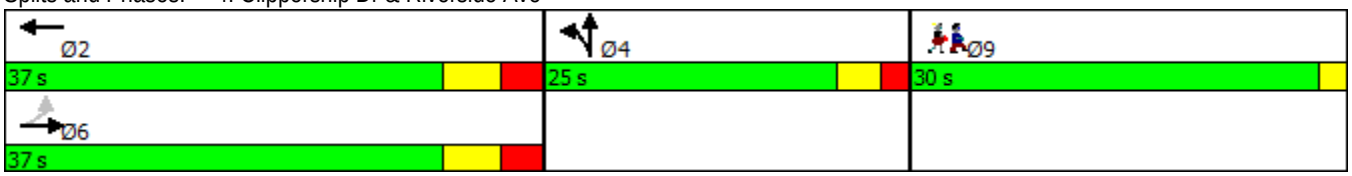


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	168	0	0	398	249	24	108	101	0	0	0
Future Volume (vph)	9	168	0	0	398	249	24	108	101	0	0	0
Satd. Flow (prot)	0	1498	0	0	1548	0	0	2695	0	0	0	0
Flt Permitted		0.830						0.994				
Satd. Flow (perm)	0	1248	0	0	1548	0	0	2694	0	0	0	0
Satd. Flow (RTOR)					36			136				
Confl. Peds. (#/hr)	6					6	1		2			
Peak Hour Factor	0.45	0.76	0.25	0.25	0.80	0.81	0.67	0.86	0.78	0.92	0.25	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	88%	7%	0%	0%	4%	4%	29%	9%	7%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	253	0	0	845	0	0	306	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	37.0	37.0			37.0		25.0	25.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		32.2			32.2			9.5				
Actuated g/C Ratio		0.56			0.56			0.16				
v/c Ratio		0.36			0.96			0.55				
Control Delay		13.2			40.3			17.1				
Queue Delay		0.0			0.0			0.0				
Total Delay		13.2			40.3			17.1				
LOS		B			D			B				
Approach Delay		13.2			40.3			17.1				
Approach LOS		B			D			B				
Queue Length 50th (ft)		32			178			24				
Queue Length 95th (ft)		148			#720			76				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		694			878			1058				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.36			0.96			0.29				

Intersection Summary	
Cycle Length: 92	
Actuated Cycle Length: 57.9	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 30.3	Intersection LOS: C
Intersection Capacity Utilization 60.6%	ICU Level of Service B
Analysis Period (min) 15	
Description: 9, 10, 12	

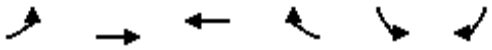
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



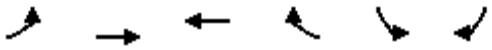
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	259	177	0	422	0	0
Future Volume (vph)	259	177	0	422	0	0
Satd. Flow (prot)	1504	1541	0	1409	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1504	1541	0	1409	0	0
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.84	0.74	0.25	0.81	0.92	0.25
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	8%	11%	0%	5%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	324	251	0	547	0	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 54.3%		ICU Level of Service A	
Analysis Period (min) 15			
Description: 18, 46, 28			



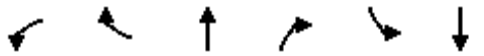
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	259	177	0	422	0	0
Future Volume (Veh/h)	259	177	0	422	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.74	0.25	0.81	0.92	0.25
Hourly flow rate (vph)	324	251	0	547	0	0
Pedestrians					4	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		887	226			
pX, platoon unblocked						
vC, conflicting volume	4				903	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4				903	4
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.5	3.3
p0 queue free %	79				100	100
cM capacity (veh/h)	1579				245	1085

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	324	251	547
Volume Left	324	0	0
Volume Right	0	0	547
cSH	1579	1700	1700
Volume to Capacity	0.21	0.15	0.32
Queue Length 95th (ft)	19	0	0
Control Delay (s)	7.9	0.0	0.0
Lane LOS	A		
Approach Delay (s)	4.4		0.0
Approach LOS			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		
Description: 18, 46, 28			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	134	228	5	1734
Future Volume (vph)	0	0	134	228	5	1734
Satd. Flow (prot)	0	0	1644	1321	0	3154
Flt Permitted						
Satd. Flow (perm)	0	0	1644	1321	0	3154
Peak Hour Factor	0.92	0.25	0.90	0.87	0.97	0.97
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	0%	4%	10%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	156	275	0	1882
Sign Control	Stop		Free			Free

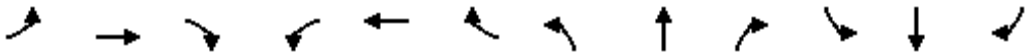
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 79.2%		ICU Level of Service D	
Analysis Period (min) 15			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	134	228	5	1734
Future Volume (Veh/h)	0	0	134	228	5	1734
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.25	0.90	0.87	0.97	0.97
Hourly flow rate (vph)	0	0	156	275	5	1877
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						140
pX, platoon unblocked						
vC, conflicting volume	1104	156			431	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1104	156			431	
tC, single (s)	6.8	6.9			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	204	868			1118	

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	156	275	631	1251
Volume Left	0	0	5	0
Volume Right	0	275	0	0
cSH	1700	1700	1118	1700
Volume to Capacity	0.09	0.16	0.00	0.74
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.1	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

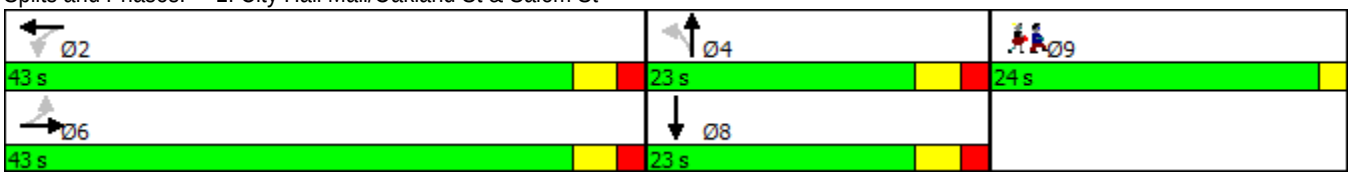


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	130	8	46	849	0	4	8	15	0	8	215
Future Volume (vph)	6	130	8	46	849	0	4	8	15	0	8	215
Satd. Flow (prot)	0	1597	0	0	3056	0	0	1482	0	0	1379	0
Flt Permitted		0.958			0.928			0.949				
Satd. Flow (perm)	0	1533	0	0	2844	0	0	1415	0	0	1379	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)						6	4					4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	178	0	0	1106	0	0	34	0	0	276	0
Turn Type	Perm	NA		Perm	NA		Perm	NA			NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4					
Total Split (s)	43.0	43.0		43.0	43.0		23.0	23.0			23.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		38.9			38.9			18.4			18.4	
Actuated g/C Ratio		0.51			0.51			0.24			0.24	
v/c Ratio		0.23			0.76			0.10			0.82	
Control Delay		14.0			22.0			27.7			52.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.0			22.0			27.7			52.5	
LOS		B			C			C			D	
Approach Delay		14.0			22.0			27.7			52.5	
Approach LOS		B			C			C			D	
Queue Length 50th (ft)		31			145			10			101	
Queue Length 95th (ft)		104			#398			39			#292	
Internal Link Dist (ft)		301			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)		788			1462			344			336	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.23			0.76			0.10			0.82	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 75.6	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 26.5	Intersection LOS: C
Intersection Capacity Utilization 66.8%	ICU Level of Service C
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	24.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

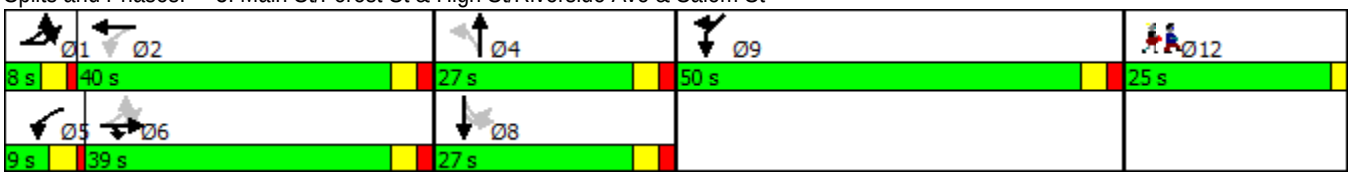
Intersection Summary

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	NBR2	SBL2
Lane Configurations												
Traffic Volume (vph)	19	71	127	380	303	24	18	21	13	62	41	17
Future Volume (vph)	19	71	127	380	303	24	18	21	13	62	41	17
Satd. Flow (prot)	0	1533	1613	1371	0	1535	0	0	1358	0	0	0
Flt Permitted		0.805				0.646			0.631			
Satd. Flow (perm)	0	1299	1613	1371	0	1035	0	0	864	0	0	0
Satd. Flow (RTOR)				282					12			
Confl. Peds. (#/hr)				19							16	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	111	157	469	0	426	0	0	170	0	0	0
Turn Type	pm+pt	pm+pt	NA	Prot	pm+pt	NA		Perm	NA			Perm
Protected Phases	1	1	6	6	5	2			4			
Permitted Phases	6	6			2			4				8
Total Split (s)	8.0	8.0	39.0	39.0	9.0	40.0		27.0	27.0			27.0
Total Lost Time (s)		4.0	5.0	5.0		5.0			5.0			
Act Effct Green (s)		44.0	43.0	43.0		35.0			22.0			
Actuated g/C Ratio		0.30	0.30	0.30		0.24			0.15			
v/c Ratio		0.28	0.33	0.78		1.71			1.21			
Control Delay		40.4	42.1	27.8		369.8			188.2			
Queue Delay		0.0	0.0	0.0		0.0			0.0			
Total Delay		40.4	42.1	27.8		369.8			188.2			
LOS		D	D	C		F			F			
Approach Delay			32.8			369.8			188.3			
Approach LOS			C			F			F			
Queue Length 50th (ft)		79	116	172		~590			~187			
Queue Length 95th (ft)		124	171	279		#747			#318			
Internal Link Dist (ft)			490			368			60			
Turn Bay Length (ft)		100		60								
Base Capacity (vph)		400	478	604		249			141			
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		0.28	0.33	0.78		1.71			1.21			

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 145	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 2.04	
Intersection Signal Delay: 288.0	Intersection LOS: F
Intersection Capacity Utilization 119.7%	ICU Level of Service H
Analysis Period (min) 15	
Description: 129, 224, 201	

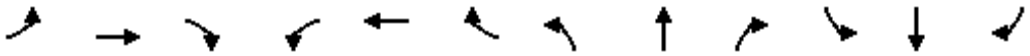
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



Lane Group	SBL	SBT	SBR	SWL	SWR	SWR2	Ø12
Lane Configurations							
Traffic Volume (vph)	10	277	3	783	465	35	
Future Volume (vph)	10	277	3	783	465	35	
Satd. Flow (prot)	0	1603	0	1533	1371	0	
Flt Permitted		0.890		0.950			
Satd. Flow (perm)	0	1429	0	1503	1371	0	
Satd. Flow (RTOR)					95		
Confl. Peds. (#/hr)	16		26	19	26	41	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	
Growth Factor	105%	105%	105%	105%	105%	105%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	379	0	967	617	0	
Turn Type	Perm	NA		Prot	Prot		
Protected Phases		8		9	9		12
Permitted Phases	8						
Total Split (s)	27.0	27.0		50.0	50.0		25.0
Total Lost Time (s)		5.0		5.0	5.0		
Act Effct Green (s)		22.0		45.0	45.0		
Actuated g/C Ratio		0.15		0.31	0.31		
v/c Ratio		1.75		2.04	1.26		
Control Delay		392.6		500.5	166.5		
Queue Delay		0.0		0.0	0.0		
Total Delay		392.6		500.5	166.5		
LOS		F		F	F		
Approach Delay		392.6		370.4			
Approach LOS		F		F			
Queue Length 50th (ft)		~530		~1428	~665		
Queue Length 95th (ft)		#685		#1569	#826		
Internal Link Dist (ft)		1749		407			
Turn Bay Length (ft)							
Base Capacity (vph)		216		475	491		
Starvation Cap Reductn		0		0	0		
Spillback Cap Reductn		0		0	0		
Storage Cap Reductn		0		0	0		
Reduced v/c Ratio		1.75		2.04	1.26		

Intersection Summary

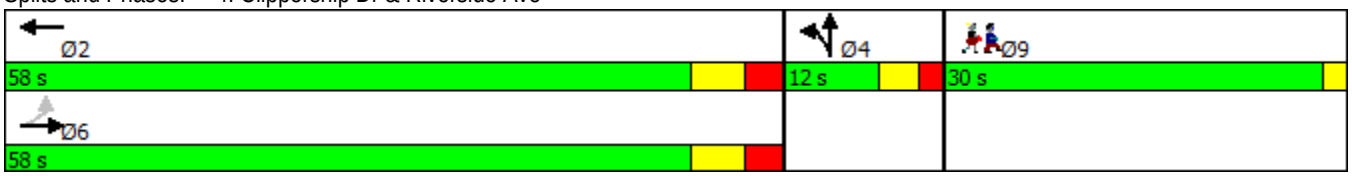


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	168	0	0	398	249	24	108	101	0	0	0
Future Volume (vph)	3	168	0	0	398	249	24	108	101	0	0	0
Satd. Flow (prot)	0	1612	0	0	1520	0	0	2809	0	0	0	0
Flt Permitted		0.988						0.995				
Satd. Flow (perm)	0	1594	0	0	1520	0	0	2807	0	0	0	0
Satd. Flow (RTOR)					46			125				
Confl. Peds. (#/hr)	6					6	1		2			
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	212	0	0	800	0	0	288	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	58.0	58.0			58.0		12.0	12.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		48.2			48.2			7.2				
Actuated g/C Ratio		0.67			0.67			0.10				
v/c Ratio		0.20			0.77			0.73				
Control Delay		6.9			17.0			31.7				
Queue Delay		0.0			0.0			0.0				
Total Delay		6.9			17.0			31.7				
LOS		A			B			C				
Approach Delay		6.9			17.0			31.7				
Approach LOS		A			B			C				
Queue Length 50th (ft)		22			140			32				
Queue Length 95th (ft)		104			#648			#118				
Internal Link Dist (ft)		140			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		1163			1121			393				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.18			0.71			0.73				

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 71.7	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 18.6	Intersection LOS: B
Intersection Capacity Utilization 60.6%	ICU Level of Service B
Analysis Period (min) 15	
Description: 9, 10, 12	

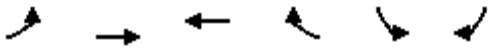
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

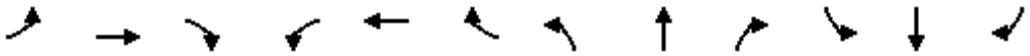


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	61	126	345	77	42	15
Future Volume (vph)	61	126	345	77	42	15
Satd. Flow (prot)	0	1587	1573	0	1501	0
Flt Permitted		0.984			0.965	
Satd. Flow (perm)	0	1587	1573	0	1501	0
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	231	521	0	71	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 52.2%		ICU Level of Service A	
Analysis Period (min) 15			
Description: 18, 46, 28			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	134	228	5	1734
Future Volume (vph)	0	0	134	228	5	1734
Satd. Flow (prot)	0	0	1613	1371	0	3065
Flt Permitted						
Satd. Flow (perm)	0	0	1613	1371	0	3065
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	166	282	0	2148
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 79.2%		ICU Level of Service D	
Analysis Period (min) 15			

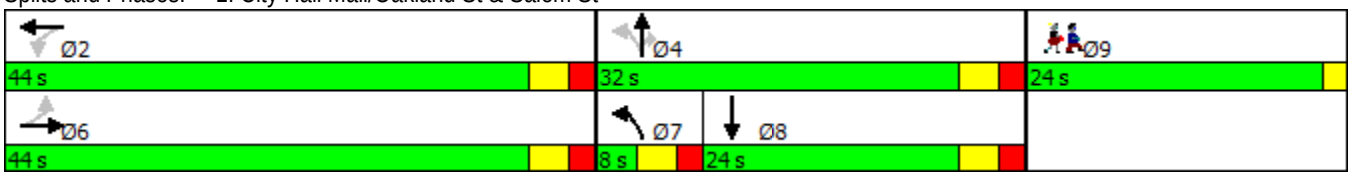


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	68	8	46	849	0	57	8	73	0	8	215
Future Volume (vph)	6	68	8	46	849	0	57	8	73	0	8	215
Satd. Flow (prot)	0	1587	0	0	3056	0	0	1545	1371	0	1379	0
Flt Permitted		0.931			0.933			0.529				
Satd. Flow (perm)	0	1482	0	0	2860	0	0	852	1371	0	1379	0
Satd. Flow (RTOR)									90			
Confl. Peds. (#/hr)						6	4					4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	101	0	0	1106	0	0	80	90	0	276	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm		NA	
Protected Phases		6			2		7	4			8	
Permitted Phases	6			2			4		4			
Total Split (s)	44.0	44.0		44.0	44.0		8.0	32.0	32.0		24.0	
Total Lost Time (s)		5.0			5.0			5.0	5.0		5.0	
Act Effct Green (s)		38.9			38.9			22.1	22.1		22.1	
Actuated g/C Ratio		0.49			0.49			0.28	0.28		0.28	
v/c Ratio		0.14			0.79			0.34	0.20		0.72	
Control Delay		16.1			25.6			31.3	7.8		40.4	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		16.1			25.6			31.3	7.8		40.4	
LOS		B			C			C	A		D	
Approach Delay		16.1			25.6			18.8			40.4	
Approach LOS		B			C			B			D	
Queue Length 50th (ft)		17			151			26	0		103	
Queue Length 95th (ft)		73			#464			80	32		#240	
Internal Link Dist (ft)		301			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)		762			1470			303	546		385	
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		0.13			0.75			0.26	0.16		0.72	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 79	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 26.8	Intersection LOS: C
Intersection Capacity Utilization 65.4%	ICU Level of Service C
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	24.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	NBR2	SBL2	SBL	SBT	SBR	SWL
Lane Configurations												
Traffic Volume (vph)	19	71	132	375	303	24	141	17	10	277	3	783
Future Volume (vph)	19	71	132	375	303	24	141	17	10	277	3	783
Satd. Flow (prot)	0	1533	1613	1371	1456	1470	1395	0	0	1603	0	1533
Flt Permitted		0.799			0.950	0.959				0.996		0.950
Satd. Flow (perm)	0	1289	1613	1371	1456	1470	1395	0	0	1595	0	1476
Satd. Flow (RTOR)				100								
Confl. Peds. (#/hr)				19			16		16		26	19
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)					46%							
Lane Group Flow (vph)	0	111	163	463	202	202	174	0	0	379	0	967
Turn Type	custom	Perm	NA	Prot	custom	NA	pt+ov	Split	Split	NA		Prot
Protected Phases	1		6	6	4	4	4 5	8	8	8		5
Permitted Phases	1	6			4							
Total Split (s)	10.0	25.0	25.0	25.0	23.0	23.0		23.0	23.0	23.0		49.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0				5.0		4.0
Act Effct Green (s)		20.0	20.0	20.0	17.9	17.9	61.9			18.0		45.0
Actuated g/C Ratio		0.17	0.17	0.17	0.15	0.15	0.52			0.15		0.38
v/c Ratio		0.52	0.61	1.49	0.93	0.92	0.24			1.58		1.68
Control Delay		55.2	57.0	264.4	96.6	94.7	9.0			313.5		342.5
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0			0.0		0.0
Total Delay		55.2	57.0	264.4	96.6	94.7	9.0			313.5		342.5
LOS		E	E	F	F	F	A			F		F
Approach Delay			187.0			95.6				313.5		219.9
Approach LOS			F			F				F		F
Queue Length 50th (ft)		79	118	~430	164	164	33			~417		~1095
Queue Length 95th (ft)		132	181	#585	#291	#289	51			#565		#1245
Internal Link Dist (ft)			490			370				1749		407
Turn Bay Length (ft)		100		60								
Base Capacity (vph)		214	268	311	218	220	721			240		575
Starvation Cap Reductn		0	0	0	0	0	0			0		0
Spillback Cap Reductn		0	0	0	0	0	0			0		0
Storage Cap Reductn		0	0	0	0	0	0			0		0
Reduced v/c Ratio		0.52	0.61	1.49	0.93	0.92	0.24			1.58		1.68

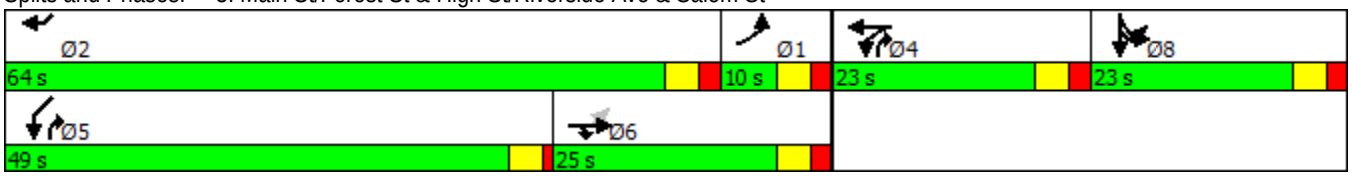
Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 119.9
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.68
Intersection Signal Delay: 197.2 Intersection LOS: F
Intersection Capacity Utilization 116.0% ICU Level of Service H
Analysis Period (min) 15
Description: 129, 224, 201

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

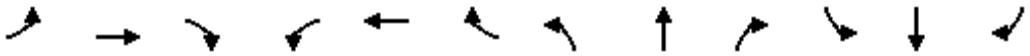
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



Lane Group	SWR	SWR2
Lane Configurations		
Traffic Volume (vph)	486	57
Future Volume (vph)	486	57
Satd. Flow (prot)	1371	0
Flt Permitted		
Satd. Flow (perm)	1371	0
Satd. Flow (RTOR)	109	
Confl. Peds. (#/hr)	26	41
Peak Hour Factor	0.85	0.85
Growth Factor	105%	105%
Shared Lane Traffic (%)		
Lane Group Flow (vph)	670	0
Turn Type	Prot	
Protected Phases	2	
Permitted Phases		
Total Split (s)	64.0	
Total Lost Time (s)	5.0	
Act Effct Green (s)	59.0	
Actuated g/C Ratio	0.49	
v/c Ratio	0.92	
Control Delay	43.0	
Queue Delay	0.0	
Total Delay	43.0	
LOS	D	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	411	
Queue Length 95th (ft)	#605	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	730	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.92	

Intersection Summary

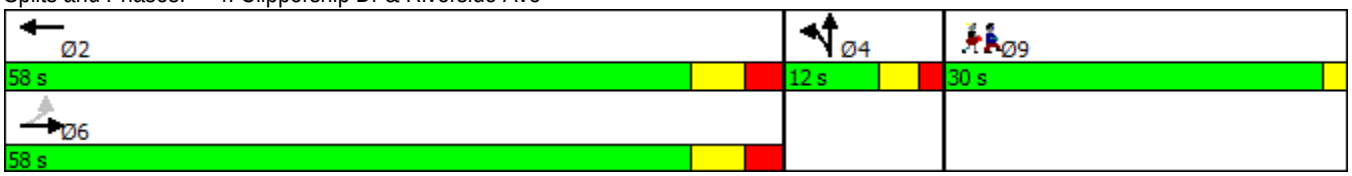


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	173	0	0	398	249	24	108	96	0	0	0
Future Volume (vph)	3	173	0	0	398	249	24	108	96	0	0	0
Satd. Flow (prot)	0	1612	0	0	1520	0	0	2817	0	0	0	0
Flt Permitted		0.989						0.995				
Satd. Flow (perm)	0	1595	0	0	1520	0	0	2814	0	0	0	0
Satd. Flow (RTOR)					46			119				
Confl. Peds. (#/hr)	6					6	1		2			
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	218	0	0	800	0	0	282	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	58.0	58.0			58.0		12.0	12.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		48.3			48.3			7.2				
Actuated g/C Ratio		0.67			0.67			0.10				
v/c Ratio		0.20			0.77			0.73				
Control Delay		6.9			16.9			31.9				
Queue Delay		0.0			0.0			0.0				
Total Delay		6.9			16.9			31.9				
LOS		A			B			C				
Approach Delay		6.9			16.9			31.9				
Approach LOS		A			B			C				
Queue Length 50th (ft)		23			140			32				
Queue Length 95th (ft)		107			#648			#118				
Internal Link Dist (ft)		140			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		1161			1119			388				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.19			0.71			0.73				

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 71.8	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 18.5	Intersection LOS: B
Intersection Capacity Utilization 60.4%	ICU Level of Service B
Analysis Period (min) 15	
Description: 9, 10, 12	

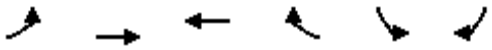
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

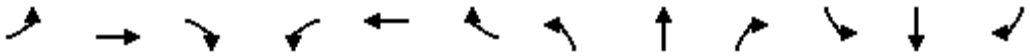


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	155	133	327	95	42	15
Future Volume (vph)	155	133	327	95	42	15
Satd. Flow (prot)	0	1571	1565	0	1501	0
Flt Permitted		0.974			0.965	
Satd. Flow (perm)	0	1571	1565	0	1501	0
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	355	521	0	71	0
Sign Control		Stop	Stop		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 58.9%		ICU Level of Service B	
Analysis Period (min) 15			
Description: 18, 46, 28			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	138	228	0	1738
Future Volume (vph)	0	0	138	228	0	1738
Satd. Flow (prot)	0	0	1613	1371	0	3065
Flt Permitted						
Satd. Flow (perm)	0	0	1613	1371	0	3065
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	170	282	0	2147
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 59.4%		ICU Level of Service B	
Analysis Period (min) 15			

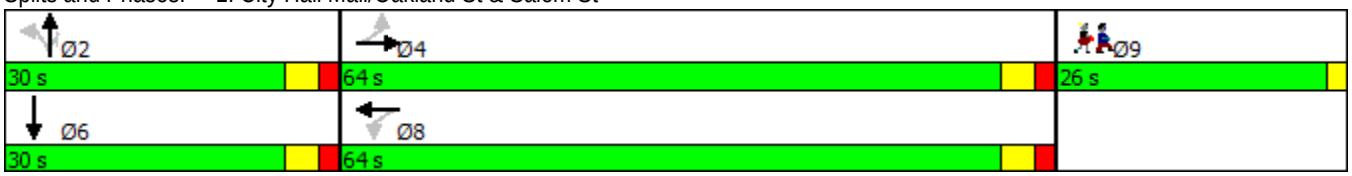


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	152	43	356	540	0	73	7	15	0	3	215
Future Volume (vph)	3	152	43	356	540	0	73	7	15	0	3	215
Satd. Flow (prot)	0	1565	0	0	3007	0	0	1544	1371	0	1374	0
Flt Permitted		0.985			0.725			0.374				
Satd. Flow (perm)	0	1543	0	0	2222	0	0	602	1371	0	1374	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)						6	4					4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	245	0	0	1107	0	0	99	19	0	270	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm		NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2			
Total Split (s)	64.0	64.0		64.0	64.0		30.0	30.0	30.0		30.0	
Total Lost Time (s)		5.0			5.0			5.0	5.0		5.0	
Act Effct Green (s)		59.8			59.8			25.4	25.4		25.4	
Actuated g/C Ratio		0.57			0.57			0.24	0.24		0.24	
v/c Ratio		0.28			0.87			0.68	0.06		0.81	
Control Delay		14.8			30.7			64.1	36.1		59.4	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		14.8			30.7			64.1	36.1		59.4	
LOS		B			C			E	D		E	
Approach Delay		14.8			30.7			59.6			59.4	
Approach LOS		B			C			E			E	
Queue Length 50th (ft)		59			234			52	8		147	
Queue Length 95th (ft)		159			#551			#158	31		#342	
Internal Link Dist (ft)		312			283			123			1450	
Turn Bay Length (ft)												
Base Capacity (vph)		884			1273			146	332		333	
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		0.28			0.87			0.68	0.06		0.81	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 104.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 34.9	Intersection LOS: C
Intersection Capacity Utilization 80.0%	ICU Level of Service D
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	NBR2	SBL2	SBL	SBT	SBR	SWL
Lane Configurations												
Traffic Volume (vph)	71	146	380	21	13	62	48	17	10	277	3	465
Future Volume (vph)	71	146	380	21	13	62	48	17	10	277	3	465
Satd. Flow (prot)	1533	1613	1371	0	1565	1371	0	0	0	1604	0	1533
Flt Permitted					0.970					0.996		0.950
Satd. Flow (perm)	1613	1613	1338	0	1565	1217	0	0	0	1600	0	1505
Satd. Flow (RTOR)			399			102						
Confl. Peds. (#/hr)			19				16		16		26	19
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	88	180	469	0	42	136	0	0	0	379	0	574
Turn Type	Perm	NA	custom	Split	NA	Perm		Split	Split	NA		Prot
Protected Phases		6	6	4	4			8	8	8		5
Permitted Phases	6		5			4						
Total Split (s)	33.0	33.0	33.0	12.0	12.0	12.0		33.0	33.0	33.0		47.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0				5.0		5.0
Act Effct Green (s)	27.3	27.3	69.3		7.0	7.0				28.0		42.0
Actuated g/C Ratio	0.18	0.18	0.47		0.05	0.05				0.19		0.28
v/c Ratio	0.30	0.61	0.56		0.57	0.88				1.25		1.32
Control Delay	55.4	65.2	6.6		105.6	73.9				184.0		200.0
Queue Delay	0.0	0.0	4.1		22.7	58.9				0.0		0.3
Total Delay	55.4	65.2	10.7		128.3	132.7				184.0		200.3
LOS	E	E	B		F	F				F		F
Approach Delay		29.4			131.7					184.0		122.4
Approach LOS		C			F					F		F
Queue Length 50th (ft)	75	163	35		35	38				~465		~729
Queue Length 95th (ft)	123	233	91		#79	#144				#621		#887
Internal Link Dist (ft)		490			60					1749		394
Turn Bay Length (ft)	100		60									
Base Capacity (vph)	305	305	850		74	155				304		435
Starvation Cap Reductn	0	0	0		22	49				0		0
Spillback Cap Reductn	0	0	294		0	0				0		15
Storage Cap Reductn	0	0	0		0	0				0		0
Reduced v/c Ratio	0.29	0.59	0.84		0.81	1.28				1.25		1.37

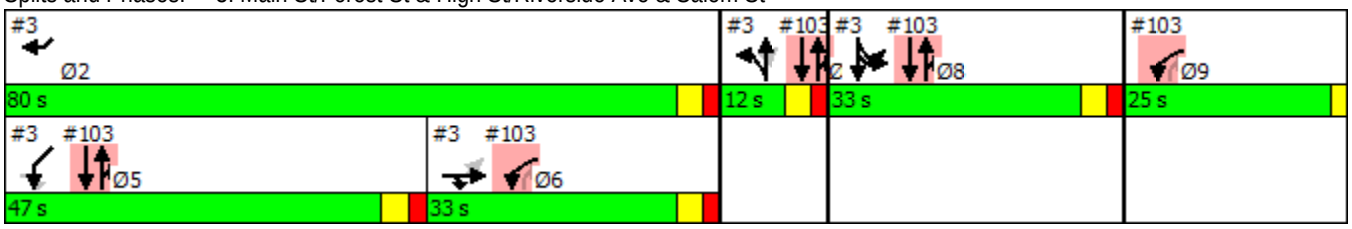
Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 147.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 105.4 Intersection LOS: F
Intersection Capacity Utilization 77.2% ICU Level of Service D
Analysis Period (min) 15
Description: 129, 224, 201

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

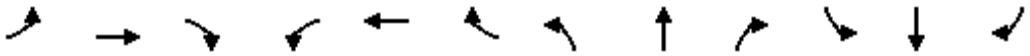
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



Lane Group	SWR	SWR2	Ø9
Lane Configurations			
Traffic Volume (vph)	489	73	
Future Volume (vph)	489	73	
Satd. Flow (prot)	1371	0	
Flt Permitted			
Satd. Flow (perm)	1371	0	
Satd. Flow (RTOR)	65		
Confl. Peds. (#/hr)	26	41	
Peak Hour Factor	0.85	0.85	
Growth Factor	105%	105%	
Shared Lane Traffic (%)			
Lane Group Flow (vph)	694	0	
Turn Type	Prot		
Protected Phases	2		9
Permitted Phases			
Total Split (s)	80.0		25.0
Total Lost Time (s)	5.0		
Act Effct Green (s)	74.3		
Actuated g/C Ratio	0.50		
v/c Ratio	0.96		
Control Delay	58.0		
Queue Delay	0.0		
Total Delay	58.0		
LOS	E		
Approach Delay			
Approach LOS			
Queue Length 50th (ft)	605		
Queue Length 95th (ft)	#801		
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)	728		
Starvation Cap Reductn	0		
Spillback Cap Reductn	0		
Storage Cap Reductn	0		
Reduced v/c Ratio	0.95		

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	168	0	303	102	249	22	97	101	0	0	0
Future Volume (vph)	3	168	0	303	102	249	22	97	101	0	0	0
Satd. Flow (prot)	0	1612	0	0	1487	0	0	1487	0	0	0	0
Flt Permitted		0.988			0.750			0.995				
Satd. Flow (perm)	0	1594	0	0	1142	0	0	1486	0	0	0	0
Satd. Flow (RTOR)					35			24				
Confl. Peds. (#/hr)	6					6	1		2			
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	212	0	0	808	0	0	272	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6			2								
Total Split (s)	94.0	94.0		94.0	94.0		26.0	26.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		87.6			87.6			21.1				
Actuated g/C Ratio		0.70			0.70			0.17				
v/c Ratio		0.19			1.00			1.00				
Control Delay		8.4			51.5			103.5				
Queue Delay		3.5			0.0			0.0				
Total Delay		12.0			51.5			103.5				
LOS		B			D			F				
Approach Delay		12.0			51.5			103.5				
Approach LOS		B			D			F				
Queue Length 50th (ft)		46			491			195				
Queue Length 95th (ft)		128			#1060			#436				
Internal Link Dist (ft)		141			1713			396			211	
Turn Bay Length (ft)												
Base Capacity (vph)		1113			808			271				
Starvation Cap Reductn		802			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.68			1.00			1.00				

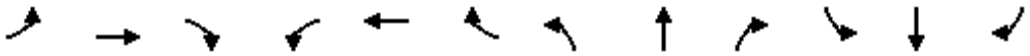
Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 125.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 56.0	Intersection LOS: E
Intersection Capacity Utilization 84.9%	ICU Level of Service E
Analysis Period (min) 15	
Description: 9, 10, 12	

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

Splits and Phases: 4: Clippership Dr & Riverside Ave

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

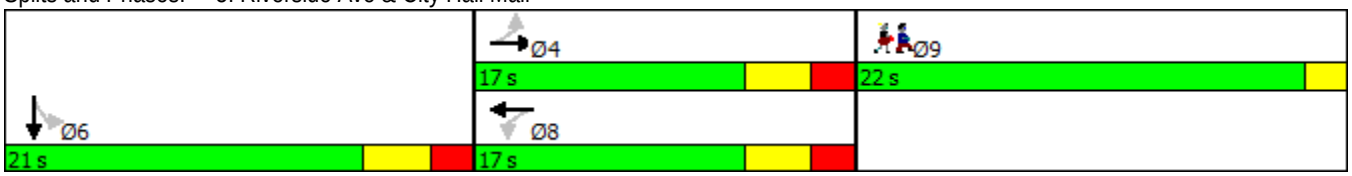


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	124	2	2	18	104	0	0	0	41	317	3
Future Volume (vph)	60	124	2	2	18	104	0	0	0	41	317	3
Satd. Flow (prot)	0	1586	0	0	1392	0	0	0	0	1533	1825	0
Flt Permitted		0.846			0.995					0.950		
Satd. Flow (perm)	0	1360	0	0	1386	0	0	0	0	1533	1825	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	4					4						
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	229	0	0	152	0	0	0	0	51	396	0
Turn Type	Perm	NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases	4			8						6		
Total Split (s)	17.0	17.0		17.0	17.0					21.0	21.0	
Total Lost Time (s)		5.0			5.0					5.0	5.0	
Act Effct Green (s)		11.9			11.9					16.4	16.4	
Actuated g/C Ratio		0.29			0.29					0.40	0.40	
v/c Ratio		0.59			0.38					0.08	0.55	
Control Delay		24.4			17.3					11.4	17.0	
Queue Delay		0.0			0.0					0.0	0.0	
Total Delay		24.4			17.3					11.4	17.0	
LOS		C			B					B	B	
Approach Delay		24.4			17.3						16.3	
Approach LOS		C			B						B	
Queue Length 50th (ft)		36			22					6	56	
Queue Length 95th (ft)		#165			91					33	#228	
Internal Link Dist (ft)		374			141			275			169	
Turn Bay Length (ft)												
Base Capacity (vph)		407			415					653	778	
Starvation Cap Reductn		0			0					0	0	
Spillback Cap Reductn		0			0					0	0	
Storage Cap Reductn		0			0					0	0	
Reduced v/c Ratio		0.56			0.37					0.08	0.51	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 41.5			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 52.9%		ICU Level of Service A	
Analysis Period (min) 15			
Description: 18, 46, 28			

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

Splits and Phases: 5: Riverside Ave & City Hall Mall



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	22.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

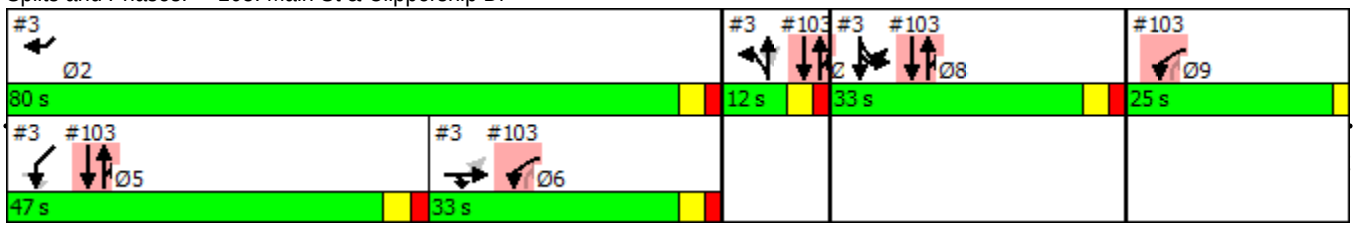
Volume
103: Main St & Clippership Dr 06/15/2018

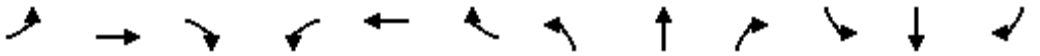
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4	Ø5	Ø6	Ø8	Ø9
Lane Configurations												
Traffic Volume (vph)	621	0	144	219	0	1119						
Future Volume (vph)	621	0	144	219	0	1119						
Satd. Flow (prot)	2973	0	1613	1371	0	3065						
Flt Permitted	0.950											
Satd. Flow (perm)	2973	0	1613	1371	0	3065						
Satd. Flow (RTOR)												
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85						
Growth Factor	105%	105%	105%	105%	105%	105%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	767	0	178	271	0	1382						
Turn Type	Prot		NA	custom		NA						
Protected Phases	6 9		4 5 8	4 5 8		4 5 8	2	4	5	6	8	9
Permitted Phases				6 9								
Total Split (s)							80.0	12.0	47.0	33.0	33.0	25.0
Total Lost Time (s)												
Act Effct Green (s)	45.8		82.0	147.8		82.0						
Actuated g/C Ratio	0.31		0.55	1.00		0.55						
v/c Ratio	0.83		0.20	0.20		0.81						
Control Delay	33.5		9.2	0.3		7.7						
Queue Delay	0.0		0.0	0.0		48.1						
Total Delay	33.5		9.2	0.3		55.8						
LOS	C		A	A		E						
Approach Delay	33.5		3.8			55.8						
Approach LOS	C		A			E						
Queue Length 50th (ft)	170		45	0		96						
Queue Length 95th (ft)	193		64	0		m81						
Internal Link Dist (ft)	844		158			60						
Turn Bay Length (ft)												
Base Capacity (vph)	966		895	1371		1701						
Starvation Cap Reductn	0		0	0		476						
Spillback Cap Reductn	0		68	0		0						
Storage Cap Reductn	0		0	0		0						
Reduced v/c Ratio	0.79		0.22	0.20		1.13						

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 147.8	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.32	
Intersection Signal Delay: 40.2	Intersection LOS: D
Intersection Capacity Utilization 65.1%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 103: Main St & Clippership Dr



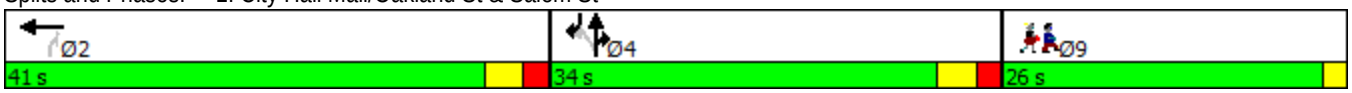


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1154	17	685	26	378	0	0	16
Future Volume (vph)	0	0	0	0	1154	17	685	26	378	0	0	16
Satd. Flow (prot)	0	0	0	0	3209	0	1498	1512	1411	0	0	1479
Flt Permitted							0.950	0.956				
Satd. Flow (perm)	0	0	0	0	3209	0	1492	1506	1411	0	0	1479
Satd. Flow (RTOR)					2							
Confl. Peds. (#/hr)						8	4					4
Peak Hour Factor	0.25	0.25	0.25	0.25	0.95	0.85	0.88	0.72	0.80	0.92	0.25	0.67
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	3%	0%	3%	2%	0%	0%
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	0	0	0	0	1309	0	429	434	501	0	0	25
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					41.0		34.0	34.0	34.0			34.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					36.5		29.4	29.4	75.3			29.4
Actuated g/C Ratio					0.46		0.37	0.37	0.94			0.37
v/c Ratio					0.90		0.79	0.79	0.38			0.05
Control Delay					31.3		36.7	36.7	3.3			20.2
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					31.3		36.7	36.7	3.3			20.2
LOS					C		D	D	A			C
Approach Delay					31.3			24.4			20.2	
Approach LOS					C			C			C	
Queue Length 50th (ft)					266		175	178	0			7
Queue Length 95th (ft)					#661		#485	#346	170			24
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1462		546	552	1324			542
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					0.90		0.79	0.79	0.38			0.05

Intersection Summary	
Cycle Length: 101	
Actuated Cycle Length: 80.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 27.7	Intersection LOS: C
Intersection Capacity Utilization 77.2%	ICU Level of Service D
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

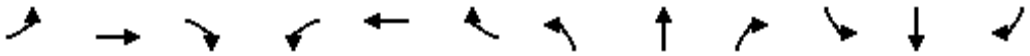
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2
Lane Configurations									
Traffic Volume (vph)	297	87	382	72	178	25	839	721	147
Future Volume (vph)	297	87	382	72	178	25	839	721	147
Satd. Flow (prot)	1660	1398	1465	0	1605	0	3120	1413	0
Flt Permitted					0.985		0.950		
Satd. Flow (perm)	1660	1398	1465	0	1574	0	2596	1413	0
Satd. Flow (RTOR)		139	707					89	
Confl. Peds. (#/hr)		55	35	35		25	55	25	44
Peak Hour Factor	0.93	0.78	0.88	0.69	0.89	0.52	0.94	0.90	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	3%	4%	1%	2%	2%	0%	1%	3%	2%
Shared Lane Traffic (%)									
Lane Group Flow (vph)	339	118	460	0	374	0	946	1020	0
Turn Type	NA	Prot	Prot	Perm	NA		Prot	Prot	
Protected Phases	6	6	4		8		5	2	
Permitted Phases				8					
Total Split (s)	30.0	30.0	34.0	34.0	34.0		46.0	76.0	
Total Lost Time (s)	5.0	5.0	12.0		12.0		5.0	5.0	
Act Effct Green (s)	25.0	25.0	22.0		22.0		41.0	71.0	
Actuated g/C Ratio	0.23	0.23	0.20		0.20		0.37	0.65	
v/c Ratio	0.90	0.28	0.54		1.19		0.81	1.08	
Control Delay	69.1	5.7	2.4		152.5		37.9	73.8	
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	69.1	5.7	2.4		152.5		37.9	73.8	
LOS	E	A	A		F		D	E	
Approach Delay	52.7				152.5		56.5		
Approach LOS	D				F		E		
Queue Length 50th (ft)	234	0	0		~319		306	~786	
Queue Length 95th (ft)	#401	19	0		#497		389	#1039	
Internal Link Dist (ft)	490				1749		402		
Turn Bay Length (ft)		60							
Base Capacity (vph)	377	425	858		314		1162	943	
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	0.90	0.28	0.54		1.19		0.81	1.08	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.19	
Intersection Signal Delay: 59.4	Intersection LOS: E
Intersection Capacity Utilization 97.5%	ICU Level of Service F
Analysis Period (min) 15	
Description: 129, 224, 201	

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St

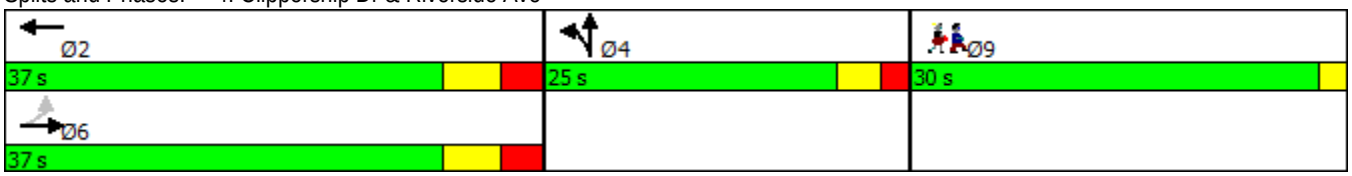


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	298	0	0	373	209	67	368	234	0	0	0
Future Volume (vph)	18	298	0	0	373	209	67	368	234	0	0	0
Satd. Flow (prot)	0	1669	0	0	1584	0	0	2947	0	0	0	0
Flt Permitted		0.810						0.995				
Satd. Flow (perm)	0	1357	0	0	1584	0	0	2947	0	0	0	0
Satd. Flow (RTOR)					34			116				
Confl. Peds. (#/hr)	3					3			7			
Peak Hour Factor	0.75	0.97	0.25	0.25	0.95	0.92	0.80	0.91	0.82	0.92	0.25	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	16%	1%	0%	0%	2%	2%	13%	1%	1%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	351	0	0	657	0	0	820	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	37.0	37.0			37.0		25.0	25.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		30.6			30.6			20.4				
Actuated g/C Ratio		0.45			0.45			0.30				
v/c Ratio		0.57			0.89			0.84				
Control Delay		21.0			34.9			30.1				
Queue Delay		0.0			0.0			0.0				
Total Delay		21.0			34.9			30.1				
LOS		C			C			C				
Approach Delay		21.0			34.9			30.1				
Approach LOS		C			C			C				
Queue Length 50th (ft)		85			190			121				
Queue Length 95th (ft)		#311			#649			#342				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		616			738			974				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.57			0.89			0.84				

Intersection Summary	
Cycle Length: 92	
Actuated Cycle Length: 67.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 30.1	Intersection LOS: C
Intersection Capacity Utilization 71.6%	ICU Level of Service C
Analysis Period (min) 15	
Description: 9, 10, 12	

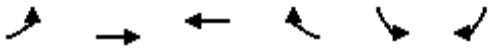
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



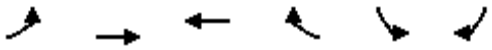
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	662	316	0	440	0	0
Future Volume (vph)	662	316	0	440	0	0
Satd. Flow (prot)	1562	1676	0	1422	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1562	1676	0	1422	0	0
Confl. Peds. (#/hr)	16			16		
Peak Hour Factor	0.88	0.98	0.25	0.95	0.92	0.25
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	2%	0%	4%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	797	342	0	491	0	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 83.5%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 18, 46, 28			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	662	316	0	440	0	0
Future Volume (Veh/h)	662	316	0	440	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.98	0.25	0.95	0.92	0.25
Hourly flow rate (vph)	797	342	0	491	0	0
Pedestrians					16	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		887	226			
pX, platoon unblocked						
vC, conflicting volume	16				1952	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	16				1952	16
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	50				100	100
cM capacity (veh/h)	1589				35	1069

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	797	342	491
Volume Left	797	0	0
Volume Right	0	0	491
cSH	1589	1700	1700
Volume to Capacity	0.50	0.20	0.29
Queue Length 95th (ft)	73	0	0
Control Delay (s)	9.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	6.7		0.0
Approach LOS			

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
Description: 18, 46, 28			

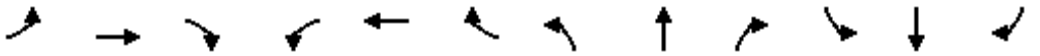
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	382	666	3	1105
Future Volume (vph)	0	0	382	666	3	1105
Satd. Flow (prot)	0	0	1693	1425	0	3185
Flt Permitted						
Satd. Flow (perm)	0	0	1693	1425	0	3185
Peak Hour Factor	0.92	0.25	0.88	0.97	0.94	0.94
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	0%	1%	2%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	460	728	0	1249
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 91.3%		ICU Level of Service F	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	382	666	3	1105
Future Volume (Veh/h)	0	0	382	666	3	1105
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.25	0.88	0.97	0.94	0.94
Hourly flow rate (vph)	0	0	460	728	3	1246
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						140
pX, platoon unblocked						
vC, conflicting volume	1089	460			1188	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1089	460			1188	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			99	
cM capacity (veh/h)	209	554			583	

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	460	728	418	831
Volume Left	0	0	3	0
Volume Right	0	728	0	0
cSH	1700	1700	583	1700
Volume to Capacity	0.27	0.43	0.01	0.49
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.2	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

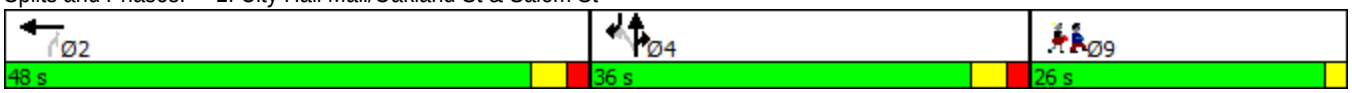


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1154	17	685	26	378	0	0	16
Future Volume (vph)	0	0	0	0	1154	17	685	26	378	0	0	16
Satd. Flow (prot)	0	0	0	0	3209	0	1498	1512	1411	0	0	1479
Flt Permitted							0.950	0.956				
Satd. Flow (perm)	0	0	0	0	3209	0	1492	1506	1411	0	0	1479
Satd. Flow (RTOR)					2							
Confl. Peds. (#/hr)						8	4					4
Peak Hour Factor	0.25	0.25	0.25	0.25	0.95	0.85	0.88	0.72	0.80	0.92	0.25	0.67
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	3%	0%	3%	2%	0%	0%
Shared Lane Traffic (%)							48%					
Lane Group Flow (vph)	0	0	0	0	1309	0	429	434	501	0	0	25
Turn Type					NA		Perm	NA	custom			Prot
Protected Phases					2			4	4			4
Permitted Phases							4		2			
Total Split (s)					48.0		36.0	36.0	36.0			36.0
Total Lost Time (s)					5.0		5.0	5.0	5.0			5.0
Act Effct Green (s)					43.5		31.4	31.4	84.2			31.4
Actuated g/C Ratio					0.49		0.35	0.35	0.94			0.35
v/c Ratio					0.84		0.82	0.82	0.38			0.05
Control Delay					27.3		42.5	42.5	3.0			22.9
Queue Delay					0.0		0.0	0.0	0.0			0.0
Total Delay					27.3		42.5	42.5	3.0			22.9
LOS					C		D	D	A			C
Approach Delay					27.3			28.0			22.9	
Approach LOS					C			C			C	
Queue Length 50th (ft)					282		206	209	0			8
Queue Length 95th (ft)					#666		#525	#374	166			25
Internal Link Dist (ft)		303			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)					1565		524	529	1331			519
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					0.84		0.82	0.82	0.38			0.05

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 89.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 27.6	Intersection LOS: C
Intersection Capacity Utilization 77.2%	ICU Level of Service D
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

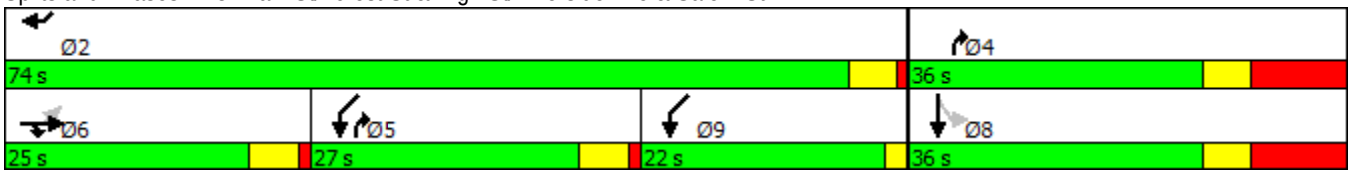
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2	Ø4	Ø5	Ø9
Lane Configurations												
Traffic Volume (vph)	297	87	382	72	178	25	839	721	147			
Future Volume (vph)	297	87	382	72	178	25	839	721	147			
Satd. Flow (prot)	3154	1398	1465	0	1605	0	3120	1413	0			
Flt Permitted					0.985		0.950					
Satd. Flow (perm)	3154	1398	1465	0	1574	0	2648	1413	0			
Satd. Flow (RTOR)		188						89				
Confl. Peds. (#/hr)		55	35	35		25	55	25	44			
Peak Hour Factor	0.93	0.78	0.88	0.69	0.89	0.52	0.94	0.90	0.91			
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%			
Heavy Vehicles (%)	3%	4%	1%	2%	2%	0%	1%	3%	2%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	339	118	460	0	374	0	946	1020	0			
Turn Type	NA	Prot	custom	Perm	NA		Prot	Prot				
Protected Phases	6	6	4 5		8		5 9	2		4	5	9
Permitted Phases				8								
Total Split (s)	25.0	25.0		36.0	36.0			74.0		36.0	27.0	22.0
Total Lost Time (s)	5.0	5.0			12.0			5.0				
Act Effct Green (s)	17.1	17.1	62.3		24.0		46.9	69.0				
Actuated g/C Ratio	0.16	0.16	0.57		0.22		0.43	0.63				
v/c Ratio	0.69	0.31	0.55		1.09		0.71	1.11				
Control Delay	51.5	2.8	18.4		116.3		30.2	85.3				
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0				
Total Delay	51.5	2.8	18.4		116.3		30.2	85.3				
LOS	D	A	B		F		C	F				
Approach Delay	38.9				116.3		58.8					
Approach LOS	D				F		E					
Queue Length 50th (ft)	119	0	131		~298		281	~803				
Queue Length 95th (ft)	165	0	#281		#476		371	#1056				
Internal Link Dist (ft)	490				1749		402					
Turn Bay Length (ft)		60										
Base Capacity (vph)	573	408	830		343		1330	919				
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	0.59	0.29	0.55		1.09		0.71	1.11				

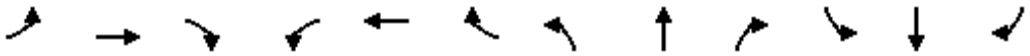
Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.11	
Intersection Signal Delay: 56.9	Intersection LOS: E
Intersection Capacity Utilization 97.5%	ICU Level of Service F
Analysis Period (min) 15	
Description: 129, 224, 201	

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



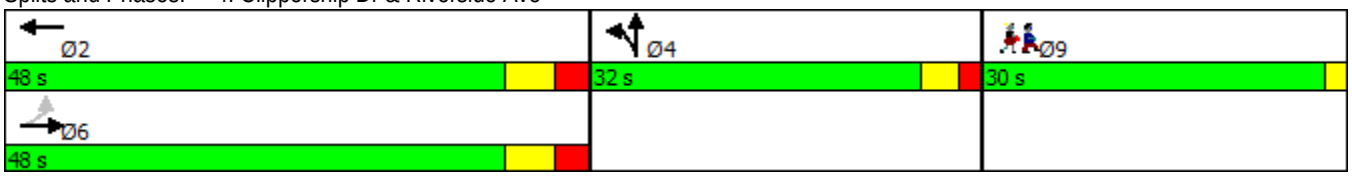


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	298	0	0	373	209	67	368	234	0	0	0
Future Volume (vph)	18	298	0	0	373	209	67	368	234	0	0	0
Satd. Flow (prot)	0	1669	0	0	1584	0	0	2949	0	0	0	0
Flt Permitted		0.849						0.995				
Satd. Flow (perm)	0	1422	0	0	1584	0	0	2949	0	0	0	0
Satd. Flow (RTOR)					30			101				
Confl. Peds. (#/hr)	3					3			7			
Peak Hour Factor	0.75	0.97	0.25	0.25	0.95	0.92	0.80	0.91	0.82	0.92	0.25	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	16%	1%	0%	0%	2%	2%	13%	1%	1%	2%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	351	0	0	657	0	0	820	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	48.0	48.0			48.0		32.0	32.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		41.6			41.6			27.4				
Actuated g/C Ratio		0.49			0.49			0.32				
v/c Ratio		0.51			0.84			0.81				
Control Delay		20.4			31.3			31.9				
Queue Delay		0.0			0.0			0.0				
Total Delay		20.4			31.3			31.9				
LOS		C			C			C				
Approach Delay		20.4			31.3			31.9				
Approach LOS		C			C			C				
Queue Length 50th (ft)		107			244			163				
Queue Length 95th (ft)		299			#706			#376				
Internal Link Dist (ft)		146			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		691			786			1013				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.51			0.84			0.81				

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 29.5	Intersection LOS: C
Intersection Capacity Utilization 71.6%	ICU Level of Service C
Analysis Period (min) 15	
Description: 9, 10, 12	

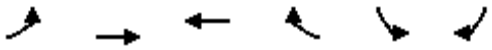
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



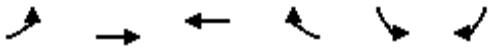
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	662	316	0	440	0	0
Future Volume (vph)	662	316	0	440	0	0
Satd. Flow (prot)	1562	1676	0	1422	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1562	1676	0	1422	0	0
Confl. Peds. (#/hr)	16			16		
Peak Hour Factor	0.88	0.98	0.25	0.95	0.92	0.25
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	2%	0%	4%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	797	342	0	491	0	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 83.5%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 18, 46, 28			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	662	316	0	440	0	0
Future Volume (Veh/h)	662	316	0	440	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.98	0.25	0.95	0.92	0.25
Hourly flow rate (vph)	797	342	0	491	0	0
Pedestrians					16	
Lane Width (ft)					0.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		887	226			
pX, platoon unblocked						
vC, conflicting volume	16				1952	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	16				1952	16
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	50				100	100
cM capacity (veh/h)	1589				35	1069

Direction, Lane #	EB 1	EB 2	WB 1
Volume Total	797	342	491
Volume Left	797	0	0
Volume Right	0	0	491
cSH	1589	1700	1700
Volume to Capacity	0.50	0.20	0.29
Queue Length 95th (ft)	73	0	0
Control Delay (s)	9.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	6.7		0.0
Approach LOS			

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
Description: 18, 46, 28			

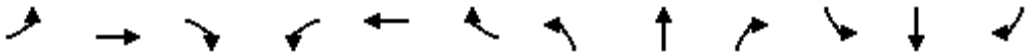
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	382	666	3	1105
Future Volume (vph)	0	0	382	666	3	1105
Satd. Flow (prot)	0	0	1693	1425	0	3185
Flt Permitted						
Satd. Flow (perm)	0	0	1693	1425	0	3185
Peak Hour Factor	0.92	0.25	0.88	0.97	0.94	0.94
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	0%	1%	2%	2%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	460	728	0	1249
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 91.3%		ICU Level of Service F	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	382	666	3	1105
Future Volume (Veh/h)	0	0	382	666	3	1105
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.25	0.88	0.97	0.94	0.94
Hourly flow rate (vph)	0	0	460	728	3	1246
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						140
pX, platoon unblocked						
vC, conflicting volume	1089	460			1188	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1089	460			1188	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			99	
cM capacity (veh/h)	209	554			583	

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	460	728	418	831
Volume Left	0	0	3	0
Volume Right	0	728	0	0
cSH	1700	1700	583	1700
Volume to Capacity	0.27	0.43	0.01	0.49
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.2	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

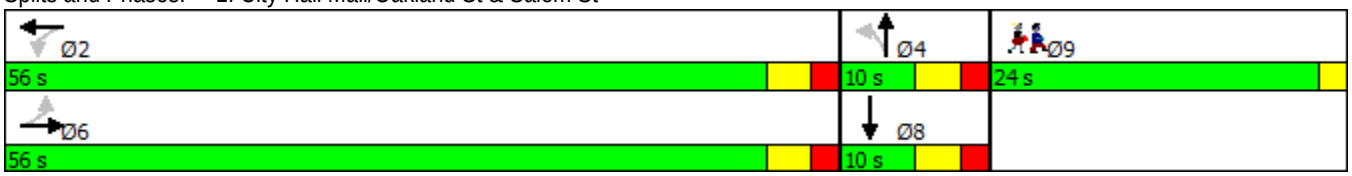


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	413	2	118	1036	17	12	21	35	0	3	16
Future Volume (vph)	5	413	2	118	1036	17	12	21	35	0	3	16
Satd. Flow (prot)	0	1657	0	0	3131	0	0	1530	0	0	1424	0
Flt Permitted		0.984			0.833			0.933				
Satd. Flow (perm)	0	1632	0	0	2621	0	0	1435	0	0	1424	0
Satd. Flow (RTOR)					3							
Confl. Peds. (#/hr)						8	4					4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	489	0	0	1364	0	0	79	0	0	22	0
Turn Type	Perm	NA		Perm	NA		Perm	NA			NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4					
Total Split (s)	56.0	56.0		56.0	56.0		10.0	10.0			10.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		52.2			52.2			5.1			5.1	
Actuated g/C Ratio		0.69			0.69			0.07			0.07	
v/c Ratio		0.43			0.75			0.82			0.23	
Control Delay		9.3			14.8			94.7			44.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		9.3			14.8			94.7			44.4	
LOS		A			B			F			D	
Approach Delay		9.3			14.8			94.7			44.4	
Approach LOS		A			B			F			D	
Queue Length 50th (ft)		44			93			32			9	
Queue Length 95th (ft)		246			#522			#136			37	
Internal Link Dist (ft)		301			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)		1126			1810			96			96	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.43			0.75			0.82			0.23	

Intersection Summary			
Cycle Length: 90			
Actuated Cycle Length: 75.6			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 17.0		Intersection LOS: B	
Intersection Capacity Utilization 88.3%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 21, 13, 14			

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	24.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	NBR2	SBL2
Lane Configurations												
Traffic Volume (vph)	49	131	142	87	283	82	18	110	60	234	6	61
Future Volume (vph)	49	131	142	87	283	82	18	110	60	234	6	61
Satd. Flow (prot)	0	1577	1660	1411	0	1591	0	0	1428	0	0	0
Flt Permitted		0.698				0.680			0.702			
Satd. Flow (perm)	0	1159	1660	1411	0	1122	0	0	1016	0	0	0
Satd. Flow (RTOR)				95								
Confl. Peds. (#/hr)				55							35	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	210	165	101	0	447	0	0	478	0	0	0
Turn Type	pm+pt	pm+pt	NA	Prot	pm+pt	NA		Perm	NA			Perm
Protected Phases	1	1	6	6	5	2			4			
Permitted Phases	6	6			2			4				8
Total Split (s)	8.0	8.0	39.0	39.0	9.0	40.0		41.0	41.0			41.0
Total Lost Time (s)		4.0	5.0	5.0		5.0			5.0			
Act Effct Green (s)		44.0	43.0	43.0		35.0			36.0			
Actuated g/C Ratio		0.30	0.30	0.30		0.24			0.25			
v/c Ratio		0.58	0.34	0.21		1.66			1.90			
Control Delay		49.5	42.2	9.0		345.4			448.2			
Queue Delay		0.0	0.0	0.0		0.0			0.0			
Total Delay		49.5	42.2	9.0		345.4			448.2			
LOS		D	D	A		F			F			
Approach Delay			38.4			345.4			448.2			
Approach LOS			D			F			F			
Queue Length 50th (ft)		160	122	4		~610			~670			
Queue Length 95th (ft)		240	190	49		#828			#862			
Internal Link Dist (ft)			490			368			60			
Turn Bay Length (ft)		100		60								
Base Capacity (vph)		363	492	485		270			252			
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		0.58	0.34	0.21		1.66			1.90			

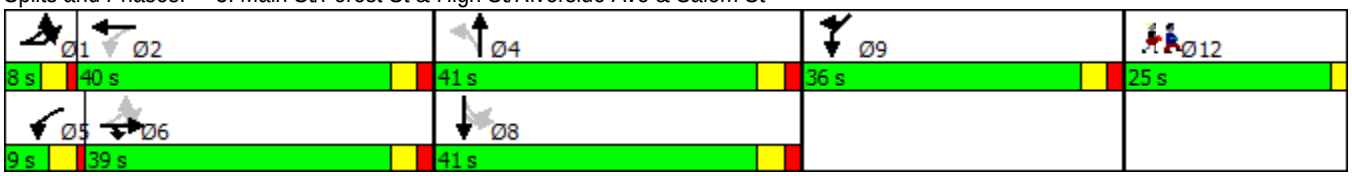
Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 145
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.93
Intersection Signal Delay: 335.0 Intersection LOS: F
Intersection Capacity Utilization 132.4% ICU Level of Service H
Analysis Period (min) 15
Description: 129, 224, 201

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



Lane Group	SBL	SBT	SBR	SWL	SWR	SWR2	Ø12
Lane Configurations							
Traffic Volume (vph)	37	178	25	557	530	20	
Future Volume (vph)	37	178	25	557	530	20	
Satd. Flow (prot)	0	1606	0	1577	1411	0	
Flt Permitted		0.563		0.950			
Satd. Flow (perm)	0	913	0	1451	1411	0	
Satd. Flow (RTOR)					95		
Confl. Peds. (#/hr)	35		25	55	25	44	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	
Growth Factor	106%	106%	106%	106%	106%	106%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	350	0	649	640	0	
Turn Type	Perm	NA		Prot	Prot		
Protected Phases		8		9	9		12
Permitted Phases	8						
Total Split (s)	41.0	41.0		36.0	36.0		25.0
Total Lost Time (s)		5.0		5.0	5.0		
Act Effct Green (s)		36.0		31.0	31.0		
Actuated g/C Ratio		0.25		0.21	0.21		
v/c Ratio		1.55		1.93	1.70		
Control Delay		304.1		457.8	356.4		
Queue Delay		0.0		0.0	0.0		
Total Delay		304.1		457.8	356.4		
LOS		F		F	F		
Approach Delay		304.1		407.4			
Approach LOS		F		F			
Queue Length 50th (ft)		~464		~941	~817		
Queue Length 95th (ft)		#665		#1182	#1060		
Internal Link Dist (ft)		1749		407			
Turn Bay Length (ft)							
Base Capacity (vph)		226		337	376		
Starvation Cap Reductn		0		0	0		
Spillback Cap Reductn		0		0	0		
Storage Cap Reductn		0		0	0		
Reduced v/c Ratio		1.55		1.93	1.70		

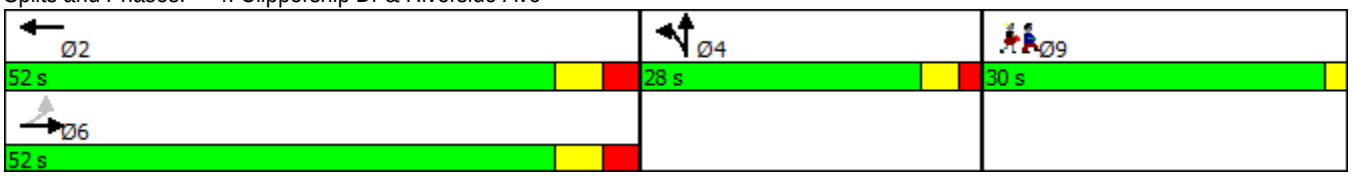
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	298	0	0	373	209	40	368	234	0	0	0
Future Volume (vph)	3	298	0	0	373	209	40	368	234	0	0	0
Satd. Flow (prot)	0	1660	0	0	1572	0	0	2933	0	0	0	0
Flt Permitted		0.996						0.997				
Satd. Flow (perm)	0	1654	0	0	1572	0	0	2933	0	0	0	0
Satd. Flow (RTOR)					31			93				
Confl. Peds. (#/hr)	3					3			7			
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	350	0	0	677	0	0	749	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	52.0	52.0			52.0		28.0	28.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		45.6			45.6			23.3				
Actuated g/C Ratio		0.53			0.53			0.27				
v/c Ratio		0.40			0.79			0.86				
Control Delay		15.4			26.0			38.5				
Queue Delay		0.0			0.0			0.0				
Total Delay		15.4			26.0			38.5				
LOS		B			C			D				
Approach Delay		15.4			26.0			38.5				
Approach LOS		B			C			D				
Queue Length 50th (ft)		89			226			156				
Queue Length 95th (ft)		260			#697			#365				
Internal Link Dist (ft)		140			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		883			853			868				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.40			0.79			0.86				

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 29.2	Intersection LOS: C
Intersection Capacity Utilization 70.7%	ICU Level of Service C
Analysis Period (min) 15	
Description: 9, 10, 12	

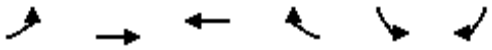
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	169	383	20	132	3
Future Volume (vph)	21	169	383	20	132	3
Satd. Flow (prot)	0	1652	1649	0	1577	0
Flt Permitted		0.995			0.953	
Satd. Flow (perm)	0	1652	1649	0	1577	0
Confl. Peds. (#/hr)	16			16		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	221	469	0	157	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 46.7%		ICU Level of Service A	
Analysis Period (min) 15			
Description: 18, 46, 28			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	410	639	3	1107
Future Volume (vph)	0	0	410	639	3	1107
Satd. Flow (prot)	0	0	1660	1411	0	3154
Flt Permitted						
Satd. Flow (perm)	0	0	1660	1411	0	3154
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	478	744	0	1292
Sign Control	Stop		Free			Free

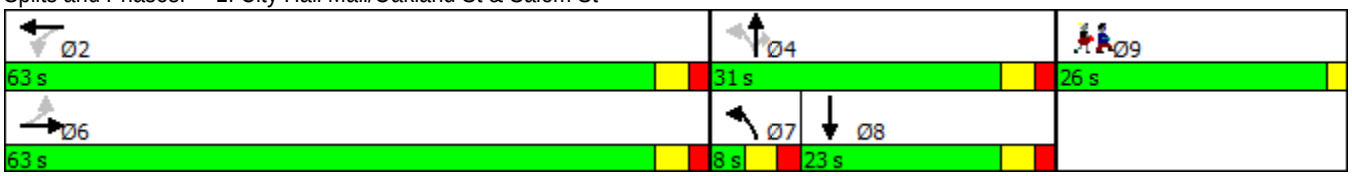
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 89.4%		ICU Level of Service E	
Analysis Period (min) 15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	190	2	118	1036	17	208	26	98	0	8	16
Future Volume (vph)	6	190	2	118	1036	17	208	26	98	0	8	16
Satd. Flow (prot)	0	1655	0	0	3131	0	0	1589	1411	0	1487	0
Flt Permitted		0.956			0.873			0.729				
Satd. Flow (perm)	0	1586	0	0	2747	0	0	1205	1411	0	1487	0
Satd. Flow (RTOR)					2				114			
Confl. Peds. (#/hr)						8	4					4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	230	0	0	1364	0	0	272	114	0	28	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm		NA	
Protected Phases		6			2		7	4			8	
Permitted Phases	6			2			4		4			
Total Split (s)	63.0	63.0		63.0	63.0		8.0	31.0	31.0		23.0	
Total Lost Time (s)		5.0			5.0			5.0	5.0		5.0	
Act Effct Green (s)		58.8			58.8			26.4	26.4		26.4	
Actuated g/C Ratio		0.56			0.56			0.25	0.25		0.25	
v/c Ratio		0.26			0.88			0.89	0.26		0.07	
Control Delay		15.0			30.4			71.4	8.8		35.1	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		15.0			30.4			71.4	8.8		35.1	
LOS		B			C			E	A		D	
Approach Delay		15.0			30.4			52.9			35.1	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)		56			297			151	0		12	
Queue Length 95th (ft)		162			#734			#400	48		44	
Internal Link Dist (ft)		301			283			120			1450	
Turn Bay Length (ft)												
Base Capacity (vph)		893			1548			304	441		375	
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		0.26			0.88			0.89	0.26		0.07	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 104.4	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 33.0	Intersection LOS: C
Intersection Capacity Utilization 85.1%	ICU Level of Service E
Analysis Period (min) 15	
Description: 21, 13, 14	

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

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	NBR2	SBL2	SBL	SBT	SBR	SWL
Lane Configurations												
Traffic Volume (vph)	49	131	142	87	283	82	330	61	37	178	25	557
Future Volume (vph)	49	131	142	87	283	82	330	61	37	178	25	557
Satd. Flow (prot)	0	1577	1660	1411	1498	1535	1436	0	0	1601	0	1577
Flt Permitted		0.498			0.950	0.973				0.984		0.950
Satd. Flow (perm)	0	827	1660	1411	1498	1535	1436	0	0	1532	0	1431
Satd. Flow (RTOR)				100								
Confl. Peds. (#/hr)				55			35		35		25	55
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)					36%							
Lane Group Flow (vph)	0	210	165	101	211	215	384	0	0	350	0	649
Turn Type	Prot	Perm	NA	Prot	custom	NA	pt+ov	Split	Split	NA		Prot
Protected Phases	1		6	6	4	4	4 5	8	8	8		5
Permitted Phases		6			4							
Total Split (s)	10.0	21.0	21.0	21.0	24.0	24.0		25.0	25.0	25.0		50.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0				5.0		4.0
Act Effct Green (s)		16.0	16.0	16.0	18.7	18.7	63.7			20.0		46.0
Actuated g/C Ratio		0.13	0.13	0.13	0.16	0.16	0.53			0.17		0.38
v/c Ratio		1.91	0.74	0.37	0.90	0.90	0.50			1.31		1.07
Control Delay		468.6	70.9	13.4	88.5	87.0	11.5			204.4		93.4
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0			0.0		0.0
Total Delay		468.6	70.9	13.4	88.5	87.0	11.5			204.4		93.4
LOS		F	E	B	F	F	B			F		F
Approach Delay			234.2			87.8				204.4		113.7
Approach LOS			F			F				F		F
Queue Length 50th (ft)		~250	125	1	170	173	85			~349		~559
Queue Length 95th (ft)		#406	#229	52	#321	#323	122			#538		#788
Internal Link Dist (ft)			490			370				1749		407
Turn Bay Length (ft)		100		60								
Base Capacity (vph)		110	222	275	238	244	767			267		606
Starvation Cap Reductn		0	0	0	0	0	0			0		0
Spillback Cap Reductn		0	0	0	0	0	0			0		0
Storage Cap Reductn		0	0	0	0	0	0			0		0
Reduced v/c Ratio		1.91	0.74	0.37	0.89	0.88	0.50			1.31		1.07

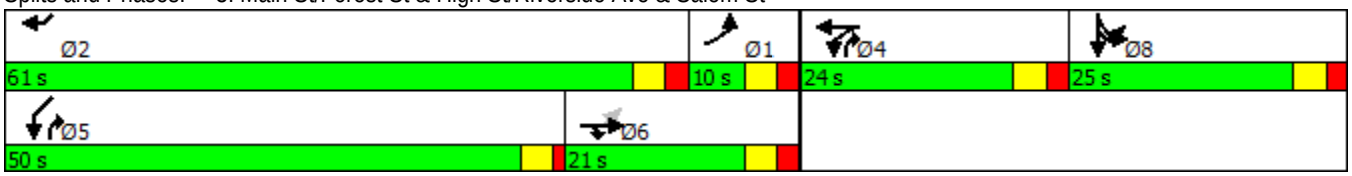
Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 119.7
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.91
Intersection Signal Delay: 126.1 Intersection LOS: F
Intersection Capacity Utilization 117.3% ICU Level of Service H
Analysis Period (min) 15
Description: 129, 224, 201

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

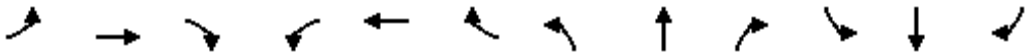
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



Lane Group	SWR	SWR2
Lane Configurations		
Traffic Volume (vph)	640	98
Future Volume (vph)	640	98
Satd. Flow (prot)	1411	0
Flt Permitted		
Satd. Flow (perm)	1411	0
Satd. Flow (RTOR)	109	
Confl. Peds. (#/hr)	25	44
Peak Hour Factor	0.91	0.91
Growth Factor	106%	106%
Shared Lane Traffic (%)		
Lane Group Flow (vph)	859	0
Turn Type	Prot	
Protected Phases	2	
Permitted Phases		
Total Split (s)	61.0	
Total Lost Time (s)	5.0	
Act Effct Green (s)	56.0	
Actuated g/C Ratio	0.47	
v/c Ratio	1.20	
Control Delay	129.1	
Queue Delay	0.0	
Total Delay	129.1	
LOS	F	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	~763	
Queue Length 95th (ft)	#1012	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	718	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	1.20	

Intersection Summary

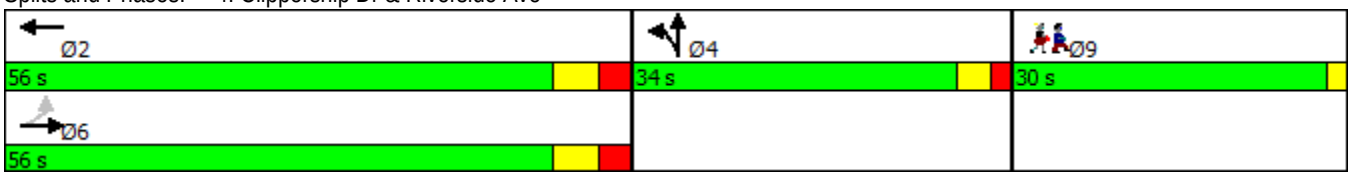


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	298	0	0	373	209	10	468	234	0	0	0
Future Volume (vph)	8	298	0	0	373	209	10	468	234	0	0	0
Satd. Flow (prot)	0	1659	0	0	1572	0	0	2963	0	0	0	0
Flt Permitted		0.982						0.999				
Satd. Flow (perm)	0	1630	0	0	1572	0	0	2963	0	0	0	0
Satd. Flow (RTOR)					28			66				
Confl. Peds. (#/hr)	3					3			7			
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	356	0	0	677	0	0	830	0	0	0	0
Turn Type	Perm	NA			NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6											
Total Split (s)	56.0	56.0			56.0		34.0	34.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		49.5			49.5			29.3				
Actuated g/C Ratio		0.52			0.52			0.31				
v/c Ratio		0.42			0.82			0.87				
Control Delay		17.9			29.8			40.5				
Queue Delay		0.0			0.0			0.0				
Total Delay		17.9			29.8			40.5				
LOS		B			C			D				
Approach Delay		17.9			29.8			40.5				
Approach LOS		B			C			D				
Queue Length 50th (ft)		111			275			204				
Queue Length 95th (ft)		289			#753			#435				
Internal Link Dist (ft)		140			1713			481			209	
Turn Bay Length (ft)												
Base Capacity (vph)		846			829			956				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.42			0.82			0.87				

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 95.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 32.3	Intersection LOS: C
Intersection Capacity Utilization 72.9%	ICU Level of Service C
Analysis Period (min) 15	
Description: 9, 10, 12	

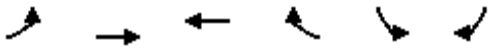
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	325	180	359	24	126	3
Future Volume (vph)	325	180	359	24	126	3
Satd. Flow (prot)	0	1609	1647	0	1577	0
Flt Permitted		0.969			0.953	
Satd. Flow (perm)	0	1609	1647	0	1577	0
Confl. Peds. (#/hr)	16			16		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	589	446	0	150	0
Sign Control		Stop	Stop		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 74.8%		ICU Level of Service D	
Analysis Period (min) 15			
Description: 18, 46, 28			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	330	715	0	1109
Future Volume (vph)	0	0	330	715	0	1109
Satd. Flow (prot)	0	0	1660	1411	0	3154
Flt Permitted						
Satd. Flow (perm)	0	0	1660	1411	0	3154
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	384	833	0	1292
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 55.5%		ICU Level of Service B	
Analysis Period (min) 15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	424	23	337	817	17	173	3	3	0	3	16
Future Volume (vph)	3	424	23	337	817	17	173	3	3	0	3	16
Satd. Flow (prot)	0	1649	0	0	3103	0	0	1582	1411	0	1448	0
Flt Permitted		0.990			0.544			0.713				
Satd. Flow (perm)	0	1632	0	0	1712	0	0	1177	1411	0	1448	0
Satd. Flow (RTOR)					2							
Confl. Peds. (#/hr)						8	4					4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	524	0	0	1365	0	0	205	3	0	22	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom		NA	
Protected Phases		4!			2!			4!	4!		6!	
Permitted Phases	4!			2!			4!		2			
Total Split (s)	30.0	30.0		64.0	64.0		30.0	30.0	30.0		64.0	
Total Lost Time (s)		5.0			5.0			5.0	5.0		5.0	
Act Effct Green (s)		25.4			59.8			25.4	93.6		59.8	
Actuated g/C Ratio		0.24			0.57			0.24	0.90		0.57	
v/c Ratio		1.32			6.14dl			0.72	0.00		0.03	
Control Delay		195.2			205.2			54.5	3.7		13.8	
Queue Delay		0.0			0.0			0.0	0.0		0.0	
Total Delay		195.2			205.2			54.5	3.7		13.8	
LOS		F			F			D	A		B	
Approach Delay		195.2			205.2			53.8			13.8	
Approach LOS		F			F			D			B	
Queue Length 50th (ft)		~384			~548			109	0		5	
Queue Length 95th (ft)		#785			#948			#288	3		23	
Internal Link Dist (ft)		312			283			123			1450	
Turn Bay Length (ft)												
Base Capacity (vph)		396			982			286	1265		829	
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		1.32			1.39			0.72	0.00		0.03	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 104.4	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 1.39	
Intersection Signal Delay: 185.9	Intersection LOS: F
Intersection Capacity Utilization 97.5%	ICU Level of Service F
Analysis Period (min) 15	
Description: 21, 13, 14	

~ 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.

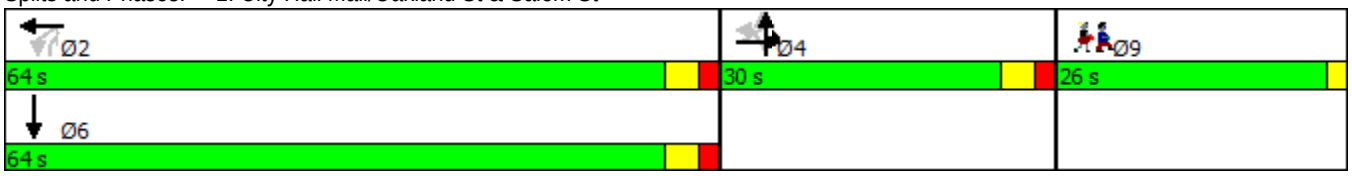
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	26.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

! Phase conflict between lane groups.

Splits and Phases: 1: City Hall Mall/Oakland St & Salem St



Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	NBR2	SBL2	SBL	SBT	SBR	SWL
Lane Configurations												
Traffic Volume (vph)	131	191	87	110	60	234	40	61	37	178	25	330
Future Volume (vph)	131	191	87	110	60	234	40	61	37	178	25	330
Satd. Flow (prot)	1577	1660	1411	0	1609	1411	0	0	0	1603	0	1577
Flt Permitted					0.969					0.984		0.950
Satd. Flow (perm)	1660	1660	1339	0	1609	1273	0	0	0	1578	0	1490
Satd. Flow (RTOR)			65			102						
Confl. Peds. (#/hr)			55				35		35		25	55
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	153	222	101	0	198	320	0	0	0	350	0	384
Turn Type	Perm	NA	custom	Split	NA	Perm		Split	Split	NA		Prot
Protected Phases		6	6	4	4			8	8	8		5
Permitted Phases	6		5			4						
Total Split (s)	31.0	31.0	31.0	23.0	23.0	23.0		30.0	30.0	30.0		41.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0				5.0		5.0
Act Effct Green (s)	26.0	26.0	62.0		18.0	18.0				25.0		36.0
Actuated g/C Ratio	0.18	0.18	0.42		0.12	0.12				0.17		0.25
v/c Ratio	0.52	0.76	0.16		1.01	1.31				1.29		0.99
Control Delay	62.4	74.8	10.4		120.8	190.8				200.2		99.4
Queue Delay	0.0	0.0	0.0		40.1	4.2				0.0		0.0
Total Delay	62.4	74.8	10.4		160.9	195.0				200.2		99.4
LOS	E	E	B		F	F				F		F
Approach Delay		57.2			182.0					200.2		125.9
Approach LOS		E			F					F		F
Queue Length 50th (ft)	134	204	19		157	~232				~422		368
Queue Length 95th (ft)	217	#333	57		#364	#520				#644		#606
Internal Link Dist (ft)		490			60					1749		394
Turn Bay Length (ft)	100		60									
Base Capacity (vph)	293	293	615		197	245				272		386
Starvation Cap Reductn	0	0	0		86	60				0		0
Spillback Cap Reductn	0	0	0		0	0				0		0
Storage Cap Reductn	0	0	0		0	0				0		0
Reduced v/c Ratio	0.52	0.76	0.16		1.78	1.73				1.29		0.99

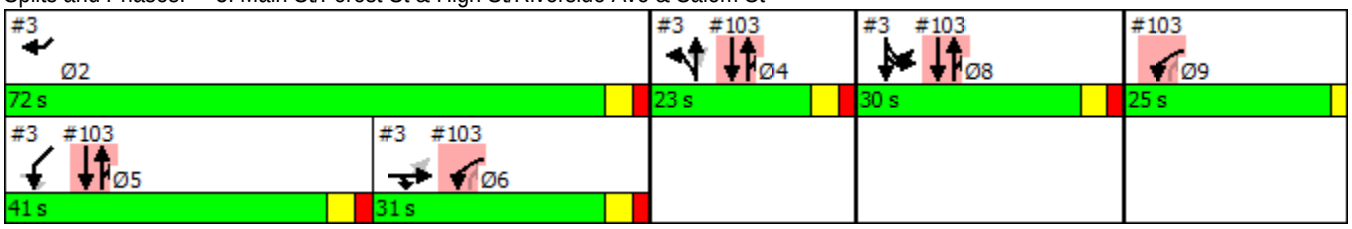
Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 146.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.31
Intersection Signal Delay: 134.7 Intersection LOS: F
Intersection Capacity Utilization 87.8% ICU Level of Service E
Analysis Period (min) 15
Description: 129, 224, 201

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St



Lane Group	SWR	SWR2	Ø9
Lane Configurations			
Traffic Volume (vph)	612	88	
Future Volume (vph)	612	88	
Satd. Flow (prot)	1411	0	
Flt Permitted			
Satd. Flow (perm)	1411	0	
Satd. Flow (RTOR)	65		
Confl. Peds. (#/hr)	25	44	
Peak Hour Factor	0.91	0.91	
Growth Factor	106%	106%	
Shared Lane Traffic (%)			
Lane Group Flow (vph)	816	0	
Turn Type	Prot		
Protected Phases	2		9
Permitted Phases			
Total Split (s)	72.0		25.0
Total Lost Time (s)	5.0		
Act Effct Green (s)	67.0		
Actuated g/C Ratio	0.46		
v/c Ratio	1.20		
Control Delay	138.4		
Queue Delay	0.0		
Total Delay	138.4		
LOS	F		
Approach Delay			
Approach LOS			
Queue Length 50th (ft)	~909		
Queue Length 95th (ft)	#1203		
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)	678		
Starvation Cap Reductn	0		
Spillback Cap Reductn	0		
Storage Cap Reductn	0		
Reduced v/c Ratio	1.20		

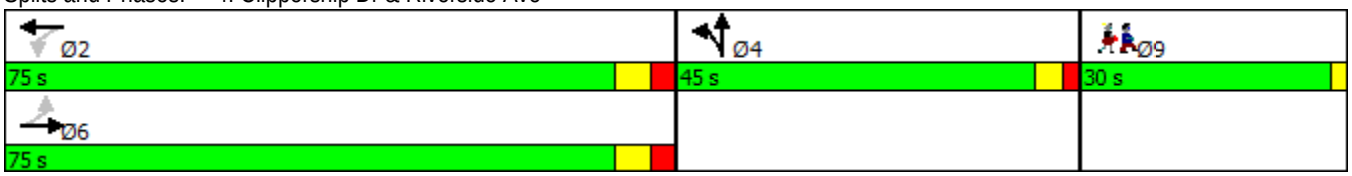
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	287	0	283	101	209	3	372	234	0	0	0
Future Volume (vph)	3	287	0	283	101	209	3	372	234	0	0	0
Satd. Flow (prot)	0	1660	0	0	1538	0	0	1554	0	0	0	0
Flt Permitted		0.995			0.661							
Satd. Flow (perm)	0	1652	0	0	1041	0	0	1554	0	0	0	0
Satd. Flow (RTOR)					24			20				
Confl. Peds. (#/hr)	3					3			7			
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	691	0	0	709	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Split	NA				
Protected Phases		6			2		4	4				
Permitted Phases	6			2								
Total Split (s)	75.0	75.0		75.0	75.0		45.0	45.0				
Total Lost Time (s)		7.0			7.0			5.0				
Act Effct Green (s)		68.4			68.4			40.3				
Actuated g/C Ratio		0.55			0.55			0.32				
v/c Ratio		0.37			1.19			1.38				
Control Delay		19.3			130.7			217.9				
Queue Delay		32.3			0.0			0.0				
Total Delay		51.6			130.7			217.9				
LOS		D			F			F				
Approach Delay		51.6			130.7			217.9				
Approach LOS		D			F			F				
Queue Length 50th (ft)		135			~624			~708				
Queue Length 95th (ft)		302			#1124			#1216				
Internal Link Dist (ft)		141			1713			396			211	
Turn Bay Length (ft)												
Base Capacity (vph)		902			579			512				
Starvation Cap Reductn		572			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		1.02			1.19			1.38				

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 125.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.38	
Intersection Signal Delay: 150.9	Intersection LOS: F
Intersection Capacity Utilization 114.0%	ICU Level of Service H
Analysis Period (min) 15	
Description: 9, 10, 12	

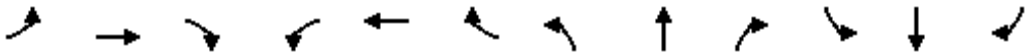
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Clippership Dr & Riverside Ave



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

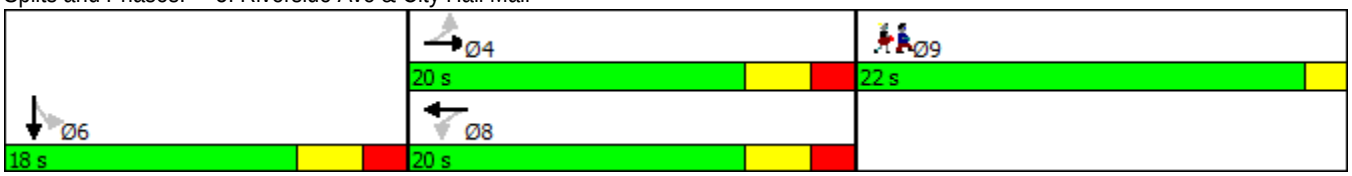


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	161	2	2	18	84	0	0	0	126	228	3
Future Volume (vph)	68	161	2	2	18	84	0	0	0	126	228	3
Satd. Flow (prot)	0	1635	0	0	1416	0	0	0	0	1577	1878	0
Flt Permitted		0.864			0.994					0.950		
Satd. Flow (perm)	0	1422	0	0	1409	0	0	0	0	1577	1878	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	16					16						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	269	0	0	121	0	0	0	0	147	269	0
Turn Type	Perm	NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases	4			8						6		
Total Split (s)	20.0	20.0		20.0	20.0					18.0	18.0	
Total Lost Time (s)		5.0			5.0					5.0	5.0	
Act Effct Green (s)		12.7			12.7					13.3	13.3	
Actuated g/C Ratio		0.30			0.30					0.31	0.31	
v/c Ratio		0.64			0.29					0.30	0.46	
Control Delay		25.1			16.6					17.9	19.3	
Queue Delay		0.0			0.0					0.0	0.0	
Total Delay		25.1			16.6					17.9	19.3	
LOS		C			B					B	B	
Approach Delay		25.1			16.6						18.8	
Approach LOS		C			B						B	
Queue Length 50th (ft)		33			13					18	35	
Queue Length 95th (ft)		#188			74					90	#159	
Internal Link Dist (ft)		374			141			275			169	
Turn Bay Length (ft)												
Base Capacity (vph)		543			539					560	667	
Starvation Cap Reductn		0			0					0	0	
Spillback Cap Reductn		0			0					0	0	
Storage Cap Reductn		0			0					0	0	
Reduced v/c Ratio		0.50			0.22					0.26	0.40	

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 42.7	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 20.6	Intersection LOS: C
Intersection Capacity Utilization 43.9%	ICU Level of Service A
Analysis Period (min) 15	
Description: 18, 46, 28	

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

Splits and Phases: 5: Riverside Ave & City Hall Mall



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	22.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

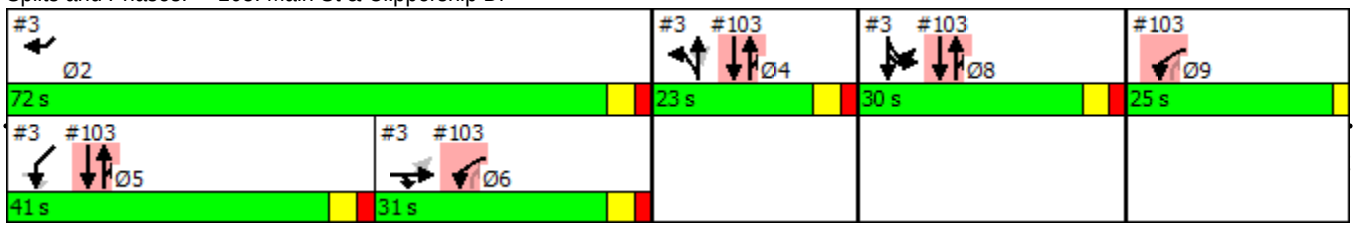
Volume
103: Main St & Clippership Dr 06/15/2018

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4	Ø5	Ø6	Ø8	Ø9
Lane Configurations												
Traffic Volume (vph)	510	0	444	620	0	600						
Future Volume (vph)	510	0	444	620	0	600						
Satd. Flow (prot)	3060	0	1660	1411	0	3154						
Flt Permitted	0.950											
Satd. Flow (perm)	3060	0	1660	1411	0	3154						
Satd. Flow (RTOR)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91						
Growth Factor	106%	106%	106%	106%	106%	106%						
Shared Lane Traffic (%)												
Lane Group Flow (vph)	594	0	517	722	0	699						
Turn Type	Prot		NA	custom		NA						
Protected Phases	6 9		4 5 8	4 5 8		4 5 8	2	4	5	6	8	9
Permitted Phases				6 9								
Total Split (s)							72.0	23.0	41.0	31.0	30.0	25.0
Total Lost Time (s)												
Act Effct Green (s)	42.9		84.0	146.9		84.0						
Actuated g/C Ratio	0.29		0.57	1.00		0.57						
v/c Ratio	0.66		0.54	0.51		0.39						
Control Delay	27.2		12.5	1.3		3.7						
Queue Delay	0.0		1.6	0.0		6.4						
Total Delay	27.2		14.0	1.3		10.1						
LOS	C		B	A		B						
Approach Delay	27.2		6.6			10.1						
Approach LOS	C		A			B						
Queue Length 50th (ft)	137		152	0		32						
Queue Length 95th (ft)	172		198	0		m33						
Internal Link Dist (ft)	844		158			60						
Turn Bay Length (ft)												
Base Capacity (vph)	958		949	1411		1803						
Starvation Cap Reductn	0		0	0		1040						
Spillback Cap Reductn	0		255	0		0						
Storage Cap Reductn	0		0	0		0						
Reduced v/c Ratio	0.62		0.74	0.51		0.92						

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 146.9	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.31	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 53.0%	ICU Level of Service A
Analysis Period (min) 15	

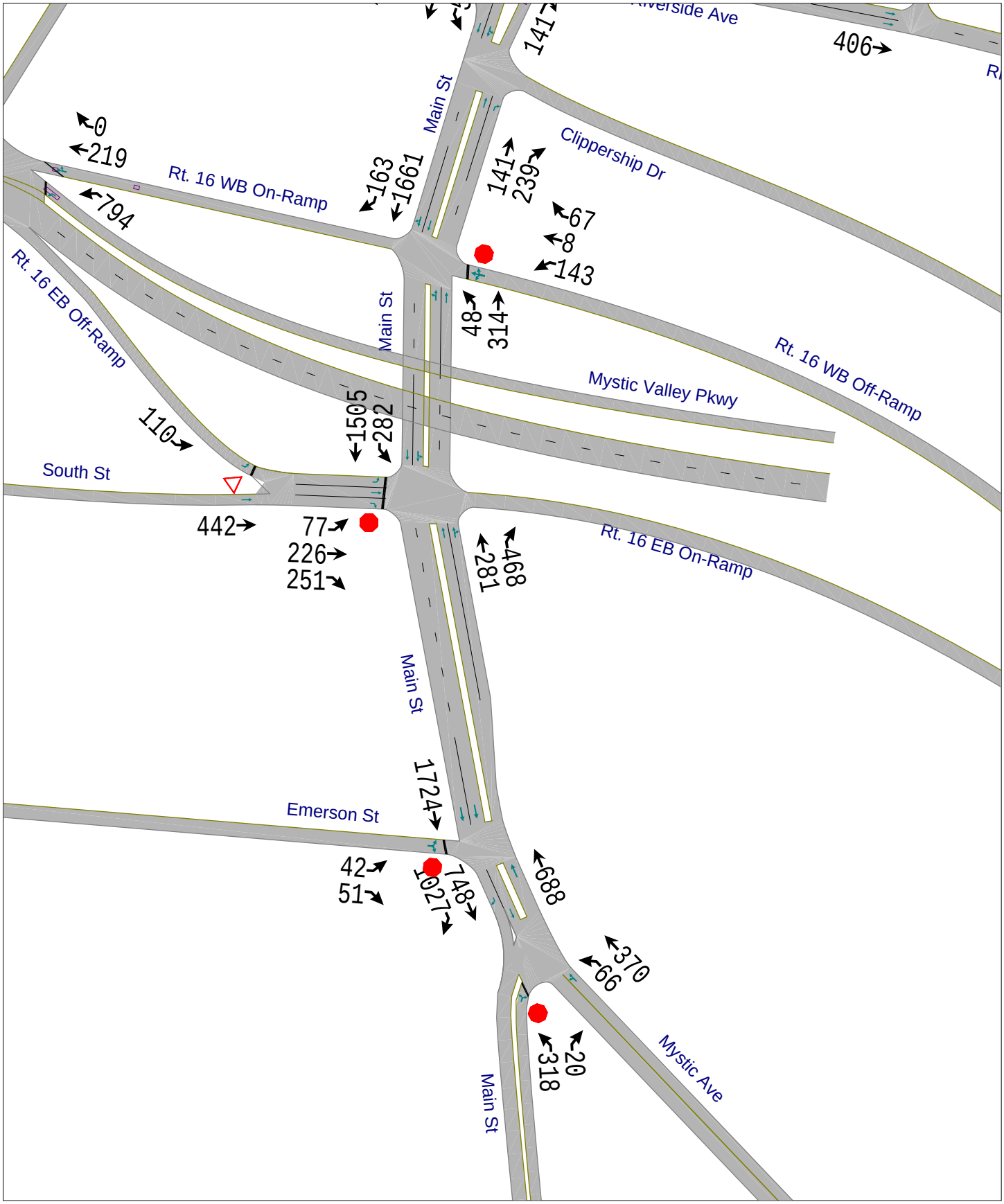
m Volume for 95th percentile queue is metered by upstream signal.

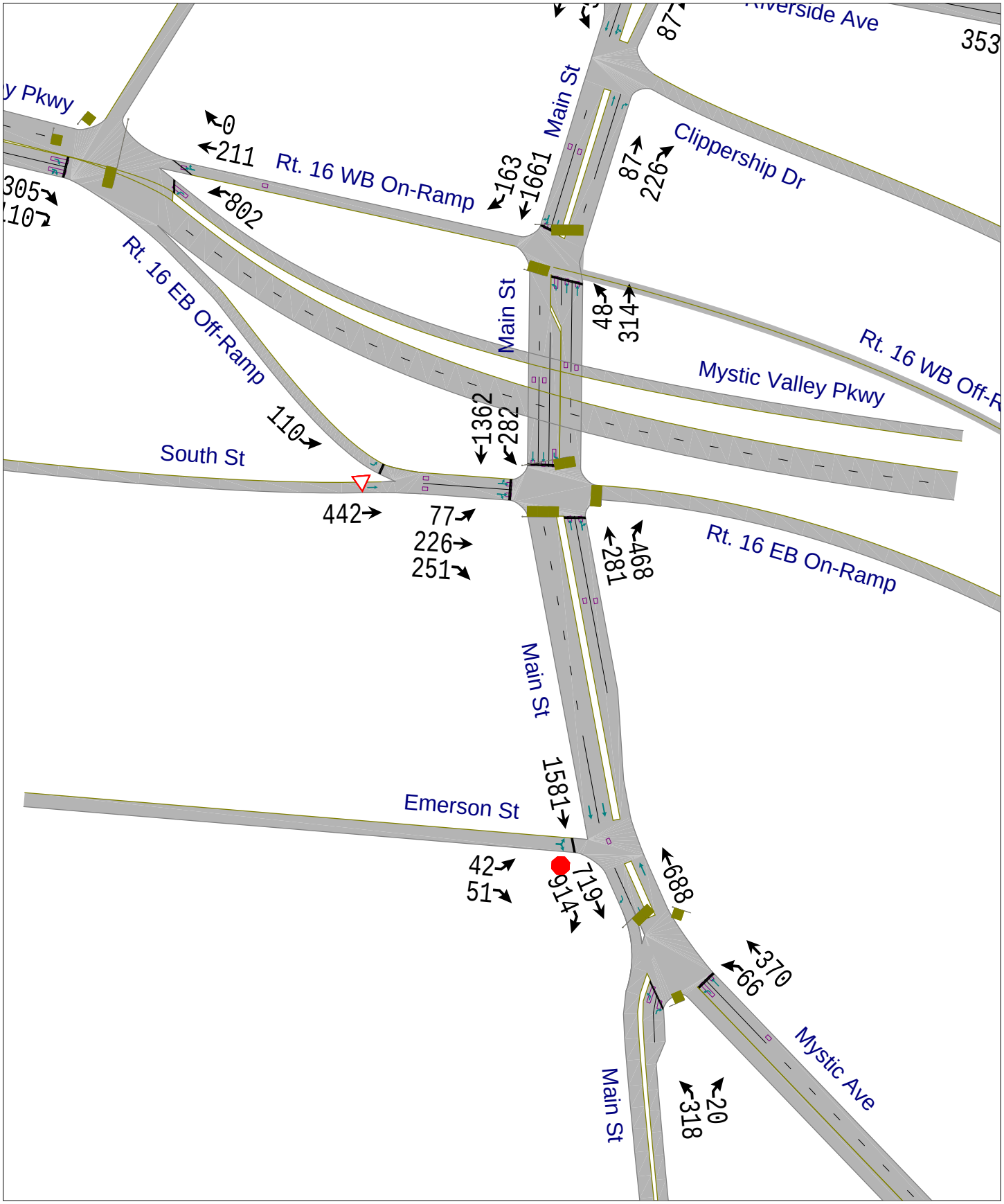
Splits and Phases: 103: Main St & Clippership Dr

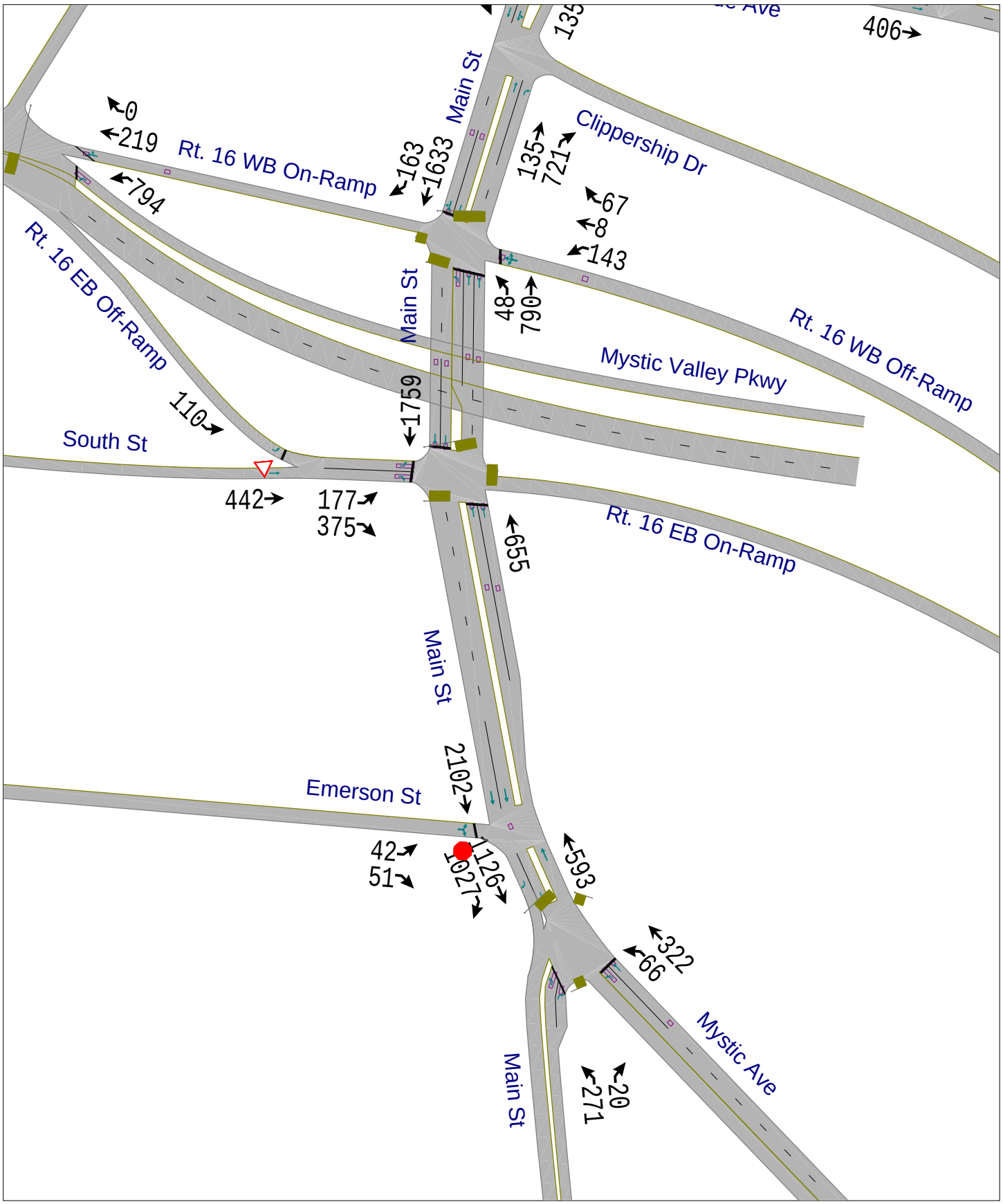


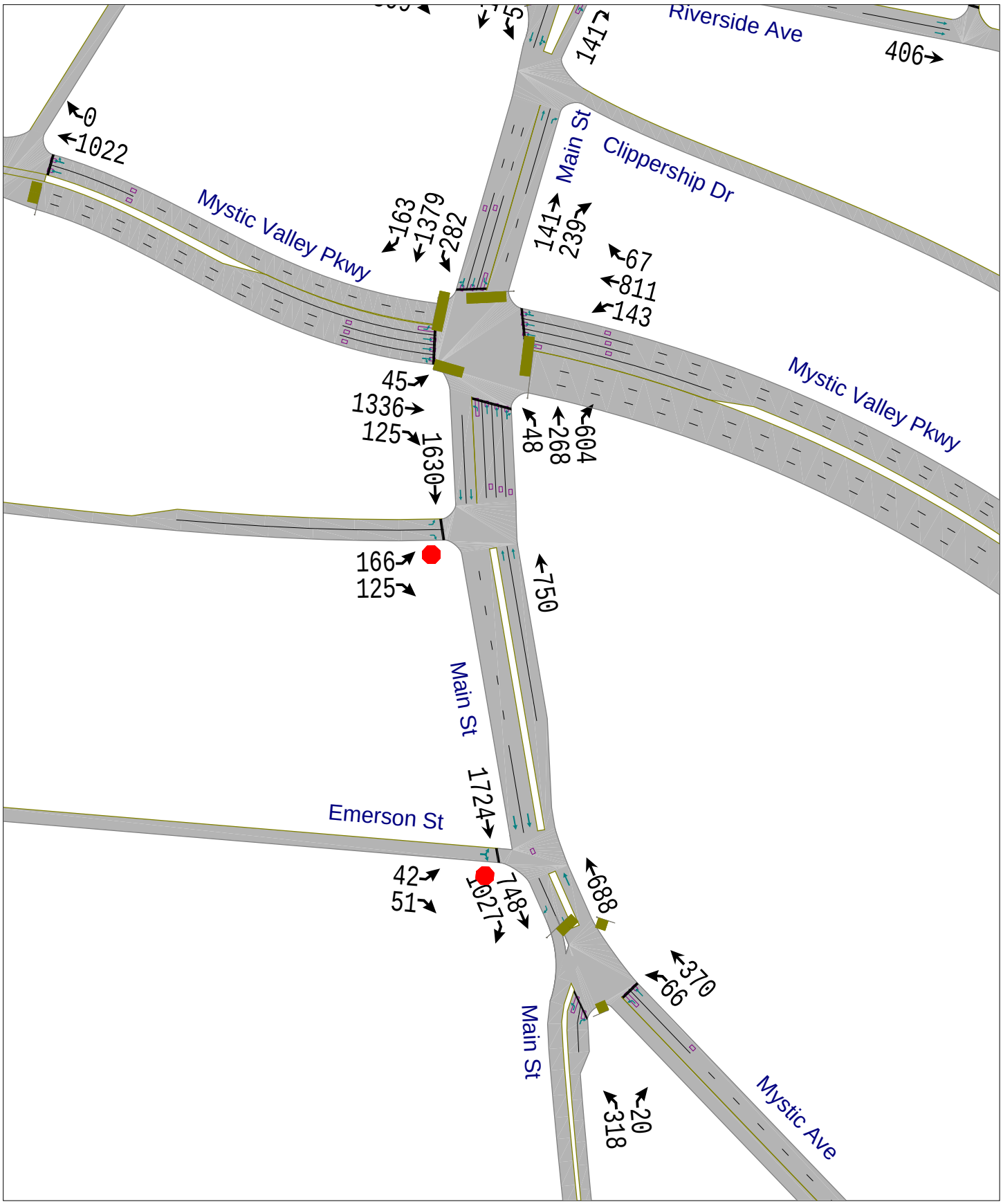
APPENDIX L

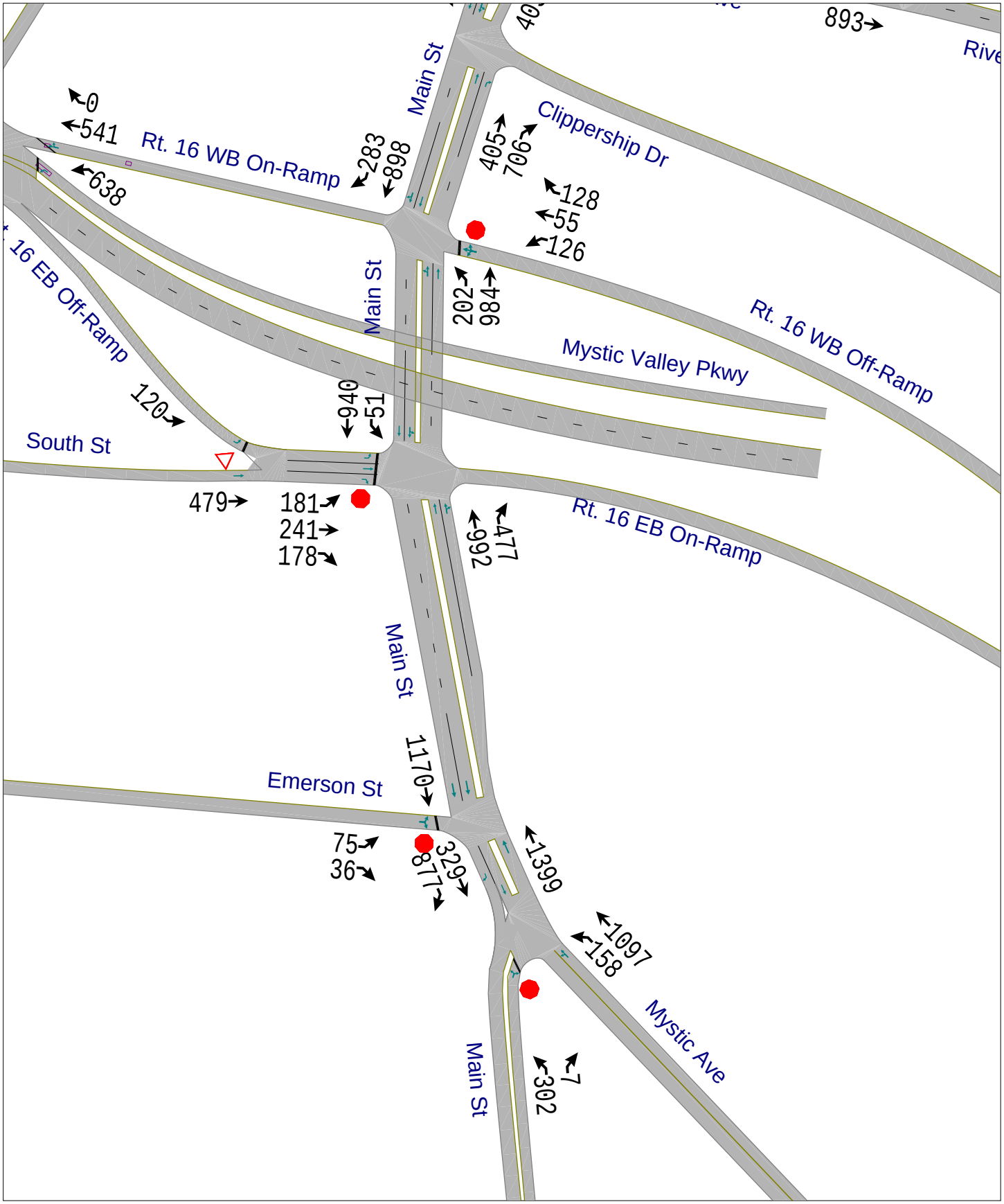
Proposed Long-Term Alternatives: Main Street at Route 16 Ramps
2040 Traffic Volume Projections (AM/PM Peak Hour)

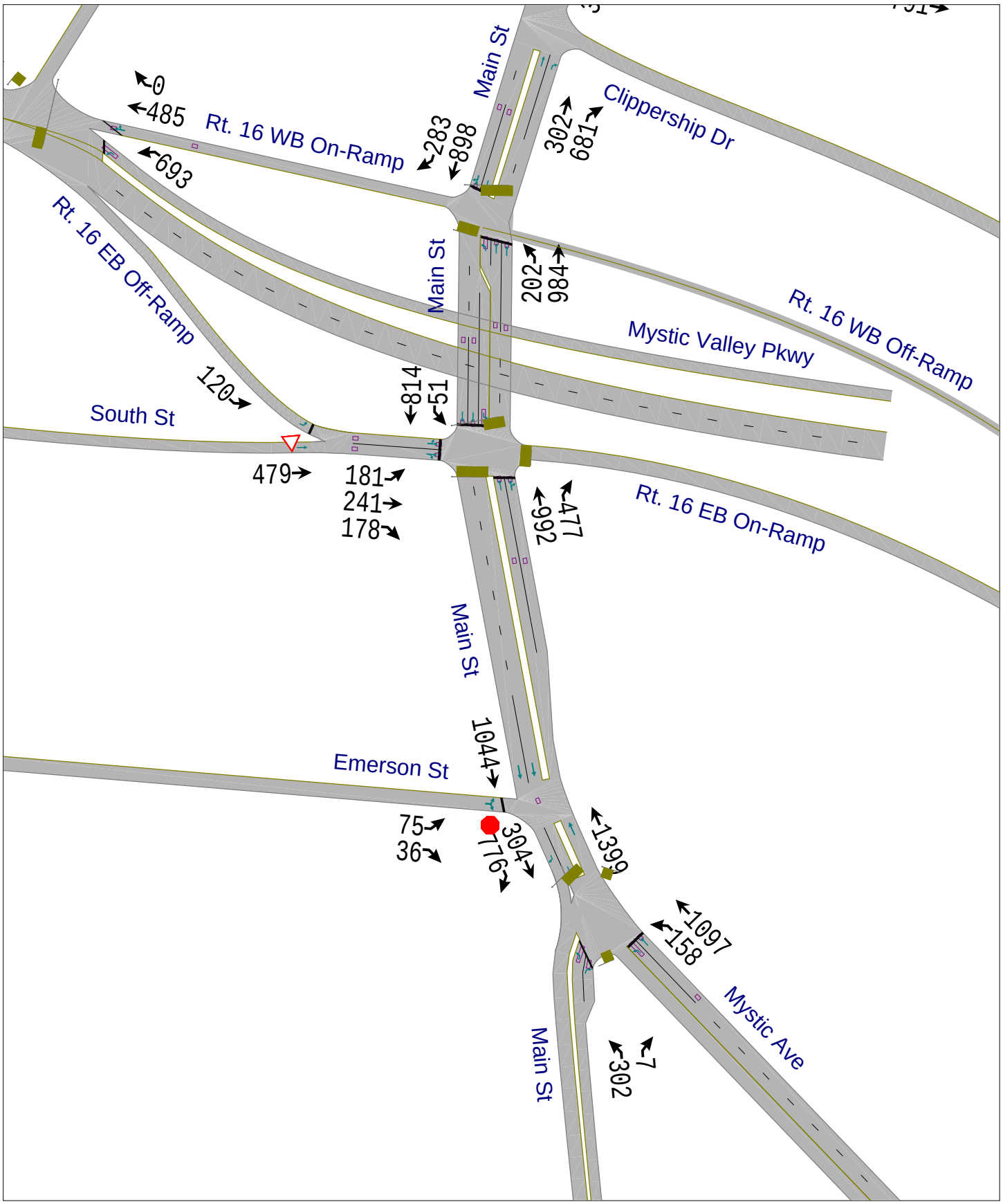

Riverside Ave
406
141
Main St
0
219
794
Rt. 16 WB On-Ramp
163
1661
141
239
Clippership Dr
67
8
143
48
314
Rt. 16 EB Off-Ramp
Main St
Rt. 16 WB Off-Ramp
Mystic Valley Pkwy
110
1505
282
South St
442
77
226
251
281
468
Rt. 16 EB On-Ramp
Main St
1724
Emerson St
42
51
748
1027
688
370
66
20
318
Mystic Ave
Main St

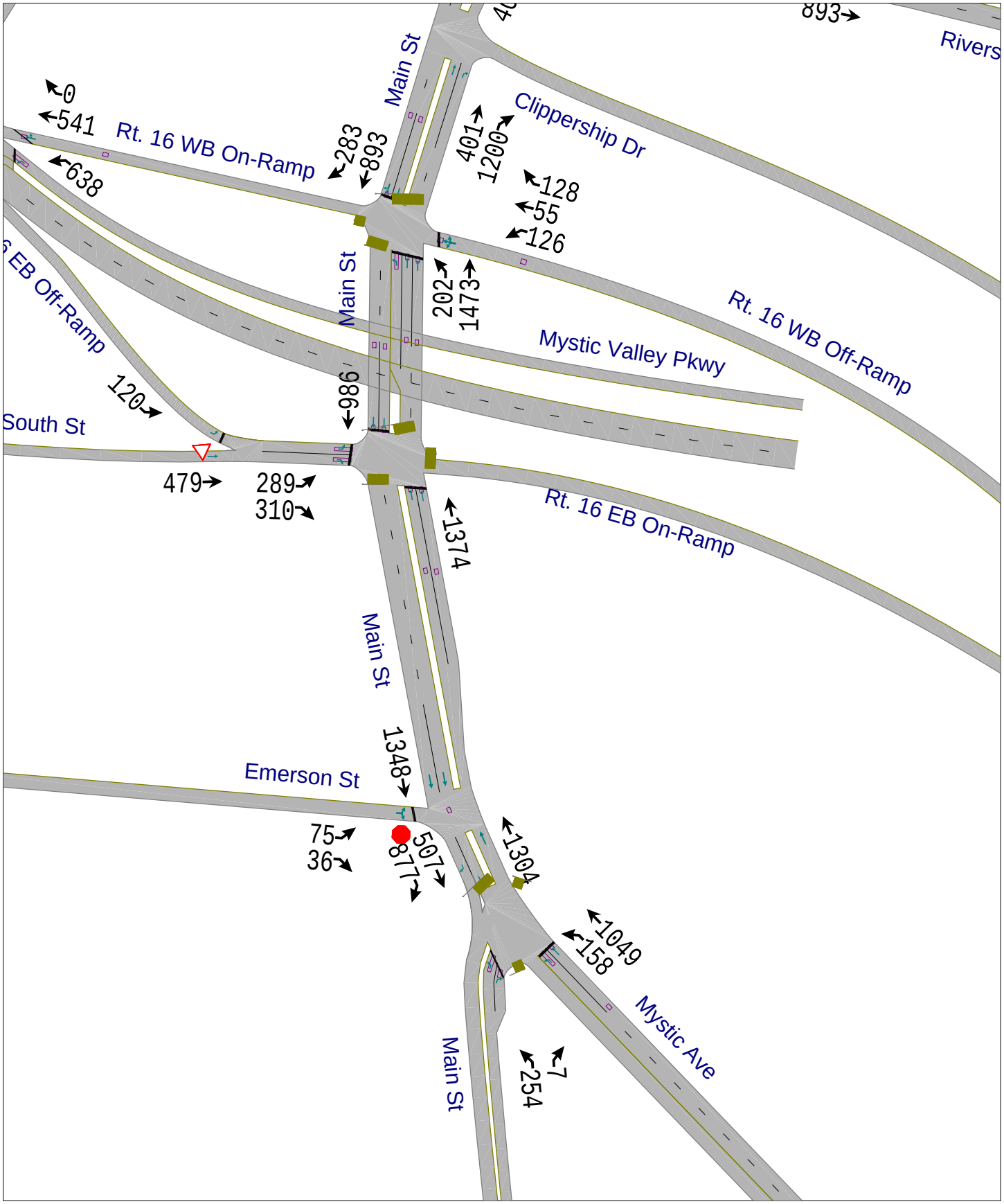

Riverside Ave
353
y Pkwy
0
211
Rt. 16 WB On-Ramp
802
305
110
163
1661
Main St
87
226
Clippership Dr
Rt. 16 EB Off-Ramp
Main St
48
314
Rt. 16 WB Off-R
Mystic Valley Pkwy
1362
282
110
South St
442
77
226
251
281
468
Rt. 16 EB On-Ramp
Main St
1581
Emerson St
42
51
914
719
688
370
66
Mystic Ave
Main St
20
318

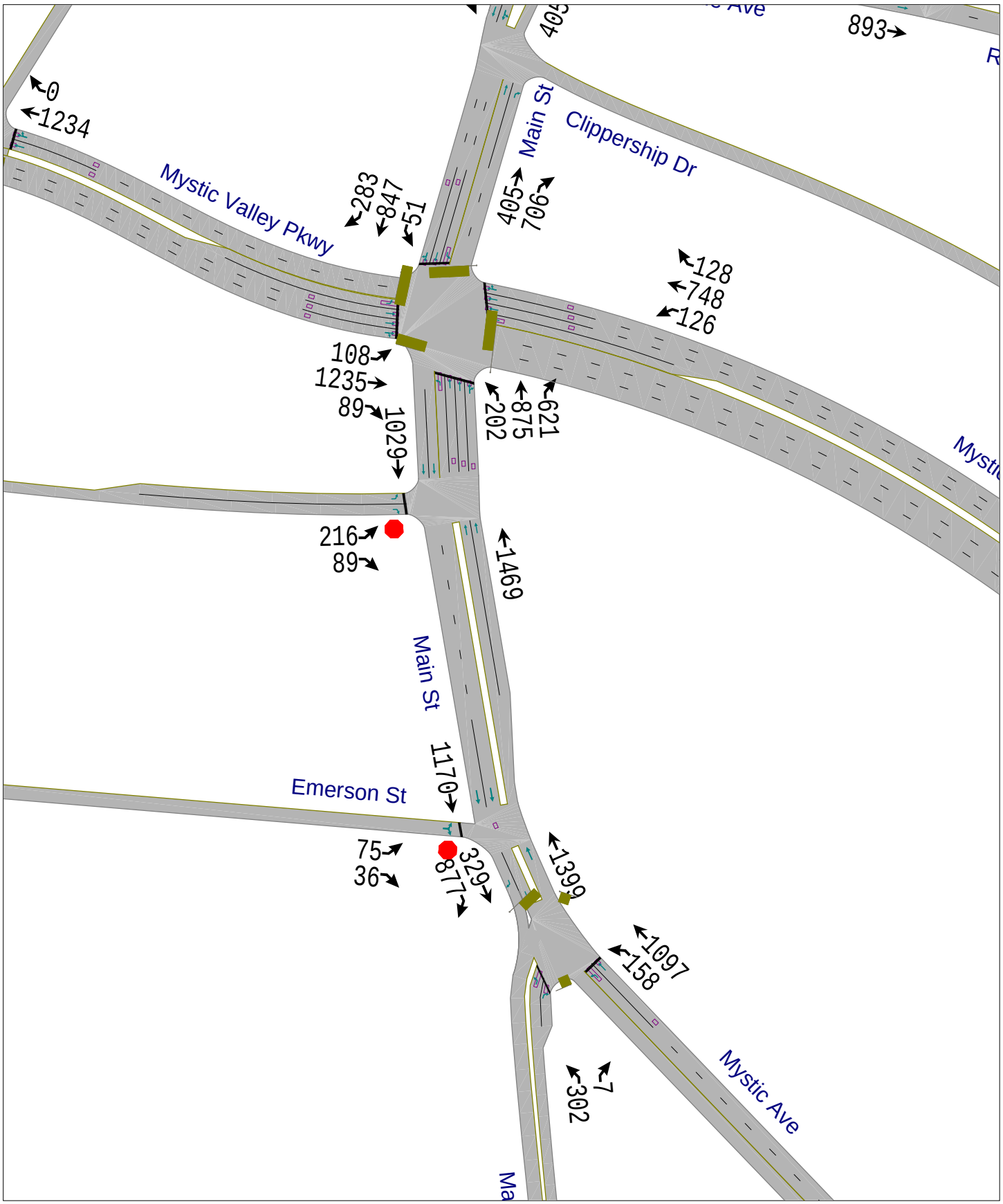

Main St
Rt. 16 WB On-Ramp
Clippership Dr
Rt. 16 EB Off-Ramp
Main St
Rt. 16 WB Off-Ramp
Mystic Valley Pkwy
South St
Rt. 16 EB On-Ramp
Main St
Emerson St
Mystic Ave
Main St
406
0
219
794
163
1633
135
721
67
8
143
48
790
1759
110
442
177
375
655
2102
42
51
1126
1027
593
322
66
20
271


Riverside Ave
406
141
5
0
1022
Mystic Valley Pkwy
Main St
Clippership Dr
163
1379
282
141
239
67
811
143
Mystic Valley Pkwy
45
1336
125
1630
48
268
604
166
125
750
Main St
Emerson St
1724
42
51
748
1027
688
370
66
Main St
20
318
Mystic Ave


Main St
Clippership Dr
Rt. 16 WB On-Ramp
Rt. 16 EB Off-Ramp
Main St
Mystic Valley Pkwy
Rt. 16 WB Off-Ramp
South St
Rt. 16 EB On-Ramp
Main St
Emerson St
Main St
Mystic Ave
0
541
638
283
898
405
706
128
55
126
202
984
940
51
120
479
181
241
178
477
992
1170
75
36
329
877
1399
1097
158
7
302
893

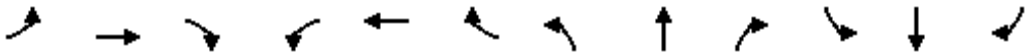

Main St
Clippership Dr
Rt. 16 WB On-Ramp
Rt. 16 EB Off-Ramp
Main St
Rt. 16 WB Off-Ramp
Mystic Valley Pkwy
South St
Rt. 16 EB On-Ramp
Main St
Emerson St
Mystic Ave
Main St
0
485
693
283
898
302
681
202
984
120
814
51
479
181
241
178
477
992
1044
75
36
304
176
1399
1097
158
7
302


Main St
Clippership Dr
Rivers
893
0
541
Rt. 16 WB On-Ramp
638
283
893
401
1200
128
55
126
Main St
202
1473
Rt. 16 WB Off-Ramp
Mystic Valley Pkwy
6 EB Off-Ramp
120
986
South St
479
289
310
Rt. 16 EB On-Ramp
1374
Main St
1348
Emerson St
75
36
507
877
1304
1049
158
Mystic Ave
Main St
7
254


Mystic Valley Pkwy
Main St
Clippership Dr
Emerson St
Mystic Ave
0
1234
283
847
51
405
706
893
128
748
126
108
1235
89
1029
202
875
621
216
89
1469
1170
75
36
329
877
1399
1097
158
7
302

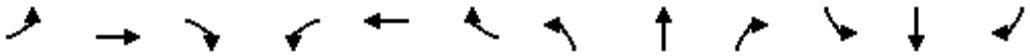
APPENDIX M

Proposed Long-Term Alternatives: Main Street at Route 16 Ramps
2040 AM/PM Peak Hour Intersection Capacity Analyses



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Future Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Satd. Flow (prot)	0	0	0	0	1770	0	0	2985	0	0	3111	0
Flt Permitted					0.968			0.993				
Satd. Flow (perm)	0	0	0	0	1770	0	0	2985	0	0	3111	0
Confl. Peds. (#/hr)				6		20	3					3
Peak Hour Factor	0.92	0.92	0.25	1.00	1.00	1.00	0.88	0.88	0.92	0.92	0.97	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	2%	9%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	218	0	0	412	0	0	1935	0
Sign Control		Stop			Stop			Free			Free	

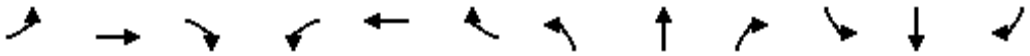
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 77.9%		ICU Level of Service D	
Analysis Period (min) 15			
Description: 29, 10, 3			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	136	8	64	46	299	0	0	1582	155
Future Volume (Veh/h)	0	0	0	136	8	64	46	299	0	0	1582	155
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.25	1.00	1.00	1.00	0.88	0.88	0.92	0.92	0.97	0.73
Hourly flow rate (vph)	0	0	0	143	8	67	55	357	0	0	1712	223
Pedestrians		3						6			20	
Lane Width (ft)		0.0						12.0			12.0	
Walking Speed (ft/s)		3.5						3.5			3.5	
Percent Blockage		0						1			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											378	
pX, platoon unblocked												
vC, conflicting volume	2206	2294	976	1329	2405	198	1938			357		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2206	2294	976	1329	2405	198	1938			357		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	71	92	82			100		
cM capacity (veh/h)	15	31	253	96	27	797	299			1198		

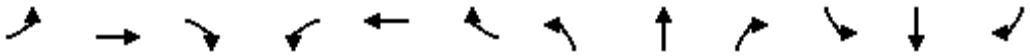
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	218	174	238	1141	794
Volume Left	143	55	0	0	0
Volume Right	67	0	0	0	223
cSH	117	299	1700	1700	1700
Volume to Capacity	1.86	0.18	0.14	0.67	0.47
Queue Length 95th (ft)	433	17	0	0	0
Control Delay (s)	479.8	8.9	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	479.8	3.8		0.0	
Approach LOS	F				

Intersection Summary				
Average Delay	41.4			
Intersection Capacity Utilization	77.9%	ICU Level of Service	D	
Analysis Period (min)	15			
Description: 29, 10, 3				



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Future Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Satd. Flow (prot)	1547	1676	1425	0	0	0	0	2761	0	0	3131	0
Flt Permitted	0.950										0.991	
Satd. Flow (perm)	1547	1676	1425	0	0	0	0	2761	0	0	3131	0
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.94	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	5%	2%	2%	0%	0%	0%	2%	10%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	259	326	0	0	0	0	850	0	0	1941	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 104.2%		ICU Level of Service G	
Analysis Period (min) 15			
Description: 6, 9, 4			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	215	239	0	0	0	0	268	446	269	1433	0
Future Volume (Veh/h)	73	215	239	0	0	0	0	268	446	269	1433	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.94	0.25
Hourly flow rate (vph)	92	259	326	0	0	0	0	335	515	340	1601	0
Pedestrians					4			2				
Lane Width (ft)					0.0			12.0				
Walking Speed (ft/s)					3.5			3.5				
Percent Blockage					0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											634	
pX, platoon unblocked												
vC, conflicting volume	2448	3135	802	2534	2878	429	1601			854		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2448	3135	802	2534	2878	429	1601			854		
tC, single (s)	7.6	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	0	0	100	100	100			56		
cM capacity (veh/h)	10	6	326	0	9	580	405			781		

Direction, Lane #	EB 1	EB 2	EB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	92	259	326	223	627	874	1067
Volume Left	92	0	0	0	0	340	0
Volume Right	0	0	326	0	515	0	0
cSH	10	6	326	1700	1700	781	1700
Volume to Capacity	9.12	42.20	1.00	0.13	0.37	0.44	0.63
Queue Length 95th (ft)	Err	Err	276	0	0	56	0
Control Delay (s)	Err	Err	86.5	0.0	0.0	10.2	0.0
Lane LOS	F	F	F			B	
Approach Delay (s)	5225.8			0.0		4.6	
Approach LOS	F						

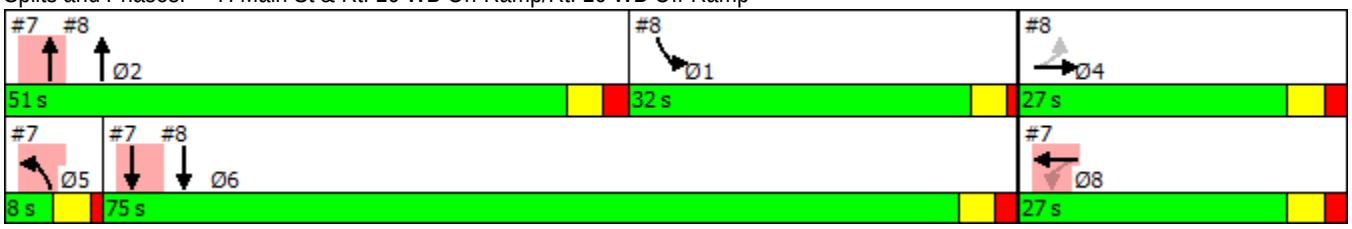
Intersection Summary				
Average Delay	1022.7			
Intersection Capacity Utilization	104.2%	ICU Level of Service	G	
Analysis Period (min)	15			
Description: 6, 9, 4				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Future Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Satd. Flow (prot)	0	0	0	0	1748	0	1593	2981	0	0	3103	0
Flt Permitted					0.968		0.950					
Satd. Flow (perm)	0	0	0	0	1738	0	1588	2981	0	0	3103	0
Satd. Flow (RTOR)											25	
Confl. Peds. (#/hr)				6		20	3					3
Peak Hour Factor	0.92	0.92	0.25	1.00	1.00	1.00	0.88	0.88	0.92	0.92	0.97	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	2%	9%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	218	0	55	357	0	0	1935	0
Turn Type				Perm	NA		Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8								
Total Split (s)				27.0	27.0		8.0	51.0			75.0	
Total Lost Time (s)					5.0		4.0	5.0			5.0	
Act Effct Green (s)					22.0		4.0	38.9			70.0	
Actuated g/C Ratio					0.20		0.04	0.35			0.64	
v/c Ratio					0.63		0.96	0.34			0.98	
Control Delay					49.3		169.9	10.6			35.0	
Queue Delay					0.0		0.0	0.4			41.8	
Total Delay					49.3		169.9	11.1			76.7	
LOS					D		F	B			E	
Approach Delay					49.3			32.3			76.7	
Approach LOS					D			C			E	
Queue Length 50th (ft)					142		40	49			629	
Queue Length 95th (ft)					224		m#71	m57			#867	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)					347		57	1246			1983	
Starvation Cap Reductn					0		0	473			429	
Spillback Cap Reductn					0		0	0			132	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.63		0.96	0.46			1.25	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 67.3	Intersection LOS: E
Intersection Capacity Utilization 88.1%	ICU Level of Service E
Analysis Period (min) 15	
Description: 29, 10, 3	

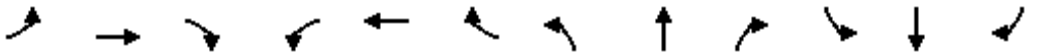
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø1	Ø4
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	1	4
Permitted Phases		
Total Split (s)	32.0	27.0
Total Lost Time (s)		
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

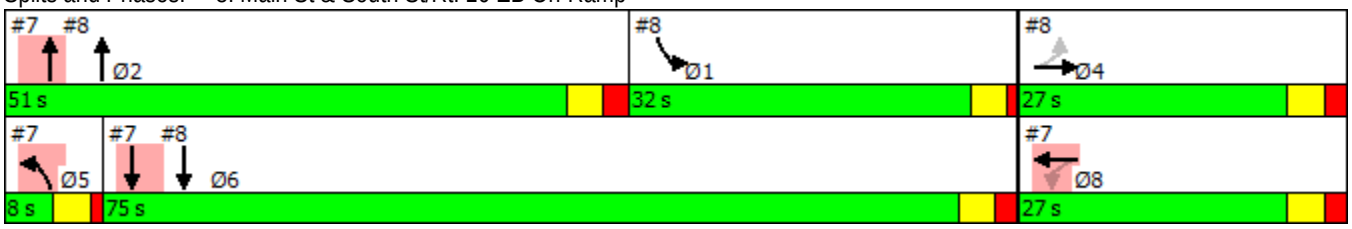


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Future Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Satd. Flow (prot)	0	2903	0	0	0	0	0	2720	0	1593	3154	0
Flt Permitted		0.993								0.950		
Satd. Flow (perm)	0	2903	0	0	0	0	0	2720	0	1589	3154	0
Satd. Flow (RTOR)		98						192				
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.94	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	5%	2%	2%	0%	0%	0%	2%	10%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	677	0	0	0	0	0	850	0	340	1601	0
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Total Split (s)	27.0	27.0						51.0		32.0	75.0	
Total Lost Time (s)		5.0						5.0		4.0	5.0	
Act Effct Green (s)		22.0						38.9		35.1	70.0	
Actuated g/C Ratio		0.20						0.35		0.32	0.64	
v/c Ratio		1.03						0.78		0.67	0.80	
Control Delay		77.9						29.1		23.1	7.8	
Queue Delay		0.0						0.0		16.6	22.3	
Total Delay		77.9						29.1		39.8	30.1	
LOS		E						C		D	C	
Approach Delay		77.9						29.1			31.8	
Approach LOS		E						C			C	
Queue Length 50th (ft)		189						217		157	109	
Queue Length 95th (ft)		207						237		m188	m121	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		659						1249		507	2007	
Starvation Cap Reductn		0						0		154	462	
Spillback Cap Reductn		0						0		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		1.03						0.68		0.96	1.04	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 40.1	Intersection LOS: D
Intersection Capacity Utilization 88.1%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 9, 4	

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

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø5	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	8
Permitted Phases		
Total Split (s)	8.0	27.0
Total Lost Time (s)		
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Future Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Satd. Flow (prot)	0	0	0	0	1746	0	1593	2981	0	0	3103	0
Flt Permitted					0.968		0.286					
Satd. Flow (perm)	0	0	0	0	1735	0	479	2981	0	0	3103	0
Satd. Flow (RTOR)											20	
Confl. Peds. (#/hr)				6		20	3					3
Peak Hour Factor	0.92	0.92	0.25	1.00	1.00	1.00	0.88	0.88	0.92	0.92	0.97	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	2%	9%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	218	0	55	357	0	0	1935	0
Turn Type				Perm	NA		custom	NA			NA	
Protected Phases					5		7	6 7 8			6 8	
Permitted Phases				5			8					
Total Split (s)				27.0	27.0		13.0					
Total Lost Time (s)					4.0		4.0					
Act Effct Green (s)					19.6		23.0	90.7			73.6	
Actuated g/C Ratio					0.16		0.19	0.76			0.62	
v/c Ratio					0.76		0.33	0.16			1.01	
Control Delay					65.0		63.1	7.1			40.7	
Queue Delay					12.6		0.0	1.4			35.6	
Total Delay					77.6		63.1	8.4			76.3	
LOS					E		E	A			E	
Approach Delay					77.6			15.7			76.3	
Approach LOS					E			B			E	
Queue Length 50th (ft)					159		41	77			~705	
Queue Length 95th (ft)					244		m53	m85			#660	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)					334		180	2214			1923	
Starvation Cap Reductn					0		0	1629			285	
Spillback Cap Reductn					93		0	0			98	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.90		0.31	0.61			1.18	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 119.3	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 66.7	Intersection LOS: E
Intersection Capacity Utilization 87.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 29, 10, 3	

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

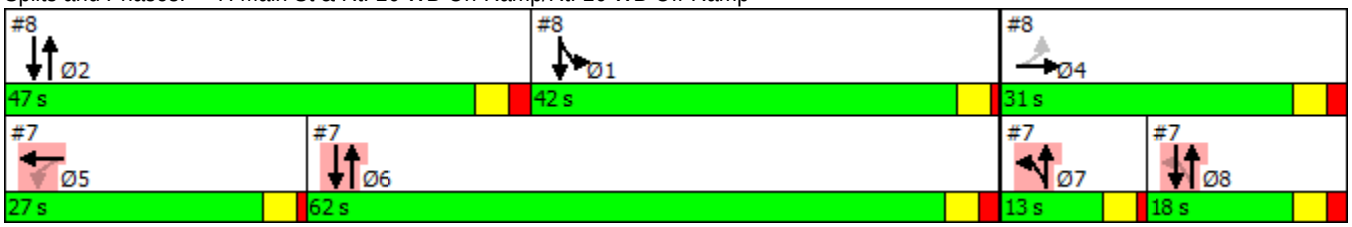
Lane Group	Ø1	Ø2	Ø4	Ø6	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Satd. Flow (RTOR)					
Confl. Peds. (#/hr)					
Peak Hour Factor					
Growth Factor					
Heavy Vehicles (%)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	4	6	8
Permitted Phases					
Total Split (s)	42.0	47.0	31.0	62.0	18.0
Total Lost Time (s)					
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					
Reduced v/c Ratio					

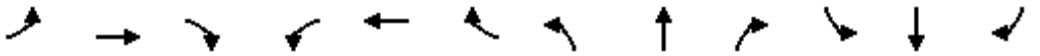
Intersection Summary

Queue shown is maximum after two cycles.

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

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



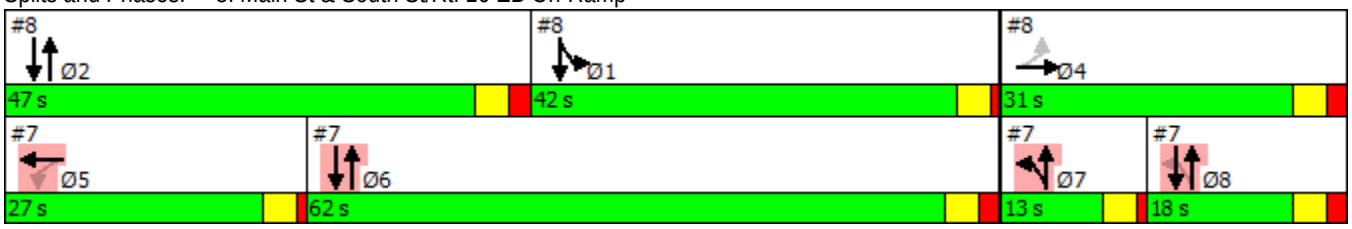


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Future Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Satd. Flow (prot)	0	2902	0	0	0	0	0	2718	0	1593	3154	0
Flt Permitted		0.993								0.950		
Satd. Flow (perm)	0	2902	0	0	0	0	0	2718	0	1590	3154	0
Satd. Flow (RTOR)		53						252				
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.94	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	5%	2%	2%	0%	0%	0%	2%	10%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	677	0	0	0	0	0	850	0	340	1601	0
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	1 2	
Permitted Phases	4											
Total Split (s)	31.0	31.0						47.0		42.0		
Total Lost Time (s)		5.0						5.0		4.0		
Act Effct Green (s)		26.0						42.0		37.3	84.3	
Actuated g/C Ratio		0.22						0.35		0.31	0.71	
v/c Ratio		1.00						0.76		0.68	0.72	
Control Delay		77.5						28.7		26.9	6.3	
Queue Delay		0.0						0.0		50.9	31.2	
Total Delay		77.5						28.7		77.9	37.5	
LOS		E						C		E	D	
Approach Delay		77.5						28.7			44.6	
Approach LOS		E						C			D	
Queue Length 50th (ft)		223						221		161	179	
Queue Length 95th (ft)		238						265		m150	m168	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		674						1120		507	2248	
Starvation Cap Reductn		0						0		193	736	
Spillback Cap Reductn		0						0		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		1.00						0.76		1.08	1.06	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 119.3	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 47.1	Intersection LOS: D
Intersection Capacity Utilization 87.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 9, 4	

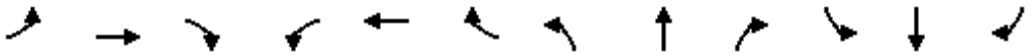
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø5	Ø6	Ø7	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Satd. Flow (RTOR)				
Confl. Peds. (#/hr)				
Peak Hour Factor				
Growth Factor				
Heavy Vehicles (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	5	6	7	8
Permitted Phases				
Total Split (s)	27.0	62.0	13.0	18.0
Total Lost Time (s)				
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
LOS				
Approach Delay				
Approach LOS				
Queue Length 50th (ft)				
Queue Length 95th (ft)				
Internal Link Dist (ft)				
Turn Bay Length (ft)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	46	299	0	0	1582	155
Future Volume (vph)	0	0	0	0	0	0	46	299	0	0	1582	155
Satd. Flow (prot)	0	0	0	0	0	0	1593	2981	0	0	3103	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	0	1589	2981	0	0	3103	0
Satd. Flow (RTOR)											27	
Confl. Peds. (#/hr)				6		20	3					3
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.88	0.88	0.92	0.92	0.97	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	2%	9%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	55	357	0	0	1935	0
Turn Type							Prot	NA			NA	
Protected Phases							5	6 4			6 4	
Permitted Phases												
Total Split (s)							8.0					
Total Lost Time (s)							4.0					
Act Effct Green (s)							4.0	60.6			60.6	
Actuated g/C Ratio							0.05	0.72			0.72	
v/c Ratio							0.72	0.17			0.86	
Control Delay							63.3	10.4			20.5	
Queue Delay							0.0	0.2			10.9	
Total Delay							63.3	10.6			31.4	
LOS							E	B			C	
Approach Delay								17.6			31.4	
Approach LOS								B			C	
Queue Length 50th (ft)							25	61			~636	
Queue Length 95th (ft)							m31	m86			#777	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)							76	2151			2246	
Starvation Cap Reductn							0	1046			320	
Spillback Cap Reductn							0	0			236	
Storage Cap Reductn							0	0			0	
Reduced v/c Ratio							0.72	0.32			1.00	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 84	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 29.0	Intersection LOS: C
Intersection Capacity Utilization 73.2%	ICU Level of Service D
Analysis Period (min) 15	
Description: 29, 10, 3	

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

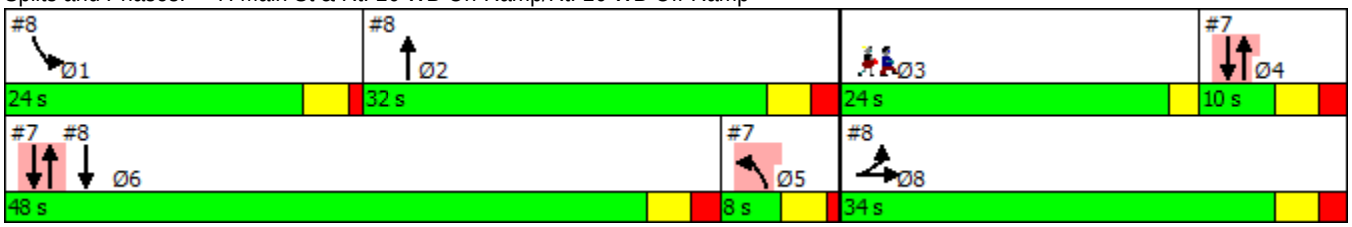
Lane Group	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Confl. Peds. (#/hr)						
Peak Hour Factor						
Growth Factor						
Heavy Vehicles (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	3	4	6	8
Permitted Phases						
Total Split (s)	24.0	32.0	24.0	10.0	48.0	34.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

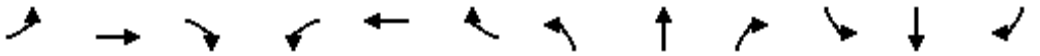
Intersection Summary

Queue shown is maximum after two cycles.

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

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



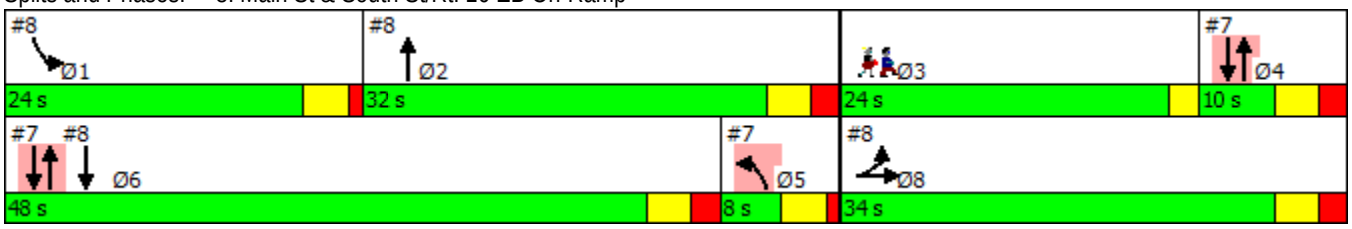


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	215	239	0	0	0	0	268	446	269	1297	0
Future Volume (vph)	73	215	239	0	0	0	0	268	446	269	1297	0
Satd. Flow (prot)	0	2903	0	0	0	0	0	2717	0	1593	3154	0
Flt Permitted		0.993								0.950		
Satd. Flow (perm)	0	2903	0	0	0	0	0	2717	0	1588	3154	0
Satd. Flow (RTOR)		93						280				
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.93	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	5%	2%	2%	0%	0%	0%	2%	10%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	677	0	0	0	0	0	850	0	340	1464	0
Turn Type	Split	NA						NA		Prot	NA	
Protected Phases	8	8						2		1	6	
Permitted Phases												
Total Split (s)	34.0	34.0						32.0		24.0	48.0	
Total Lost Time (s)		5.0						5.0		4.0	5.0	
Act Effct Green (s)		24.2						25.7		19.9	43.5	
Actuated g/C Ratio		0.29						0.31		0.24	0.52	
v/c Ratio		0.75						0.83		0.90	0.90	
Control Delay		27.7						26.8		53.6	16.7	
Queue Delay		0.0						0.0		21.5	39.9	
Total Delay		27.7						26.8		75.1	56.6	
LOS		C						C		E	E	
Approach Delay		27.7						26.8			60.1	
Approach LOS		C						C			E	
Queue Length 50th (ft)		127						164		160	171	
Queue Length 95th (ft)		145						213		m182	m236	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		1074						1073		384	1633	
Starvation Cap Reductn		0						0		49	283	
Spillback Cap Reductn		0						0		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		0.63						0.79		1.01	1.08	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 84	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 45.0	Intersection LOS: D
Intersection Capacity Utilization 73.2%	ICU Level of Service D
Analysis Period (min) 15	
Description: 6, 9, 4	

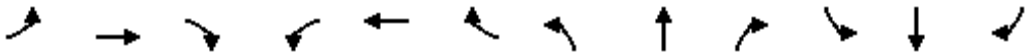
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø3	Ø4	Ø5
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Confl. Peds. (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	3	4	5
Permitted Phases			
Total Split (s)	24.0	10.0	8.0
Total Lost Time (s)			
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	136	8	64	46	752	0	0	1555	155
Future Volume (vph)	0	0	0	136	8	64	46	752	0	0	1555	155
Satd. Flow (prot)	0	0	0	0	1749	0	1593	3065	0	0	3098	0
Flt Permitted					0.968		0.950					
Satd. Flow (perm)	0	0	0	0	1740	0	1592	3065	0	0	3098	0
Satd. Flow (RTOR)											25	
Confl. Peds. (#/hr)				6		20	3					3
Peak Hour Factor	0.92	0.92	0.25	1.00	1.00	1.00	0.88	0.92	0.92	0.92	0.97	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	2%	6%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	218	0	55	858	0	0	1906	0
Turn Type				Perm	NA		Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8								
Total Split (s)				29.0	29.0		8.0	71.0			63.0	
Total Lost Time (s)					5.0		4.0	5.0			5.0	
Act Effct Green (s)					24.0		4.0	66.0			58.0	
Actuated g/C Ratio					0.24		0.04	0.66			0.58	
v/c Ratio					0.52		0.87	0.42			1.05	
Control Delay					38.3		123.6	7.3			59.3	
Queue Delay					0.0		0.0	0.3			19.3	
Total Delay					38.3		123.6	7.7			78.6	
LOS					D		F	A			E	
Approach Delay					38.3			14.6			78.6	
Approach LOS					D			B			E	
Queue Length 50th (ft)					121		35	91			~701	
Queue Length 95th (ft)					196		#104	109			#842	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							125					
Base Capacity (vph)					417		63	2022			1807	
Starvation Cap Reductn					0		0	550			350	
Spillback Cap Reductn					0		0	0			142	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.52		0.87	0.58			1.31	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 56.5	Intersection LOS: E
Intersection Capacity Utilization 88.4%	ICU Level of Service E
Analysis Period (min) 15	
Description: 29, 10, 3	

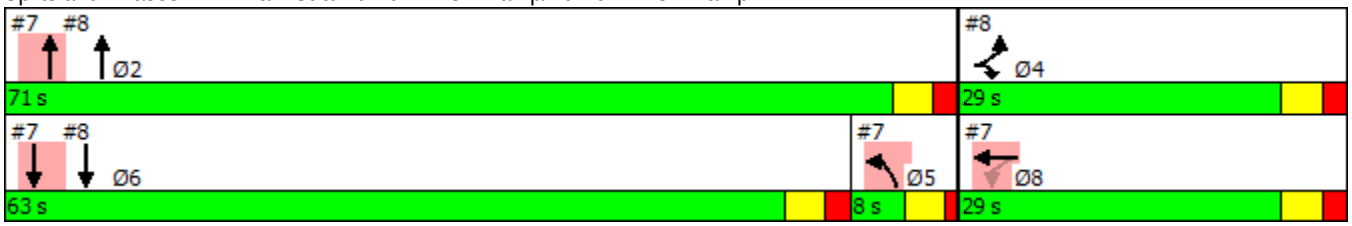
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.

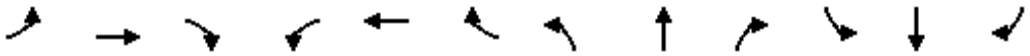
Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	29.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Queue shown is maximum after two cycles.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	0	357	0	0	0	0	624	0	0	1675	0
Future Volume (vph)	169	0	357	0	0	0	0	624	0	0	1675	0
Satd. Flow (prot)	1577	0	1425	0	0	0	0	3036	0	0	3154	0
Flt Permitted	0.950											
Satd. Flow (perm)	1577	0	1425	0	0	0	0	3036	0	0	3154	0
Satd. Flow (RTOR)			76									
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.87	0.92	0.84	0.25	0.25	0.25	0.92	0.93	0.92	0.92	0.97	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	3%	2%	2%	0%	0%	0%	2%	7%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	204	0	446	0	0	0	0	705	0	0	1813	0
Turn Type	Prot		Prot					NA			NA	
Protected Phases	4		4					2			6	
Permitted Phases												
Total Split (s)	29.0		29.0					71.0			63.0	
Total Lost Time (s)	5.0		5.0					5.0			5.0	
Act Effct Green (s)	24.0		24.0					66.0			58.0	
Actuated g/C Ratio	0.24		0.24					0.66			0.58	
v/c Ratio	0.54		1.12					0.35			0.99	
Control Delay	37.1		113.7					8.1			14.2	
Queue Delay	0.0		0.0					0.0			38.7	
Total Delay	37.1		113.7					8.1			52.9	
LOS	D		F					A			D	
Approach Delay		89.6						8.1			52.9	
Approach LOS		F						A			D	
Queue Length 50th (ft)	64		~344					93			128	
Queue Length 95th (ft)	55		#570					124			m123	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)												
Base Capacity (vph)	378		399					2003			1829	
Starvation Cap Reductn	0		0					0			182	
Spillback Cap Reductn	0		0					33			0	
Storage Cap Reductn	0		0					0			0	
Reduced v/c Ratio	0.54		1.12					0.36			1.10	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 50.5	Intersection LOS: D
Intersection Capacity Utilization 88.4%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 9, 4	

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

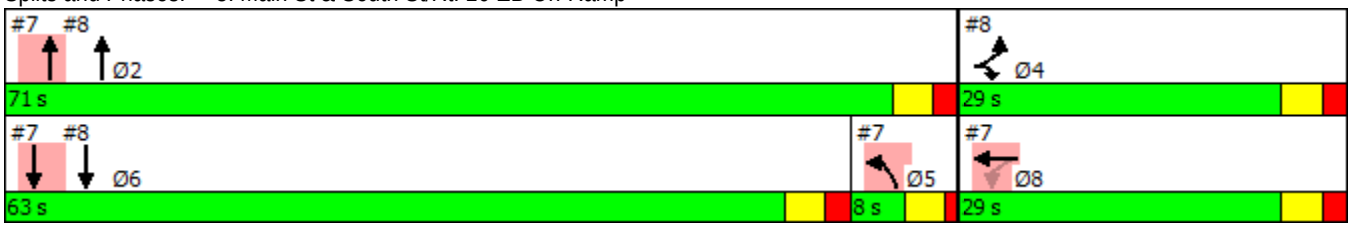
Lane Group	Ø5	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	8
Permitted Phases		
Total Split (s)	8.0	29.0
Total Lost Time (s)		
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Queue shown is maximum after two cycles.

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

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	1272	119	136	772	64	46	255	575	269	1313	155
Future Volume (vph)	43	1272	119	136	772	64	46	255	575	269	1313	155
Satd. Flow (prot)	1496	4433	0	1540	4448	0	1540	3790	0	1540	2994	0
Flt Permitted	0.193			0.096			0.097			0.126		
Satd. Flow (perm)	302	4433	0	156	4448	0	157	3790	0	204	2994	0
Satd. Flow (RTOR)											13	
Confl. Peds. (#/hr)	20		6	6		20	3		3			3
Peak Hour Factor	0.83	0.88	0.77	1.00	0.97	1.00	0.88	0.83	0.90	0.83	0.96	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	5%	0%	2%	2%	0%	1%	2%	10%	4%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	1680	0	143	903	0	55	994	0	340	1659	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	9.0	42.0		11.0	44.0		8.0	46.0		21.0	59.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	41.6	37.6		46.4	41.8		43.0	40.0		61.3	55.1	
Actuated g/C Ratio	0.30	0.28		0.34	0.31		0.31	0.29		0.45	0.40	
v/c Ratio	0.43	1.38		1.25	0.66		0.69	1.72dr		1.36	1.37	
Control Delay	48.0	212.9		199.7	47.2		74.7	59.1		214.7	202.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.7	
Total Delay	48.0	212.9		199.7	47.2		74.7	59.1		214.7	203.5	
LOS	D	F		F	D		E	E		F	F	
Approach Delay		207.7			68.1			59.9			205.4	
Approach LOS		F			E			E			F	
Queue Length 50th (ft)	37	~842		~144	302		33	353		~398	~1195	
Queue Length 95th (ft)	67	#908		#293	358		#90	#373		#533	#1334	
Internal Link Dist (ft)		476			1232			150			219	
Turn Bay Length (ft)	200			200								
Base Capacity (vph)	127	1219		114	1360		80	1155		250	1215	
Starvation Cap Reductn	0	0		0	0		0	0		0	169	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.43	1.38		1.25	0.66		0.69	0.86		1.36	1.59	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 136.6	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.38	
Intersection Signal Delay: 155.3	Intersection LOS: F
Intersection Capacity Utilization 108.7%	ICU Level of Service G
Analysis Period (min) 15	
Description: Ped calls: AM=29, PM=10, Sat=3	

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

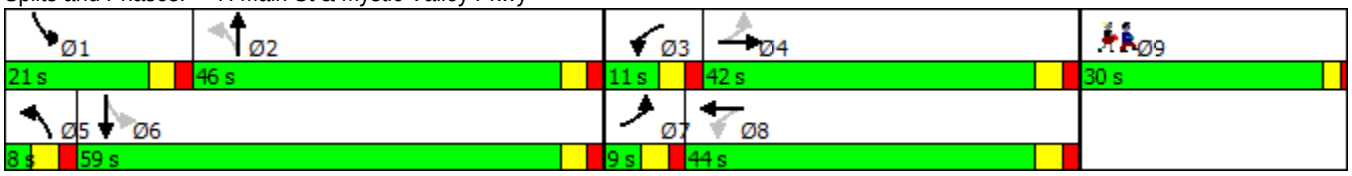
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

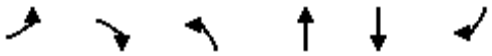
Intersection Summary

Queue shown is maximum after two cycles.

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

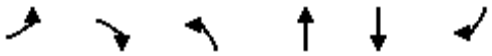
Splits and Phases: 7: Main St & Mystic Valley Pkwy





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	158	119	0	714	1552	0
Future Volume (vph)	158	119	0	714	1552	0
Satd. Flow (prot)	1577	1425	0	3036	3154	0
Flt Permitted	0.950					
Satd. Flow (perm)	1577	1425	0	3036	3154	0
Confl. Peds. (#/hr)		2				
Peak Hour Factor	0.87	0.77	0.92	0.93	0.94	0.25
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	3%	2%	2%	7%	3%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	191	162	0	806	1734	0
Sign Control	Stop			Free	Free	

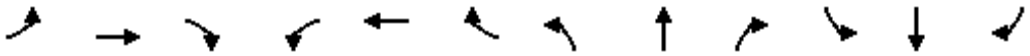
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 67.1%		ICU Level of Service C	
Analysis Period (min) 15			
Description: Ped calls: AM=6, PM=9, Sat=4			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	158	119	0	714	1552	0
Future Volume (Veh/h)	158	119	0	714	1552	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.77	0.92	0.93	0.94	0.25
Hourly flow rate (vph)	191	162	0	806	1734	0
Pedestrians				2		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				3.5		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				504	230	
pX, platoon unblocked	0.62	0.62	0.62			
vC, conflicting volume	2137	869	1734			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1602	0	949			
tC, single (s)	6.9	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	76	100			
cM capacity (veh/h)	59	668	444			

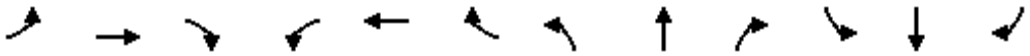
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	191	162	403	403	867	867
Volume Left	191	0	0	0	0	0
Volume Right	0	162	0	0	0	0
cSH	59	668	1700	1700	1700	1700
Volume to Capacity	3.24	0.24	0.24	0.24	0.51	0.51
Queue Length 95th (ft)	Err	24	0	0	0	0
Control Delay (s)	Err	12.1	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	5415.8		0.0		0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	660.8		
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		
Description: Ped calls: AM=6, PM=9, Sat=4			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Future Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Satd. Flow (prot)	0	0	0	0	1760	0	0	3166	0	0	3082	0
Flt Permitted					0.979			0.990				
Satd. Flow (perm)	0	0	0	0	1760	0	0	3166	0	0	3082	0
Confl. Peds. (#/hr)				2			8					8
Peak Hour Factor	0.92	0.92	0.25	0.93	1.00	0.98	0.80	0.94	0.92	0.92	0.93	0.90
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	0%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	322	0	0	1299	0	0	1279	0
Sign Control		Stop			Stop			Free			Free	

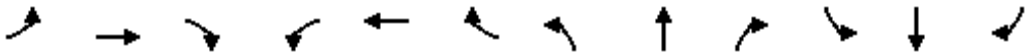
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 104.3%		ICU Level of Service G	
Analysis Period (min) 15			
Description: 29, 10, 3			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	119	52	121	191	928	0	0	847	267
Future Volume (Veh/h)	0	0	0	119	52	121	191	928	0	0	847	267
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.25	0.93	1.00	0.98	0.80	0.94	0.92	0.92	0.93	0.90
Hourly flow rate (vph)	0	0	0	136	55	131	253	1046	0	0	965	314
Pedestrians		8						2				
Lane Width (ft)		0.0						12.0				
Walking Speed (ft/s)		3.5						3.5				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											378	
pX, platoon unblocked												
vC, conflicting volume	2318	2682	650	2036	2839	523	1287			1046		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2318	2682	650	2036	2839	523	1287			1046		
tC, single (s)	7.5	6.5	6.9	7.6	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	100	0	0	74	54			100		
cM capacity (veh/h)	0	12	416	21	9	504	546			661		

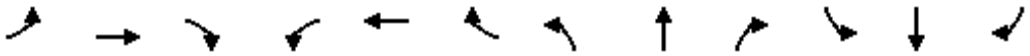
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	322	602	697	643	636
Volume Left	136	253	0	0	0
Volume Right	131	0	0	0	314
cSH	25	546	1700	1700	1700
Volume to Capacity	12.80	0.46	0.41	0.38	0.37
Queue Length 95th (ft)	Err	61	0	0	0
Control Delay (s)	Err	13.0	0.0	0.0	0.0
Lane LOS	F	B			
Approach Delay (s)	Err	6.0		0.0	
Approach LOS	F				

Intersection Summary				
Average Delay	1112.9			
Intersection Capacity Utilization	104.3%	ICU Level of Service	G	
Analysis Period (min)	15			
Description: 29, 10, 3				



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Future Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Satd. Flow (prot)	1562	1660	1425	0	0	0	0	3026	0	0	3147	0
Flt Permitted	0.950										0.997	
Satd. Flow (perm)	1562	1660	1425	0	0	0	0	3026	0	0	3147	0
Confl. Peds. (#/hr)	1		4						4	4		
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.94	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	3%	2%	0%	0%	0%	2%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	221	283	187	0	0	0	0	1562	0	0	1064	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 91.7%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 6, 9, 4			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	171	227	168	0	0	0	0	936	450	48	887	0
Future Volume (Veh/h)	171	227	168	0	0	0	0	936	450	48	887	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.94	0.25
Hourly flow rate (vph)	221	283	187	0	0	0	0	1044	518	64	1000	0
Pedestrians					4			4			1	
Lane Width (ft)					0.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											634	
pX, platoon unblocked												
vC, conflicting volume	1651	2694	504	2268	2435	786	1000			1566		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1651	2694	504	2268	2435	786	1000			1566		
tC, single (s)	7.6	6.6	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	63	0	100	100	100			85		
cM capacity (veh/h)	56	18	511	0	27	339	688			418		

Direction, Lane #	EB 1	EB 2	EB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	221	283	187	696	866	397	667
Volume Left	221	0	0	0	0	64	0
Volume Right	0	0	187	0	518	0	0
cSH	56	18	511	1700	1700	418	1700
Volume to Capacity	3.94	15.99	0.37	0.41	0.51	0.15	0.39
Queue Length 95th (ft)	Err	Err	42	0	0	13	0
Control Delay (s)	Err	Err	16.0	0.0	0.0	4.9	0.0
Lane LOS	F	F	C			A	
Approach Delay (s)	7297.4			0.0		1.8	
Approach LOS	F						

Intersection Summary				
Average Delay	1520.8			
Intersection Capacity Utilization	91.7%	ICU Level of Service	F	
Analysis Period (min)	15			
Description: 6, 9, 4				

Volume

7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp

06/15/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Future Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Satd. Flow (prot)	0	0	0	0	1760	0	1624	3185	0	0	3060	0
Flt Permitted					0.979		0.950					
Satd. Flow (perm)	0	0	0	0	1758	0	1618	3185	0	0	3060	0
Satd. Flow (RTOR)											62	
Adj. Flow (vph)	0	0	0	136	55	131	253	1046	0	0	965	314
Lane Group Flow (vph)	0	0	0	0	322	0	253	1046	0	0	1279	0
Turn Type				Perm	NA		Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8								
Total Split (s)				27.0	27.0		19.0	53.0			44.0	
Total Lost Time (s)					5.0		4.0	5.0			5.0	
Act Effct Green (s)					21.6		15.0	50.0			39.0	
Actuated g/C Ratio					0.24		0.17	0.56			0.44	
v/c Ratio					0.76		0.93	0.59			0.94	
Control Delay					44.8		52.5	8.4			37.3	
Queue Delay					0.0		0.0	2.5			44.8	
Total Delay					44.8		52.5	10.9			82.1	
LOS					D		D	B			F	
Approach Delay					44.8			19.0			82.1	
Approach LOS					D			B			F	
Queue Length 50th (ft)					170		145	102			342	
Queue Length 95th (ft)					#291		m155	m128			#496	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)					431		271	1777			1366	
Starvation Cap Reductn					0		0	580			245	
Spillback Cap Reductn					0		0	0			28	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.75		0.93	0.87			1.14	

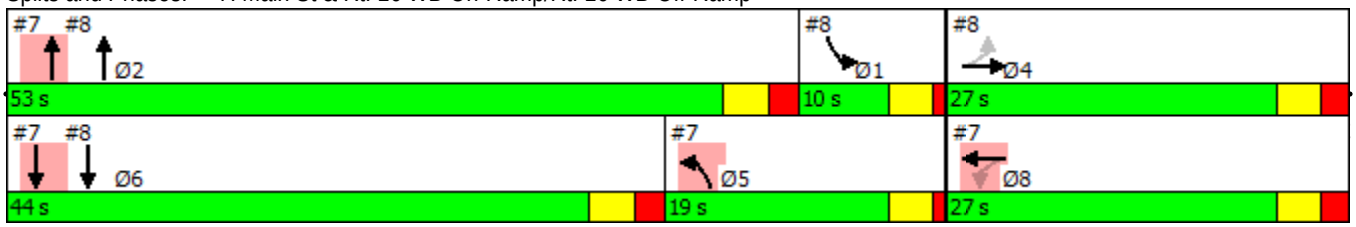
Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 89.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 49.7 — Intersection LOS: D
Intersection Capacity Utilization 82.3% — ICU Level of Service E
Analysis Period (min) 15
Description: 29, 10, 3

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

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

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø1	Ø4
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Adj. Flow (vph)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	1	4
Permitted Phases		
Total Split (s)	10.0	27.0
Total Lost Time (s)		
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Volume

8: Main St & South St/Rt. 16 EB On-Ramp

06/15/2018

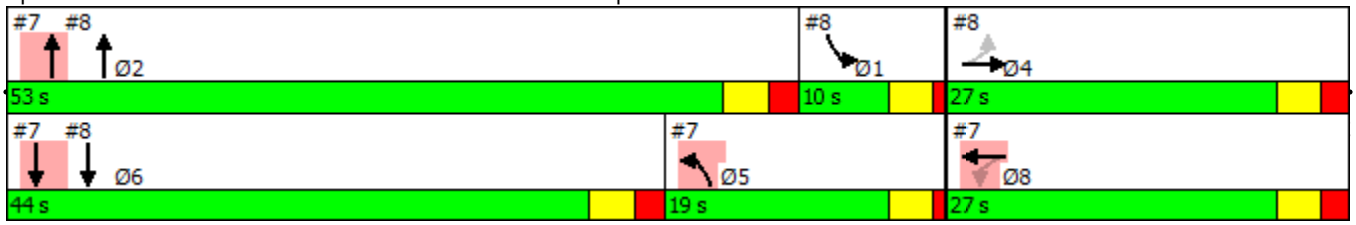
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Future Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Satd. Flow (prot)	0	2962	0	0	0	0	0	3002	0	1593	3154	0
Flt Permitted		0.984								0.950		
Satd. Flow (perm)	0	2961	0	0	0	0	0	3002	0	1587	3154	0
Satd. Flow (RTOR)		56						146				
Adj. Flow (vph)	221	283	187	0	0	0	0	1044	518	64	1000	0
Lane Group Flow (vph)	0	691	0	0	0	0	0	1562	0	64	1000	0
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Total Split (s)	27.0	27.0						53.0		10.0	44.0	
Total Lost Time (s)		5.0						5.0		4.0	5.0	
Act Effct Green (s)		21.6						50.0		6.0	39.0	
Actuated g/C Ratio		0.24						0.56		0.07	0.44	
v/c Ratio		0.91						0.90		0.60	0.73	
Control Delay		50.2						25.4		41.1	10.1	
Queue Delay		0.0						1.6		0.0	3.3	
Total Delay		50.2						27.0		41.1	13.4	
LOS		D						C		D	B	
Approach Delay		50.2						27.0			15.1	
Approach LOS		D						C			B	
Queue Length 50th (ft)		210						382		40	84	
Queue Length 95th (ft)		#358						#571		m42	m108	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		769						1740		106	1372	
Starvation Cap Reductn		0						71		0	270	
Spillback Cap Reductn		0						68		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		0.90						0.94		0.60	0.91	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 89.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 28.0 — Intersection LOS: C
Intersection Capacity Utilization 82.3% — ICU Level of Service E
Analysis Period (min) 15
Description: 6, 9, 4

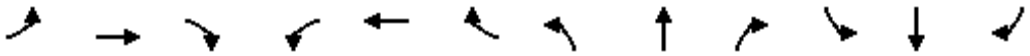
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø5	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Adj. Flow (vph)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	8
Permitted Phases		
Total Split (s)	19.0	27.0
Total Lost Time (s)		
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



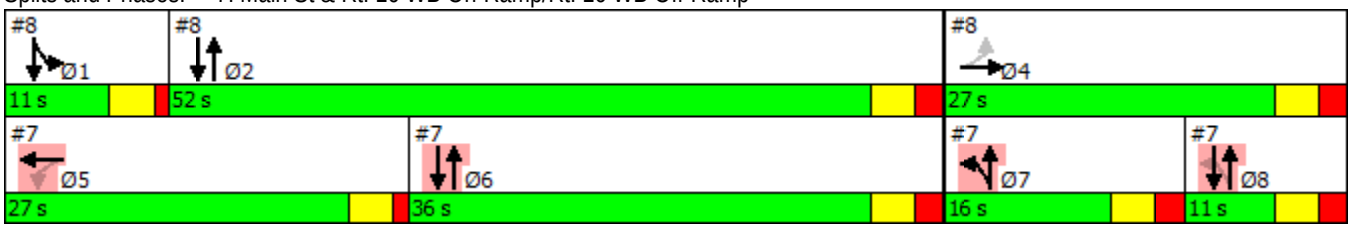
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Future Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Satd. Flow (prot)	0	0	0	0	1760	0	1624	3185	0	0	3060	0
Flt Permitted					0.979		0.667					
Satd. Flow (perm)	0	0	0	0	1758	0	1136	3185	0	0	3060	0
Satd. Flow (RTOR)											59	
Confl. Peds. (#/hr)				2			8					8
Peak Hour Factor	0.92	0.92	0.25	0.93	1.00	0.98	0.80	0.94	0.92	0.92	0.93	0.90
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	0%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	322	0	253	1046	0	0	1279	0
Turn Type				Perm	NA		custom	NA			NA	
Protected Phases					5		7	6 7 8			6 8	
Permitted Phases				5			8					
Total Split (s)				27.0	27.0		16.0					
Total Lost Time (s)					4.0		5.0					
Act Effct Green (s)					20.2		17.0	60.8			39.8	
Actuated g/C Ratio					0.22		0.19	0.68			0.44	
v/c Ratio					0.82		0.92	0.49			0.92	
Control Delay					50.0		54.2	3.8			31.6	
Queue Delay					0.0		0.0	2.7			11.0	
Total Delay					50.0		54.2	6.5			42.6	
LOS					D		D	A			D	
Approach Delay					50.0			15.8			42.6	
Approach LOS					D			B			D	
Queue Length 50th (ft)					171		151	67			281	
Queue Length 95th (ft)					#270		m155	m92			#452	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)					449		274	2150			1385	
Starvation Cap Reductn					0		0	950			113	
Spillback Cap Reductn					0		0	0			0	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.72		0.92	0.87			1.01	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 31.4	Intersection LOS: C
Intersection Capacity Utilization 82.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 29, 10, 3	

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

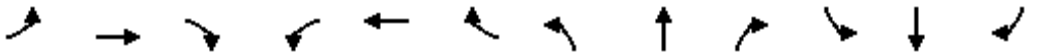
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø1	Ø2	Ø4	Ø6	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Satd. Flow (RTOR)					
Confl. Peds. (#/hr)					
Peak Hour Factor					
Growth Factor					
Heavy Vehicles (%)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	4	6	8
Permitted Phases					
Total Split (s)	11.0	52.0	27.0	36.0	11.0
Total Lost Time (s)					
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					
Reduced v/c Ratio					

Intersection Summary



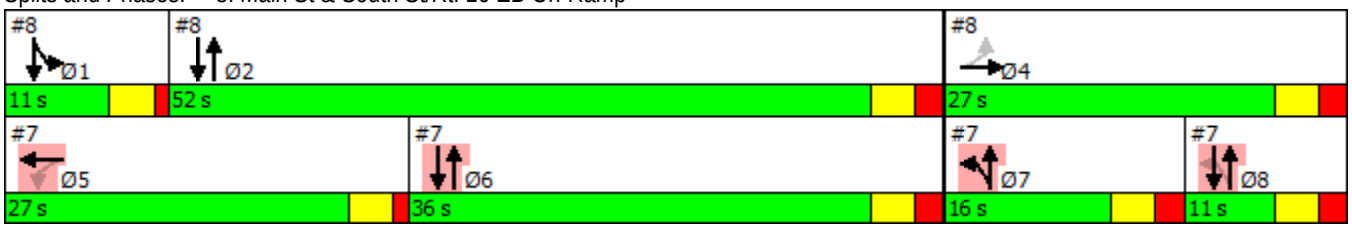
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Future Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Satd. Flow (prot)	0	2962	0	0	0	0	0	3002	0	1593	3154	0
Flt Permitted		0.984								0.950		
Satd. Flow (perm)	0	2961	0	0	0	0	0	3002	0	1588	3154	0
Satd. Flow (RTOR)		56						143				
Confl. Peds. (#/hr)	1		4						4	4		
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.94	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	3%	2%	0%	0%	0%	2%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	691	0	0	0	0	0	1562	0	64	1000	0
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	1 2	
Permitted Phases	4											
Total Split (s)	27.0	27.0						52.0		11.0		
Total Lost Time (s)		5.0						5.0		4.0		
Act Effct Green (s)		22.0						47.0		7.0	59.0	
Actuated g/C Ratio		0.24						0.52		0.08	0.66	
v/c Ratio		0.90						0.95		0.52	0.48	
Control Delay		48.7						33.5		43.9	4.6	
Queue Delay		0.0						5.6		0.0	1.3	
Total Delay		48.7						39.1		43.9	5.9	
LOS		D						D		D	A	
Approach Delay		48.7						39.1			8.2	
Approach LOS		D						D			A	
Queue Length 50th (ft)		210						393		35	61	
Queue Length 95th (ft)		#358						#582		m38	m102	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		766						1636		123	2067	
Starvation Cap Reductn		0						56		0	796	
Spillback Cap Reductn		0						64		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		0.90						0.99		0.52	0.79	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 31.2	Intersection LOS: C
Intersection Capacity Utilization 82.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 9, 4	

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

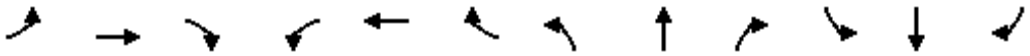
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø5	Ø6	Ø7	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Satd. Flow (RTOR)				
Confl. Peds. (#/hr)				
Peak Hour Factor				
Growth Factor				
Heavy Vehicles (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	5	6	7	8
Permitted Phases				
Total Split (s)	27.0	36.0	16.0	11.0
Total Lost Time (s)				
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
LOS				
Approach Delay				
Approach LOS				
Queue Length 50th (ft)				
Queue Length 95th (ft)				
Internal Link Dist (ft)				
Turn Bay Length (ft)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary

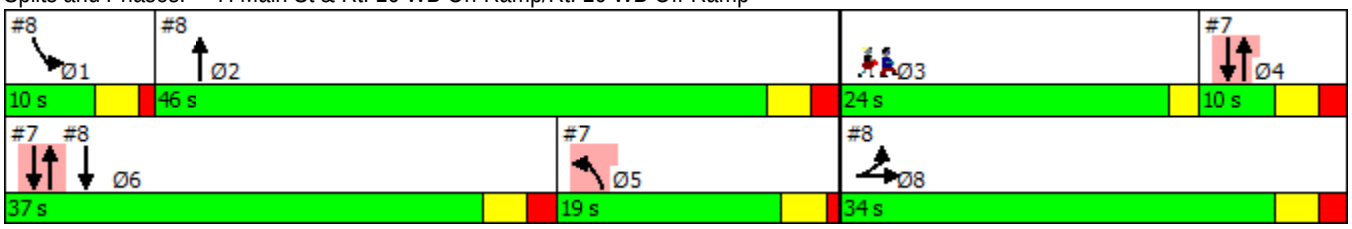


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	191	928	0	0	847	267
Future Volume (vph)	0	0	0	0	0	0	191	928	0	0	847	267
Satd. Flow (prot)	0	0	0	0	0	0	1624	3185	0	0	3061	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	0	0	0	0	0	1618	3185	0	0	3061	0
Satd. Flow (RTOR)											66	
Confl. Peds. (#/hr)				6		20	8					8
Peak Hour Factor	0.92	0.92	0.25	0.92	0.92	0.92	0.80	0.94	0.92	0.92	0.93	0.90
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	0%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	253	1046	0	0	1279	0
Turn Type							Prot	NA			NA	
Protected Phases							5	6 4			6 4	
Permitted Phases												
Total Split (s)							19.0					
Total Lost Time (s)							4.0					
Act Effct Green (s)							15.0	56.8			56.8	
Actuated g/C Ratio							0.18	0.67			0.67	
v/c Ratio							0.89	0.49			0.62	
Control Delay							38.5	12.9			11.6	
Queue Delay							0.0	8.9			1.9	
Total Delay							38.5	21.9			13.5	
LOS							D	C			B	
Approach Delay								25.1			13.5	
Approach LOS								C			B	
Queue Length 50th (ft)							108	156			135	
Queue Length 95th (ft)							m114	m244			#435	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)							286	2118			2058	
Starvation Cap Reductn							0	1037			587	
Spillback Cap Reductn							0	0			355	
Storage Cap Reductn							0	0			0	
Reduced v/c Ratio							0.88	0.97			0.87	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 19.4	Intersection LOS: B
Intersection Capacity Utilization 82.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 29, 10, 3	

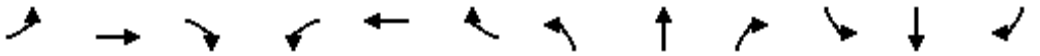
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø1	Ø2	Ø3	Ø4	Ø6	Ø8
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Confl. Peds. (#/hr)						
Peak Hour Factor						
Growth Factor						
Heavy Vehicles (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	3	4	6	8
Permitted Phases						
Total Split (s)	10.0	46.0	24.0	10.0	37.0	34.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	227	168	0	0	0	0	936	450	48	768	0
Future Volume (vph)	171	227	168	0	0	0	0	936	450	48	768	0
Satd. Flow (prot)	0	2962	0	0	0	0	0	3002	0	1593	3154	0
Flt Permitted		0.984								0.950		
Satd. Flow (perm)	0	2961	0	0	0	0	0	3002	0	1587	3154	0
Satd. Flow (RTOR)		62						125				
Confl. Peds. (#/hr)	1		4						4	4		
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.93	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	3%	2%	0%	0%	0%	2%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	691	0	0	0	0	0	1562	0	64	875	0
Turn Type	Split	NA						NA		Prot	NA	
Protected Phases	8	8						2		1	6	
Permitted Phases												
Total Split (s)	34.0	34.0						46.0		10.0	37.0	
Total Lost Time (s)		5.0						5.0		4.0	5.0	
Act Effct Green (s)		24.2						43.3		6.0	32.1	
Actuated g/C Ratio		0.28						0.51		0.07	0.38	
v/c Ratio		0.78						0.99		0.58	0.74	
Control Delay		33.2						42.2		59.3	19.7	
Queue Delay		1.2						12.4		0.0	2.4	
Total Delay		34.4						54.6		59.3	22.1	
LOS		C						D		E	C	
Approach Delay		34.4						54.6			24.6	
Approach LOS		C						D			C	
Queue Length 50th (ft)		184						~468		34	212	
Queue Length 95th (ft)		269						#648		m54	140	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		1049						1583		112	1185	
Starvation Cap Reductn		0						0		0	189	
Spillback Cap Reductn		170						70		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		0.79						1.03		0.57	0.88	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 41.4	Intersection LOS: D
Intersection Capacity Utilization 82.3%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 9, 4	

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

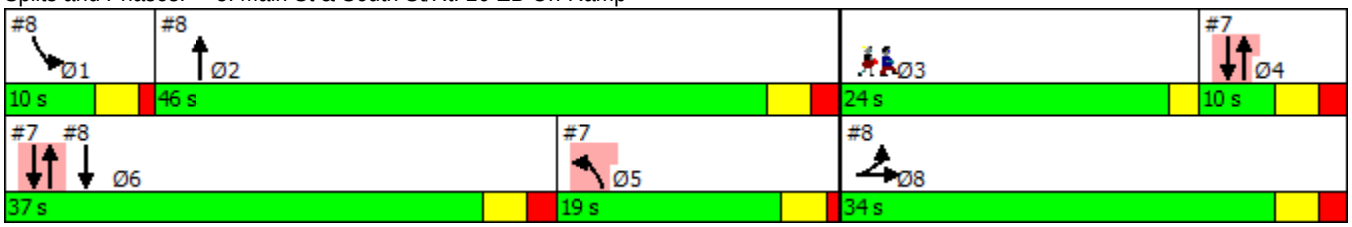
Lane Group	Ø3	Ø4	Ø5
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Satd. Flow (RTOR)			
Confl. Peds. (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	3	4	5
Permitted Phases			
Total Split (s)	24.0	10.0	19.0
Total Lost Time (s)			
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

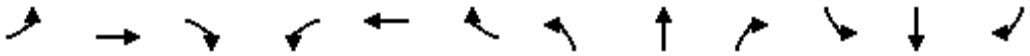
Intersection Summary

Queue shown is maximum after two cycles.

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

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



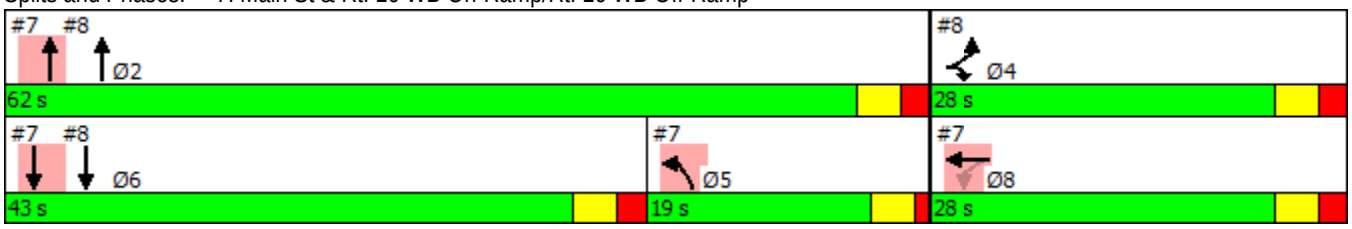


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	119	52	121	191	1390	0	0	842	267
Future Volume (vph)	0	0	0	119	52	121	191	1390	0	0	842	267
Satd. Flow (prot)	0	0	0	0	1760	0	1624	3185	0	0	3052	0
Flt Permitted					0.979		0.950					
Satd. Flow (perm)	0	0	0	0	1758	0	1619	3185	0	0	3052	0
Satd. Flow (RTOR)											61	
Confl. Peds. (#/hr)				2			8					8
Peak Hour Factor	0.92	0.92	0.25	0.93	1.00	0.98	0.80	0.96	0.92	0.92	0.93	0.90
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	0%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	322	0	253	1535	0	0	1274	0
Turn Type				Perm	NA		Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8								
Total Split (s)				28.0	28.0		19.0	62.0			43.0	
Total Lost Time (s)					5.0		4.0	5.0			5.0	
Act Effct Green (s)					21.3		15.0	57.0			38.0	
Actuated g/C Ratio					0.24		0.17	0.65			0.43	
v/c Ratio					0.76		0.92	0.75			0.95	
Control Delay					44.0		57.6	8.8			39.0	
Queue Delay					0.0		0.0	0.9			44.2	
Total Delay					44.0		57.6	9.7			83.1	
LOS					D		E	A			F	
Approach Delay					44.0			16.5			83.1	
Approach LOS					D			B			F	
Queue Length 50th (ft)					167		144	139			347	
Queue Length 95th (ft)					#270		#239	188			#505	
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							125					
Base Capacity (vph)					458		275	2057			1348	
Starvation Cap Reductn					0		0	257			224	
Spillback Cap Reductn					0		0	0			38	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.70		0.92	0.85			1.13	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 88.3	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 44.2	Intersection LOS: D
Intersection Capacity Utilization 81.5%	ICU Level of Service D
Analysis Period (min) 15	
Description: 29, 10, 3	

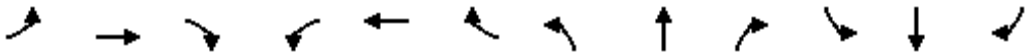
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø4
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	28.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



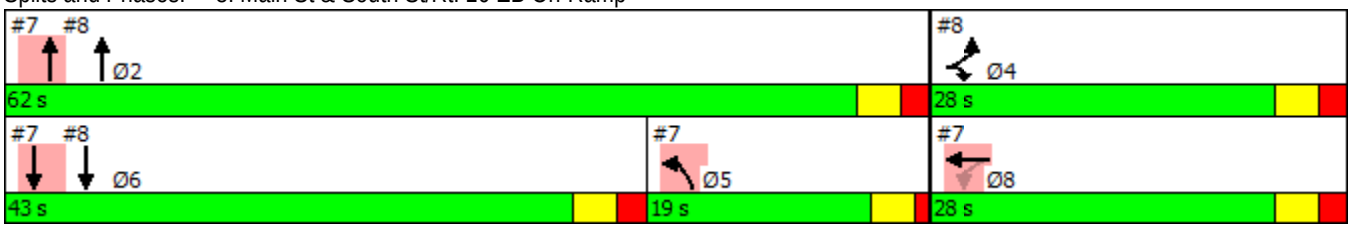
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	273	0	292	0	0	0	0	1296	0	0	930	0
Future Volume (vph)	273	0	292	0	0	0	0	1296	0	0	930	0
Satd. Flow (prot)	1577	0	1425	0	0	0	0	3185	0	0	3154	0
Flt Permitted	0.950											
Satd. Flow (perm)	1575	0	1425	0	0	0	0	3185	0	0	3154	0
Satd. Flow (RTOR)			323									
Confl. Peds. (#/hr)	1		4						4	4		
Peak Hour Factor	0.87	0.92	0.93	0.25	0.25	0.25	0.92	0.94	0.92	0.92	0.95	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	3%	2%	2%	0%	0%	0%	2%	2%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	333	0	333	0	0	0	0	1461	0	0	1038	0
Turn Type	Prot		Prot					NA			NA	
Protected Phases	4		4					2			6	
Permitted Phases												
Total Split (s)	28.0		28.0					62.0			43.0	
Total Lost Time (s)	5.0		5.0					5.0			5.0	
Act Effct Green (s)	21.3		21.3					57.0			38.0	
Actuated g/C Ratio	0.24		0.24					0.65			0.43	
v/c Ratio	0.88		0.57					0.71			0.76	
Control Delay	51.3		17.7					13.0			11.0	
Queue Delay	0.0		0.0					0.8			3.8	
Total Delay	51.3		17.7					13.9			14.8	
LOS	D		B					B			B	
Approach Delay		34.5						13.9			14.8	
Approach LOS		C						B			B	
Queue Length 50th (ft)	59		102					266			93	
Queue Length 95th (ft)	29		#822					348			m111	
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)												
Base Capacity (vph)	411		610					2057			1357	
Starvation Cap Reductn	0		0					293			234	
Spillback Cap Reductn	0		0					183			0	
Storage Cap Reductn	0		0					0			0	
Reduced v/c Ratio	0.81		0.55					0.83			0.92	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 88.3	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 18.5	Intersection LOS: B
Intersection Capacity Utilization 81.5%	ICU Level of Service D
Analysis Period (min) 15	
Description: 6, 9, 4	

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

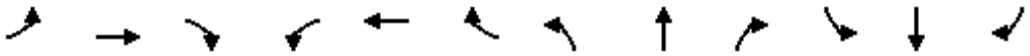
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø5	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Confl. Peds. (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	8
Permitted Phases		
Total Split (s)	19.0	28.0
Total Lost Time (s)		
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	102	1165	84	119	706	121	191	825	586	48	799	267
Future Volume (vph)	102	1165	84	119	706	121	191	825	586	48	799	267
Satd. Flow (prot)	1510	4416	0	1510	4418	0	1570	4145	0	1540	2940	0
Flt Permitted	0.113			0.123			0.078			0.086		
Satd. Flow (perm)	180	4416	0	195	4418	0	129	4145	0	139	2940	0
Satd. Flow (RTOR)											32	
Confl. Peds. (#/hr)			2	2			8					8
Peak Hour Factor	0.82	0.90	0.95	0.93	0.92	0.98	0.80	0.94	0.93	0.80	0.92	0.90
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	1%	2%	4%	0%	0%	0%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	132	1466	0	136	944	0	253	1598	0	64	1235	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	14.0	40.0		11.0	37.0		18.0	61.0		8.0	51.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	44.5	35.4		38.5	32.4		64.8	56.7		49.6	46.6	
Actuated g/C Ratio	0.32	0.26		0.28	0.23		0.47	0.41		0.36	0.34	
v/c Ratio	0.91	1.29		1.21	0.91		1.28	1.18dr		0.80	1.22	
Control Delay	93.7	179.6		189.8	65.7		193.0	51.8		90.5	146.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.7	
Total Delay	93.7	179.6		189.8	65.7		193.0	51.8		90.5	147.0	
LOS	F	F		F	E		F	D		F	F	
Approach Delay		172.5			81.3			71.1			144.3	
Approach LOS		F			F			E			F	
Queue Length 50th (ft)	98	~706		~129	~342		~287	~612		37	~817	
Queue Length 95th (ft)	#198	#804		#276	#447		#394	#709		#90	#959	
Internal Link Dist (ft)		476			1232			150			219	
Turn Bay Length (ft)	200			200								
Base Capacity (vph)	145	1133		112	1036		197	1702		80	1012	
Starvation Cap Reductn	0	0		0	0		0	0		0	127	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.91	1.29		1.21	0.91		1.28	0.94		0.80	1.40	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 138	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.29	
Intersection Signal Delay: 117.1	Intersection LOS: F
Intersection Capacity Utilization 101.9%	ICU Level of Service G
Analysis Period (min) 15	
Description: Ped calls: AM=29, PM=10, Sat=3	

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

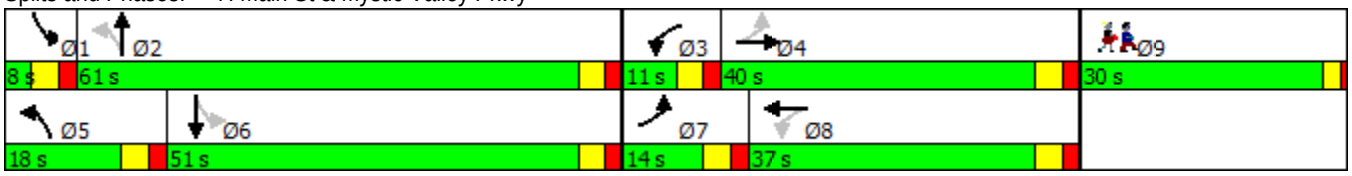
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

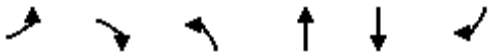
Intersection Summary

Queue shown is maximum after two cycles.

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

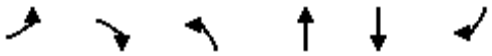
Splits and Phases: 7: Main St & Mystic Valley Pkwy





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	204	84	0	1386	971	0
Future Volume (vph)	204	84	0	1386	971	0
Satd. Flow (prot)	1577	1425	0	3185	3154	0
Flt Permitted	0.950					
Satd. Flow (perm)	1577	1425	0	3185	3154	0
Confl. Peds. (#/hr)	1	4				
Peak Hour Factor	0.92	0.95	0.92	0.94	0.95	0.25
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	3%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	235	94	0	1563	1083	0
Sign Control	Stop			Free	Free	

Intersection Summary		
Control Type: Unsignalized		
Intersection Capacity Utilization 65.1%		ICU Level of Service C
Analysis Period (min) 15		
Description: Ped calls: AM=6, PM=9, Sat=4		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	204	84	0	1386	971	0
Future Volume (Veh/h)	204	84	0	1386	971	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.95	0.92	0.94	0.95	0.25
Hourly flow rate (vph)	235	94	0	1563	1083	0
Pedestrians				4	1	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				3.5	3.5	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				504	230	
pX, platoon unblocked	0.68	0.68	0.68			
vC, conflicting volume	1866	546	1083			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1340	0	196			
tC, single (s)	6.9	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	87	100			
cM capacity (veh/h)	97	738	940			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	235	94	782	782	542	542
Volume Left	235	0	0	0	0	0
Volume Right	0	94	0	0	0	0
cSH	97	738	1700	1700	1700	1700
Volume to Capacity	2.41	0.13	0.46	0.46	0.32	0.32
Queue Length 95th (ft)	533	11	0	0	0	0
Control Delay (s)	736.5	10.6	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	529.1		0.0		0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	58.5		
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
Description: Ped calls: AM=6, PM=9, Sat=4			

APPENDIX N

Proposed Long-Term Alternatives: Main Street at Mystic Avenue
2040 AM/PM Peak Hour Intersection Capacity Analyses

Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	63	352	712	978	303	19
Future Volume (vph)	63	352	712	978	303	19
Satd. Flow (prot)	0	1517	1676	1411	1546	0
Flt Permitted		0.991			0.955	
Satd. Flow (perm)	0	1517	1676	1411	1546	0
Confl. Peds. (#/hr)				6		6
Peak Hour Factor	0.68	0.88	0.94	0.91	0.88	0.79
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	19%	10%	2%	3%	4%	15%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	517	795	1128	387	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 103.6%		ICU Level of Service G	
Analysis Period (min) 15			
Description: 6, 14, 1			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	63	352	712	978	303	19
Future Volume (Veh/h)	63	352	712	978	303	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.68	0.88	0.94	0.91	0.88	0.79
Hourly flow rate (vph)	97	420	795	1128	362	25
Pedestrians		6			6	
Lane Width (ft)		12.0			12.0	
Walking Speed (ft/s)		3.5			3.5	
Percent Blockage		1			1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			1173			
pX, platoon unblocked						
vC, conflicting volume	801				1415	807
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	801				1415	807
tC, single (s)	4.3				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.4				3.5	3.4
p0 queue free %	87				0	93
cM capacity (veh/h)	748				130	358

Direction, Lane #	NB 1	SB 1	SB 2	NE 1
Volume Total	517	795	1128	387
Volume Left	97	0	0	362
Volume Right	0	0	1128	25
cSH	748	1700	1700	135
Volume to Capacity	0.13	0.47	0.66	2.86
Queue Length 95th (ft)	11	0	0	889
Control Delay (s)	3.4	0.0	0.0	907.8
Lane LOS	A			F
Approach Delay (s)	3.4	0.0		907.8
Approach LOS				F

Intersection Summary			
Average Delay	124.9		
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		
Description: 6, 14, 1			

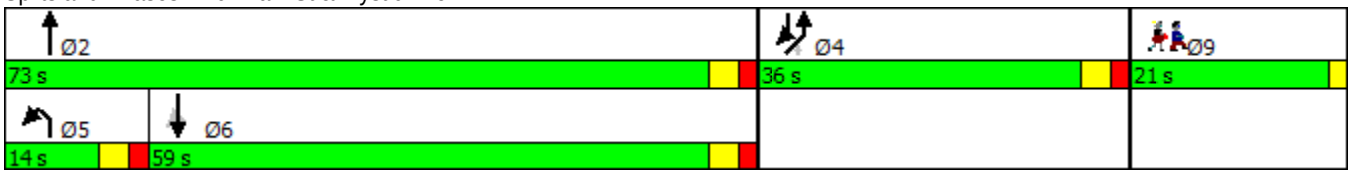
Lane Group	NBL	NBT	SBT	SBR	NEL	NER	Ø9
Lane Configurations							
Traffic Volume (vph)	63	352	712	978	303	19	
Future Volume (vph)	63	352	712	978	303	19	
Satd. Flow (prot)	1365	1555	1676	1411	1562	1264	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1365	1555	1676	1377	1562	1223	
Satd. Flow (RTOR)							
Confl. Peds. (#/hr)				6		6	
Peak Hour Factor	0.68	0.88	0.94	0.91	0.88	0.79	
Growth Factor	105%	105%	105%	105%	105%	105%	
Heavy Vehicles (%)	19%	10%	2%	3%	4%	15%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	97	420	795	1128	362	25	
Turn Type	Prot	NA	NA	pm+ov	Prot	Perm	
Protected Phases	5	2	6	4	4		9
Permitted Phases				6		4	
Total Split (s)	14.0	73.0	59.0	36.0	36.0	36.0	21.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)	9.0	68.3	54.2	85.4	31.1	31.1	
Actuated g/C Ratio	0.08	0.60	0.48	0.76	0.28	0.28	
v/c Ratio	0.89	0.45	0.99	1.08	0.84	0.07	
Control Delay	114.2	15.2	58.7	63.6	57.9	33.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	114.2	15.2	58.7	63.6	57.9	33.6	
LOS	F	B	E	E	E	C	
Approach Delay		33.8	61.6		56.4		
Approach LOS		C	E		E		
Queue Length 50th (ft)	68	140	485	~457	236	13	
Queue Length 95th (ft)	#133	304	#914	#1286	#480	36	
Internal Link Dist (ft)		1436	38		986		
Turn Bay Length (ft)						50	
Base Capacity (vph)	109	940	804	1049	430	336	
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	0.89	0.45	0.99	1.08	0.84	0.07	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 113	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 55.8	Intersection LOS: E
Intersection Capacity Utilization 83.7%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 14, 1	

~ 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: 9: Main St & Mystic Ave



Lane Group	NBL	NBT	SBT	SBR	NEL	NER	Ø9
Lane Configurations							
Traffic Volume (vph)	63	352	712	978	303	19	
Future Volume (vph)	63	352	712	978	303	19	
Satd. Flow (prot)	1365	2954	1676	1411	1562	1264	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1365	2954	1676	1377	1562	1221	
Satd. Flow (RTOR)							
Confl. Peds. (#/hr)				6		6	
Peak Hour Factor	0.68	0.88	0.94	0.91	0.88	0.79	
Growth Factor	105%	105%	105%	105%	105%	105%	
Heavy Vehicles (%)	19%	10%	2%	3%	4%	15%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	97	420	795	1128	362	25	
Turn Type	Prot	NA	NA	pm+ov	Prot	Perm	
Protected Phases	5	2	6	4	4		9
Permitted Phases				6		4	
Total Split (s)	14.0	76.0	62.0	33.0	33.0	33.0	21.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)	9.0	71.3	57.3	85.4	28.1	28.1	
Actuated g/C Ratio	0.08	0.63	0.51	0.76	0.25	0.25	
v/c Ratio	0.89	0.23	0.94	1.08	0.93	0.08	
Control Delay	114.2	10.2	45.9	63.9	74.0	36.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	114.2	10.2	45.9	63.9	74.0	36.1	
LOS	F	B	D	E	E	D	
Approach Delay		29.7	56.5		71.6		
Approach LOS		C	E		E		
Queue Length 50th (ft)	68	57	455	~460	246	13	
Queue Length 95th (ft)	#133	121	#880	#1286	#511	37	
Internal Link Dist (ft)		1436	38		986		
Turn Bay Length (ft)	150					50	
Base Capacity (vph)	109	1864	849	1048	389	303	
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	0.89	0.23	0.94	1.08	0.93	0.08	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 113	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 53.6	Intersection LOS: D
Intersection Capacity Utilization 83.7%	ICU Level of Service E
Analysis Period (min) 15	
Description: 6, 14, 1	

~ 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.

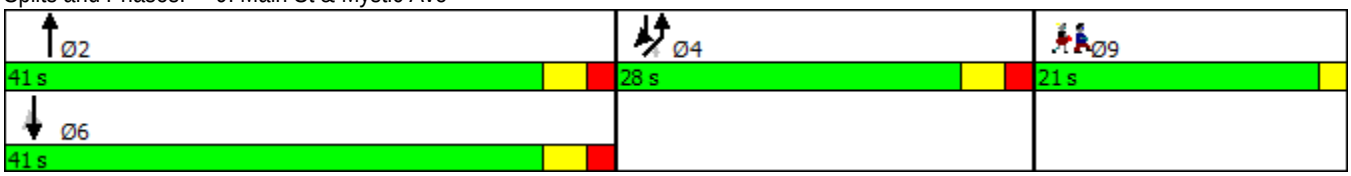
Splits and Phases: 9: Main St & Mystic Ave

Lane Group	NBL	NBT	SBT	SBR	NEL	NER	Ø9
Lane Configurations							
Traffic Volume (vph)	0	384	712	978	303	19	
Future Volume (vph)	0	384	712	978	303	19	
Satd. Flow (prot)	0	2954	1676	1411	1562	1264	
Flt Permitted					0.950		
Satd. Flow (perm)	0	2954	1676	1377	1562	1224	
Satd. Flow (RTOR)							
Confl. Peds. (#/hr)				6		6	
Peak Hour Factor	0.68	0.88	0.94	0.91	0.88	0.79	
Growth Factor	105%	105%	105%	105%	105%	105%	
Heavy Vehicles (%)	19%	10%	2%	3%	4%	15%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	458	795	1128	362	25	
Turn Type		NA	NA	pm+ov	Prot	Perm	
Protected Phases		2	6	4	4		9
Permitted Phases				6		4	
Total Split (s)		41.0	41.0	28.0	28.0	28.0	21.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)		36.4	36.4	59.6	23.2	23.2	
Actuated g/C Ratio		0.50	0.50	0.82	0.32	0.32	
v/c Ratio		0.31	0.95	0.99	0.73	0.06	
Control Delay		12.8	41.7	33.8	34.4	20.8	
Queue Delay		0.0	0.0	0.0	0.0	0.0	
Total Delay		12.8	41.7	33.8	34.4	20.8	
LOS		B	D	C	C	C	
Approach Delay		12.8	37.1		33.5		
Approach LOS		B	D		C		
Queue Length 50th (ft)		53	268	0	131	7	
Queue Length 95th (ft)		129	#686	#930	#345	27	
Internal Link Dist (ft)		1436	38		986		
Turn Bay Length (ft)						50	
Base Capacity (vph)		1472	835	1135	497	390	
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		0.31	0.95	0.99	0.73	0.06	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 73	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 32.6	Intersection LOS: C
Intersection Capacity Utilization 75.5%	ICU Level of Service D
Analysis Period (min) 15	
Description: 6, 14, 1	

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

Splits and Phases: 9: Main St & Mystic Ave



Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	149	1035	310	827	285	7
Future Volume (vph)	149	1035	310	827	285	7
Satd. Flow (prot)	0	1681	1660	1425	1554	0
Flt Permitted		0.993			0.955	
Satd. Flow (perm)	0	1681	1660	1425	1554	0
Confl. Peds. (#/hr)	2			8	4	8
Peak Hour Factor	0.83	0.90	0.90	0.94	0.87	0.44
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	1%	1%	3%	2%	4%	14%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1409	365	933	364	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 141.7%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 6, 14, 1			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	149	1035	310	827	285	7
Future Volume (Veh/h)	149	1035	310	827	285	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.90	0.90	0.94	0.87	0.44
Hourly flow rate (vph)	190	1219	365	933	347	17
Pedestrians		8	4		8	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		1	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			1173			
pX, platoon unblocked						
vC, conflicting volume	373				1976	381
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	373				1976	381
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	84				0	97
cM capacity (veh/h)	1182				56	631

Direction, Lane #	NB 1	SB 1	SB 2	NE 1
Volume Total	1409	365	933	364
Volume Left	190	0	0	347
Volume Right	0	0	933	17
cSH	1182	1700	1700	58
Volume to Capacity	0.16	0.21	0.55	6.24
Queue Length 95th (ft)	14	0	0	Err
Control Delay (s)	5.4	0.0	0.0	Err
Lane LOS	A			F
Approach Delay (s)	5.4	0.0		Err
Approach LOS				F

Intersection Summary			
Average Delay	1187.6		
Intersection Capacity Utilization	141.7%	ICU Level of Service	H
Analysis Period (min)	15		
Description: 6, 14, 1			

Lane Group	NBL	NBT	SBT	SBR	NEL	NER	Ø9
Lane Configurations							
Traffic Volume (vph)	149	1035	310	827	285	7	
Future Volume (vph)	149	1035	310	827	285	7	
Satd. Flow (prot)	1608	1693	1660	1425	1562	1275	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1603	1693	1660	1386	1557	1222	
Satd. Flow (RTOR)							
Confl. Peds. (#/hr)	2			8	4	8	
Peak Hour Factor	0.83	0.90	0.90	0.94	0.87	0.44	
Growth Factor	106%	106%	106%	106%	106%	106%	
Heavy Vehicles (%)	1%	1%	3%	2%	4%	14%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	190	1219	365	933	347	17	
Turn Type	Prot	NA	NA	pm+ov	Prot	Perm	
Protected Phases	5	2	6	4	4		9
Permitted Phases				6		4	
Total Split (s)	29.0	80.0	51.0	29.0	29.0	29.0	21.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)	18.2	75.5	52.3	76.4	24.2	24.2	
Actuated g/C Ratio	0.16	0.65	0.45	0.65	0.21	0.21	
v/c Ratio	0.76	1.12	0.49	1.02	1.08	0.07	
Control Delay	67.4	87.7	29.1	56.2	117.2	42.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	67.4	87.7	29.1	56.2	117.2	42.1	
LOS	E	F	C	E	F	D	
Approach Delay		85.0	48.6		113.7		
Approach LOS		F	D		F		
Queue Length 50th (ft)	128	~929	165	410	~248	9	
Queue Length 95th (ft)	210	#1525	359	#977	#517	16	
Internal Link Dist (ft)		1436	38		986		
Turn Bay Length (ft)						50	
Base Capacity (vph)	332	1092	741	913	322	252	
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	0.57	1.12	0.49	1.02	1.08	0.07	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 117	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 73.0	Intersection LOS: E
Intersection Capacity Utilization 91.1%	ICU Level of Service F
Analysis Period (min) 15	
Description: 6, 14, 1	

~ 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.

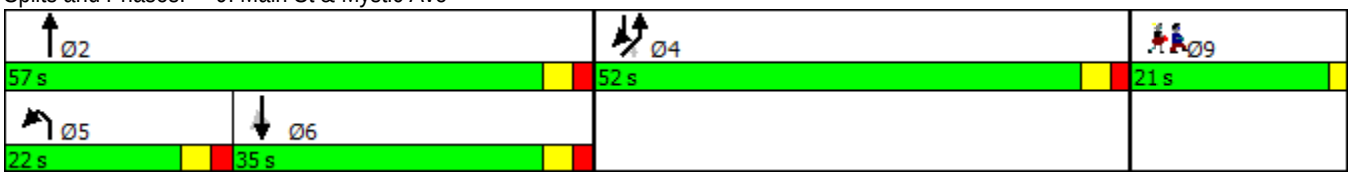
Splits and Phases: 9: Main St & Mystic Ave

Lane Group	NBL	NBT	SBT	SBR	NEL	NER	Ø9
Lane Configurations							
Traffic Volume (vph)	149	1035	310	827	285	7	
Future Volume (vph)	149	1035	310	827	285	7	
Satd. Flow (prot)	1608	3217	1660	1425	1562	1275	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1601	3217	1660	1387	1561	1236	
Satd. Flow (RTOR)							
Confl. Peds. (#/hr)	2			8	4	8	
Peak Hour Factor	0.83	0.90	0.90	0.94	0.87	0.44	
Growth Factor	106%	106%	106%	106%	106%	106%	
Heavy Vehicles (%)	1%	1%	3%	2%	4%	14%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	190	1219	365	933	347	17	
Turn Type	Prot	NA	NA	pm+ov	Prot	Perm	
Protected Phases	5	2	6	4	4		9
Permitted Phases				6		4	
Total Split (s)	22.0	57.0	35.0	52.0	52.0	52.0	21.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)	16.6	50.7	29.1	76.5	47.5	47.5	
Actuated g/C Ratio	0.14	0.44	0.25	0.66	0.41	0.41	
v/c Ratio	0.83	0.86	0.88	1.00	0.54	0.03	
Control Delay	77.6	38.0	65.0	49.2	32.0	24.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	77.6	38.0	65.0	49.2	32.0	24.9	
LOS	E	D	E	D	C	C	
Approach Delay		43.4	53.6		31.6		
Approach LOS		D	D		C		
Queue Length 50th (ft)	129	365	237	395	174	7	
Queue Length 95th (ft)	#262	#659	#495	#1145	327	12	
Internal Link Dist (ft)		1436	38		986		
Turn Bay Length (ft)	150					50	
Base Capacity (vph)	238	1463	435	935	642	508	
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	0.80	0.83	0.84	1.00	0.54	0.03	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 115.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 46.3	Intersection LOS: D
Intersection Capacity Utilization 79.2%	ICU Level of Service D
Analysis Period (min) 15	
Description: 6, 14, 1	

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

Splits and Phases: 9: Main St & Mystic Ave

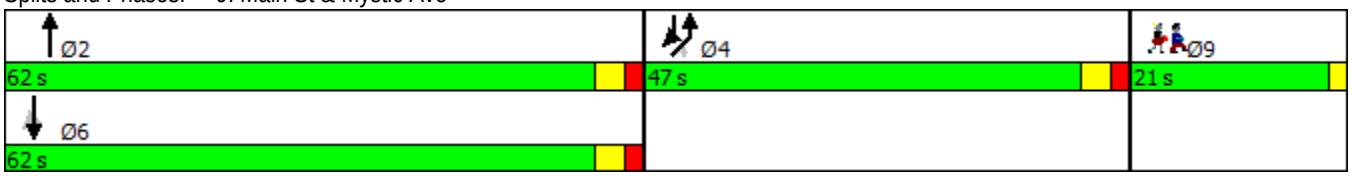


Lane Group	NBL	NBT	SBT	SBR	NEL	NER	Ø9
Lane Configurations							
Traffic Volume (vph)	0	1110	310	827	285	7	
Future Volume (vph)	0	1110	310	827	285	7	
Satd. Flow (prot)	0	3217	1660	1425	1562	1275	
Flt Permitted					0.950		
Satd. Flow (perm)	0	3217	1660	1389	1560	1234	
Satd. Flow (RTOR)							
Confl. Peds. (#/hr)	2			8	4	8	
Peak Hour Factor	0.83	0.90	0.90	0.94	0.87	0.44	
Growth Factor	106%	106%	106%	106%	106%	106%	
Heavy Vehicles (%)	1%	1%	3%	2%	4%	14%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	1307	365	933	347	17	
Turn Type		NA	NA	pm+ov	Prot	Perm	
Protected Phases		2	6	4	4		9
Permitted Phases				6		4	
Total Split (s)		62.0	62.0	47.0	47.0	47.0	21.0
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)		48.7	48.7	79.0	30.3	30.3	
Actuated g/C Ratio		0.51	0.51	0.82	0.32	0.32	
v/c Ratio		0.80	0.43	0.81	0.70	0.04	
Control Delay		27.7	20.6	12.6	40.4	28.4	
Queue Delay		0.0	0.0	0.0	0.0	0.0	
Total Delay		27.7	20.6	12.6	40.4	28.4	
LOS		C	C	B	D	C	
Approach Delay		27.7	14.9		39.8		
Approach LOS		C	B		D		
Queue Length 50th (ft)		260	105	0	169	7	
Queue Length 95th (ft)		#684	308	#597	348	13	
Internal Link Dist (ft)		1436	38		986		
Turn Bay Length (ft)						50	
Base Capacity (vph)		2103	1085	1218	752	594	
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		0.62	0.34	0.77	0.46	0.03	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 95.9	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 23.6	Intersection LOS: C
Intersection Capacity Utilization 65.3%	ICU Level of Service C
Analysis Period (min) 15	
Description: 6, 14, 1	

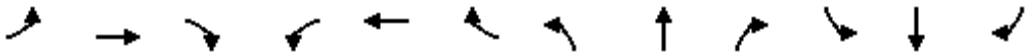
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Main St & Mystic Ave



APPENDIX O

Proposed Long-Term Alternatives: Route 16 at Winthrop Street
2040 AM/PM Peak Hour Intersection Capacity Analyses



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Future Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Satd. Flow (prot)	0	1701	0	0	1710	1411	0	1614	1454	1608	1636	0
Flt Permitted								0.641		0.284		
Satd. Flow (perm)	0	1701	*1	0	1710	1381	0	1038	1402	478	1636	0
Satd. Flow (RTOR)		1				132			246		8	
Confl. Peds. (#/hr)	1					1			7	7		
Peak Hour Factor	0.92	0.86	0.50	0.92	0.91	0.85	0.90	0.90	0.87	0.90	0.91	0.68
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	12%	0%	0%	3%	0%	6%	0%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	837	0	0	929	201	0	319	360	401	666	0
Turn Type		NA			NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		6			2			4		3	8	
Permitted Phases						2	4		4	8		
Total Split (s)		56.0			56.0	56.0	34.0	34.0	34.0	16.0	50.0	
Total Lost Time (s)		6.0			6.0	6.0		6.0	6.0	4.0	6.0	
Act Effct Green (s)		50.3			50.3	50.3		28.1	28.1	46.2	44.2	
Actuated g/C Ratio		0.46			0.46	0.46		0.25	0.25	0.42	0.40	
v/c Ratio		1.08			1.19	0.29		1.20	0.67	1.24	1.01	
Control Delay		86.1			128.1	8.8		159.3	19.2	157.5	70.6	
Queue Delay		0.0			0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		86.1			128.1	8.8		159.3	19.2	157.5	70.6	
LOS		F			F	A		F	B	F	E	
Approach Delay		86.1			106.9			85.1			103.3	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)		~618			~745	25		~258	63	~258	431	
Queue Length 95th (ft)		#1035			#1264	82		#536	188	#646	#885	
Internal Link Dist (ft)		2116			926			482			724	
Turn Bay Length (ft)						300			125			
Base Capacity (vph)		776			779	701		265	541	324	661	
Starvation Cap Reductn		0			0	0		0	0	0	0	
Spillback Cap Reductn		0			0	0		0	0	0	0	
Storage Cap Reductn		0			0	0		0	0	0	0	
Reduced v/c Ratio		1.08			1.19	0.29		1.20	0.67	1.24	1.01	

Intersection Summary	
Cycle Length: 127	
Actuated Cycle Length: 110.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.24	
Intersection Signal Delay: 97.2	Intersection LOS: F
Intersection Capacity Utilization 115.9%	ICU Level of Service H
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

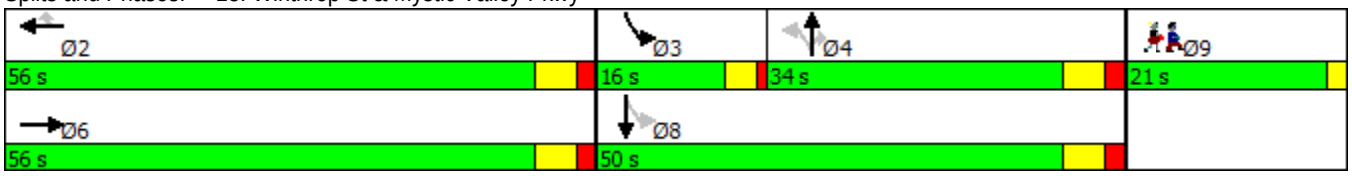
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

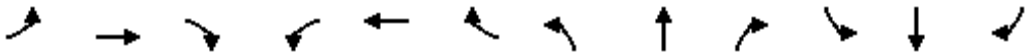
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

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

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Future Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Satd. Flow (prot)	0	1701	0	0	3133	0	1624	1613	1454	1608	1636	0
Flt Permitted							0.148			0.266		
Satd. Flow (perm)	0	1701	*1	0	3133	0	253	1613	1399	448	1636	0
Satd. Flow (RTOR)		1			24				249		7	
Confl. Peds. (#/hr)	1					1			7	7		
Peak Hour Factor	0.92	0.86	0.50	0.92	0.91	0.85	0.90	0.90	0.87	0.90	0.91	0.68
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	12%	0%	0%	3%	0%	6%	0%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	837	0	0	1130	0	21	298	360	401	666	0
Turn Type		NA			NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases							4		4	8		
Total Split (s)		57.0			57.0		7.0	30.0	30.0	22.0	45.0	
Total Lost Time (s)		5.0			5.0		4.0	5.0	5.0	4.0	5.0	
Act Effct Green (s)		52.3			52.3		28.6	24.6	24.6	47.7	44.1	
Actuated g/C Ratio		0.46			0.46		0.25	0.22	0.22	0.42	0.39	
v/c Ratio		1.06			0.77		0.21	0.85	0.72	1.07	1.03	
Control Delay		79.9			30.2		28.0	65.3	22.6	93.6	79.4	
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		79.9			30.2		28.0	65.3	22.6	93.6	79.4	
LOS		E			C		C	E	C	F	E	
Approach Delay		79.9			30.2			41.5			84.7	
Approach LOS		E			C			D			F	
Queue Length 50th (ft)		~629			322		8	198	67	~215	432	
Queue Length 95th (ft)		#1047			#566		30	#432	196	#532	#959	
Internal Link Dist (ft)		660			608			482			737	
Turn Bay Length (ft)							25		125			
Base Capacity (vph)		789			1466		101	359	505	375	644	
Starvation Cap Reductn		0			0		0	0	0	0	0	
Spillback Cap Reductn		0			0		0	0	0	0	0	
Storage Cap Reductn		0			0		0	0	0	0	0	
Reduced v/c Ratio		1.06			0.77		0.21	0.83	0.71	1.07	1.03	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 112.7	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 59.1	Intersection LOS: E
Intersection Capacity Utilization 98.0%	ICU Level of Service F
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

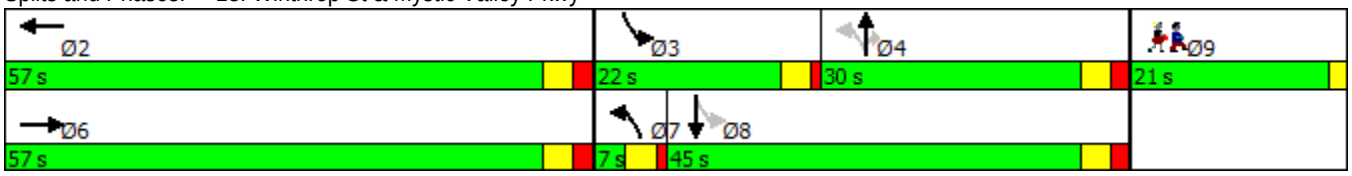
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

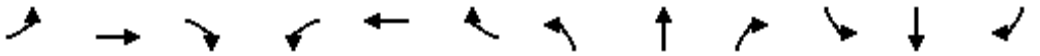
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

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

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy





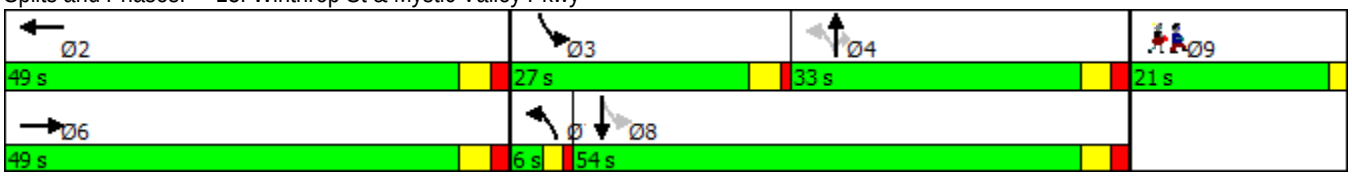
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Future Volume (vph)	0	672	8	0	805	163	18	255	298	344	486	68
Satd. Flow (prot)	0	3231	0	0	3133	0	1624	1613	1454	1608	1636	0
Flt Permitted							0.275			0.284		
Satd. Flow (perm)	0	3231	*1	0	3133	0	470	1613	1422	480	1636	0
Satd. Flow (RTOR)		2			21				256		8	
Confl. Peds. (#/hr)	1					1			7	7		
Peak Hour Factor	0.92	0.86	0.50	0.92	0.91	0.85	0.90	0.90	0.87	0.90	0.91	0.68
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	12%	0%	0%	3%	0%	6%	0%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	837	0	0	1130	0	21	298	360	401	666	0
Turn Type		NA			NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases							4		4	8		
Total Split (s)		49.0			49.0		6.0	33.0	33.0	27.0	54.0	
Total Lost Time (s)		5.0			5.0		3.0	5.0	5.0	4.0	5.0	
Act Effct Green (s)		44.3			44.3		31.1	26.0	26.0	54.2	51.0	
Actuated g/C Ratio		0.40			0.40		0.28	0.23	0.23	0.49	0.46	
v/c Ratio		0.65			0.90		0.13	0.79	0.68	0.86	0.88	
Control Delay		31.4			42.2		20.8	56.9	19.4	40.3	43.5	
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		31.4			42.2		20.8	56.9	19.4	40.3	43.5	
LOS		C			D		C	E	B	D	D	
Approach Delay		31.4			42.2			35.9			42.3	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)		243			373		7	190	59	175	370	
Queue Length 95th (ft)		384			#680		27	#400	181	#442	#857	
Internal Link Dist (ft)		660			608			482			737	
Turn Bay Length (ft)							25		125			
Base Capacity (vph)		1288			1261		162	409	551	468	754	
Starvation Cap Reductn		0			0		0	0	0	0	0	
Spillback Cap Reductn		0			0		0	0	0	0	0	
Storage Cap Reductn		0			0		0	0	0	0	0	
Reduced v/c Ratio		0.65			0.90		0.13	0.73	0.65	0.86	0.88	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 111.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 38.6	Intersection LOS: D
Intersection Capacity Utilization 81.7%	ICU Level of Service D
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

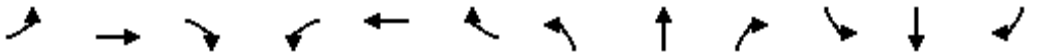
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Future Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Satd. Flow (prot)	0	1700	0	0	1710	1454	0	1690	1425	1624	1640	0
Flt Permitted								0.958		0.125		
Satd. Flow (perm)	0	1700	*1	0	1710	1417	0	1622	1390	214	1640	0
Satd. Flow (RTOR)		1				274			112		7	
Confl. Peds. (#/hr)	1					4	4		2	2		4
Peak Hour Factor	0.92	0.92	0.67	0.92	0.92	0.76	0.90	0.79	0.92	0.85	0.87	0.81
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	0%	1%	2%	0%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	813	0	0	933	421	0	438	225	403	516	0
Turn Type		NA			NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases		6			2			4		3	8	
Permitted Phases						2	4		4	8		
Total Split (s)		56.0			56.0	56.0	34.0	34.0	34.0	16.0	50.0	
Total Lost Time (s)		6.0			6.0	6.0		6.0	6.0	4.0	6.0	
Act Effct Green (s)		50.3			50.3	50.3		28.1	28.1	46.2	44.2	
Actuated g/C Ratio		0.46			0.46	0.46		0.25	0.25	0.42	0.40	
v/c Ratio		1.05			1.20	0.53		1.06	0.51	1.65	0.78	
Control Delay		76.3			130.2	10.4		101.0	22.9	335.6	39.1	
Queue Delay		0.0			0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		76.3			130.2	10.4		101.0	22.9	335.6	39.1	
LOS		E			F	B		F	C	F	D	
Approach Delay		76.3			92.9			74.5			169.1	
Approach LOS		E			F			E			F	
Queue Length 50th (ft)		~556			~751	57		~317	62	~346	289	
Queue Length 95th (ft)		#1070			#1272	116		#534	168	#618	#571	
Internal Link Dist (ft)		2116			926			482			724	
Turn Bay Length (ft)						300			125			
Base Capacity (vph)		775			779	795		414	438	244	662	
Starvation Cap Reductn		0			0	0		0	0	0	0	
Spillback Cap Reductn		0			0	0		0	0	0	0	
Storage Cap Reductn		0			0	0		0	0	0	0	
Reduced v/c Ratio		1.05			1.20	0.53		1.06	0.51	1.65	0.78	

Intersection Summary	
Cycle Length: 127	
Actuated Cycle Length: 110.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.65	
Intersection Signal Delay: 104.8	Intersection LOS: F
Intersection Capacity Utilization 112.2%	ICU Level of Service H
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

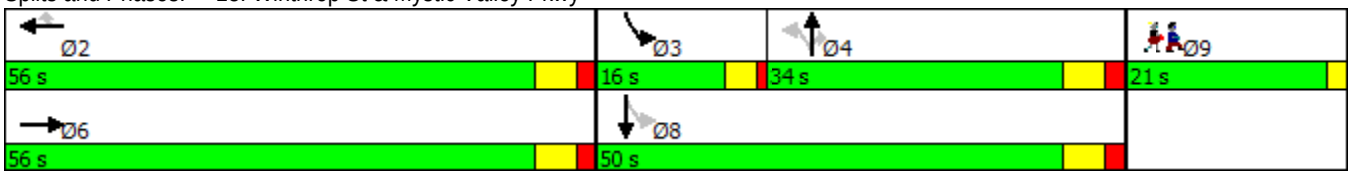
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

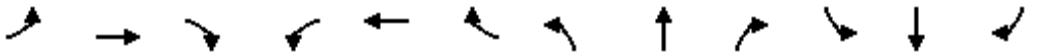
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

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

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Future Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Satd. Flow (prot)	0	1700	0	0	3072	0	1624	1693	1425	1624	1642	0
Flt Permitted							0.364			0.127		
Satd. Flow (perm)	0	1700	*1	0	3072	0	621	1693	1389	217	1642	0
Satd. Flow (RTOR)		1			66				111		6	
Confl. Peds. (#/hr)	1					4	4		2	2		4
Peak Hour Factor	0.92	0.92	0.67	0.92	0.92	0.76	0.90	0.79	0.92	0.85	0.87	0.81
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	0%	1%	2%	0%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	813	0	0	1354	0	21	417	225	403	516	0
Turn Type		NA			NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases							4		4	8		
Total Split (s)		56.0			56.0		8.0	30.0	30.0	23.0	45.0	
Total Lost Time (s)		5.0			5.0		4.0	5.0	5.0	4.0	5.0	
Act Effct Green (s)		51.3			51.3		30.1	25.1	25.1	49.2	45.2	
Actuated g/C Ratio		0.45			0.45		0.27	0.22	0.22	0.43	0.40	
v/c Ratio		1.06			0.95		0.10	1.11	0.57	1.22	0.78	
Control Delay		79.7			43.6		23.6	121.3	26.8	152.4	41.1	
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		79.7			43.6		23.6	121.3	26.8	152.4	41.1	
LOS		E			D		C	F	C	F	D	
Approach Delay		79.7			43.6			86.1			89.9	
Approach LOS		E			D			F			F	
Queue Length 50th (ft)		~606			435		8	~325	68	~294	284	
Queue Length 95th (ft)		#1093			#798		30	#536	181	#567	#639	
Internal Link Dist (ft)		660			608			482			737	
Turn Bay Length (ft)							25		125			
Base Capacity (vph)		769			1427		200	375	394	331	659	
Starvation Cap Reductn		0			0		0	0	0	0	0	
Spillback Cap Reductn		0			0		0	0	0	0	0	
Storage Cap Reductn		0			0		0	0	0	0	0	
Reduced v/c Ratio		1.06			0.95		0.10	1.11	0.57	1.22	0.78	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 113.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 70.3	Intersection LOS: E
Intersection Capacity Utilization 95.6%	ICU Level of Service F
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

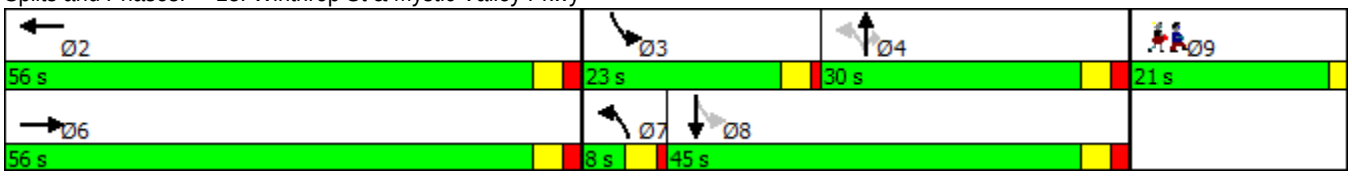
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

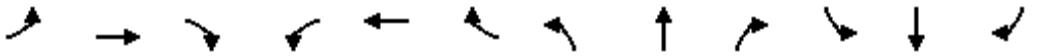
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

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

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Future Volume (vph)	0	684	16	0	810	302	18	311	195	323	368	52
Satd. Flow (prot)	0	3227	0	0	3072	0	1624	1693	1425	1624	1642	0
Flt Permitted							0.406			0.125		
Satd. Flow (perm)	0	3227	*1	0	3072	0	693	1693	1404	214	1642	0
Satd. Flow (RTOR)		3			65				112		6	
Confl. Peds. (#/hr)	1					4	4		2	2		4
Peak Hour Factor	0.92	0.92	0.67	0.92	0.92	0.76	0.90	0.79	0.92	0.85	0.87	0.81
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	0%	1%	2%	0%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	813	0	0	1354	0	21	417	225	403	516	0
Turn Type		NA			NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases							4		4	8		
Total Split (s)		55.0			55.0		6.0	31.0	31.0	23.0	48.0	
Total Lost Time (s)		5.0			5.0		3.0	5.0	5.0	4.0	5.0	
Act Effct Green (s)		50.2			50.2		31.2	26.1	26.1	50.2	47.0	
Actuated g/C Ratio		0.44			0.44		0.28	0.23	0.23	0.44	0.42	
v/c Ratio		0.57			0.97		0.10	1.07	0.55	1.21	0.75	
Control Delay		26.2			47.5		22.5	107.4	25.5	150.9	38.0	
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		26.2			47.5		22.5	107.4	25.5	150.9	38.0	
LOS		C			D		C	F	C	F	D	
Approach Delay		26.2			47.5			76.9			87.5	
Approach LOS		C			D			E			F	
Queue Length 50th (ft)		209			444		8	~314	66	~293	279	
Queue Length 95th (ft)		365			#810		29	#525	178	#565	#605	
Internal Link Dist (ft)		660			608			482			737	
Turn Bay Length (ft)							25		125			
Base Capacity (vph)		1433			1399		215	390	410	332	684	
Starvation Cap Reductn		0			0		0	0	0	0	0	
Spillback Cap Reductn		0			0		0	0	0	0	0	
Storage Cap Reductn		0			0		0	0	0	0	0	
Reduced v/c Ratio		0.57			0.97		0.10	1.07	0.55	1.21	0.75	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 113.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.21	
Intersection Signal Delay: 57.9	Intersection LOS: E
Intersection Capacity Utilization 89.9%	ICU Level of Service E
Analysis Period (min) 15	
Description: 8, 10, 12	

* User Entered Value

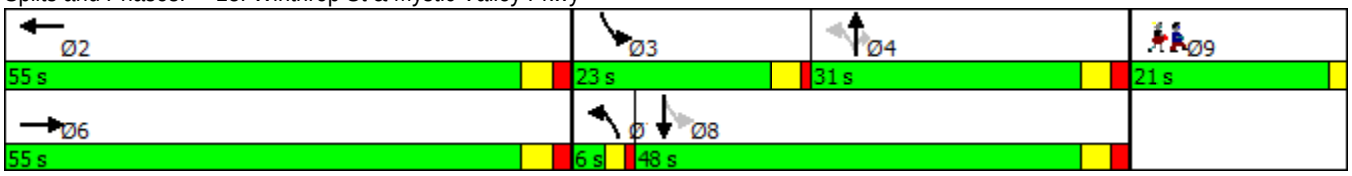
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	21.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

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

Splits and Phases: 13: Winthrop St & Mystic Valley Pkwy



APPENDIX P

Proposed Long-Term Alternatives: High Street at Winthrop Street
2040 AM/PM Peak Hour Intersection Capacity Analyses

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	28	3	223	347	187	591	96	7	92	253	3	53
Future Volume (vph)	28	3	223	347	187	591	96	7	92	253	3	53
Satd. Flow (prot)	0	0	1472	1367	0	1595	0	0	0	1608	1441	0
Flt Permitted			0.993			0.990				0.986		
Satd. Flow (perm)	0	0	1472	1367	0	1595	0	0	0	1608	1441	0
Confl. Peds. (#/hr)	3						3		1			16
Peak Hour Factor	0.70	0.38	0.82	0.96	0.90	0.91	0.77	0.44	0.79	0.89	0.38	0.83
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	7%	0%	9%	1%	1%	3%	14%	14%	7%	4%	0%	1%
Shared Lane Traffic (%)				12%								
Lane Group Flow (vph)	0	0	382	334	0	1048	0	0	0	420	75	0
Sign Control			Yield			Yield				Yield		

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 161.0%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Lane Configurations							
Traffic Volume (vph)	66	324	45	17	67	141	2
Future Volume (vph)	66	324	45	17	67	141	2
Satd. Flow (prot)	0	1590	0	0	1424	0	0
Flt Permitted		0.991			0.982		
Satd. Flow (perm)	0	1590	0	0	1424	0	0
Confl. Peds. (#/hr)	16		1	16		1	3
Peak Hour Factor	0.72	0.87	0.75	0.61	0.70	0.69	0.50
Growth Factor	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	19%	2%	2%	88%	2%	0%	0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	550	0	0	349	0	0
Sign Control		Yield			Stop		

Intersection Summary

Movement	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Right Turn Channelized								MOYes				
Traffic Volume (veh/h)	28	3	223	347	187	591	96	7	92	253	3	53
Future Volume (veh/h)	28	3	223	347	187	591	96	7	92	253	3	53
Peak Hour Factor	0.70	0.38	0.82	0.96	0.90	0.91	0.77	0.44	0.79	0.89	0.38	0.83
Hourly flow rate (vph)	42	8	286	380	218	682	131	17	122	298	8	67
Approach Volume (veh/h)			716			1031				495		
Crossing Volume (veh/h)			835			478				461		
High Capacity (veh/h)			712			950				963		
High v/c (veh/h)			1.01			1.09				0.51		
Low Capacity (veh/h)			560			769				781		
Low v/c (veh/h)			1.28			1.34				0.63		

Intersection Summary				
Maximum v/c High	1.20			
Maximum v/c Low	1.60			
Intersection Capacity Utilization	161.0%	ICU Level of Service	H	
# Crossing flow exceeds 1200, method is not applicable				
Description: 50, 17, 14				

Movement	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Right Turn Channelized							
Traffic Volume (veh/h)	66	324	45	17	67	141	2
Future Volume (veh/h)	66	324	45	17	67	141	2
Peak Hour Factor	0.72	0.87	0.75	0.61	0.70	0.69	0.50
Hourly flow rate (vph)	96	391	63	29	101	215	4
Approach Volume (veh/h)		550			349		
Crossing Volume (veh/h)		1367#			1493#		
High Capacity (veh/h)		459			413		
High v/c (veh/h)		1.20			0.84		
Low Capacity (veh/h)		344			306		
Low v/c (veh/h)		1.60			1.14		

Intersection Summary

Intersection	
Intersection Delay, s/veh	234.7
Intersection LOS	F

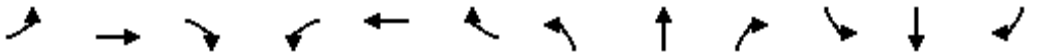
Approach	EB	WB	NB	SB
Entry Lanes	2	1	2	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	716	1048	495	550
Demand Flow Rate, veh/h	749	1090	517	577
Vehicles Circulating, veh/h	891	502	534	1426
Vehicles Exiting, veh/h	1112	549	1106	508
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	1	16	0	3
Ped Cap Adj	1.000	0.998	1.000	1.000
Approach Delay, s/veh	38.6	276.4	17.7	550.3
Approach LOS	E	F	C	F

Lane	Left	Right	Left	Bypass	Left	Right	Left
Designated Moves	LT	R	LTR	R	LT	R	LTR
Assumed Moves	LT	R	LTR	R	LT	R	LTR
RT Channelized				Free			
Lane Util	0.487	0.513	1.000		0.853	0.147	1.000
Critical Headway, s	5.193	5.193	5.193		5.193	5.193	5.193
Entry Flow, veh/h	365	384	1071	19	441	76	577
Cap Entry Lane, veh/h	464	464	684	2171	662	662	271
Entry HV Adj Factor	0.921	0.990	0.962	0.877	0.953	0.987	0.954
Flow Entry, veh/h	336	380	1031	17	420	75	550
Cap Entry, veh/h	427	459	657	1900	631	654	259
V/C Ratio	0.787	0.828	1.569	0.009	0.666	0.115	2.125
Control Delay, s/veh	37.2	39.8	281.0	0.0	19.6	6.8	550.3
LOS	E	E	F	A	C	A	F
95th %tile Queue, veh	7	8	54	0	5	0	41

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	1
Adj Approach Flow, veh/h	349
Demand Flow Rate, veh/h	377
Vehicles Circulating, veh/h	1557
Vehicles Exiting, veh/h	16
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	16
Ped Cap Adj	1.000
Approach Delay, s/veh	322.3
Approach LOS	F

Lane	Left
Designated Moves	LR
Assumed Moves	LR
RT Channelized	
Lane Util	1.000
Critical Headway, s	5.193
Entry Flow, veh/h	377
Cap Entry Lane, veh/h	238
Entry HV Adj Factor	0.926
Flow Entry, veh/h	349
Cap Entry, veh/h	221
V/C Ratio	1.583
Control Delay, s/veh	322.3
LOS	F
95th %tile Queue, veh	22



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	223	347	193	605	96	92	255	53	81	384	171
Future Volume (vph)	28	223	347	193	605	96	92	255	53	81	384	171
Satd. Flow (prot)	1518	1569	1439	1608	1660	1275	1518	1644	1439	1231	1676	1439
Flt Permitted	0.120			0.437			0.159			0.309		
Satd. Flow (perm)	192	1569	1439	740	1660	1245	254	1644	1394	397	1676	1408
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	3					3	1		16	16		1
Peak Hour Factor	0.70	0.82	0.96	0.89	0.91	0.78	0.79	0.90	0.83	0.82	0.91	0.71
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	7%	9%	1%	1%	3%	14%	7%	4%	1%	32%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	286	380	228	698	129	122	298	67	104	443	253
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Total Split (s)	8.0	61.0	61.0	13.0	66.0	66.0	10.0	41.0	41.0	13.0	44.0	44.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Act Effct Green (s)	59.6	54.6	54.6	68.7	61.5	61.5	43.6	36.6	36.6	49.1	39.3	39.3
Actuated g/C Ratio	0.43	0.39	0.39	0.50	0.44	0.44	0.32	0.26	0.26	0.35	0.28	0.28
v/c Ratio	0.35	0.46	0.67	0.54	0.95	0.23	0.90	0.69	0.18	0.54	0.93	0.63
Control Delay	29.2	35.5	43.0	28.3	61.1	27.8	95.4	57.4	44.6	45.7	76.9	53.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	35.5	43.0	28.3	61.1	27.8	95.4	57.4	44.6	45.7	76.9	53.9
LOS	C	D	D	C	E	C	F	E	D	D	E	D
Approach Delay		39.1			50.0			65.1			65.6	
Approach LOS		D			D			E			E	
Queue Length 50th (ft)	22	209	309	133	~712	81	85	268	52	73	~433	221
Queue Length 95th (ft)	35	266	436	194	#958	112	#166	382	88	112	#665	240
Internal Link Dist (ft)		1707			121			715			1156	
Turn Bay Length (ft)	50		50				100		100	75		50
Base Capacity (vph)	121	639	586	424	737	553	135	434	368	196	475	400
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.45	0.65	0.54	0.95	0.23	0.90	0.69	0.18	0.53	0.93	0.63

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 138.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 54.0	Intersection LOS: D
Intersection Capacity Utilization 85.0%	ICU Level of Service E
Analysis Period (min) 15	
Description: 50, 17, 14	

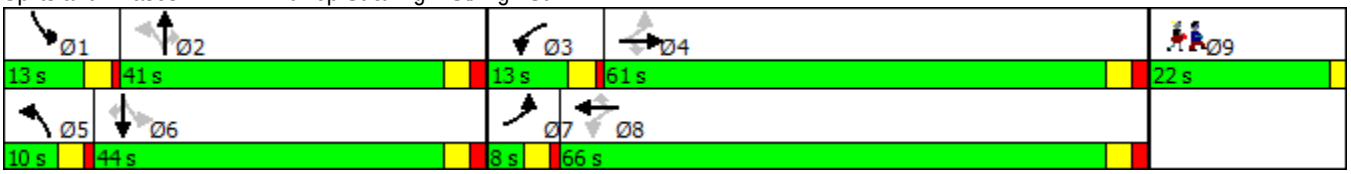
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.

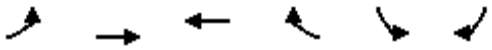
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	22.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Queue shown is maximum after two cycles.

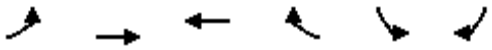
Splits and Phases: 12: Winthrop St & High St/High St





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	357	874	7	1	21
Future Volume (vph)	0	357	874	7	1	21
Satd. Flow (prot)	0	3621	2063	0	1757	0
Flt Permitted					0.997	
Satd. Flow (perm)	0	3621	2063	0	1757	0
Peak Hour Factor	0.92	0.86	0.91	0.44	0.61	0.78
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	13%	4%	14%	88%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	436	1025	0	30	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 58.7%	ICU Level of Service B
Analysis Period (min) 15	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	357	874	7	1	21
Future Volume (Veh/h)	0	357	874	7	1	21
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.86	0.91	0.44	0.61	0.78
Hourly flow rate (vph)	0	436	1008	17	2	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		201	1110			
pX, platoon unblocked	0.72				0.72	0.72
vC, conflicting volume	1025				1234	1016
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	841				1131	829
tC, single (s)	4.1				8.6	6.9
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				97	88
cM capacity (veh/h)	569				74	228

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	145	291	1025	30
Volume Left	0	0	0	2
Volume Right	0	0	17	28
cSH	569	1700	1700	200
Volume to Capacity	0.00	0.17	0.60	0.15
Queue Length 95th (ft)	0	0	0	13
Control Delay (s)	0.0	0.0	0.0	26.2
Lane LOS				D
Approach Delay (s)	0.0		0.0	26.2
Approach LOS				D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	28	3	223	347	187	591	96	7	92	253	3	53
Future Volume (vph)	28	3	223	347	187	591	96	7	92	253	3	53
Satd. Flow (prot)	0	1534	1497	0	1608	1585	0	0	0	1608	1441	0
Flt Permitted		0.950			0.950					0.986		
Satd. Flow (perm)	0	1534	1497	0	1608	1585	0	0	0	1608	1441	0
Confl. Peds. (#/hr)	3						3		1			16
Peak Hour Factor	0.70	0.38	0.82	0.96	0.90	0.91	0.77	0.44	0.79	0.89	0.38	0.83
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	7%	0%	9%	1%	1%	3%	14%	14%	7%	4%	0%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	50	666	0	218	830	0	0	0	420	75	0
Sign Control			Yield			Yield				Yield		

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 127.7%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Lane Configurations							
Traffic Volume (vph)	66	324	45	17	67	141	2
Future Volume (vph)	66	324	45	17	67	141	2
Satd. Flow (prot)	1365	1641	0	0	1424	0	0
Flt Permitted	0.950				0.982		
Satd. Flow (perm)	1365	1641	0	0	1424	0	0
Confl. Peds. (#/hr)	16		1	16		1	3
Peak Hour Factor	0.72	0.87	0.75	0.61	0.70	0.69	0.50
Growth Factor	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	19%	2%	2%	88%	2%	0%	0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	96	454	0	0	349	0	0
Sign Control		Yield			Stop		

Intersection Summary

Intersection	
Intersection Delay, s/veh	50.0
Intersection LOS	E

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	716	1048	495	550
Demand Flow Rate, veh/h	749	1090	517	577
Vehicles Circulating, veh/h	891	502	534	1426
Vehicles Exiting, veh/h	1112	549	722	508
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	1	16	0	3
Ped Cap Adj	1.000	0.990	1.000	1.000
Approach Delay, s/veh	6.8	63.5	13.3	93.8
Approach LOS	A	F	B	F

Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Left	Right
Designated Moves	L	TR	R	L	TR	R	LT	R	L	TR
Assumed Moves	L	TR	R	L	TR	R	LT	R	L	TR
RT Channelized			Free			Free				
Lane Util	0.145	0.855		0.205	0.795		0.853	0.147	0.198	0.802
Critical Headway, s	4.293	4.113		4.293	4.113		4.293	4.113	4.293	4.113
Entry Flow, veh/h	53	312	384	220	851	19	441	76	114	463
Cap Entry Lane, veh/h	579	606	1919	775	795	2188	757	778	388	416
Entry HV Adj Factor	0.944	0.917	0.990	0.991	0.955	0.877	0.953	0.987	0.842	0.981
Flow Entry, veh/h	50	286	380	218	813	17	420	75	96	454
Cap Entry, veh/h	547	556	1900	761	752	1900	721	767	327	408
V/C Ratio	0.092	0.515	0.200	0.287	1.081	0.009	0.583	0.098	0.294	1.112
Control Delay, s/veh	7.7	15.7	0.0	8.1	79.7	0.0	14.6	5.7	17.0	110.0
LOS	A	C	A	A	F	A	B	A	C	F
95th %tile Queue, veh	0	3	1	1	22	0	4	0	1	16

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	2
Adj Approach Flow, veh/h	349
Demand Flow Rate, veh/h	377
Vehicles Circulating, veh/h	1557
Vehicles Exiting, veh/h	16
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	16
Ped Cap Adj	1.000
Approach Delay, s/veh	81.0
Approach LOS	F

Lane	Left
Designated Moves	LR
Assumed Moves	LR
RT Channelized	
Lane Util	1.000
Critical Headway, s	4.113
Entry Flow, veh/h	377
Cap Entry Lane, veh/h	380
Entry HV Adj Factor	0.926
Flow Entry, veh/h	349
Cap Entry, veh/h	352
V/C Ratio	0.992
Control Delay, s/veh	81.0
LOS	F
95th %tile Queue, veh	11

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	91	20	291	286	112	439	92	6	147	322	16	90
Future Volume (vph)	91	20	291	286	112	439	92	6	147	322	16	90
Satd. Flow (prot)	0	0	1550	1354	0	1629	0	0	0	1681	1441	0
Flt Permitted			0.986			0.992				0.986		
Satd. Flow (perm)	0	0	1550	1354	0	1629	0	0	0	1681	1441	0
Confl. Peds. (#/hr)	3	3		5	5		3		7			1
Peak Hour Factor	0.84	0.62	0.86	0.84	0.88	0.86	0.82	0.75	0.92	0.83	0.57	0.59
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	1%	0%	3%	2%	1%	2%	3%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	544	325	0	803	0	0	0	580	192	0
Sign Control			Yield			Yield				Yield		

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 159.0%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Lane Configurations							
Traffic Volume (vph)	55	343	99	1	26	38	4
Future Volume (vph)	55	343	99	1	26	38	4
Satd. Flow (prot)	0	1627	0	0	1531	0	0
Flt Permitted		0.994			0.984		
Satd. Flow (perm)	0	1627	0	0	1531	0	0
Confl. Peds. (#/hr)	1		7	1	5	7	3
Peak Hour Factor	0.81	0.86	0.92	0.25	0.93	0.73	0.33
Growth Factor	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	10%	1%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	609	0	0	102	0	0
Sign Control		Yield			Stop		

Intersection Summary

Movement	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Right Turn Channelized								MOYes				
Traffic Volume (veh/h)	91	20	291	286	112	439	92	6	147	322	16	90
Future Volume (veh/h)	91	20	291	286	112	439	92	6	147	322	16	90
Peak Hour Factor	0.84	0.62	0.86	0.84	0.88	0.86	0.82	0.75	0.92	0.83	0.57	0.59
Hourly flow rate (vph)	115	34	359	361	135	541	119	8	169	411	30	162
Approach Volume (veh/h)			869			795				772		
Crossing Volume (veh/h)			664			759				584		
High Capacity (veh/h)			818			758				873		
High v/c (veh/h)			1.06			1.05				0.88		
Low Capacity (veh/h)			653			600				701		
Low v/c (veh/h)			1.33			1.33				1.10		

Intersection Summary					
Maximum v/c High	1.06				
Maximum v/c Low	1.33				
Intersection Capacity Utilization	159.0%	ICU Level of Service		H	
# Crossing flow exceeds 1200, method is not applicable					
Description: 50, 17, 14					

Movement	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Right Turn Channelized							
Traffic Volume (veh/h)	55	343	99	1	26	38	4
Future Volume (veh/h)	55	343	99	1	26	38	4
Peak Hour Factor	0.81	0.86	0.92	0.25	0.93	0.73	0.33
Hourly flow rate (vph)	72	423	114	4	30	55	13
Approach Volume (veh/h)		609			102		
Crossing Volume (veh/h)		934			1490#		
High Capacity (veh/h)		657			414		
High v/c (veh/h)		0.93			0.25		
Low Capacity (veh/h)		512			307		
Low v/c (veh/h)		1.19			0.33		

Intersection Summary

Intersection	
Intersection Delay, s/veh	132.4
Intersection LOS	F

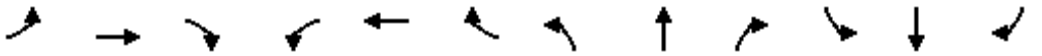
Approach	EB	WB	NB	SB
Entry Lanes	2	1	2	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	869	803	772	609
Demand Flow Rate, veh/h	888	819	776	620
Vehicles Circulating, veh/h	676	762	603	948
Vehicles Exiting, veh/h	892	617	961	663
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	7	1	5	3
Ped Cap Adj	0.997	1.000	0.997	1.000
Approach Delay, s/veh	35.0	269.8	39.6	225.7
Approach LOS	E	F	E	F

Lane	Left	Right	Left	Bypass	Left	Right	Left
Designated Moves	LT	R	LTR	R	LT	R	LTR
Assumed Moves	LT	R	LTR	R	LT	R	LTR
RT Channelized				Free			
Lane Util	0.586	0.414	1.000		0.750	0.250	1.000
Critical Headway, s	5.193	5.193	5.193		5.193	5.193	5.193
Entry Flow, veh/h	520	368	811	8	582	194	620
Cap Entry Lane, veh/h	575	575	527	1900	618	618	438
Entry HV Adj Factor	0.977	0.981	0.980	1.000	0.997	0.990	0.982
Flow Entry, veh/h	508	361	795	8	580	192	609
Cap Entry, veh/h	560	562	517	1900	615	610	430
V/C Ratio	0.907	0.642	1.538	0.004	0.944	0.315	1.416
Control Delay, s/veh	45.4	20.4	272.6	0.0	49.4	10.2	225.7
LOS	E	C	F	A	E	B	F
95th %tile Queue, veh	11	5	42	0	13	1	30

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	1
Adj Approach Flow, veh/h	102
Demand Flow Rate, veh/h	102
Vehicles Circulating, veh/h	1509
Vehicles Exiting, veh/h	64
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	16
Ped Cap Adj	1.000
Approach Delay, s/veh	26.0
Approach LOS	D

Lane	Left
Designated Moves	LR
Assumed Moves	LR
RT Channelized	
Lane Util	1.000
Critical Headway, s	5.193
Entry Flow, veh/h	102
Cap Entry Lane, veh/h	250
Entry HV Adj Factor	1.000
Flow Entry, veh/h	102
Cap Entry, veh/h	250
V/C Ratio	0.408
Control Delay, s/veh	26.0
LOS	D
95th %tile Queue, veh	2

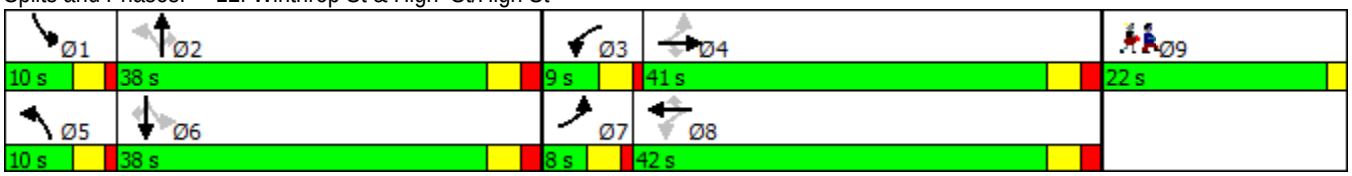


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	291	286	114	442	92	147	336	91	55	366	133
Future Volume (vph)	91	291	286	114	442	92	147	336	91	55	366	133
Satd. Flow (prot)	1608	1660	1425	1608	1676	1411	1608	1710	1439	1477	1693	1454
Flt Permitted	0.160			0.350			0.194			0.226		
Satd. Flow (perm)	271	1660	1385	591	1676	1376	327	1710	1397	351	1693	1406
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	3		5	5		3	7		16	1		7
Peak Hour Factor	0.84	0.86	0.84	0.88	0.86	0.82	0.92	0.83	0.59	0.82	0.86	0.86
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	1%	3%	2%	1%	2%	3%	1%	0%	1%	10%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	359	361	137	545	119	169	429	163	71	451	164
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Total Split (s)	8.0	41.0	41.0	9.0	42.0	42.0	10.0	38.0	38.0	10.0	38.0	38.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0
Act Effct Green (s)	41.4	36.4	36.4	43.4	37.4	37.4	39.3	32.2	32.2	39.3	32.2	32.2
Actuated g/C Ratio	0.39	0.35	0.35	0.41	0.36	0.36	0.37	0.31	0.31	0.37	0.31	0.31
v/c Ratio	0.73	0.63	0.75	0.47	0.91	0.24	0.86	0.82	0.38	0.36	0.87	0.38
Control Delay	52.6	36.6	44.2	28.0	55.9	28.3	65.3	49.3	33.7	27.4	54.4	33.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.6	36.6	44.2	28.0	55.9	28.3	65.3	49.3	33.7	27.4	54.4	33.7
LOS	D	D	D	C	E	C	E	D	C	C	D	C
Approach Delay		42.1			47.0			49.5			46.6	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	40	178	190	48	308	50	63	235	76	25	252	76
Queue Length 95th (ft)	#124	333	#377	113	#615	107	#219	#432	103	62	#503	160
Internal Link Dist (ft)		1707			121			715			1156	
Turn Bay Length (ft)	50		50				100		100	75		50
Base Capacity (vph)	158	574	479	293	596	489	196	542	443	196	537	446
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.63	0.75	0.47	0.91	0.24	0.86	0.79	0.37	0.36	0.84	0.37

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 105	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 46.2	Intersection LOS: D
Intersection Capacity Utilization 80.6%	ICU Level of Service D
Analysis Period (min) 15	
Description: 50, 17, 14	

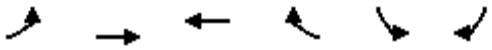
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Winthrop St & High St/High St



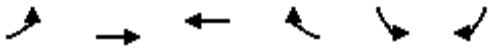
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	22.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	438	643	6	0	6
Future Volume (vph)	0	438	643	6	0	6
Satd. Flow (prot)	0	3972	2109	0	1863	0
Flt Permitted						
Satd. Flow (perm)	0	3972	2109	0	1863	0
Peak Hour Factor	0.92	0.96	0.93	0.75	0.25	0.77
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	3%	2%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	484	741	0	8	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 46.3%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	438	643	6	0	6
Future Volume (Veh/h)	0	438	643	6	0	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.96	0.93	0.75	0.25	0.77
Hourly flow rate (vph)	0	484	733	8	0	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		201	1110			
pX, platoon unblocked	0.85				0.85	0.85
vC, conflicting volume	741				979	737
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	602				884	598
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	98
cM capacity (veh/h)	821				244	381

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	161	323	741	8
Volume Left	0	0	0	0
Volume Right	0	0	8	8
cSH	821	1700	1700	381
Volume to Capacity	0.00	0.19	0.44	0.02
Queue Length 95th (ft)	0	0	0	2
Control Delay (s)	0.0	0.0	0.0	14.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	14.6
Approach LOS				B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL2	EBL	EBT	EBR	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NBR2
Lane Configurations												
Traffic Volume (vph)	91	20	291	286	112	439	92	6	147	322	16	90
Future Volume (vph)	91	20	291	286	112	439	92	6	147	322	16	90
Satd. Flow (prot)	0	1612	1543	0	1608	1625	0	0	0	1681	1441	0
Flt Permitted		0.950			0.950					0.986		
Satd. Flow (perm)	0	1612	1543	0	1608	1625	0	0	0	1681	1441	0
Confl. Peds. (#/hr)	3			5	5		3		7			1
Peak Hour Factor	0.84	0.62	0.86	0.84	0.88	0.86	0.82	0.75	0.92	0.83	0.57	0.59
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	1%	0%	3%	2%	1%	2%	3%	0%	1%	0%	0%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	149	720	0	135	668	0	0	0	580	192	0
Sign Control			Yield			Yield				Yield		

Intersection Summary			
Control Type: Roundabout			
Intersection Capacity Utilization 127.9%		ICU Level of Service H	
Analysis Period (min) 15			
Description: 50, 17, 14			

Lane Group	SBL	SBT	SBR	SWL2	SWL	SWR	SWR2
Lane Configurations							
Traffic Volume (vph)	55	343	99	1	26	38	4
Future Volume (vph)	55	343	99	1	26	38	4
Satd. Flow (prot)	1477	1642	0	0	1531	0	0
Flt Permitted	0.950				0.984		
Satd. Flow (perm)	1477	1642	0	0	1531	0	0
Confl. Peds. (#/hr)	1		7	1	5	7	3
Peak Hour Factor	0.81	0.86	0.92	0.25	0.93	0.73	0.33
Growth Factor	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	10%	1%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	72	537	0	0	102	0	0
Sign Control		Yield			Stop		

Intersection Summary

Intersection	
Intersection Delay, s/veh	30.3
Intersection LOS	D

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	869	803	772	609
Demand Flow Rate, veh/h	888	819	776	620
Vehicles Circulating, veh/h	676	762	603	948
Vehicles Exiting, veh/h	892	617	593	663
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	7	1	5	3
Ped Cap Adj	0.997	1.000	0.997	1.000
Approach Delay, s/veh	7.0	55.1	22.3	43.9
Approach LOS	A	F	C	E

Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Left	Right
Designated Moves	L	TR	R	L	TR	R	LT	R	L	TR
Assumed Moves	L	TR	R	L	TR	R	LT	R	L	TR
RT Channelized			Free			Free				
Lane Util	0.288	0.712		0.168	0.832		0.750	0.250	0.127	0.873
Critical Headway, s	4.293	4.113		4.293	4.113		4.293	4.113	4.293	4.113
Entry Flow, veh/h	150	370	368	136	675	8	582	194	79	541
Cap Entry Lane, veh/h	681	704	1943	638	663	1901	719	741	555	582
Entry HV Adj Factor	0.992	0.971	0.980	0.993	0.978	1.000	0.997	0.990	0.911	0.992
Flow Entry, veh/h	149	359	361	135	660	8	580	192	72	537
Cap Entry, veh/h	673	682	1900	633	648	1900	715	731	506	577
V/C Ratio	0.221	0.527	0.190	0.213	1.019	0.004	0.812	0.263	0.142	0.930
Control Delay, s/veh	8.0	13.7	0.0	8.3	65.4	0.0	27.0	8.0	9.0	48.5
LOS	A	B	A	A	F	A	D	A	A	E
95th %tile Queue, veh	1	3	1	1	17	0	9	1	0	12

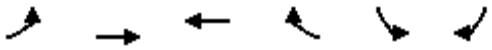
Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Approach	SW
Entry Lanes	1
Conflicting Circle Lanes	2
Adj Approach Flow, veh/h	102
Demand Flow Rate, veh/h	102
Vehicles Circulating, veh/h	1509
Vehicles Exiting, veh/h	64
Follow-Up Headway, s	3.186
Ped Vol Crossing Leg, #/h	16
Ped Cap Adj	1.000
Approach Delay, s/veh	13.6
Approach LOS	B

Lane	Left
Designated Moves	LR
Assumed Moves	LR
RT Channelized	
Lane Util	1.000
Critical Headway, s	4.113
Entry Flow, veh/h	102
Cap Entry Lane, veh/h	393
Entry HV Adj Factor	1.000
Flow Entry, veh/h	102
Cap Entry, veh/h	393
V/C Ratio	0.260
Control Delay, s/veh	13.6
LOS	B
95th %tile Queue, veh	1

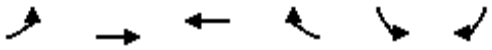
APPENDIX Q

Proposed Long-Term Improvements: High Street at Governors Avenue
2040 AM/PM Peak Hour Intersection Capacity Analyses



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	30	378	607	52	198	70
Future Volume (vph)	30	378	607	52	198	70
Satd. Flow (prot)	0	1570	1609	0	1608	1425
Flt Permitted		0.996			0.950	
Satd. Flow (perm)	0	1570	1609	0	1608	1425
Confl. Peds. (#/hr)	14			14	11	10
Peak Hour Factor	0.75	0.91	0.80	0.72	0.88	0.67
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	3%	9%	5%	5%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	478	873	0	236	110
Sign Control		Free	Free		Stop	

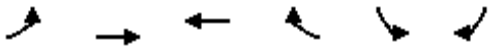
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 71.7%		ICU Level of Service C	
Analysis Period (min) 15			
Description: 35, 94, 128			



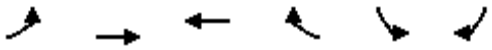
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	378	607	52	198	70
Future Volume (Veh/h)	30	378	607	52	198	70
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.91	0.80	0.72	0.88	0.67
Hourly flow rate (vph)	42	436	797	76	236	110
Pedestrians		10	11		14	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		1	1		1	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		665	570			
pX, platoon unblocked						
vC, conflicting volume	887				1380	859
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	887				1380	859
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				0	68
cM capacity (veh/h)	749				147	348

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	478	873	346
Volume Left	42	0	236
Volume Right	0	76	110
cSH	749	1700	182
Volume to Capacity	0.06	0.51	1.90
Queue Length 95th (ft)	4	0	640
Control Delay (s)	1.6	0.0	468.9
Lane LOS	A		F
Approach Delay (s)	1.6	0.0	468.9
Approach LOS			F

Intersection Summary			
Average Delay	96.0		
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
Description: 35, 94, 128			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	30	378	607	52	198	70	
Future Volume (vph)	30	378	607	52	198	70	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	12	12	12	
Storage Length (ft)	0			0	0	25	
Storage Lanes	0			0	1	1	
Taper Length (ft)	0				25		
Satd. Flow (prot)	0	1570	1605	0	1608	1425	
Flt Permitted		0.707			0.950		
Satd. Flow (perm)	0	1114	1605	0	1542	1344	
Right Turn on Red				No		Yes	
Satd. Flow (RTOR)						32	
Link Speed (mph)		25	25		25		
Link Distance (ft)		666	570		1844		
Travel Time (s)		18.2	15.5		50.3		
Confl. Peds. (#/hr)	14			14	11	10	
Peak Hour Factor	0.75	0.91	0.80	0.72	0.88	0.67	
Growth Factor	105%	105%	105%	105%	105%	105%	
Heavy Vehicles (%)	3%	9%	5%	5%	1%	2%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	478	873	0	236	110	
Turn Type	Perm	NA	NA		Prot	Perm	
Protected Phases		4	8		6		9
Permitted Phases	4					6	
Detector Phase	4	4	8		6	6	
Switch Phase							
Minimum Initial (s)	3.0	3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	10.0	10.0	10.0		10.0	10.0	22.0
Total Split (s)	77.0	77.0	77.0		21.0	21.0	22.0
Total Split (%)	64.2%	64.2%	64.2%		17.5%	17.5%	18%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	0.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min	Min	Min		None	None	None
Act Effct Green (s)		59.4	59.4		17.3	17.3	
Actuated g/C Ratio		0.61	0.61		0.18	0.18	
v/c Ratio		0.70	0.89		0.83	0.42	
Control Delay		21.1	30.8		68.9	38.2	
Queue Delay		0.0	1.2		0.0	0.0	
Total Delay		21.1	31.9		68.9	38.2	
LOS		C	C		E	D	
Approach Delay		21.1	31.9		59.1		
Approach LOS		C	C		E		
Queue Length 50th (ft)		233	532		~201	55	
Queue Length 95th (ft)		373	589		#352	76	



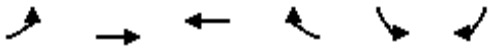
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Internal Link Dist (ft)		586	490		1764		
Turn Bay Length (ft)						25	
Base Capacity (vph)		853	1229		285	264	
Starvation Cap Reductn		0	164		0	0	
Spillback Cap Reductn		0	0		0	0	
Storage Cap Reductn		0	0		0	0	
Reduced v/c Ratio		0.56	0.82		0.83	0.42	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 120			
Actuated Cycle Length: 97.4			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 34.4		Intersection LOS: C	
Intersection Capacity Utilization 73.2%		ICU Level of Service D	
Analysis Period (min) 15			
Description: 35, 94, 128			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

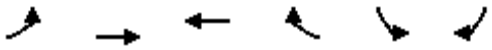
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: High St & Governors Ave



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	343	618	103	48	62
Future Volume (vph)	95	343	618	103	48	62
Satd. Flow (prot)	0	1631	1628	0	1562	1439
Flt Permitted		0.987			0.950	
Satd. Flow (perm)	0	1631	1628	0	1562	1439
Confl. Peds. (#/hr)	51			51	26	17
Peak Hour Factor	0.68	0.90	0.93	0.86	0.71	0.74
Growth Factor	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	4%	3%	2%	4%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	552	831	0	72	89
Sign Control		Free	Free		Stop	

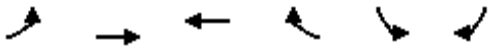
Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 91.4%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 35, 94, 128			



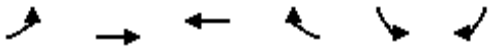
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	95	343	618	103	48	62
Future Volume (Veh/h)	95	343	618	103	48	62
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.68	0.90	0.93	0.86	0.71	0.74
Hourly flow rate (vph)	148	404	704	127	72	89
Pedestrians		17	26		51	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		3.5	3.5		3.5	
Percent Blockage		2	2		5	
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		665	570			
pX, platoon unblocked					0.95	
vC, conflicting volume	882				1544	836
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	882				1547	836
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	80				18	74
cM capacity (veh/h)	729				88	345

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	552	831	161
Volume Left	148	0	72
Volume Right	0	127	89
cSH	729	1700	161
Volume to Capacity	0.20	0.49	1.00
Queue Length 95th (ft)	19	0	194
Control Delay (s)	5.2	0.0	127.3
Lane LOS	A		F
Approach Delay (s)	5.2	0.0	127.3
Approach LOS			F

Intersection Summary			
Average Delay	15.1		
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		
Description: 35, 94, 128			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	95	343	618	103	48	62	
Future Volume (vph)	95	343	618	103	48	62	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	12	12	12	
Storage Length (ft)	0			0	0	25	
Storage Lanes	0			0	1	1	
Taper Length (ft)	0				0		
Satd. Flow (prot)	0	1631	1613	0	1562	1439	
Flt Permitted		0.509			0.950		
Satd. Flow (perm)	0	839	1613	0	1318	1266	
Right Turn on Red				No		Yes	
Satd. Flow (RTOR)						81	
Link Speed (mph)		25	25		25		
Link Distance (ft)		666	570		1844		
Travel Time (s)		18.2	15.5		50.3		
Confl. Peds. (#/hr)	51			51	26	17	
Peak Hour Factor	0.68	0.90	0.93	0.86	0.71	0.74	
Growth Factor	106%	106%	106%	106%	106%	106%	
Heavy Vehicles (%)	2%	4%	3%	2%	4%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	552	831	0	72	89	
Turn Type	Perm	NA	NA		Prot	Perm	
Protected Phases		4	8		6		9
Permitted Phases	4					6	
Detector Phase	4	4	8		6	6	
Switch Phase							
Minimum Initial (s)	3.0	3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	10.0	10.0	10.0		10.0	10.0	22.0
Total Split (s)	83.0	83.0	83.0		15.0	15.0	22.0
Total Split (%)	69.2%	69.2%	69.2%		12.5%	12.5%	18%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	0.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min	Min	Min		None	None	None
Act Effct Green (s)		85.0	85.0		9.0	9.0	
Actuated g/C Ratio		0.74	0.74		0.08	0.08	
v/c Ratio		0.90	0.70		0.60	0.51	
Control Delay		36.0	15.2		72.4	24.6	
Queue Delay		0.0	2.3		0.0	0.0	
Total Delay		36.0	17.4		72.4	24.6	
LOS		D	B		E	C	
Approach Delay		36.0	17.4		46.0		
Approach LOS		D	B		D		
Queue Length 50th (ft)		382	405		55	6	
Queue Length 95th (ft)		#653	596		81	36	



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Internal Link Dist (ft)		586	490		1764		
Turn Bay Length (ft)						25	
Base Capacity (vph)		616	1185		135	183	
Starvation Cap Reductn		0	221		0	0	
Spillback Cap Reductn		0	0		0	0	
Storage Cap Reductn		0	0		0	0	
Reduced v/c Ratio		0.90	0.86		0.53	0.49	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 120			
Actuated Cycle Length: 115.6			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 27.0		Intersection LOS: C	
Intersection Capacity Utilization 89.5%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 35, 94, 128			

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

Splits and Phases: 10: High St & Governorrs Ave

APPENDIX R

2040 AM/PM Peak Hour Intersection Capacity Analyses
Proposed Long-Term Improvements: Traffic Signal Coordination

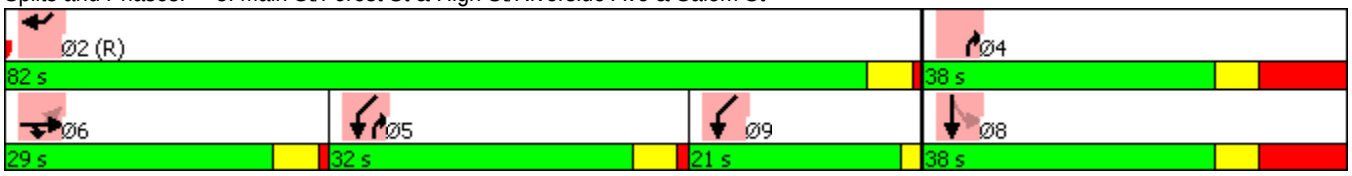
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2	Ø4	Ø5	Ø9
Lane Configurations												
Traffic Volume (vph)	210	380	134	21	277	3	1086	510	85			
Future Volume (vph)	210	380	134	21	277	3	1086	510	85			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	12	12	12	12	12	12	12	12			
Storage Length (ft)		60		0		0	0	0				
Storage Lanes		1		0		0	2	1				
Taper Length (ft)				0			0					
Satd. Flow (prot)	2954	1398	1422	0	1659	0	3060	1360	0			
Flt Permitted					0.995		0.950					
Satd. Flow (perm)	2954	1398	1422	0	1653	0	2885	1360	0			
Right Turn on Red		Yes	No			No			Yes			
Satd. Flow (RTOR)		173						82				
Link Speed (mph)	25				25		25					
Link Distance (ft)	570				1829		482					
Travel Time (s)	15.5				49.9		13.1					
Confl. Peds. (#/hr)		19	16	16		26	19	26	41			
Peak Hour Factor	0.72	0.90	0.90	0.58	0.95	0.75	0.96	0.84	0.81			
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%			
Heavy Vehicles (%)	10%	4%	4%	9%	1%	33%	3%	7%	6%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	306	443	156	0	348	0	1188	748	0			
Turn Type	NA	Prot	custom	Perm	NA		Prot	Prot				
Protected Phases	6	6	4 5		8		5 9	2		4	5	9
Permitted Phases				8								
Detector Phase	6	6	4 5	8	8		5	2				
Switch Phase												
Minimum Initial (s)	1.0	1.0		3.0	3.0			3.0		1.0	3.0	3.0
Minimum Split (s)	25.0	25.0		30.0	30.0			26.0		13.0	15.0	21.0
Total Split (s)	29.0	29.0		38.0	38.0			82.0		38.0	32.0	21.0
Total Split (%)	24.2%	24.2%		31.7%	31.7%			68.3%		32%	27%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		8.0	8.0			1.0		8.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	5.0	5.0			12.0			5.0				
Lead/Lag	Lead	Lead									Lag	
Lead-Lag Optimize?	Yes	Yes									Yes	
Recall Mode	Min	Min		None	None			C-Max		None	Min	None
Act Effct Green (s)	24.0	24.0	65.8		26.0		48.0	77.0				
Actuated g/C Ratio	0.20	0.20	0.55		0.22		0.40	0.64				
v/c Ratio	0.52	1.06	0.20		0.97		0.97	0.83				
Control Delay	46.5	89.4	9.8		88.2		55.3	24.4				
Queue Delay	0.0	2.7	0.0		0.0		16.5	0.0				
Total Delay	46.5	92.1	9.8		88.2		71.8	24.4				
LOS	D	F	A		F		E	C				
Approach Delay	73.5				88.2		53.4					
Approach LOS	E				F		D					
Queue Length 50th (ft)	112	~263	39		269		458	373				
Queue Length 95th (ft)	123	#471	m57		#459		#612	493				

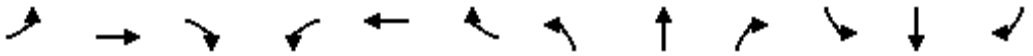
Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2	Ø4	Ø5	Ø9
Internal Link Dist (ft)	490				1749		402					
Turn Bay Length (ft)		60										
Base Capacity (vph)	590	418	780		358		1224	902				
Starvation Cap Reductn	0	0	0		0		0	0				
Spillback Cap Reductn	0	3	0		0		78	0				
Storage Cap Reductn	0	0	0		0		0	0				
Reduced v/c Ratio	0.52	1.07	0.20		0.97		1.04	0.83				

Intersection Summary			
Area Type:	CBD		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:SWR, Start of Green, Master Intersection			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.06			
Intersection Signal Delay: 59.8		Intersection LOS: E	
Intersection Capacity Utilization 91.2%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 129, 224, 201			

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Future Volume (vph)	0	0	0	136	8	64	46	299	0	0	1582	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	16	12	16	16	16	12	12	16	16	12	12
Storage Length (ft)	0		0	0		0	25		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	0			0			25			0		
Satd. Flow (prot)	0	0	0	0	1746	0	1593	2981	0	0	3103	0
Flt Permitted					0.968		0.263					
Satd. Flow (perm)	0	0	0	0	1735	0	441	2981	0	0	3103	0
Right Turn on Red			No			No			No			Yes
Satd. Flow (RTOR)											21	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		545			934			256			238	
Travel Time (s)		14.9			25.5			7.0			6.5	
Confl. Peds. (#/hr)				6		20	3					3
Peak Hour Factor	0.92	0.92	0.25	1.00	1.00	1.00	0.88	0.88	0.92	0.92	0.97	0.73
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	0%	1%	2%	9%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	218	0	55	357	0	0	1935	0
Turn Type				Perm	NA		custom	NA			NA	
Protected Phases					5		7	6 7 8			6 8	
Permitted Phases				5			8					
Detector Phase				5	5		7	6 7 8			6 8	
Switch Phase												
Minimum Initial (s)				3.0	3.0		3.0					
Minimum Split (s)				27.0	27.0		8.0					
Total Split (s)				27.0	27.0		11.0					
Total Split (%)				22.5%	22.5%		9.2%					
Yellow Time (s)				3.0	3.0		3.0					
All-Red Time (s)				1.0	1.0		1.0					
Lost Time Adjust (s)					0.0		0.0					
Total Lost Time (s)					4.0		4.0					
Lead/Lag				Lead	Lead		Lead					
Lead-Lag Optimize?				Yes	Yes		Yes					
Recall Mode				None	None		None					
Act Effct Green (s)					19.7		23.0	91.3			75.5	
Actuated g/C Ratio					0.16		0.19	0.76			0.63	
v/c Ratio					0.76		0.37	0.16			0.99	
Control Delay					65.3		65.1	7.0			16.4	
Queue Delay					35.4		0.0	1.1			22.6	
Total Delay					100.7		65.1	8.1			39.0	
LOS					F		E	A			D	
Approach Delay					100.7			15.7			39.0	
Approach LOS					F			B			D	
Queue Length 50th (ft)					159		41	77			~176	
Queue Length 95th (ft)					244		m55	m84			m#679	

Lane Group	Ø1	Ø2	Ø4	Ø6	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Width (ft)					
Storage Length (ft)					
Storage Lanes					
Taper Length (ft)					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn on Red					
Satd. Flow (RTOR)					
Link Speed (mph)					
Link Distance (ft)					
Travel Time (s)					
Confl. Peds. (#/hr)					
Peak Hour Factor					
Growth Factor					
Heavy Vehicles (%)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	4	6	8
Permitted Phases					
Detector Phase					
Switch Phase					
Minimum Initial (s)	3.0	3.0	3.0	3.0	3.0
Minimum Split (s)	10.0	21.0	27.0	21.0	10.0
Total Split (s)	40.0	49.0	31.0	62.0	20.0
Total Split (%)	33%	41%	26%	52%	17%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lag	Lead		Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes
Recall Mode	None	Min	None	C-Min	None
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)					332		152	2248			1960	
Starvation Cap Reductn					0		0	1618			3	
Spillback Cap Reductn					118		0	0			133	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					1.02		0.36	0.57			1.06	

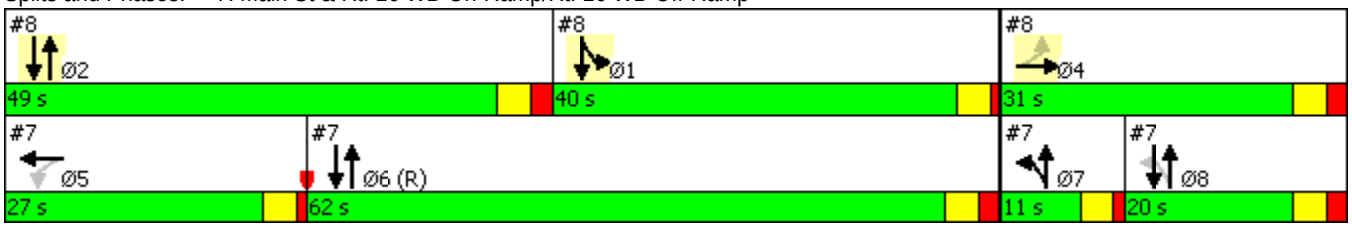
Intersection Summary			
Area Type:	CBD		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 26 (22%), Referenced to phase 6:NBSB, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.01			
Intersection Signal Delay: 40.5		Intersection LOS: D	
Intersection Capacity Utilization 87.3%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 29, 10, 3			

~ 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.

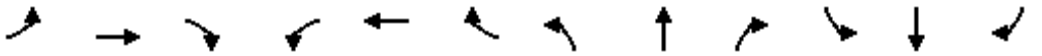
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø1	Ø2	Ø4	Ø6	Ø8
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					
Reduced v/c Ratio					

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Future Volume (vph)	73	215	239	0	0	0	0	268	446	269	1433	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	0		0	0		0	0		0	150		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	0			0			0			25		
Satd. Flow (prot)	0	2902	0	0	0	0	0	2718	0	1593	3154	0
Flt Permitted		0.993								0.950		
Satd. Flow (perm)	0	2902	0	0	0	0	0	2718	0	1589	3154	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		53						239				
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		176			1384			421			256	
Travel Time (s)		4.8			37.7			11.5			7.0	
Confl. Peds. (#/hr)			2						4	4		
Peak Hour Factor	0.83	0.87	0.77	0.25	0.25	0.25	0.92	0.84	0.91	0.83	0.94	0.25
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	5%	2%	2%	0%	0%	0%	2%	10%	5%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	677	0	0	0	0	0	850	0	340	1601	0
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	1 2	
Permitted Phases	4											
Detector Phase	4	4						2		1	1 2	
Switch Phase												
Minimum Initial (s)	3.0	3.0						3.0		3.0		
Minimum Split (s)	27.0	27.0						21.0		10.0		
Total Split (s)	31.0	31.0						49.0		40.0		
Total Split (%)	25.8%	25.8%						40.8%		33.3%		
Yellow Time (s)	3.0	3.0						3.0		3.0		
All-Red Time (s)	2.0	2.0						2.0		1.0		
Lost Time Adjust (s)		0.0						0.0		0.0		
Total Lost Time (s)		5.0						5.0		4.0		
Lead/Lag								Lead		Lag		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None						Min		None		
Act Effct Green (s)		26.0						44.0		36.0	85.0	
Actuated g/C Ratio		0.22						0.37		0.30	0.71	
v/c Ratio		1.01						0.74		0.71	0.72	
Control Delay		79.0						27.8		29.5	6.7	
Queue Delay		0.0						0.0		57.1	35.2	
Total Delay		79.0						27.8		86.6	41.9	
LOS		E						C		F	D	
Approach Delay		79.0						27.8			49.7	
Approach LOS		E						C			D	
Queue Length 50th (ft)		223						220		176	196	
Queue Length 95th (ft)		238						263		m169	m187	

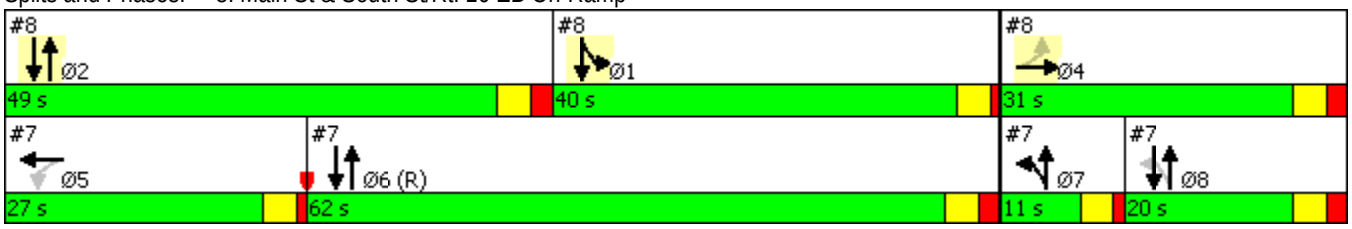
Lane Group	Ø5	Ø6	Ø7	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Ideal Flow (vphpl)				
Lane Width (ft)				
Storage Length (ft)				
Storage Lanes				
Taper Length (ft)				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Right Turn on Red				
Satd. Flow (RTOR)				
Link Speed (mph)				
Link Distance (ft)				
Travel Time (s)				
Confl. Peds. (#/hr)				
Peak Hour Factor				
Growth Factor				
Heavy Vehicles (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	5	6	7	8
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	3.0	3.0	3.0	3.0
Minimum Split (s)	27.0	21.0	8.0	10.0
Total Split (s)	27.0	62.0	11.0	20.0
Total Split (%)	23%	52%	9%	17%
Yellow Time (s)	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0	2.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	None	None
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
LOS				
Approach Delay				
Approach LOS				
Queue Length 50th (ft)				
Queue Length 95th (ft)				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		670						1147		477	2234	
Starvation Cap Reductn		0						0		176	736	
Spillback Cap Reductn		0						0		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		1.01						0.74		1.13	1.07	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 26 (22%), Referenced to phase 6:NBSB, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.01			
Intersection Signal Delay: 50.1		Intersection LOS: D	
Intersection Capacity Utilization 87.3%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 6, 9, 4			

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

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp



Lane Group	Ø5	Ø6	Ø7	Ø8
Internal Link Dist (ft)				
Turn Bay Length (ft)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary

Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2	Ø4	Ø5	Ø9
Lane Configurations												
Traffic Volume (vph)	297	87	382	72	178	25	839	721	147			
Future Volume (vph)	297	87	382	72	178	25	839	721	147			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	12	12	12	12	12	12	12	12			
Storage Length (ft)		60		0		0	0	0				
Storage Lanes		1		0		0	2	1				
Taper Length (ft)				0			0					
Satd. Flow (prot)	3154	1398	1465	0	1606	0	3120	1413	0			
Flt Permitted					0.985		0.950					
Satd. Flow (perm)	3154	1398	1465	0	1579	0	2691	1413	0			
Right Turn on Red		Yes	No			No			Yes			
Satd. Flow (RTOR)		207						98				
Link Speed (mph)	25				25		25					
Link Distance (ft)	570				1829		482					
Travel Time (s)	15.5				49.9		13.1					
Confl. Peds. (#/hr)		55	35	35		25	55	25	44			
Peak Hour Factor	0.93	0.78	0.88	0.69	0.89	0.52	0.94	0.90	0.91			
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%			
Heavy Vehicles (%)	3%	4%	1%	2%	2%	0%	1%	3%	2%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	339	118	460	0	374	0	946	1020	0			
Turn Type	NA	Prot	custom	Perm	NA		Prot	Prot				
Protected Phases	6	6	4 5		8		5 9	2		4	5	9
Permitted Phases				8								
Detector Phase	6	6	4 5	8	8		5	2				
Switch Phase												
Minimum Initial (s)	1.0	1.0		3.0	3.0			3.0		1.0	3.0	3.0
Minimum Split (s)	25.0	25.0		30.0	30.0			26.0		13.0	15.0	21.0
Total Split (s)	28.0	28.0		34.0	34.0			66.0		34.0	16.0	22.0
Total Split (%)	28.0%	28.0%		34.0%	34.0%			66.0%		34%	16%	22%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		8.0	8.0			1.0		8.0	1.0	0.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	5.0	5.0			12.0			5.0				
Lead/Lag	Lead	Lead									Lag	
Lead-Lag Optimize?	Yes	Yes									Yes	
Recall Mode	Min	Min		None	None			C-Max		None	Min	None
Act Effct Green (s)	16.9	16.9	52.5		22.0		39.1	61.0				
Actuated g/C Ratio	0.17	0.17	0.52		0.22		0.39	0.61				
v/c Ratio	0.63	0.29	0.60		1.08		0.78	1.13				
Control Delay	43.7	1.8	20.3		109.3		33.1	94.0				
Queue Delay	0.0	0.0	0.4		0.0		1.0	0.0				
Total Delay	43.7	1.8	20.8		109.3		34.2	94.0				
LOS	D	A	C		F		C	F				
Approach Delay	32.9				109.3		65.2					
Approach LOS	C				F		E					
Queue Length 50th (ft)	107	0	63		~267		267	~737				
Queue Length 95th (ft)	145	0	m#473		#439		#408	#985				

Lane Group	EBT	EBR	NBR2	SBL	SBT	SBR	SWL	SWR	SWR2	Ø4	Ø5	Ø9
Internal Link Dist (ft)	490				1749		402					
Turn Bay Length (ft)		60										
Base Capacity (vph)	725	480	768		347		1218	900				
Starvation Cap Reductn	0	0	70		0		0	0				
Spillback Cap Reductn	0	6	0		0		100	0				
Storage Cap Reductn	0	0	0		0		0	0				
Reduced v/c Ratio	0.47	0.25	0.66		1.08		0.85	1.13				

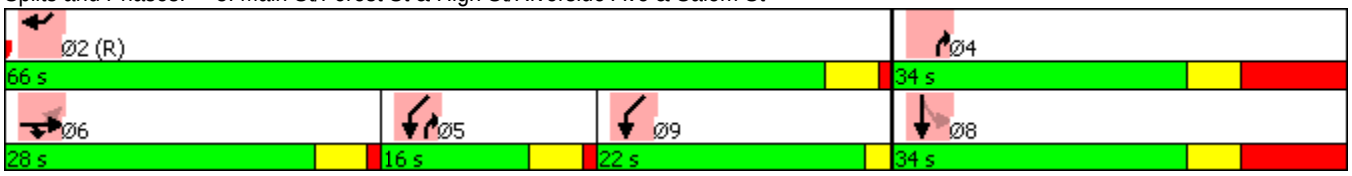
Intersection Summary			
Area Type:	CBD		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:SWR, Start of Green, Master Intersection			
Natural Cycle: 135			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 59.5		Intersection LOS: E	
Intersection Capacity Utilization 97.5%		ICU Level of Service F	
Analysis Period (min) 15			
Description: 129, 224, 201			

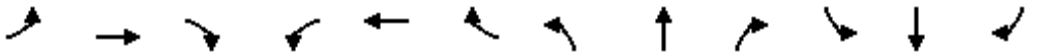
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

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

Splits and Phases: 3: Main St/Forest St & High St/Riverside Ave & Salem St





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Future Volume (vph)	0	0	0	119	52	121	191	928	0	0	847	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	16	12	16	16	16	12	12	16	16	12	12
Storage Length (ft)	0		0	0		0	25		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	0			0			25			0		
Satd. Flow (prot)	0	0	0	0	1760	0	1624	3185	0	0	3061	0
Flt Permitted					0.979		0.800					
Satd. Flow (perm)	0	0	0	0	1758	0	1363	3185	0	0	3061	0
Right Turn on Red			No			No			No			Yes
Satd. Flow (RTOR)											57	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		545			934			256			238	
Travel Time (s)		14.9			25.5			7.0			6.5	
Confl. Peds. (#/hr)				2			8					8
Peak Hour Factor	0.92	0.92	0.25	0.93	1.00	0.98	0.80	0.94	0.92	0.92	0.93	0.90
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	0%	4%	1%	0%	0%	2%	2%	2%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	322	0	253	1046	0	0	1279	0
Turn Type				Perm	NA		custom	NA			NA	
Protected Phases					5		7	6 7 8			6 8	
Permitted Phases				5			8					
Detector Phase				5	5		7	6 7 8			6 8	
Switch Phase												
Minimum Initial (s)				3.0	3.0		3.0					
Minimum Split (s)				27.0	27.0		8.0					
Total Split (s)				27.0	27.0		18.0					
Total Split (%)				27.0%	27.0%		18.0%					
Yellow Time (s)				3.0	3.0		3.0					
All-Red Time (s)				1.0	1.0		1.0					
Lost Time Adjust (s)					0.0		0.0					
Total Lost Time (s)					4.0		4.0					
Lead/Lag				Lead	Lead		Lead					
Lead-Lag Optimize?				Yes	Yes		Yes					
Recall Mode				None	None		None					
Act Effct Green (s)					21.3		20.0	69.7			46.7	
Actuated g/C Ratio					0.21		0.20	0.70			0.47	
v/c Ratio					0.86		0.82	0.47			0.88	
Control Delay					60.5		48.1	3.6			12.3	
Queue Delay					0.0		0.0	2.5			0.0	
Total Delay					60.5		48.1	6.1			12.3	
LOS					E		D	A			B	
Approach Delay					60.5			14.3			12.3	
Approach LOS					E			B			B	
Queue Length 50th (ft)					194		167	79			71	
Queue Length 95th (ft)					#329		m179	m83			m#121	

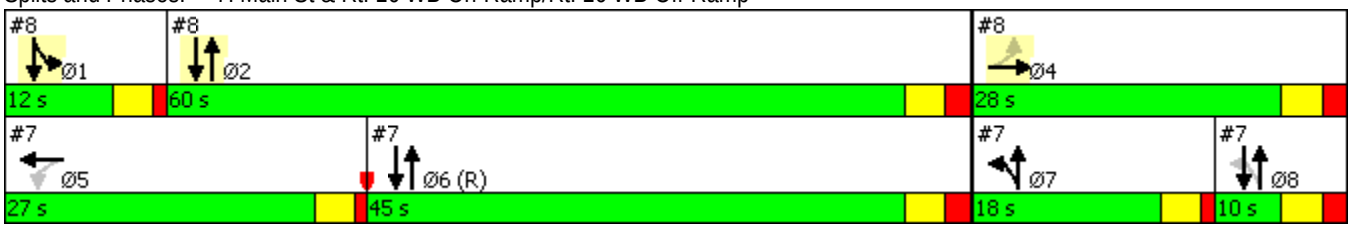
Lane Group	Ø1	Ø2	Ø4	Ø6	Ø8
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Width (ft)					
Storage Length (ft)					
Storage Lanes					
Taper Length (ft)					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn on Red					
Satd. Flow (RTOR)					
Link Speed (mph)					
Link Distance (ft)					
Travel Time (s)					
Confl. Peds. (#/hr)					
Peak Hour Factor					
Growth Factor					
Heavy Vehicles (%)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	4	6	8
Permitted Phases					
Detector Phase					
Switch Phase					
Minimum Initial (s)	3.0	3.0	3.0	3.0	3.0
Minimum Split (s)	10.0	21.0	27.0	21.0	10.0
Total Split (s)	12.0	60.0	28.0	45.0	10.0
Total Split (%)	12%	60%	28%	45%	10%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lead	Lag		Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes
Recall Mode	None	Min	None	C-Min	None
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					
LOS					
Approach Delay					
Approach LOS					
Queue Length 50th (ft)					
Queue Length 95th (ft)					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		465			854			176			158	
Turn Bay Length (ft)							25					
Base Capacity (vph)					404		309	2220			1460	
Starvation Cap Reductn					0		0	1010			0	
Spillback Cap Reductn					0		0	237			0	
Storage Cap Reductn					0		0	0			0	
Reduced v/c Ratio					0.80		0.82	0.86			0.88	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 31 (31%), Referenced to phase 6:NBSB, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 18.5		Intersection LOS: B	
Intersection Capacity Utilization 82.3%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 29, 10, 3			

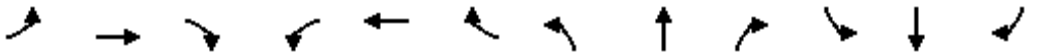
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Main St & Rt. 16 WB On-Ramp/Rt. 16 WB Off-Ramp



Lane Group	Ø1	Ø2	Ø4	Ø6	Ø8
Internal Link Dist (ft)					
Turn Bay Length (ft)					
Base Capacity (vph)					
Starvation Cap Reductn					
Spillback Cap Reductn					
Storage Cap Reductn					
Reduced v/c Ratio					

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Future Volume (vph)	171	227	168	0	0	0	0	936	450	48	887	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	0		0	0		0	0		0	150		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	0			0			0			25		
Satd. Flow (prot)	0	2961	0	0	0	0	0	3002	0	1593	3154	0
Flt Permitted		0.984								0.950		
Satd. Flow (perm)	0	2960	0	0	0	0	0	3002	0	1588	3154	0
Right Turn on Red			Yes			No			Yes			No
Satd. Flow (RTOR)		49						136				
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		176			1384			421			256	
Travel Time (s)		4.8			37.7			11.5			7.0	
Confl. Peds. (#/hr)	1		4						4	4		
Peak Hour Factor	0.82	0.85	0.95	0.25	0.25	0.25	0.92	0.95	0.92	0.80	0.94	0.25
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	4%	3%	2%	0%	0%	0%	2%	2%	2%	2%	3%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	691	0	0	0	0	0	1562	0	64	1000	0
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	1 2	
Permitted Phases	4											
Detector Phase	4	4						2		1	1 2	
Switch Phase												
Minimum Initial (s)	3.0	3.0						3.0		3.0		
Minimum Split (s)	27.0	27.0						21.0		10.0		
Total Split (s)	28.0	28.0						60.0		12.0		
Total Split (%)	28.0%	28.0%						60.0%		12.0%		
Yellow Time (s)	3.0	3.0						3.0		3.0		
All-Red Time (s)	2.0	2.0						2.0		1.0		
Lost Time Adjust (s)		0.0						0.0		0.0		
Total Lost Time (s)		5.0						5.0		4.0		
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	None	None						Min		None		
Act Effct Green (s)		23.0						55.0		8.0	68.0	
Actuated g/C Ratio		0.23						0.55		0.08	0.68	
v/c Ratio		0.96						0.91		0.50	0.47	
Control Delay		63.3						28.2		51.3	3.3	
Queue Delay		0.0						10.7		0.0	1.0	
Total Delay		63.3						38.9		51.3	4.4	
LOS		E						D		D	A	
Approach Delay		63.3						38.9			7.2	
Approach LOS		E						D			A	
Queue Length 50th (ft)		~262						417		40	18	
Queue Length 95th (ft)		#409						#610		m46	m90	

Lane Group	Ø5	Ø6	Ø7	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Ideal Flow (vphpl)				
Lane Width (ft)				
Storage Length (ft)				
Storage Lanes				
Taper Length (ft)				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Right Turn on Red				
Satd. Flow (RTOR)				
Link Speed (mph)				
Link Distance (ft)				
Travel Time (s)				
Confl. Peds. (#/hr)				
Peak Hour Factor				
Growth Factor				
Heavy Vehicles (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	5	6	7	8
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	3.0	3.0	3.0	3.0
Minimum Split (s)	27.0	21.0	8.0	10.0
Total Split (s)	27.0	45.0	18.0	10.0
Total Split (%)	27%	45%	18%	10%
Yellow Time (s)	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0	2.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	None	None
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
LOS				
Approach Delay				
Approach LOS				
Queue Length 50th (ft)				
Queue Length 95th (ft)				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		96			1304			341			176	
Turn Bay Length (ft)										150		
Base Capacity (vph)		718						1712		127	2144	
Starvation Cap Reductn		0						158		0	824	
Spillback Cap Reductn		0						85		0	0	
Storage Cap Reductn		0						0		0	0	
Reduced v/c Ratio		0.96						1.01		0.50	0.76	

Intersection Summary			
Area Type:	CBD		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 31 (31%), Referenced to phase 6:NBSB, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 33.8		Intersection LOS: C	
Intersection Capacity Utilization 82.3%		ICU Level of Service E	
Analysis Period (min) 15			
Description: 6, 9, 4			

~ 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.

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

Splits and Phases: 8: Main St & South St/Rt. 16 EB On-Ramp

Lane Group	Ø5	Ø6	Ø7	Ø8
Internal Link Dist (ft)				
Turn Bay Length (ft)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary

APPENDIX S

MassDOT Project Development Process

Overview of the Project Development Process

Transportation decision-making is complex and can be influenced by legislative mandates, environmental regulations, financial limitations, agency programmatic commitments, and partnering opportunities. Decision-makers and reviewing agencies, when consulted early and often throughout the project development process, can ensure that all participants understand the potential impact these factors can have on project implementation. Project development is the process that takes a transportation improvement from concept through construction.

The MassDOT Highway Division has developed a comprehensive project development process which is contained in Chapter 2 of the *MassDOT Highway Division's Project Development and Design Guide*. The eight-step process covers a range of activities extending from identification of a project need, through completion of a set of finished contract plans, to construction of the project. The sequence of decisions made through the project development process progressively narrows the project focus and, ultimately, leads to a project that addresses the identified needs. The descriptions provided below are focused on the process for a highway project, but the same basic process will need to be followed for non-highway projects as well.

1. Needs Identification

For each of the locations at which an improvement is to be implemented, MassDOT leads an effort to define the problem, establishes project goals and objectives, and defines the scope of the planning needed for implementation. To that end, it has to complete a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facility or location. The PNF documents the problems and explains why corrective action is needed. For this study, the information defining the need for the project will be drawn primarily, perhaps exclusively, from the present report. Also, at this point in the process, MassDOT meets with potential participants, such as the Metropolitan Planning Organization (MPO) and community members, to allow for an informal review of the project.

The PNF is reviewed by the MassDOT Highway Division district office whose jurisdiction includes the location of the proposed project. MassDOT also sends the PNF to the MPO, for informational purposes. The outcome of this step determines whether the project requires further planning, whether it is already well supported by prior planning studies, and, therefore, whether it is ready to move forward into the design phase, or whether it should be dismissed from further consideration.

2. Planning

This phase will likely not be required for the implementation of the improvements proposed in this planning study, as this planning report should constitute the outcome of this step. However, in general, the purpose of this implementation step is for the project proponent to identify issues, impacts, and approvals that may need to be obtained, so that the subsequent design and permitting processes are understood.

The level of planning needed will vary widely, based on the complexity of the project. Typical tasks include: define the existing context, confirm project need, establish goals and objectives, initiate public outreach, define the project, collect data, develop and analyze alternatives, make

recommendations, and provide documentation. Likely outcomes include consensus on the project definition to enable it to move forward into environmental documentation (if needed) and design, or a recommendation to delay the project or dismiss it from further consideration.

3. Project Initiation

At this point in the process, the proponent, MassDOT Highway Division, fills out a Project Initiation Form (PIF) for each improvement, which is reviewed by its Project Review Committee (PRC) and the MPO. The PRC is composed of the Chief Engineer, each District Highway Director, and representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge departments, and the MassDOT Federal Aid Program Office (FAPO). The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First the PRC reviews and evaluates the proposed project based on the MassDOT's statewide priorities and criteria. If the result is positive, MassDOT Highway Division moves the project forward to the design phase, and to programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes project evaluation based on the MPO's regional priorities and criteria. The MPO may assign project evaluation criteria score, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

4. Environmental Permitting, Design, and Right-of-Way Process

This step has four distinct but closely integrated elements: public outreach, environmental documentation and permitting (if required), design, and right-of-way acquisition (if required). The outcome of this step is a fully designed and permitted project ready for construction. However, a project does not have to be fully designed in order for the MPO to program it in the TIP. The sections below provide more detailed information on the four elements of this step of the project development process.

Public Outreach

Continued public outreach in the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. The public outreach is often in the form of required public hearings, but can also include less formal dialogues with those interested in and affected by a proposed project.

Environmental Documentation and Permitting

The project proponent, in coordination with the Environmental Services section of the MassDOT Highway Division, will be responsible for identifying and complying with all applicable federal, state, and local environmental laws and requirements. This includes determining the appropriate project category for both the Massachusetts Environmental Protection Act (MEPA) and the National Environmental Protection Act (NEPA). Environmental documentation and permitting is often completed in conjunction with the **Preliminary Design** phase described below.

Design
There are three major phases of design. The first is **Preliminary Design**, which is also referred to as the 25-percent submission. The major components of this phase include full survey of the project area, preparation of base plans, development of basic geometric layout, development of preliminary cost estimates, and submission of a functional design report. Preliminary Design, although not required to, is often completed in conjunction with the Environmental Documentation and Permitting. The next phase is **Final Design**, which is also referred to as the 75-percent and 100-percent submission. The major components of this phase include preparation of a subsurface exploratory plan (if required), coordination of utility relocations, development of traffic management plans through construction zones, development of final cost estimates, and refinement and finalization of the construction plans. Once Final Design is complete, a full set of **Plans, Specifications, and Estimates (PS&E)** is developed for the project.

Right-of-Way Acquisition
A separate set of Right-of-Way plans are required for any project that requires land acquisition or easements. The plans must identify the existing and proposed layout lines, easements, property lines, names of property owners, and the dimensions and areas of estimated takings and easements.

5. Programming (Identification of Funding)
Programming, which typically begins during the design phase, can actually occur at any time during the process, from planning to design. In this step, which is distinct from project initiation, the proponent requests that the MPO place the project in the region's Transportation Improvement Program (TIP). The proponent requesting the project's listing on the TIP can be the community or it can be one of the MPO member agencies (the Regional Planning Agency, MassDOT, and the Regional Transit Authority). The MPO then considers the project in terms of state and regional needs, evaluation criteria, and compliance with the regional Transportation Plan and decides whether to place it in the draft TIP for public review and then in the final TIP.

6. Procurement
Following project design and programming of a highway project, the MassDOT Highway Division publishes a request for proposals. It then reviews the bids and awards the contract to the qualified bidder with the lowest bid.

7. Construction
After a construction contract is awarded, MassDOT Highway Division and the contractor develop a public participation plan and a management plan for the construction process.

8. Project Assessment
The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. MassDOT Highway Division can apply what is learned in this process to future projects.

Project Development Schematic Timetable

Description	Schedule Influence	Typical Duration
Step I: Problem/Need/Opportunity Identification The proponent completes a Project Need Form (PNF). This form is then reviewed by the MassDOT Highway District office which provides guidance to the proponent on the subsequent steps of the process.	The Project Need Form has been developed so that it can be prepared quickly by the proponent, including any supporting data that is readily available. The District office shall return comments to the proponent within one month of PNF submission.	1 to 3 months
Step II: Planning Project planning can range from agreement that the problem should be addressed through a clear solution to a detailed analysis of alternatives and their impacts.	For some projects, no planning beyond preparation of the Project Need Form is required. Some projects require a planning study centered on specific project issues associated with the proposed solution or a narrow family of alternatives. More complex projects will likely require a detailed alternatives analysis.	Project Planning Report: 3 to 24+ months
Step III: Project Initiation The proponent prepares and submits a Project Initiation Form (PIF) and a Transportation Evaluation Criteria (TEC) form in this step. The PIF and TEC are informally reviewed by the Metropolitan Planning Organization (MPO) and MassDOT Highway District office, and formally reviewed by the PRC.	The PIF includes refinement of the preliminary information contained in the PNF. Additional information summarizing the results of the planning process, such as the Project Planning Report, are included with the PIF and TEC. The schedule is determined by PRC staff review (dependent on project complexity) and meeting schedule.	1 to 4 months
Step IV: Design, Environmental, and Right of Way The proponent completes the project design. Concurrently, the proponent completes necessary environmental permitting analyses and files applications for permits. Any right of way needed for the project is identified and the acquisition process begins.	The schedule for this step is dependent upon the size of the project and the complexity of the design, permitting, and right-of-way issues. Design review by the MassDOT Highway district and appropriate sections is completed in this step.	3 to 48+ months
Step V: Programming The MPO considers the project in terms of its regional priorities and determines whether or not to include the project in the draft Regional Transportation Improvement Program (TIP) which is then made available for public comment. The TIP includes a project description and funding source.	The schedule for this step is subject to each MPO's programming cycle and meeting schedule. It is also possible that the MPO will not include a project in its Draft TIP based on its review and approval procedures.	3 to 12+ months
Step VI: Procurement The project is advertised for construction and a contract awarded.	Administration of competing projects can influence the advertising schedule.	1 to 12 months
Step VII: Construction The construction process is initiated including public notification and any anticipated public involvement. Construction continues to project completion.	The duration for this step is entirely dependent upon project complexity and phasing.	3 to 60+ months
Step VIII: Project Assessment The construction period is complete and project elements and processes are evaluated on a voluntary basis.	The duration for this step is dependent upon the proponent's approach to this step and any follow-up required.	1 month

Source: MassDOT Highway Division Project Development and Design Guide