Washington Street Corridor Study

Canton, Massachusetts

Washington Street Corridor Study in Canton

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Abstract

The *Washington Street Corridor Study in Canton* is one in a series of studies supported by the Boston Region Metropolitan Planning Organization that address safety, mobility, and access on the Boston region's roadways. This report identifies specific transportation issues and concerns in the Washington Street Corridor and a major commercial district at Cobb Corner adjacent to the corridor; presents an in-depth analysis of multiple transportation-related factors, such as accommodations for people who walk and bike and safe access to adjacent businesses; proposes short- and long-term improvements to address the problems; and provides a vision for the corridor's long-term development.

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Each year, the Boston Region Metropolitan Planning Organization (MPO) conducts outreach to local agencies, municipalities, the public, and other stakeholders during the development of the Unified Planning Work Program, a program of studies and research projects that provide transportation planning and technical assistance to municipalities and agencies in the Boston region. The purpose of this outreach is to gather information about specific transportation problems in the region so that studies may be conducted to analyze these issues, and projects may be developed to address these issues to improve the operation of the transportation system.

The MPO's series of *Subregional Priority Roadways* studies grew out of this information-gathering process. These studies identify safety, mobility, access, and other transportation-related concerns on specific roadways identified as requiring improvements by subregional planning groups. The studies evaluate potential multimodal solutions to the problems and then make recommendations for agencies and municipalities to implement. Each year, the Boston Region MPO chooses an arterial or collector roadway for staff to analyze, which results in recommendations of short- and long-term improvements for that roadway area.

Selecting a study area in the Boston region is a thorough and exacting process, based on many factors. 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, MPO staff can address each problem area methodically, according to priority and regional needs.

This report focuses on the Washington Street corridor from Sherman Street to Cobb Corner (the junction of Washington Street and Route 27) in Canton, Massachusetts. It contains a review of existing conditions, various safety and operations analyses, and proposed short- and long-term improvements to address the problems in the study area that contains a Canton Center section and a residential section in the corridor and a major commercial district at Cobb Corner adjacent to the corridor.

Key issues and concerns identified for the corridor include the following:

- High corridor crash rate
- High vehicle travel speeds
- Recurrent traffic congestions

- Insufficient accommodation for people who walk or use a mobility device
- Lack of accommodation for people who bike
- Lack of safe and convenient access to side streets and adjacent developments
- Safety concerns for all users, especially for those who walk, use a mobility device, and bike

The proposed short-term improvements could enhance safety and improve traffic operations. They have a high benefit-to-cost ratio and should be planned, designed, and implemented as soon as resources are available, especially those recommended for the Canton Center section. Long-term improvements requiring major roadway reconfigurations are considered not applicable under the surrounding well-developed conditions in this section of the corridor

For the residential section and the Cobb Corner commercial district, it would require a series of long-term improvements to significantly improve the safety, mobility, and access for all users. The study proposes the following major improvements:

- Reduce travel-lane width to 11.5 feet wide.
- Install separated bike lanes or multiuse paths on both sides of the roadway.
- Install six-foot sidewalks wherever absent and improve the existing sidewalks and expand them to six feet wide wherever applicable.
- Remove the unsafe two-way left-turn lane on Washington in the Cobb Corner commercial district and install a left-turn-only center lane combined with traffic medians on Washington Street.
- Work with property and business owners to develop a comprehensive access management plan for the Cobb Corner commercial district.
- Reconstruct the intersection of Washington Street at Route 27 with an upgraded traffic signal system.
- Signalize two major business driveways on Washington Street and one on Sharon Street under a coordinated signal system based on the signal at the Washington Street/Route 27 intersection.
- Provide crosswalks and pedestrian signals at the signalized locations.
- Reduce driveway widths and turning radii wherever applicable.
- Enforce travel speed regulations in the corridor.

These proposed long-term improvements would have the following expected benefits:

- Improve accommodations and safety for people who walk, bike, and use a mobility device.
- Improve mobility and safety for people to access adjacent businesses.
- Sustain appropriate travel speeds and increase safety for all users in the corridor.
- Maintain efficient traffic operations in the corridor.
- Support and enhance economic activities in the subregion.
- Enhance livability for neighborhoods and the subregion.

Together, the proposed improvements in this study provide a vision for the long-term development of the corridor and the adjacent commercial district. Achieving the proposed Complete Streets vision for the corridor and the adjacent commercial district via the recommended improvements would require sufficient resources and significant effort and collaboration on the part of all stakeholders, including the three towns of Canton, Sharon, and Stoughton, residents, property and business owners, Brockton Area Transit Authority, Massachusetts Bay Transportation Authority, and Massachusetts Department of Transportation Highway Division Districts 5 and 6.

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's subregional groups, and the Massachusetts Department of Transportation (MassDOT) to identify transportation problems in the region. These problems generally involve accommodations for people who walk, bike, and use mobility devices; 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 that have not been cited in the regional needs assessment conducted for the LRTP.[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 *Washington Street Corridor Study in Canton* was documented in the federal fiscal year (FFY) 2022 UPWP, and a work program outlining the study was endorsed by the MPO board on August 19, 2021.

1.2 STUDY OBJECTIVES

The *Washington Street Corridor Study in Canton* focused on safety, mobility and access, and specific concerns related to bicycle and pedestrian transportation, multiuse trail feasibility, and other subjects raised by stakeholders. The objectives of the study were to

- identify safety, mobility, access, and other transportation-related problems in the study corridor; and
- develop and evaluate potential multimodal solutions to the problems, including those addressing the pedestrian, bicycle, truck, and transit modes.

[1] Roadways prioritized for improvement through this needs assessment are addressed through another annual work program, Addressing Priority Corridors from the Long-Range Transportation Plan Needs Assessment.

1.3 SELECTION PROCEDURE

The MPO selected the Washington Street corridor in Canton by assessing 20 roadway corridors in the Boston region that were identified as potential candidates for study by various sources, including (1) suggestions heard during outreach for the FFY 2022 UPWP; (2) concerns documented in meeting records from the UPWP outreach process since 2013; and (3) data from the MPO's Congestion Management Process. 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 there have been a significant number of collisions (two or more per mile) involving people who walk or bike.
- **Multimodal Significance:** The roadway supports transit, bicycle, or walking activity, or accommodates large numbers of heavy vehicles (trucks and 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 other stakeholders who voiced strong support for the improvements.
- **Transportation and Regional Equity:** The roadway contains adjacent areas with populations that show at least two of six MPO transportation equity indicators exceeding determined thresholds or is situated in a subregion that has not been selected for the Subregional Priority Roadways study in the past two years.[2]

Washington Street is a major north-south corridor that serves regional traffic and goes through the central part of Canton. It is a two-lane roadway classified as an Urban Principal Arterial and is under the jurisdiction of Canton. The selected study corridor is about 1.6 miles of Washington Street from Sherman Street to Route 27. It contains a Canton Center section, a residential section, and a major commercial section near Cobb Corner (Washington Street at Route 27).

The Town of Canton recently completed a town master plan, which identified these two areas in the corridor as priorities for implementation. The section in between the two areas is a densely settled residential district that contains single-family houses, multifamily buildings, and affordable housing units,

[2] Details of the criteria and rating system may be found in the Central Transportation Planning Staff's technical memorandum, "Selection of FFY 2022 Subregional Priority Roadway Study Location," dated January 20, 2022.

including Canton Housing Authority units for seniors. Improving the accommodation and safety for people who walk and use a mobility device would significantly benefit the seniors and people with disabilities. Meanwhile, improving the accommodation and safety for people who bike on Washington Street is one of the high priorities in the town master plan.

1.4 STUDY AREA AND DATA COLLECTION

In addition to the selected Washington Street corridor, the study area includes the intersection of Washington Street at Route 27 and a section of Route 27 (Sharon Street) adjacent to the Cobb Corner commercial district and cross and side street from the corridor. Major cross streets in the corridor include Sherman Street, Neponset Street, High Street, and Route 27 (Sharon Street in Stoughton/North Main Street in Sharon). Figure 1 shows the study corridor, adjacent roadways, and major developments in the study area.

At the request of MPO staff, MassDOT collected daily traffic volumes and intersection turning movement counts (including pedestrian and bicycle movements and the percentage of heavy vehicles) for this study from November 29 to December 5, 2021, a period during the COVID-19 pandemic when traffic was still less intensive than the usual conditions. Staff reviewed historical counts and MassDOT COVID-19 traffic monitoring reports and made a series of adjustments to the collected data, so that the data would reflect the normal traffic conditions to be used for a series of essential analyses in this study.

MPO staff also collected a series of data from the Town of Canton, including land use and zoning information, traffic studies from recent proposed developments and redevelopments in the corridor, and the police crash reports for a five-year period from 2015 to 2019.

MPO staff developed a corridor user survey to gather feedback from the public on perceived and actual problems with the corridor and to solicit improvement ideas. The survey yielded helpful information in identifying the issues and concerns and in developing improvement strategies for the corridor.

1.5 STUDY ADVISORY COMMITTEE MEETINGS

During the study, MPO staff worked closely with an advisory committee comprised of representatives from Canton, Sharon, Stoughton, Old Colony Planning Council, Brockton Area Transit Authority, MassDOT Office of Transportation Planning, and MassDOT Highway Division District 6. Appendix A contains a complete list of the study advisory members.

Two advisory committee meetings were held to support and guide the study. In the first meeting (March 9, 2022), MPO staff introduced the study, received input about the corridor's issues and concerns, and coordinated data collection needs. In the second meeting (September 14, 2022), staff presented the analyses and findings and discussed the proposed short- and long-term improvement alternatives with the advisory committee members. After the meetings, staff received comments and revised the proposed improvements accordingly.

Chapter 2— Existing Conditions and Issues

2.1 CORRIDOR OVERVIEW

Washington Street can be regarded as the most important arterial roadway for the town. It runs through the central area of Canton from Route 27 in the south near the town border with Sharon and Stoughton to Route 138 (Turnpike Street) in the north near Interstate 93 (I-93) and the Town of Milton. Washington Street can also be regarded as the "Main Street" of Canton, as its central section serves Canton Center, an economic and cultural district that is popular with residents of the town and adjacent communities. Due to its connections to Interstate 95 (via Route 27 and Neponset Street) and I-93 (via Route 138), it also carries a high proportion of through-town regional traffic.

The study corridor is about 1.6 miles of Washington Street from Sherman Street to Route 27, including the intersections at both ends (Figure 1). It is a two-lane roadway, one lane in each direction, which carries approximately 14,000 to 21,000 vehicles per weekday. The entire corridor is classified as Urban Principal Arterial and is under the jurisdiction of the Town of Canton, except the intersection of Washington Street at Route 27 which is under the jurisdiction of the Town of Sharon.

Based on the adjacent land uses and the existing roadway layouts, the corridor can be divided into three sections:

1. Canton Center Section: Washington Street from Sherman Street to Walnut Street
2. Residential Section: Washington Street between Walnut Street and Village Shoppes Driveway
3. Cobb Corner Commercial Section: Washington Street from Village Shoppes Driveway to Route 27 (Sharon Street/North Main)

2.1.1 Canton Center Section

The first section is located within the Canton Center Economic Opportunity District.[3] It is a vibrant district that contains various types of land uses, including municipal institutions and offices (Town Hall, Town Library, and Canton Housing Authority), US Postal Service, transportation services (Canton Center commuter rail station and Shell gas station), senior housing, religious institutions (St. Oscar Romero Catholic Church and St. John's School), banks and financial services,

[3] Zoning Map, Town of Canton, 2019.

health care services, Walgreen Pharmacy, convenience stores (Canton Market and 7-Eleven), local stores and businesses, and many popular restaurants and cafes. It is also a district with rich heritage. A small municipal park near Forge Pond is dedicated to celebrating the historical sites in this area, such as Kinsley Iron & Machine Company, Revere Copper Company, and Paul Revere's residence in 1801.

To support the various economic and cultural activities, on-street and off-street parking spaces are provided throughout the district. A recent parking study conducted for the district found that the on-street parking spaces (existing on both sides of Washington Street) were fairly well used and the off-street parking lots (most located just behind the stores and accessible from side streets near Washington Street) were underused probably due to insufficient information.[4]

This section contains five signalized intersections at Sherman Street, Revere Street, Bolivar Street, Church Street, and Neponset Street, and many side streets and driveways from adjacent commercial and residential developments. Church Street and Neponset Street are under one signal controller. Sherman Street excepted, traffic signals at these intersections are coordinated with the Church Street/Neponset Street intersection as the master intersection.[5]

All the signalized intersections contain crosswalks for people to cross Washington Street and pedestrian signals with exclusive signal phases. In addition, five crosswalks with no traffic controls exist in the section at Centre Street, the entrance of Canton Center commuter rail station, St. Oscar Romero Church, Mechanic Street, and Walnut Street.

Sidewalks exist on both sides of Washington Street. With landscaping and street furniture, they are pleasant and generally sufficient for two-way pedestrian traffic, except for the section between Bolivar Street and Neponset Street that appears to be somewhat narrow. No dedicated bike lanes exist in this roadway section. Bicyclists (mostly youths) frequently ride or walk their bikes on sidewalks.

With intensive traffic, on-street parking maneuvers, and pedestrian crossing activities, this downtown section is usually congested during peak hours, especially in the busy section of Washington Street between Bolivar Street and Neponset Street. In particular, the short section between Church Street and

[4] Town of Canton: Downtown Parking Strategy, November 2018, Stantec Engineering Services. The parking utilization was conducted on June 14 and 23, 2018.

[5] The master intersection is the key intersection of a signal coordination system. The signal timing offsets at the other coordinated intersections is according to traffic demands and their distances from the master intersection.

Neponset Street can be regarded as a key bottleneck location in the corridor due to its high traffic volume operated under limited travel lanes.[6]

2.1.2 Residential Section

The second section, Washington Street between Walnut Street and the driveway of Village Shoppes Shopping Mall, contains residential districts. Its adjacent areas are thickly settled with single-family houses and several apartments and condos on Washington Street or adjacent side streets. The travel lanes in this section are wide and vehicles frequently travel at speeds much higher than the posted speed limits. There are no dedicated bike lanes, and the shoulders generally are narrow with a width of about two to three feet.

The intersection of Washington Street at High Street is the major intersection in this section. It is unsignalized and the stop-controlled High Street approach is usually congested during peak hours, as it carries crosstown traffic (from Route 27 and I-95) in addition to the neighborhood traffic. The intersection has crosswalks on Washington Street northbound and on High Street. The crosswalks are equipped with Rectangular Rapid Flashing Beacons (RRFB). However, they are not easily observable due to the intersection's large layout.

Another crosswalk on Washington Street, also equipped with RRFBs, is at Hagan Court. It is near a curve section south of Pond Street, with no advance pedestrian crossing warning signage. Sidewalks exist on both sides in most sections and no sidewalks exist on the southbound side south of Pond Street.

2.1.3 Cobb Corner Section

The third section, Washington Street from Village Shoppes Driveway to Route 27, contains large commercial areas on both sides. The east side has a large area that hosts a major shopping mall (Village Shoppes), a shopping plaza (Cobb Corner Plaza), CVS, McDonald's, Starbucks, and several popular restaurants, with plenty of parking spaces. The area on the west side is smaller and contains two traditional shopping plazas that house stores, shops, and pizzerias, with sufficient parking spaces.

Washington Street in this commercial section consists of three travel lanes, one for northbound, one for southbound, and a two-way left-turn lane (TWLTL) in the middle. The TWLTL may not be suitable in this section with multiple driveways, as it creates numerous conflicting points on Washington Street (see Section 3.3

[6] Church Street operates in one-way westbound only and Neponset Street operates in one-way eastbound only. This adds additional circulatory traffic on Washington Street northbound and a high left-turn demand at the Church Street intersection where a single travel lane is frequently blocked by left-turn vehicles waiting for traffic gaps.

for the collision analysis for this roadway section). No sidewalks exist on the southbound side and a short section on the northbound side between Route 27 and the driveway of Cobb Corner Plaza is missing.

A midblock crosswalk exists just north of the plaza driveway near the McDonald's. It is not signalized and does not have advance crossing warning signage. No dedicated bike lanes exist in this section, and shoulders are narrow with a width of about two feet.

The key intersection in this section is at Route 27 (Sharon Street/North Main Street). It is signalized and has a large layout with double travel lanes on all approaches. Crosswalks are provided on all approaches with push buttons for an exclusive pedestrian signal phase. Traffic is usually congested during peak hours at this intersection, as it carries significant regional traffic with various trip purposes in addition to the area's shopping traffic. Left-turn demands are high on all approaches (especially on the southbound and eastbound), but no dedicated left-turn lanes are provided. Meanwhile, the signal system appears to be outdated.

In addition to this Washington Street section, a section of Sharon Street extending east from Cobb Corner for about 750 feet is highly related to the transportation operations in this commercial area. This study thus includes the Sharon Street section for analysis and exploration of potential improvements. When referring to the entire commercial area adjacent to Cobb Corner, this report names it as Cobb Corner Commercial District, such as Section 5.4 in Chapter 5 Proposed Improvements.

2.1.4 Transit Services

Transit services in the corridor and the adjacent areas include two Massachusetts Bay Transportation Authority (MBTA) commuter rail lines, MBTA Bus Route 716, and Brockton Area Transit Authority (BAT) Route 14. Figure 2 shows the locations of these routes in the study area.

The MBTA commuter rail Providence Line runs between Wickford Junction or Providence in Rhode Island and South Station in Boston, with a station at Canton Junction. The MBTA Commuter Rail Stoughton Line runs between Stoughton and South Station, with a station at Canton Center. Both lines join at Canton Junction and use the same track all the way to Boston, serving several communities. Sufficient parking is provided at both stations. The Canton Center

Station is in the study corridor and the Canton Junction is just about half a mile from Canton Center and accessible from Sherman Street.[7]

The MBTA bus Route 716 runs between Cobb Corner and Mattapan Station in Milton, via Washington Street and Turnpike Street in Canton and Washington Street and Blue Hill Avenue in Milton. It provides eight inbound and nine outbound trips per weekday and nine inbound and nine outbound trips on Saturdays. The headway between the trips is about one and half hours. There are no specific stops. Buses stop at any safe location along the route. To board the buses, riders must signal the driver at a safe roadside location. If they change their usual boarding spot, they can call A&A Metro, the current service provider.

BAT Route 14 runs between Cobb Corner and BAT Center in Downtown Brockton, via Stoughton Center. Along the way, it serves several major destinations, such as Good Samaritan Medical Center and Westgate Mall. It provides 12 inbound/outbound trips per weekday, 11 inbound/outbound trips on Saturday, and six inbound/outbound trips on Sundays, all with a headway of about an hour. According to BAT, the route is well used by residents from the three communities.

2.2 CORRIDOR USER SURVEY

Boston Region Metropolitan Planning Organization (MPO) staff prepared and conducted a survey to help determine the public's opinion about the issues and problems on the study corridor, and to gather ideas for resolving them. The online survey was performed on the Boston Region MPO website and the town's website and local media and social channels and received responses from 185 respondents between May 6 and June 7, 2022.

2.2.1 Survey Questions and Answers

The survey contained the following nine questions.

1. How do you usually use the corridor?
2. Please indicate the purpose of your usual trips in the corridor.
3. Please indicate the destination of your usual trips in the corridor.
4. If you drive in the corridor, what problems do you encounter?
5. If you walk or use a mobility device in the corridor, what problems do you encounter?

[7] According to the study advisory members from Canton, Sherman Street is a popular route to access Canton Junction by locals and residents from the nearby communities.

6. If you bike in the corridor, what problems do you encounter?
7. Please indicate any improvements that you would like to see implemented in the corridor.
8. Where do you live? Please indicate the five-digit zip code of your residence.
9. Please use the space below to describe specific problem locations and improvements that you would like to see implemented in the corridor.

Multiple choice answers were allowed in Questions 1 to 7 and a single answer applied to Question 8; Question 9 required a written response. Figures 3 and 4 summarize the results from the first seven questions of the survey, with the number of respondents and the percentage of applicable answers to each question being summarized in horizontal bar charts. In addition, the number and percentage of each answer and comments in answering “other (please specify)” for Questions 1 to 8 and written comments for Question 9 are summarized in Appendix B.

Question 8 is designed to understand the geographical distribution of the respondents. The answers indicate that 129 respondents (about 70 percent of the total 185 respondent) live in Canton and 34 respondents are from the adjacent communities: 26 from Sharon, four from Stoughton, and four from Milton. The remaining 22 respondents are from the communities throughout the region.

Question 9 is a free response question for the respondents to describe further viewpoints and to cover the problems and improvement ideas that the survey answers might not have included. Nearly half of the respondents left significant feedback for the question. Their comments are listed with no alterations in Appendix B.

2.2.2 Summary of Survey Results

The following list includes notable conclusions drawn from the survey.

- Almost all the respondents (96 percent) indicated that they usually drive in the corridor. Meanwhile, a noticeable portion of respondents said that they also walk (37 percent) and/or bike (17 percent) in the corridor. Two respondents (one percent) said they also use public bus services and one respondent said that they used a mobility device.
- Shopping (88 percent) and dining (71 percent) are the predominant purposes of trips made in the corridor. Social and recreational (63 percent) are also prevailing in the corridor. About 37 percent of the respondents

indicated that they also use the corridor for walking, jogging, biking and other fitness activities. About 36 percent of the respondents said that they used the corridor for commuting to work. About 14 percent of the respondents regularly used the corridor to school or daycare.

- The Cobb Corner commercial area is the most frequent destination for the respondents (87 percent). The downtown (Canton Center) area is also popular, frequented by 78 percent of the respondents. About half of the respondents indicated that the residential area (between Downtown and Cobb Corner) also is their usual trip destination.
- For people who drive in the corridor, high traffic volumes and long waits at signalized intersections are the issues that concern them the most, followed by difficulty turning into and out of side streets and shopping areas.
- For people who walk or use a mobility device in the corridor, high volume of traffic and high speed of vehicles are their major concerns. Meanwhile, they also felt that sidewalks are narrow or in poor condition and crossing Washington Street is difficult or deficient.
- For people who bike in the corridor, the major problem that they encountered is the lack of bike lanes or usable shoulders along Washington Street. Meanwhile, they are also concerned with high volumes of traffic, high speed of vehicles, and drivers' poor attention to bicyclists.
- Most respondents (about 70 percent) indicated that they would like to see the reduction of traffic congestion in the corridor. Half of the respondents would also like to see improvements in increasing safety for all road users. Nearly half of them would also like to see the addition of left-turn lanes to access commercial developments and at key intersections.

In addition, there are two improvement ideas from Question 9 that were repeated by a few respondents who live in Canton. First, they felt that the parking spot on Washington Street northbound near Church Street should be removed to reduce congestion at the intersection. Second, they suggested enforcing speed limit regulations to reduce speed of vehicles and improve the safety for all users.

Feedback from the survey was helpful to gauge community sentiment and to solicit ideas for solutions to the existing problems. Some of the ideas were considered in developing the improvement alternatives discussed in Chapter 5.

2.3 ISSUES AND CONCERNS

Based on findings from the user survey and discussions with the study advisory members in the scoping meeting, major issues and concerns of the corridor include the following.

Traffic Circulations and Operations

- The downtown section of the corridor is congested during AM and PM peak weekday travel periods, as well as Saturday midday travel periods. However, the congested conditions did not appear to be worsening since 2016.
- Washington Street carries regional traffic via Church Street/Neponset Street to and from Interstate 95 (I -95). The downtown section is considered a transportation focus area in the town's Master Plan.
- Truck turning radius from Neponset Street to Washington Street northbound is appropriate but very tight. Trucks turning from Washington Street northbound to Church Street encounter a similar problem, especially when a vehicle is parked at the on-street parking spot in front of the optometrist office. Parking at the spot is prohibited 6:30–9:00 AM and possible removal of the spot has been discussed with no resolution.
- Drivers often use Mechanic Street, a local street, as an alternative route to bypass the downtown area to continue north on Washington Street to reach I-93 or turn left to Church Street via Neponset Street to reach I-95.
- The intersection of Washington Street and Route 27 is busy during AM and PM peak hours (though not extremely congested). Traffic congestion occurs on all approaches, including Bay Road. None of the approaches at the intersection currently contain dedicated left-turn lanes.

Business Access/Parking Issues

- A downtown parking management study conducted a few years ago concluded that there is sufficient parking (public and private). Most of the public parking spaces are located on-street and several businesses provide off-street parking that can be accessed from side streets. However, when the on-street spaces are occupied, people may not know about off-street parking or may perceive that there is not more parking available since signs indicating additional parking or directions to additional parking do not currently exist along Washington Street
- Crash data indicate that many crashes occurred on Sharon Street (Route 27) near the Cobb Corner Plaza. There are several wide driveways allowing vehicles to move uncontrolled in and out of the plaza. This creates potential conflicts with the traffic on Sharon Street. People also

use driveways in the area to get in and out of the plaza when traffic is congested and left turns in and out from the plaza are difficult on Washington Street. There is a need to review these driveways and reorganize them via access management control such as driveway consolidation and one-way-in/one-way-out treatments.

- At the Cobb Corner Plaza, Starbucks recently moved to a location closer to the intersection of Washington Street and Route 27 and added drive-thru services. From time to time, especially in the AM peak hour, the drive-thru queue would back up onto Washington Street near the intersection.

Pedestrian Accommodation and Safety

- Sidewalk gaps exist on the Washington Street southbound side between Pond Street and Cobb Corner's main driveway and on Washington Street northbound side between Route 27 and Cobb Corner's main driveway.
- A multiuse path for pedestrians and cyclists has been proposed on Neponset Street and Church Street from the viaduct to Washington Street. It is currently under design.
- RRFBs for pedestrian crossings were installed in recent years at High Street and at Hagan Circle. They appear to be effective.
- The Town recently received a Complete Street grant from Massachusetts Department of Transportation (MassDOT) to improve Washington Street (downtown section) sidewalks, including American with Disabilities Act-compliant curb cuts.
- The commercial area on Sharon Street (Route 27) in Stoughton also includes a few stores on the opposite side of Cobb Corner Plaza, such as Citizens Bank. It is inconvenient and unsafe for pedestrians to walk in the area, as the sidewalks near the plaza are fragmented by frequent driveways and no crosswalk connects both sides of Sharon Street.

Bicycle Accommodation and Safety

- The right-of-way of the corridor is not very wide—about 50 feet in the residential sections and 65 to 70 feet in the Canton Center section. This will make bicycle accommodations difficult to achieve without removing on-street parking spaces.[8] It may require some type of shared accommodations.

[8] Although removal of parking spaces in the Canton Center section of the corridor has been recommended in this report, the main purpose is to improve vehicular travel along Washington Street. Should the town consider making improvements for cyclists that include separated bike facilities, additional on-street parking removal might be necessary to facilitate their implementation.

- MassDOT identified this Washington Street corridor as high potential for everyday biking. It is a primary bike access to the commuter rail stations and to the residential areas adjacent to the corridor.
- As part of the reconstruction by the Complete Street's grant, the Town will investigate the potential of on-road bicycle accommodations, which is challenging because of the limited right-of-way.
- A multiuse path in the Canton Center section is not likely feasible because of the relatively high pedestrian volumes, and it would require taking land for easements from adjacent properties.

Transit Access

- Sidewalk and accessibility improvements are needed at Cobb Corner for bus users (BAT bus Route 14).
- Signage and service frequency improvements are needed for MBTA bus Route 716.
- In general, increasing MBTA suburban bus services with better connections with local transit services (such as BAT) would support the region's economic and social development.

Emergency Responses and Operations

- All the signalized intersections in the corridor are equipped with emergency preemption function, except the intersection of Washington Street at Route 27.

Land Use and Other Transportation Related Issues

- A new housing development (272 units) at the Paul Revere Heritage site is in progress.
- A proposed housing development on Washington Street, just north of the town center area, will contain 17 housing units.

These issues and concerns are about the corridor in general. The issues and concerns at specific locations in the corridor are further analyzed and identified in Chapters 3 and 4 and are summarized by location along with the proposed improvements in Chapter 5.

Chapter 3—Crash Data Analysis

3.1 CORRIDOR CRASH STATISTICS

Crash data are an essential resource for identifying safety and operational problems in a study area. 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 the time of day and roadway surface conditions) also helps to develop improvement strategies.

For this study, Metropolitan Planning Organization (MPO) staff collected the most recent five-year (2015–19) crash reports from Massachusetts Department of Transportation (MassDOT) Crash Data Portal (https://apps.impact.dot.state.ma.us/cdp/home) for the entire corridor and conducted a series of crash data analyses.[9]

In total, 294 crashes were recorded in the five-year period at different locations in the corridor. Major statistics analyzed from the data set include the following (see Appendix C for the crash data summarized by year):

- Crash severity: 63 crashes (21 percent) resulted in personal injuries
- Crash types
  - 99 (34 percent) angle collisions
  - 83 (28 percent) rear-end collisions
  - 68 (23 percent) sideswipe collisions (mostly same direction)
  - 28 (10 percent) single-vehicle collisions
- Six pedestrian crashes and three bicycle crashes[10]
- Weekday peak-period crashes (7:00 AM–10:00 AM and 3:30 PM–6:30 PM): 32 percent
- Crashes in dark conditions: 16 percent
- Crashes with wet or icy pavement conditions: 19 percent

[9] Additional crash data may be available from local police reports. Future projects along the corridor should take this into consideration.

[10] In this study, the term “pedestrian crashes” refers to crashes that involve at least one vehicle and one pedestrian; “bicycle crashes” refers to crashes that involve at least one vehicle and one bicycle. No crashes between at least one bicycle and one pedestrian were identified in the data.

3.2 CORRIDOR AND INTERSECTION CRASH RATES

Based on the five-year crash data and the estimated average daily traffic, MPO staff estimated that the corridor has a crash rate of 5.21 crashes per million vehicle-miles traveled (MVMT). This crash rate is much higher than the statewide average for urban principal arterials, which is 3.58 crashes per MVMT (updated July 2020, based on 2017 crash data).

Staff calculated the crash rates by three sections in the corridor based on the land use characteristics. The crash rates estimated for the sections are

- Canton Center Section (Washington Street from Sherman Street to Walnut Street): 5.51 crashes per MVMT;
- Residential Section (Washington Street from the south of Walnut Street to Dunbar Street): 1.86 crashes per MVMT; and
- Cobb Corner Commercial District (Washington Street from the south of Dunbar Street to Bay Road and a section of Route 27 adjacent to Cobb Corner): 7.14 crashes per MVMT.[11]

Note that the Cobb Corner commercial district has a very high crash rate due to intensive traffic activities under poor access management conditions not only on Washington Street but also on Sharon Street. Appendix D contains worksheets showing the crash rate calculations for the corridor and the three sections.

Staff also calculated the crash rates at major intersections in the corridor, based on the yearly average of MassDOT crash data and the estimated intersection traffic counts. The crash rates for the signalized intersections are as follows:

- Washington Street at Sherman Street: 0.39 crashes per million entering vehicles (MEV)
- Washington Street at Revere Street: 0.38 crashes per MEV
- Washington Street at Bolivar Street: 0.52 crashes per MEV
- Washington Street at Church Street: 0.52 crashes per MEV
- Washington Street at Neponset Street: 0.54 crashes per MEV
- Washington Street/Bay Road at Route 27 (Sharon Street/North Main Street): 0.92 crashes per MEV

[11] In addition to Washington Street, the corridor length estimated for the Cobb Corner Commercial district includes sections on Bay Road (150 feet), Sharon Street (750 feet), and North Main Street (250 feet).

The average crash rate is 0.71 crashes per MEV for signalized intersections in MassDOT District 6 (updated June 2018, based on 2016 crash data) and is 0.75 for MassDOT District 5. Note that the intersection of Washington Street at Route 27 has a crash rate much higher than the average of signalized intersections in MassDOT District 5.

The crash rates for the unsignalized intersections are as follows:

- Washington Street at Mechanic Street/Wall Street: 0.40 crashes per MEV
- Washington Street at High Street: 0.32 crashes per MEV
- Washington Street at Village Shoppes Driveway: 0.38 crashes per MEV
- Washington Street at Cobb Corner Driveway: 0.24 crashes per MEV
- Sharon Street at Cobb Corner: 0.54 crashes per MEV
- Sharon Street at Village Shoppes Driveway: 0.68 crashes per MEV

The average crash rate for unsignalized intersections is 0.52 crashes per MEV in MassDOT District 6 and is 0.57 for MassDOT District 5. Note that the intersection of Sharon Street at Cobb Corner Driveway has a crash rate about the average of District 5 and the intersection of Sharon Street at Village Shoppes Driveway has a crash rate much higher than the average of District 5.

Appendix E contains worksheets showing the crash rate calculations for all the signalized and unsignalized intersections in the corridor.

3.3 ANALYSIS OF COLLISION DIAGRAMS

To investigate safety and operational problems further, MPO staff constructed collision diagrams for the entire corridor in the six roadway segments, based on the recent five-year crash data. Appendix F presents collision diagrams for the six consecutive sections in the corridor. It also includes information on the crashes in each section (indexed by chronological order of occurrence) summarized in a lookup table following the collision diagrams. The information includes crash date and time, severity (property damage only, nonfatal injury, fatality, or unknown), manner of collision type (rear-end, angle, single vehicle, rear-to-rear, sideswipe [same or opposite direction], head-on, or unknown), road surface conditions, weather conditions, most harmful event, vehicle actions prior to crash, and driver contributing code.

Key findings from collision diagram analysis and factors that might have affected safety and operations at major intersections and roadway segments in the corridor are summarized below.

Washington Street between Sherman Street and Revere Street: Canton Center Section 1 (Figure F-1 and Table F-1 in Appendix F)

- In total, 42 crashes occurred in the recent five-year period. They were scattered throughout the section.
- During peak hours, traffic is moderately busy in this section. The only noticeable congested location is the signalized Sherman Street intersection, where left-turn vehicles frequently block thru traffic on Washington, especially at the northbound approach in the AM and the southbound approach in the PM peak hours. Nevertheless, the intersection did not have a high crash rate. Eleven crashes occurred at or near the intersection in the recent five-year period.
- Two pedestrian crashes occurred in the recent five-year period. Both involved a person walking in the crosswalk, one at Canton Center Station and one at the Revere Street intersection.
- One bike crash involved a young bicyclist riding on a sidewalk who was struck by a curbside iron chain impacted by an out-of-control vehicle.

Washington Street between Revere Street and Neponset Street: Canton Center Section 2 (Figure F-2 and Table F-2 in Appendix F)

- This section contains dense commercial developments on both sides of Washington Street, especially in the section between Bolivar Street and Neponset Street. The section is very congested during the weekday AM, weekday PM, and Saturday midday peak hours, under the intensive traffic, parking, and pedestrian crossing activities.
- The section had 72 crashes in the recent five-year period and most of them occurred in the section between Bolivar Street and Neponset Street and in the functional areas of the signalized intersections at Bolivar Street and at Neponset Street.
- Eleven crashes (approximately 15 percent of total crashes) involved a vehicle traveling on Washington Street and a vehicle in a parking maneuver or a vehicle parked on the roadside.
- Three pedestrian crashes occurred in this section. One crash involved a person walking on the crosswalk, struck by a westbound right-turn vehicle from Bolivar Street. The other two crashes both involved a person crossing Washington Street just south of Neponset Street without using the intersection crosswalk nearby.
- One bicycle crash involved an adult bicyclist traveling southbound on the Washington Street northbound lane and colliding with a southbound left turning vehicle.

Washington Street between Neponset Street and High Street (Figure F-3 and Table F-3 in Appendix F)

- This section contains mainly residential districts, except the section north of Walnut Street that contains 7-Eleven, two funeral homes, and a few local businesses.
- It has a relatively wide travel lane in both directions. Vehicles frequently travel at speeds higher than the posted speed limits, especially in the southbound direction when the vehicles just pass the congested downtown area.
- In total, 26 crashes were recorded in the recent five-year period. Most of the crashes occurred in two areas: the business district near Neponset Street and the vicinity of the High Street intersection.
- No pedestrian or bike crashes occurred in this section in the recent five-year period.

Washington Street between High Street and Cobb Corner Commercial District (Figure F-4 and Table F-4 in Appendix F)

- This section is in a residential area continuing from the previous section. It is thickly settled by single-family houses and a few multiunit apartments.
- It has a relatively wide travel lane in each direction and vehicles frequently travel at high speeds.
- Sixteen crashes, scattered through the corridor, were recorded in the recent five-year period.
- One crash involved a person walking on the crosswalk at Hagan Court. The crosswalk currently is equipped with a Rectangular Rapid Flashing Beacon (RRFB) that might not have existed then. However, there are no advance pedestrian crossing warning signage and pavement markings to supplement the existing RRFB to raise drivers' awareness of the crossing location.

Washington Street in the Vicinity of Cobb Corner (Figure F-5 and Table F-5 in Appendix F)

- This section serves a major commercial district and carries a high volume of traffic. It contains multiple driveways connecting to several adjacent shopping plazas with major shopping in the vicinity.
- More than 40 crashes were recorded in this relatively short section (about 900 feet in length) in the recent five-year period.

- A major portion of this section has three travel lanes with the center lane operating as a continuous two-way left-turn lane (TWLTL). Field observations in the roadway section indicate that at times vehicles would gridlock or nearly crash each other. Nearly 20 percent of the crashes are related to the TWLTL operations.[12]
- All the movements from the driveways in this section are allowed. This creates multiple conflicting points with the vehicles traveling on Washington Street. Left turns from the driveways are difficult during peak hours and dangerous when vehicles travel on Washington Street in high speeds. Nearly 25 percent of the crashes are related to this type of left turn.
- People who walk or use a mobility device have many difficulties traveling in this section, either crossing or along Washington Street. Fortunately, no pedestrian crashes occurred in the five-year period.

Washington Street/Bay Road at Route 27 (Figure F-6 and Table F-6 in Appendix F)

- The intersection carries significant regional and local traffic and is near a major commercial district. Traffic is usually congested during peak hours.
- The intersection has an estimated crash rate much higher than average (Section 3.2). In total, 44 crashes occurred during the five-year period.
- None of the approaches contain a dedicated left-turn lane. Left-turn operations are difficult and unsafe under the frequently congested conditions. Among the total crashes, 25 percent were left-turn crashes.
- This collision diagram also includes a 750-foot section of Sharon Street that contains multiple driveways from Cobb Corner Plaza and Village Shoppes Shopping Mall. In total, nearly 40 crashes occurred at these driveways in the section, and the intersection of Sharon Street at Village Shoppes Driveway has an estimated crash rate much higher than average (Section 3.2).

The findings from collision diagrams are useful for identifying safety and operational problems and developing improvement alternatives at major

[12] The main purpose of a TWLTL is to provide left-turn access to the adjacent developments. However, it is not applicable if the density of the adjacent development driveway is too high. The TWLTL in this section is about 450 feet long and serves six driveways. The space in between these driveways is insufficient for left-turn maneuvers to enter the TWLTL, slow down, and wait for a traffic gap to access the adjacent development. Police crash reports also indicate that a few rear-end and sideswipe crashes occurred on travel lanes near the TWLTL were due to the drivers' difficulties in entering or exiting the TWLTL.

intersections and specific roadway segments in the corridor. The findings are further discussed in the context of proposed improvements in Chapter 5.

Chapter 4—Roadway Operations Analysis

To analyze the existing roadway operations, Metropolitan Planning Organization (MPO) staff requested the Massachusetts Department of Transportation's (MassDOT) assistance in collecting automatic traffic recorder (ATR) counts on the approaching roadways and intersection turning movement counts (TMC) for this study. The ATR counts include daily traffic volumes and spot speed counts and the TMCs include pedestrian and bicycle counts at the intersections.

The data collection was performed from November 29 to December 5, 2021, a period that traffic increased substantially since spring 2020 when the COVID-19 pandemic was prevalent.[13] However, the traffic had not reached the pre-pandemic level, according to MassDOT COVID-19 traffic monitoring reports.[14]

Staff reviewed historical counts and MassDOT COVID-19 traffic monitoring reports for major roadways in District 6 and made a series of adjustments to the collected data, so that the data being used in these operational analyses would reflect the normal pre-pandemic traffic conditions.[15]

4.1 DAILY TRAFFIC VOLUMES

Daily traffic volumes are the fundamental data for analyzing traffic intensity and patterns in a roadway corridor. Staff used the ATR counts collected on weekdays from November 29 to December 3 as the basis to estimate the annual average weekday traffic volumes at key locations in the corridor (see Appendix G for the originally recorded counts by hour).

Staff estimated the annual average weekday daily traffic (AAWDT) in two steps: (1) applying axle adjustment (one percent reduction) and seasonal adjustment (eight percent reduction) factors to the recorded volumes, and (2) increasing the factored volumes by five percent to represent the normal traffic conditions based on the analysis of available historical counts.

[13] Governor Baker's COVID-19 Order #5, which prohibited gatherings of more than 25 people, was issued on March 15, 2021.

[14] Since April 2020, MassDOT continually monitored the impacts of COVID-19 on the state's transportation network, including roadways and transit services, and published weekly traffic volumes at permanent count stations in the state, with comparison of the volumes in the same period in 2019, on the MassDOT Mobility Dashboard (https://mobility-massdot.hub.arcgis.com).

[15] Engineering directive E-22-003 was issued by MassDOT on July 28, 2022, that states any traffic counts taken after March 1, 2022, be used in lieu of historical counts. Should future work be done along the corridor, new traffic counts will need to be collected, and should no longer be adjusted to reflect pre-pandemic conditions.

Figure 5 shows the estimated 2021 average weekday traffic volumes. The numbers in the graphic are average weekday directional AAWDT volumes representing the normal traffic conditions in 2021. The two tables in the graphic further summarize the data by count location, originally recorded volume, estimated AAWDT from the recorded volumes, and the final adjusted AAWDT by directions and in combination.

In general, the corridor carries an average daily traffic volume of about 14,000 to 21,000 vehicles per weekday, from Sherman Street to the Cobb Corner commercial district. The sections in the vicinity of Church Street and Neponset Street generally carry more than 20,000 vehicles per weekday. Among the adjacent roadways, Neponset Street and Route 27 both carry noticeable high volumes of daily traffic.

4.2 INTERSECTION TURNING MOVEMENT COUNTS

In addition to daily traffic counts, MassDOT collected TMCs at major intersections in the study corridor, including vehicle movements (by vehicle classifications), bicycle movements, and pedestrian crossings. These counts were collected during the morning peak period (7:00 AM–11:00 AM) and the evening peak period (2:00 PM–6:00 PM) on Wednesday, December 1, 2021, and during the midday peak period (10:00 AM–2:00 PM) on Saturday, December 4, 2021. Appendix H contains these counts summarized by hourly and 15-minute intervals.

During the study, staff requested MassDOT's assistance to collect additional TMCs for three locations at Cobb Corner in order to review the activities on Sharon Street and at the new Starbucks driveway. These counts were collected during the morning peak period (7:00 AM–10:00 AM) and the evening peak period (3:00 PM–6:00 PM) on Thursday, July 14, 2022, and during the midday peak period (11:00 AM–2:00 PM) on Saturday, July 16, 2022. These counts are also included in Appendix H.

Based on the analysis of historical data, staff found that the volumes in these counts are generally lower than those collected in recent years before the pandemic.[16] The analysis observed the following traffic volume and pattern changes:

[16] The historical data include three main resources: (1) available traffic counts in and around the study area from MassDOT Transportation Data Management System (Massachusetts government webpage https://www.mass.gov/traffic-volume-and-classification), (2) Community Transportation Technical Assistance Program: Washington Street and Randolph Street

- In the weekday morning, the peak-hour traffic decreased significantly and shifted to one-half hour later from 7:15 AM–8:15 AM to 7:45 AM–8:45 AM.
- In the weekday evening, the peak hour traffic decreased less significantly and remained in the same time period around 4:45 PM–5:45 PM.
- Both the AM and PM traffic periods had a more flattened peak pattern. The AM peak period shifted to later than usual in the period around 7:45 AM–9:45 AM. The PM peak period expanded to more than three hours and started much earlier at around 3:00 PM.
- In the Saturday midday, traffic decreased slightly from the pre-pandemic period, with a magnitude similar to the PM peak period. The peak hour was identified as around 12:00 PM–1:00 PM.

On average, staff increased the recorded turning movements at the count locations by 12 percent in weekday AM peak hour and by four percent in the weekday PM and Saturday midday peak hours to represent normal (nonpandemic) traffic conditions.

Figures 6 and 7 show the estimated weekday AM and PM peak hour TMCs at major intersections in the corridor. The counts estimate that on an average weekday under normal traffic conditions, the major intersections in the corridor generally carry about 1,500 to 2,000 vehicles per peak hour, except the intersection of Washington at Route 27. The intersection could carry about 2,300 vehicles in the AM peak hour and nearly 2,700 vehicles in the PM peak hour. Among the access points on Washington Street in the Cobb Corner commercial section, the Village Shoppes driveway could carry about 2,000 vehicles in the PM peak hour, higher than other unsignalized intersections in the area. Among the intersections north of Cobb Corner, the intersections at High Street, Neponset Street, and Church Street each could carry 2,000 or more vehicles per peak hour.

Figures 8 and 9 show the estimated Saturday peak hour TMCs at major intersections in the corridor. The counts indicate that the major intersections in the corridor generally carry about 1,500 to 1,900 vehicles per peak hour. The intersection of Washington Street at Route 27 could carry about 2,300 vehicles per peak hour. Near Cobb Corner, the Village Shoppes driveway could carry nearly 2,000 vehicles per peak hour.

Intersection in Canton, Boston Region MPO, March 2018, and (3) Canton Master Plan Transportation focus Areas, McMAHON Associates, March 2019.

4.3 PEDESTRIAN AND BICYCLE VOLUMES

In addition to traffic volumes, the intersection TMCs, conducted in the extended four-hour peak periods in the weekday morning and evening and on Saturday midday, also provided pedestrian crossing counts and bicycle counts by turning movements on each approach for this study.

The pedestrian crossing counts in the weekday AM/PM and Saturday peak hours at major intersections in the corridor are shown in Figures 6, 7, 8, and 9.[17]

The counts indicate that pedestrians are very active in the Canton Center area, especially in the weekday evening and Saturday midday. In the weekday evening peak traffic hour, the intersections of Washington Street at Sherman Street, Revere Street, Bolivar Street, and Mechanic Street, each carry about 20 to 50 pedestrian crossings per hour. On a fair-weather Saturday (such as December 4, 2021), the intersections at Revere Street, Bolivar Street, and Mechanic Street, each carry about 100 to 120 pedestrian crossings in the noon hour. The intersections at Church Street and Neponset Street carry fewer pedestrian crossings, with about 10 to 20 pedestrian crossings per hour in the weekday evening and Saturday midday. The other intersections in the corridor each carry about two to five pedestrian crossings per hour. Note that there are insufficient sidewalks and safe crossing facilities in the residential and Cobb Corner sections.

Review of the bicycle counts at the major intersections indicate that about one to two cyclists traveled along the corridor during the weekday AM or PM peak period. On Saturday, December 4, 2021, there were about two to five cyclists traveling in the corridor from 10:00 AM to 2:00 PM.

Note that the counts were performed in early December when it was somewhat colder than other warmer months of the year. Moreover, there are no separated bicycle accommodations in the corridor. This may likely affect people’s decision on biking activities. The corridor, especially in the Canton center section, has the potential to attract more everyday cyclists.

Meanwhile, the counts were collected for the on-road bike movements. During the site visits, one on a Friday afternoon (June 10, 2022) and one on a Saturday around noon (July 9, 2022), staff observed quite a few people (mainly youths)

[17] The data from MassDOT Mobility Dashboard indicate that pedestrian and bicycle activities generally did not decrease, and they even increased somewhat in some urban areas during the pandemic. Therefore, the pedestrian and bicycle counts in this study were not adjusted and the same numbers of pedestrian crossings were used in Figures 6, 7, 8, and 9.

riding or walking their bikes on sidewalks in the Canton Center and Cobb Corner areas.

4.4 HEAVY VEHICLE VOLUMES

It is essential to examine the amount of truck and bus traffic in a study corridor, as an unusually high percentage of these heavy vehicles may seriously impact roadway operations.[18]

Staff reviewed vehicle classifications in the TMCs and identified the percentages of heavy vehicles within the total traffic at major locations in the corridor. On average, heavy vehicles accounted for approximately three to five percent of the corridor traffic in the AM peak hour, and approximately one to three percent in the PM and Saturday peak hours. These percentages are regarded as normal for an urban minor arterial.

The percentage of heavy vehicle traffic by direction of approach to the major intersections was calculated in the intersection capacity analyses and the traffic simulation models used for this study. The capacity analyses detailed in the following sections indicate that the existing volumes of heavy vehicles do not seriously affect traffic operations at the intersections studied.

4.5 INTERSECTION CAPACITY ANALYSES

Based on the estimated TMCs, MPO staff constructed peak-hour traffic models for the entire corridor and conducted capacity analyses for major intersections using Synchro, a traffic analysis and simulation program.[19] The model set consisted of weekday AM/PM and Saturday midday peak hour models and scenarios, including signal retiming under the assumed existing conditions and proposed improvement alternatives under the projected future traffic conditions in 2030.

Figures 10 and 11 show the results of weekday AM/PM peak-hour capacity analyses for the assumed 2021 normal traffic conditions at major intersections in the corridor and the level of service (LOS) each intersection provides. Figures 12 and 13 show the results of Saturday peak-hour analyses.

[18] Heavy vehicles include single-unit trucks (Federal Highway Administration [FHWA] Vehicle Classes 5 to 7), articulated trucks (single- and multi-trailer trucks, FHWA Vehicle Classes 8 to 13), and buses (FHWA Vehicle Class 4). Vehicles on a single frame with two axles and six tires (dual rear wheels) (FHWA Vehicle Class 5) include trucks and recreational vehicles. Passenger cars of any type and all other two-axle, four-tire vehicles (FHWA Vehicle Class 3), such as pickups, vans, mini-buses, ambulances, motorhomes, and trailers (even a passenger car pulling a trailer) are not considered heavy vehicles.

[19] Synchro Version 10.3 was used for the analyses. This software is developed and distributed by Trafficware Ltd. It can perform capacity analyses and traffic simulation (when combined with SimTraffic) for an individual intersection or a series of intersections in a roadway network.

The LOS was determined based on criteria from the Highway Capacity Manual (HCM).[20] The HCM defines LOS, using a qualitative scale from A to F, for signalized and unsignalized intersections as a function of the average vehicle control delay.[21] 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.

The analyses indicate that most of the signalized intersections in the Canton Center area would operate at acceptable levels of service during weekday and Saturday peak hours.[22] The Synchro network settings comprised the traffic signal coordination on Washington Street at Revere Street, Bolivar Street, Church Street, and Neponset Street and the analyses considered the coordination setting to be appropriate.

The most congested location in this area is the Church Street intersection that was evaluated to operate at an undesirable LOS F in the weekday PM and Saturday peak hours with intensive delays. Field observations indicated that the congestion at Church Street frequently caused traffic queues spilling back far beyond the Neponset Street intersection in the south and reaching or passing the Bolivar Street intersection in the north. In addition to heavy thru traffic, the intersection carries intensive left-turn traffic and operates under a single travel lane in both the northbound and southbound approaches.[23]

[20] *Highway Capacity Manual 2010*, Transportation Research Board of the National Academies, Washington, DC.

[21] 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.

[22] Note that the Synchro intersection capacity analyses do not completely reflect the delays in the Canton Center area, as they cannot reflect the congestion effects caused by the on-street parking activities and pedestrian crossings at midblock locations.

[23] To expedite the northbound traffic at the intersection, on-street parking is currently prohibited from 6:30 AM to 9:00 AM during weekdays on Washington Street northbound from Walnut Street to Church Street. To reflect the condition, the intersection's northbound approach was coded with a left-turn only lane and a thru lane in the AM peak-hour scenario and the capacity analysis resulted in an acceptable LOS. However, field observations indicate that traffic could back up intensively on the northbound in the morning when one or two cars are illegally parked near Church Street, especially when the single spot between Rockland Street and Church Street is occupied. As the space between Neponset Street and Church Street is limited, even one or two vehicles waiting to turn left on Washington Street could cause undesirable intersection congestions when the single parking spot is occupied during other times of the day.

In the residential section, Washington Street at High Street is unsignalized and the stop-controlled High Street approach is evaluated to operate at an undesirable LOS F with significant delays during peak hours.

In the Cobb Corner commercial district, there are several unsignalized intersections with driveways from shopping plazas or individual businesses on both sides of Washington Street and Sharon Street. Evaluations of both the stop-controlled approaches from Village Shoppes on Washington Street and Sharon Street produced operations of an undesirable LOS F with noticeable delays during peak hours.[24]

Washington Street/Bay Road at Route 27 (Sharon Street/North Main Street) is the key intersection in the Cobb Corner section. The intersection overall is evaluated to operate at acceptable LOS C and D with an average delay of 30 seconds to a minute, based on the estimated traffic volumes. However, the northbound approach (Bay Road) would operate at LOS F with an average delay of more than one and one-half minutes in the AM peak hour. The analyses also indicate that traffic queues would build up significantly on the westbound approach (Sharon Street) due to its limited space to accommodate high traffic volumes in the peak hours.

Note that no dedicated left-turn lane is provided on any approaches at this intersection, even though left-turn demands are high. All approaches have two lanes, one shared by left-turn and thru movements and one shared by thru and right-turn movements. Left turns on the southbound and eastbound approaches are operated under a leading left-turn protected/permissive mode. However, during peak hours, left turns on the two approaches often do not clear entirely and block thru traffic. Left turns on the northbound approach are especially difficult where they usually encounter a high volume of traffic from the southbound. Meanwhile, left turns are unsafe at this intersection due to its layout, which allows the opposite thru traffic to flow fast in double lanes. Consequently, the intersection had many left-turn crashes in recent years (see the collision diagram analysis in Section 3.3).

Details of Synchro capacity analysis reports for the major intersections in the weekday AM, weekday PM, and Saturday peak hours under the estimated 2021 traffic conditions are included in Appendices I, J, and K.

[24] Note that traffic operations on Washington Street and Sharon Street are frequently interrupted by the vehicles from driveways in this area, which is not reflected in the standard unsignalized intersection capacity analyses.

4.6 ROADWAY TRAVEL SPEEDS

One of the major concerns raised by the town residents is the high travel speeds in the corridor. To examine the prevailing travel speeds versus regulated speeds, MPO staff requested that MassDOT help collect spot-speed data during the period when automatic traffic counts were being conducted. Appendix L contains these data collected in December 2021.

Figure 14 shows the existing speed regulations and estimated 85th percentile speed at selected locations in the corridor, based on spot-speed counts collected from automatic traffic recorders. The 85th percentile speed is the speed at or below which 85 percent of vehicles passing a given point are traveling, and it is the principal value used to establish speed controls by MassDOT. It is generally regarded as the prevailing speed at a location where the speed data is collected.

The study corridor has three speed regulations:

1. 20-mph speed limit: Washington Street from Sherman Street to Walnut Street (Canton Center Section)
2. 30-mph speed limit: Washington Street between Walnut Street and Dunbar Street (Residential Section)
3. 25-mph speed limit: Washington Street between Dunbar Street and Sharon Street/North Main (Cobb Corner Commercial Section)

The regulated speed limit in each zone applies to both directions of the roadways in corridor, except the southbound section from Sherman Street to Central Street that is under 25-mph regulation.

The 85th percentile speeds estimated from the data indicate that vehicles generally traveled about eight to 10 mph higher than the regulated speeds. It is concerning that drivers tend to drive at speeds much higher the regulated speed limits in all these different sections of the corridor.

4.7 EXISTING ROADWAY LAYOUTS AND PROPOSED IMPROVEMENTS AND RECONFIGURATIONS

In this study, the corridor is divided into three sections for analysis: Canton Center Section, Residential Section, and Cobb Corner Commercial Section. Based on the division, this section further examines the adjacent buildup conditions and available right-of-way space and explores potential improvements and reconfigurations to accommodate pedestrians and bicyclists.

Figures 15, 16, and 17 show the existing roadway cross section and proposed improvements and reconfiguration alternatives in the three sections. In each of them, the cross section represents a typical layout in or near the tightest right-of-way area. It exhibits the view of a southbound driver in the corridor.

Canton Center Section (Washington Street from Sherman Street to Walnut Street)

The top graphic in Figure 15 shows that the existing roadway contains a 14- to 15-foot travel lane, an eight-foot parking lane, and an eight- to 12-foot sidewalk in each direction.[25]

As the adjacent areas are fully developed with pleasant and continuous sidewalks, staff consider that major roadway reconfigurations may not be appropriate for this section. Cultural values, such as historical buildings, friendly human-scale street layout, and pleasant open spaces, should all be preserved in this section.

A major drawback in this section is the lack of bike accommodation. Currently the entire section is under a 20-mph speed regulation. If vehicles generally travel at speeds around 20 mph and below 25 mph, it may be appropriate to operate as a shared bike road. However, vehicles generally travel at speeds higher than 25 mph and near 30 mph. In the corridor survey, a noticeable number of residents said that they would like to see a stronger enforcement of the speed regulation in this section.

The bottom graphic in Figure 15 shows the proposed improvements in this section in both directions:

- Reduce the parking lanes to 7.5 feet wide.
- Stripe white dash lines along the parking lane to clearly delineate the door zone (at least two feet wide).
- Install shared bike lane pavement markings (sharrows) on the travel lane.
- Enforce 20 mph speed limit in this section.

Residential Section (Washington Street between Walnut Street and Village Shoppes Driveway)

The section contains mostly residential land uses. Its adjacent areas are thickly settled with single-family houses and several apartments and condos on or adjacent to Washington Street. The top graphic in Figure 16 shows that travel

[25] The actual travel lane is about 12 feet wide, as two to three feet near the parking lane functions as the door zone of parked vehicles.

lanes in this section are wide, with a width of about 14 to 15 feet, with narrow shoulders of about two to three feet wide. Sidewalks (five to six feet wide) exist on the northbound side and in the southbound section between Walnut Street and Pond Street. South of Pond Street, no sidewalks are provided, except a very short section near the intersection of Hagan Court and Washington Street.

The middle and bottom graphics of Figure 16 show two potential reconfiguration alternatives for this roadway section: (1) to reduce the travel lane to an 11.5-foot lane and install a street-level bike lane (five feet wide) with a traffic buffer (two feet wide) in each direction, and to install six-foot sidewalks on the southbound side south of Pond Street; and (2) to reduce the travel lane to an 11.5-foot lane and install a multiuse path shared by people who walk and bike (10 feet wide) with a grass buffer (four feet wide) on the northbound side to accommodate the existing utility poles.[26]

Cobb Corner Commercial Section (Washington Street from Village Shoppes Driveway to Route 27)

This section is adjacent to a major commercial district with vibrant shopping and dining activities. As shown in the top graphic of Figure 17, it contains three 12-foot travel lanes, one for northbound, one for southbound, and a two-way left-turn lane (TWLTL) in the middle, with narrow shoulders of two to three feet wide. Sidewalks exist on the northbound side, except the section between Route 27 and Cobb Corner Plaza Driveway where it is necessary to access the intersection and the adjacent Mobil convenience store and Starbucks. No sidewalks exist on the southbound side and a short section between Route 27 and Cobb Corner Plaza Driveway is missing on the northbound side.

As discussed in the previous sections, the TWLTL is not suitable for this relatively short section with multiple driveways, as it is difficult to access and maneuver under the busy traffic conditions and creates multiple conflicting points on Washington Street. This study thus proposes to replace the existing TWLTL with a left-turn only lane that provides left turns at essential locations in conjunction with access management of the adjacent driveways to reduce conflicting points on Washington Street.

Two potential reconfiguration alternatives are proposed for this roadway section: (1) to convert the middle lane to a left-turn only lane, reduce the travel lane to 11 feet wide, install a five-foot bike lane with a two-foot street buffer in each direction, and provide continuous six-foot sidewalks on both sides and (2) to convert the middle lane to a left-turn only lane, reduce the travel lane to 11 feet

[26] In this alternative, some of the utility poles may need to be relocated slightly east.

wide with a three-foot shoulder in each direction, and provide continuous 10-foot multiuse paths on both sides.

In summary, staff developed two potential reconfiguration alternatives for the corridor based on the analyses of existing roadway layouts and adjacent land uses in different sections. Either of them would significantly improve the safety and accommodation for people who walk and bike, through provisions of sufficient sidewalks and bike lane with striped buffer (Alternative 1) or multiuse paths (Alternative 2), while maintaining efficient traffic flow in the corridor. They have a similar overall layout that provides a framework for developing improvement strategies for the different sections and at critical locations of the corridor.

Chapter 5—Proposed Improvements

Based on the analyses in the previous chapters, Metropolitan Planning Organization (MPO) staff developed a series of short- and long-term improvements to address safety and operational problems in the corridor. The proposed short-term improvements could be implemented within two years at a relatively low cost. The long-term improvements are more complicated and cover larger areas, thus requiring intensive planning and design, and significant funding.

This chapter contains five sections. The first section outlines the corridor improvement objectives and design strategies based on the identified issues and concerns for the corridor. The next three sections review the existing roadway conditions, discuss issues and concerns, and propose short- and long-term improvements for the three distinctive roadway sections of the corridor. The last section in this chapter provides an overview of the proposed long-term improvements under the projected 2030 traffic conditions.

5.1 CORRIDOR IMPROVEMENT OBJECTIVES AND DESIGN STRATEGIES

Based on findings from the user survey, analyses of crash data and existing traffic operations, and discussions with the study advisory members, major issues and concerns of the corridor can be summarized as the following:

- High corridor crash rate
- High vehicle travel speeds
- Recurrent traffic congestion
- Insufficient accommodation for people who walk or use a mobility device
- Lack of accommodation for people who bike
- Lack of safe and convenient access to side streets and adjacent business developments
- Safety concerns for all users, especially for those who walk, use a mobility device, and bike

To address these issues, MPO staff developed the following objectives for this study:

- Improve safety for all users of the corridor
- Maintain safe travel speeds in the corridor

- Improve and provide safe and comfortable accommodations for people who walk and bike
- Provide safe and convenient access to adjacent businesses and residences
- Enhance access management to reduce traffic conflicts
- Minimize delays and increase safety at intersections while maintaining efficient traffic flow in the corridor

To achieve the objectives, staff applied the following design strategies to the proposed improvement alternatives:

- Reduce travel lane width
- Reduce intersection layout and turning radii
- Add sidewalks where absent and expand existing sidewalks to at least six feet wide where feasible
- Improve safety and operations at existing crosswalks and add crosswalks where needed
- Provide separated bike accommodations wherever applicable
- Provide sufficient buffer from traffic for people who walk and bike
- Modify intersection layout and operations to improve safety and mobility for all users
- Modify roadway configuration and operations to provide safe and convenient access to and from adjacent developments for all users including people who walk, use a mobility device, and bike
- Reduce or combine driveways where applicable

5.2 CANTON CENTER SECTION

This section discusses Washington Street between Sherman Street and Walnut Street, including the intersection of Washington Street at Sherman Street. The section is located in a vibrant downtown district with mixed land uses. As the adjacent areas are fully developed with pleasant surroundings, major reconfigurations of the existing layout are considered not suitable at the moment and the proposed improvements for this section are mostly short term. Figures 18 and 19 show the key proposed improvements in this section. They also can be used to refer to the concerned locations that are discussed below.

5.2.1 Issues and Concerns

In summary, the following are major issues and concerns identified at critical locations (from the north to the south) in this section:

- At the signalized intersection of Washington Street at Sherman Street, left-turn vehicles frequently block thru traffic, especially at the northbound approach in the AM peak hour and the southbound approach in the PM peak hour. Currently the northbound has a left-turn/thru shared lane and an exclusive right-turn lane that serve a relatively low right turn volume during peak hours.
- At Canton Center Station, the pedestrian paths across the train tracks are insufficiently wide due to the obstructions of the signal and gate posts. The path pavements are rutted with lumps and dips, and there are no Americans with Disabilities Act (ADA) compliant ramps connecting to the sidewalks.
- One pedestrian crash in 2018 near the station involved a person walking on the crosswalk across Washington Street and hit by a vehicle going straight. The diagonally placed crosswalk has a long crossing distance, which is not conspicuous from a distance.
- The section between Revere Street and Bolivar Street has increasing commercial activities, but it lacks safe crossings to reach the stores and restaurants on both sides. People are particularly fond of strolling in the area near Forge Pond, which contains a walking path on the north side and a small park with seating on the south side of the pond.
- The southbound approach at the Bolivar Street intersection has a long left-turn lane that is underused even during peak hours. It also makes the section between Forge Pond and Bolivar Street wider than other sections in this area and allows vehicles to travel faster before reaching the intersection.
- One pedestrian crash in 2016 at the Bolivar Street intersection involved a person walking on the crosswalk across Washington Street and hit by a vehicle turning right from Bolivar Street. There is no “No Turn On Red” regulation at this intersection.
- The section between Bolivar Street and Neponset Street is abutted by dense commercial developments. With busy traffic and intensive pedestrian activities, it is usually congested during peak hour. People frequently cross at unmarked locations in this section. The traffic medians in this section help provide refuge for pedestrians during peak traffic periods.

- Mechanic Street is a cut-through route for people in the area to access Washington Street. Field observations indicated that during the PM peak period, the southbound left-turn vehicles at the intersection would occasionally block the intersection when experiencing heavy northbound traffic. Meanwhile, crosswalks exist on all approaches at the intersection, except on the southbound approach.
- The short section between Church Street and Neponset Street can be regarded as the key bottleneck location in this section. The section is very congested during peak hours because of the high traffic volumes operating within limited travel lanes.[27]
- No dedicated bike lanes exist in the section. The entire section is under a 20-mph speed regulation, but vehicles generally travel at speeds near 30 mph.

5.2.2 Proposed Short-Term Improvements

In the short term, this study proposes the following improvements to enhance the safety and mobility of all users in this section:

- Restripe the northbound and southbound approaches to contain an exclusive left-turn lane and a thru/right-turn lane and retime the signal at the Sherman Street intersection (Figure 18).[28],[29]
- Resurface the pavement of the pedestrian paths across the track at the Canton Center station and provide sufficient path widths and ADA-compliant connections to adjacent sidewalks.
- Reconstruct and realign the crosswalk near the station entrance to shorten crossing distance and make it prominent with a width of at least 16 feet and thick white lines on both sides.

[27] Parking on the northbound side in this section is prohibited from 6:30 to 9:00 AM. However, from time to time, one or two cars are observed parked there. Meanwhile, the parking, especially the single spot near Church Street, also affects traffic operations at the intersection during other times of the day. See Section 4.5 for detailed analysis of the congested conditions at the intersection.

[28] Appendix M shows the intersection capacity analysis based on the projected 2030 traffic volume. The stop lines on both Washington Street approaches may need to be relocated backward slightly to provide sufficient space for turning vehicles from Sherman Street. This should be further examined at the design stage of the restriping. Meanwhile, the actual retiming plan should be based on traffic counts (turning movements) collected at that time.

[29] Stakeholders noted that vehicles making the through movement on the northbound leg currently use the right-turn lane to go around vehicles queuing in the through-left lane. Restriping would alleviate this issue.

- Install a crosswalk at the bridge near Forge Pond. The crosswalk should be at least 16 feet wide with prominent white edge lines and yield lines (shark's teeth) in both directions, in conjunction with a curb extension (bulb-out) on the west side.[30]
- Shorten the length of the left-turn lane on the southbound approach of the Bolivar intersection and convert it into a traffic median to enhance the safety for all users of the roadway.[31]
- Apply "No Turn On Red" regulation to the westbound approach of the Bolivar Street intersection. The regulatory sign can be placed on the traffic signal post facing Bolivar Street.[32]
- Install a crosswalk with sidewalk extensions at both ends on the southbound approach of the Mechanic Street/Wall Street intersection.[33]
- Consider regulating "No left turn" on the southbound approach of the Mechanic Street/Wall Street from 4:00–6:00 PM.
- Remove the single parking space on the northbound approach near Church Street and clearly stripe an exclusive left-turn lane and a thru lane on the approach.
- Redesignate parking prohibition on Washington Street northbound from the driveway of Stanetsky Memorial Chapels to Church Street (including two spaces north of Church Street) from 6:30–9:00 AM to 6:30–9:30 AM and 2:30–5:30 PM. Install wayfinding signs to public parking lots to encourage off-street parking.
- Remove parking prohibition on Washington Street northbound from Walnut Street to the driveway of Stanetsky Memorial Chapels and allow two-hour parking during daytime.
- Restripe Washington Street southbound after Neponset Street, with a 11.5-foot travel lane and a five-foot shoulder, with two-foot traffic buffer if applicable, for bike accommodation.

[30] The bulb-out would reduce the crossing distance and provide clear views of traffic for people before crossing Washington Street. It would require removing two to three parking spaces on the west side.

[31] The traffic median in this section can have the same textured surface treatment as the other sections (between Bolivar Street and Church Street).

[32] The Manual on Uniform Traffic Control Devices (MUTCD) provides standards and applications of the "No Turn On Red" regulatory sign (R10-11a, R10-11b). The demand of the right-turn traffic is moderate, and it is provided with sufficient capacity under an overlapped signal phase with the southbound left turns. The intersection capacity analysis based on projected 2030 traffic volumes indicates that it would operate acceptably during peak hours under the regulation.

[33] The crosswalk should have the same brick surface as others in this downtown section.

5.2.3 Proposed Long-Term Improvements

In the long term, this study proposes the following improvements for consideration:

- Upgrade the traffic signal system at Sherman Street intersection and operate in a protected/permissive left-turn mode for the Washington Street approaches.
- Continue monitoring walking and biking activities in this section for the need of improvement measures.
- Further investigate a potential waterfront path on the west side of Washington Street connecting to Paul Revere Heritage Site from the proposed crosswalk near Forge Pond.

5.3 RESIDENTIAL SECTION

This section discusses Washington Street between Walnut Street and Village Shoppes Driveway. The section contains residential districts that are thickly settled with single-family houses and several apartments and condos on or adjacent to Washington Street.

5.3.1 Issues and Concerns

In summary, these are major issues and concerns regarding this roadway section:

- No sidewalks exist on the southbound side from Pond Street to Village Shoppes Driveway.
- No dedicated bike lanes exist for people to bike and the shoulders are narrow with a width of about two to three feet. With the relatively wide travel lanes, vehicles usually travel at speeds of nearly 40 mph throughout the section (under 30-mph speed regulation).
- The intersection of Washington Street at High Street is unsignalized. The stop-controlled High Street approach is usually congested during peak hours.
- The intersection has crosswalks on Washington Street northbound and on High Street. The crosswalks are equipped with Rectangular Rapid Flashing Beacons (RRFB). However, they are not conspicuous from a distance due to the intersection’s large layout.
- A crosswalk, also equipped with RRFBs, exists on Washington Street at Hagan Court. It is near a curved section south of Pond Street, with no advance pedestrian crossing warning signage.

5.3.2 Proposed Short-Term Improvements

In the short term, this study proposes the following improvements for consideration:

- Conduct a survey of the existing roadway layout to explore the potential of restriping the travel lanes to 11.5 feet wide with shoulders of at least five feet on both sides for temporary bike accommodation.
- Install yield line pavement markings (shark's teeth) on both Washington Street approaches at about 50 feet from the crosswalk at the High Street intersection.
- Install yield line pavement markings on both Washington Street approaches at about 50 feet from the Hagan Court crosswalk (see the proposed locations in Figure 20).
- Install advance pedestrian crossing warning signs on both Washington Street approaches at about 200 feet in advance of the Hagan Court crosswalk.

5.2.3 Proposed Long-Term Improvements

In the long term, this study proposes the following improvements for the section in general and the intersection of Washington Street at High Street. Figure 20 shows the conceptual plan of the proposed improvements.[34]

The section in general

- Reduce the travel lanes to 11.5 feet wide.
- Widen the roadway and install five-foot bike lanes and two-foot street buffers or 10-foot multiuse paths shared by people who walk and bike with three-foot roadway shoulders on both sides (Figure 16).
- Improve the existing sidewalks and expand them to at least six feet wide wherever applicable.
- Add six-foot sidewalks on Washington Street southbound from Pond Street to Village Shoppes Driveway.

[34] This is a preliminary planning study that does not incorporate detailed design of the proposed improvements. Figures 20 and 21, the proposed improvements conceptual plans, exhibit the layout and approximate dimensions of key elements in the proposed reconfiguration Alternative 1 that contains street-level separated bike lanes. They can also be used to gauge the proposed reconfiguration Alternative 2 that contains multiuse paths for people who walk, use a mobility device, and bike, as both alternatives have a similar roadway layout (Section 4.7).

Washington Street at High Street

- Signalize the intersection with pedestrian signals.[35]
- Reconstruct the intersection with a smaller layout to reduce vehicle turning radii and shorten pedestrian crossing distances.
- Provide separated left-turn and right-turn lanes on High Street approach near the intersection.[36]
- Provide exclusive signal phases for people crossing the intersection.

5.4 COBB CORNER COMMERCIAL DISTRICT

This section discusses the concerned issues and proposed improvements for the Cobb Corner commercial district that contains two roadway sections and a major intersection: (1) Washington Street between Village Shoppes Driveway and Route 27, (2) Sharon Street between Washington Street and another driveway from Village Shoppes Shopping Mall, and (3) the intersection of Washington Street/Bay Road at Route 27 (Sharon Street/North Main Street).

The Washington Street section consists of three travel lanes, one for northbound, one for southbound, and a two-way left-turn lane (TWLTL) in the middle. Meanwhile, there are multiple driveways on both sides of this section serving the adjacent shopping mall and shopping plazas.

The Sharon Street section serves a high volume of traffic during peak hour under a limited roadway surface. It is a two-lane roadway, one lane in each direction, except for a short, flared section near Washington Street. Meanwhile, there are several wide and uncontrolled driveways from Cobb Corner Plaza and Village Shoppes Shopping Mall.

The intersection of Washington Street at Route 27 is signalized and has a large layout with double travel lanes on all approaches, one for left-turn/thru movements and one for thru/right-turn movements. Crosswalks are provided on all approaches with push buttons for an exclusive pedestrian signal phase.

This district has been developed for decades with increasing commercial activities. In the meantime, motorized and nonmotorized activities have been

[35] Appendix N contains a preliminary analysis of traffic signal needs based on MUTCD. It shows that the intersection is justified for installation of a traffic signal with the traffic volumes (collected for this study in December 2021) meeting the required thresholds of Warrant 1 and Warrant 4.

[36] The intersection capacity analysis, based on 2030 projected volumes, indicates that a left-turn lane of about 50 feet would be sufficient to process the approach's left turns in most signal cycles during peak hours.

increasing steadily on Washington Street and Sharon Street. Figure 21 shows the major proposed improvements for this district. They are mostly long-term, as they would require roadway modifications, significant resources, and collaboration among all stakeholders.

5.4.1 Issues and Concerns

In summary, these are the major issues and concerns in this commercial district:

- The two roadway sections and the intersection in this district all carry high traffic volumes. They are usually very congested during peak hours.
- Vehicles from the driveways are supposed to stop and yield to thru traffic on Washington Street and Sharon Street, but only the driveway on Washington Street from Village Shoppes is equipped with a stop sign.
- The Washington Street section has a very high crash rate (see Section 3.2) due to the TWLTL operation within a short distance that creates multiple conflicting points between thru traffic and traffic to and from the many business driveways in this section.
- The section has insufficient pedestrian accommodations and lacks bike accommodation. No sidewalks exist on the southbound side and a short section on the northbound side between Route 27 and the driveway of Cobb Corner Plaza is missing. One crosswalk exists at an uncontrolled location near the McDonald's, with no crossing warning signage. No dedicated bike lanes exist in this section, and shoulders are narrow.
- The Sharon Street section also has a very high crash rate due to its limited roadway space and several wide and uncontrolled driveways that create multiple conflicting points between thru traffic and traffic to and from the driveways in this section.
- The north side of Sharon Street is especially challenging to people who walk, use a mobility device, and bike. There are two adjacent wide driveways from Cobb Corner Plaza and a very wide driveway from Village Shoppes that contain double entry lanes and double exit lanes. With no clear signage to stop or yield to traffic on Sharon Street, vehicles frequently exit these driveways at high speeds without regard to people walking or biking nearby.
- The section also has insufficient pedestrian accommodations and lacks bike accommodation. Sidewalks exist on both sides. However, they are fragmented by the frequent wide and uncontrolled driveways on the north side, and they are absent from Citizens Bank eastward. No crosswalks exist in this section. No dedicated bike lanes exist in this section, and shoulders are very narrow.

- The intersection of Washington Street at Route 27 carries high volumes of traffic during peak hours. No dedicated lanes are provided to accommodate high left-turn demands on all approaches. Left-turning vehicles frequently block thru traffic, especially on the southbound and eastbound. Meanwhile, the signal system appears to be outdated.
- The intersection has a crash rate much higher than average (see Section 3.2). Among the crashes in recent years, 25 percent of them were left-turn crashes.
- People have to walk long distances to cross the intersection.
- No bike accommodation at the intersection.

5.4.2 Proposed Short-Term Improvements

In the short term, this study proposes the following improvements for this district:

- Work with property and business owners to further investigate suitable locations for access improvement measures and develop an access management plan for this busy commercial district.[37]
- Work with the adjacent property owners to identify and select a suitable location in the Village Shoppes parking lot for installation of a bus berth and shelter for Brockton Area Transit Authority (BAT) Route 14 and Massachusetts Bay Transportation Authority (MBTA) Route 716 (Figure 21).
- Install ADA-compliant wheelchair ramps at both ends of the crosswalk.
- Install a “Yield Here To Pedestrians” regulatory sign (MUTCD R1-5 or R1-5a) along with yield line pavement markings at about 30 feet from the crosswalk on both approaches of Washington Street.
- Further investigate locations and work with property and business owners to install stop signs at the driveways where they are currently absent.[38]
- Combine the two adjacent driveways on Sharon Street from Cobb Corner Plaza into one and prohibit left turns from the driveway and install double-up stop signs at suitable locations.

[37] Access improvement measures include reducing driveway widths, combining driveways, closing driveways, one-way entry or exit, and prohibiting left turns. It is important to consider and design these measures not only for the drivers but for people who walk and bike. Figure 21 shows some potential locations for such measures.

[38] The stop signs should be installed at appropriate locations where they will not obstruct the drivers’ view to the traffic on Washington Street or Sharon Street.

- Narrow the driveway on Sharon Street from village Shoppes by removing one of the entry lanes and reduce the widths of the remaining lanes and install double-up stop signs at suitable locations.
- Retime the traffic signal at the intersection of Washington Street and Route 27 under the existing roadway layout and phasing sequence.[39]

5.4.3 Proposed Long-Term Improvements

To significantly improve the transportation conditions in this busy commercial district, it would require major long-term improvements. This study proposes the following improvements for two roadway sections and the key intersection.

Washington Street section

- Reduce the travel lanes to 11.5 feet wide.
- Convert the center TWLTL into a one-way left-turn only lane with intermediate traffic medians.
- Install five-foot bike lanes and two-foot street buffers or 10-foot multiuse paths shared by people who walk and bike with three-foot roadway shoulders on both sides (Figure 17).
- Reconstruct and signalize the intersection at Village Shoppes Driveway with realignment of the driveway on the west side and installation of crosswalks and pedestrian signals. Coordinate the traffic signal at this intersection with the signal of the master intersection at Route 27.
- Reconstruct and signalize the intersection at Cobb Corner Driveway with modifications of the driveway on the west side and installation of crosswalks and pedestrian signals. Coordinate the traffic signal at this intersection with the signal of the master intersection at Route 27.
- With the signalization at the two major driveways, consider (1) making the driveway between Village Shoppes and Cobb Corner Plaza right-in and right-out only, and (2) working with owners of the shopping plazas on the west side to close excessive driveways, open the access for the Dunkin' to reach the intersection at Village Shoppes Driveway, and make the driveway near Route 27 right-in and right-out only.

[39] Currently the intersection has a single signal timing plan for all time periods. However, traffic patterns are quite different in the weekday AM, weekday PM, and Saturday midday periods. The intersection capacity analysis indicates that traffic operations at the intersection would operate at acceptable levels of service under three different timing plans based on projected 2030 traffic volumes (Appendix M). Note that (1) the actual retiming plans should be based on traffic counts collected near the time of implementation, and (2) the signal retiming would somewhat improve traffic conditions but would not significantly improve traffic operations and safety for all users.

- Further investigate other signalization options in this section at the design stage, such as signalizing only the intersection at Village Shoppes Driveway, Cobb Corner Plaza Driveway, or the driveway between them.[40]

Sharon Street section

- Widen the section between the driveway from Cobb Corner Plaza and the driveway from Village Shoppes and add a westbound thru/right-turn shared lane to Cobb Corner Plaza and an eastbound left-turn only lane to Village Shoppes (Figure 21).
- Reconstruct and signalize the intersection at the driveway from Village Shoppes with reduction of the driveway width and installation of crosswalks and pedestrian signals. Coordinate the traffic signal at this intersection with the signal of the master intersection at Washington Street.[41]
- Reconstruct sidewalks on the south side and add sidewalks on the north side in the vicinity of the intersection proposed for signalization.
- Install shared bike road pavement markings on the outside lane in both directions.

Washington Street at Route 27

- Reconstruct the intersection under the existing right-of-way.[42]
- Add necessary turning lanes and rearrange travel lanes on all approaches[43]

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[40] This study conducted preliminary analyses of the options of signalizing only one intersection at either Village Shoppes Driveway or Cobb Corner Driveway. The analyses indicate that left turns from Cobb Corner Plaza would endure unacceptable delays in the first option and left turns from Village Shoppes would endure extensive delays in the second option. The signalization only at the driveway between them is not applicable under the existing layout and the locations of the various shopping plazas. However, this third option is at the central location serving the mall and the plazas in this section and suitable for the coordination with the signal at Route 27. It is an option worthy of consideration when Cobb Corner Plaza and/or the two conventional plazas on the west side are to be redeveloped. This option would also reduce conflict points exiting and entering the plazas on both sides of Washington Street.

[41] Signal warrant analysis will need to be conducted for proposed signalization at this intersection, as well as the intersections on Washington Street outlined in the section above, to determine if signals are warranted at any of the locations.

[42] With the reductions of travel lanes to 11.5 feet wide and turning radii, the proposed intersection layout is feasible under the existing right-of-way without increasing the pedestrian crossing distance.

[43] The proposed layout was selected from a number of reconfiguration alternatives tested with projected 2030 AM and PM peak-hour traffic conditions. Appendices O to Q contain detailed intersection capacity analyses for this proposed alternative, including the estimated average traffic queue on all the travel lanes.

  - Southbound (Washington Street): convert the existing two lanes into three that include a left-turn lane of at least 250 feet long, a through lane, and a right-turn lane of about 80 feet long.
  - Northbound (Washington Street): convert the existing two lanes into a left-turn lane of about 100 feet long and a thru/right-turn shared lane.
  - Westbound (Sharon Street): convert the existing two lanes into three that include a left-turn lane of about 100 feet long, a through lane, and a thru/right-turn shared lane.
  - Eastbound (North Main Street): convert the existing two lanes into a left-turn lane about 200 feet long and a thru/right-turn shared lane.
- Provide bike lanes continuing through the intersection on Washington Street.[44]
- Upgrade traffic signal system and signal displays with backplates and retroreflective borders.

5.5 OVERVIEW OF PROPOSED LONG-TERM IMPROVEMENTS UNDER PROJECTED 2030 TRAFFIC CONDITIONS

To further examine the effect of the proposed long-term improvements at the various locations in the corridor, staff constructed traffic models for projecting traffic conditions in the study corridor to the horizon year 2030. Staff projected the 2030 traffic volumes by using growth factors estimated from the Boston Region MPO's regional transportation planning model. The models project that traffic in the study area would increase by four percent (about 0.5 percent annually) in the weekday AM, weekday PM, and Saturday midday peak periods from 2021 to 2030.

Figures 22 and 23 summarize the weekday AM and PM peak hour intersection capacity analyses for major intersections in the corridor, with the assumption that the proposed improvements are implemented, under the projected 2030 traffic conditions. As shown, all the intersections would operate at an acceptable level of service (LOS), a LOS E or better, during the weekday AM and PM peak hours. The analyses are included in Appendices O and P.

Figures 24 and 25 summarize the Saturday peak hour intersection capacity analyses for major intersections in the corridor under the projected 2030 traffic conditions. With the proposed long-term improvements, all the intersections

[44] At the design stage, the bike lane on Washington Street northbound should be further refined to reduce conflicts between people continue straight on bicycles and northbound right-turn traffic.

would operate at an acceptable level of service (LOS D or better) during the Saturday peak hour. The analyses are included in Appendix Q.

The analyses indicate that the proposed long-term improvements would improve traffic operations and the accommodation and safety for people who walk at critical locations of the corridor. Meanwhile, as analyzed in the previous sections of this chapter, they would significantly enhance the mobility and safety of all users in the corridor.

Chapter 6—Summary and Recommendations

This study presents a series of proposed improvements that would support the Washington Street corridor to operate safely and efficiently for all people who walk, use a mobility device, bike, and drive, or ride with others in the corridor. The proposed short- and long-term improvements are based on a series of analyses that were performed to identify safety and operational problems in the study area including a Canton Center section and a residential section in the corridor and a major commercial district at Cobb Corner adjacent to the corridor. Together, they provide a vision for the long-term development of the corridor and the adjacent commercial district.

The proposed short-term improvements could enhance safety for all users and improve traffic operations. These improvements should be planned, designed, and implemented as soon as resources are available, especially those recommended for the Canton Center section. The section is in a vibrant economic and cultural downtown district and long-term improvements requiring major roadway reconfigurations are considered not applicable under the surrounding well-developed conditions.

For the residential section and the Cobb Corner commercial district, it would require a series of long-term improvements to significantly improve the safety, mobility, and access for all users. The study proposes the following major improvements:

- Reduce travel lane width to 11.5 feet wide.
- Install separated bike lanes or multiuse paths on both sides of the roadway.
- Install six-foot sidewalks wherever absent and improve the existing sidewalks and expand them to six feet wide wherever applicable.
- Remove the TWLTL and install a left-turn only center lane combined with traffic medians on Washington Street.
- Work with property and business owners to develop a comprehensive access management plan for the Cobb Corner commercial district.
- Reconstruct the intersection of Washington Street at Route 27 with an upgraded traffic signal system.
- Signalize two major business driveways on Washington Street and one on Sharon Street, under a coordinated signal system based on the signal at the Washington Street/Route 27 intersection.

- Provide crosswalks and pedestrian signals at the signalized locations.
- Reduce driveway widths and turning radii wherever applicable.
- Enforce travel speed regulations in the corridor.

These proposed long-term improvements would have several expected benefits:

- Improve accommodations and safety for people who walk, bike, and use a mobility device.
- Improve mobility and safety for people to access adjacent businesses.
- Sustain appropriate travel speeds and increase safety for all users in the corridor.
- Maintain efficient traffic operations in the corridor.
- Support and enhance economic activities in the subregion.
- Enhance livability for neighborhoods and the subregion.

At this preliminary planning stage, this study proposed these four implementation phases for consideration.

- Short-term improvements for Canton Center Section
- Short-term improvements for the Residential and the Cobb Corner commercial district
- Seek resources for long-term improvements in Residential Section
- Work with all stakeholders to plan and design long-term improvements for Cobb Corner Commercial District

The complicated Cobb Corner district would need further planning and coordination efforts to decide the priorities and phasing scheme. For example, improving the intersection of Washington Street at Route 27 may be considered as a priority location.

Implementing the proposed long-term improvements would require sufficient resources, especially for the complicated Cobb Corner commercial district that is identified with many safety and operational problems. The district and the adjacent roadways are under the jurisdictions of Canton, Sharon, and Stoughton.

Meanwhile, achieving the proposed Complete Streets vision for the corridor and the adjacent commercial district via the recommended improvements would require significant effort and collaboration on the part of all stakeholders, including the Towns of Canton, Sharon, and Stoughton, residents, property and

business owners, BAT, MBTA, and Massachusetts Department of Transportation (MassDOT) Districts 5 and 6.

The next steps toward implementation are for the towns to identify priority sections in the study area and work with MassDOT to initiate a project. For municipalities to initiate roadway projects, MassDOT developed an online tool for submission. The Massachusetts Project Intake Tool, also known as 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 geoDOT local hub (https://geodot-local-massdot.hub.arcgis.com/) or from the state's Initiating a Project website (https://www.mass.gov/info-details/massdot-highway-initiating-a-project).

To move a project from the initiation to the development stage, the Town(s) must obtain favorable assessment from MassDOT's Project Review Committee, start the project design process, and identify potential funding sources by coordinating with MassDOT and the Boston Region MPO.

MPO staff will continue to support this work by assisting with further project planning and the funding process. In addition, staff will continue monitoring the progress toward implementing this study's recommendations via the MPO's Unified Planning Work Program Study Recommendations Tracking Database.

Appendix R contains details about the various steps in MassDOT's project development process, including a schematic timetable. Information about the project development process may be found on MassDOT's website, at https://www.mass.gov/service-details/project-development-process.

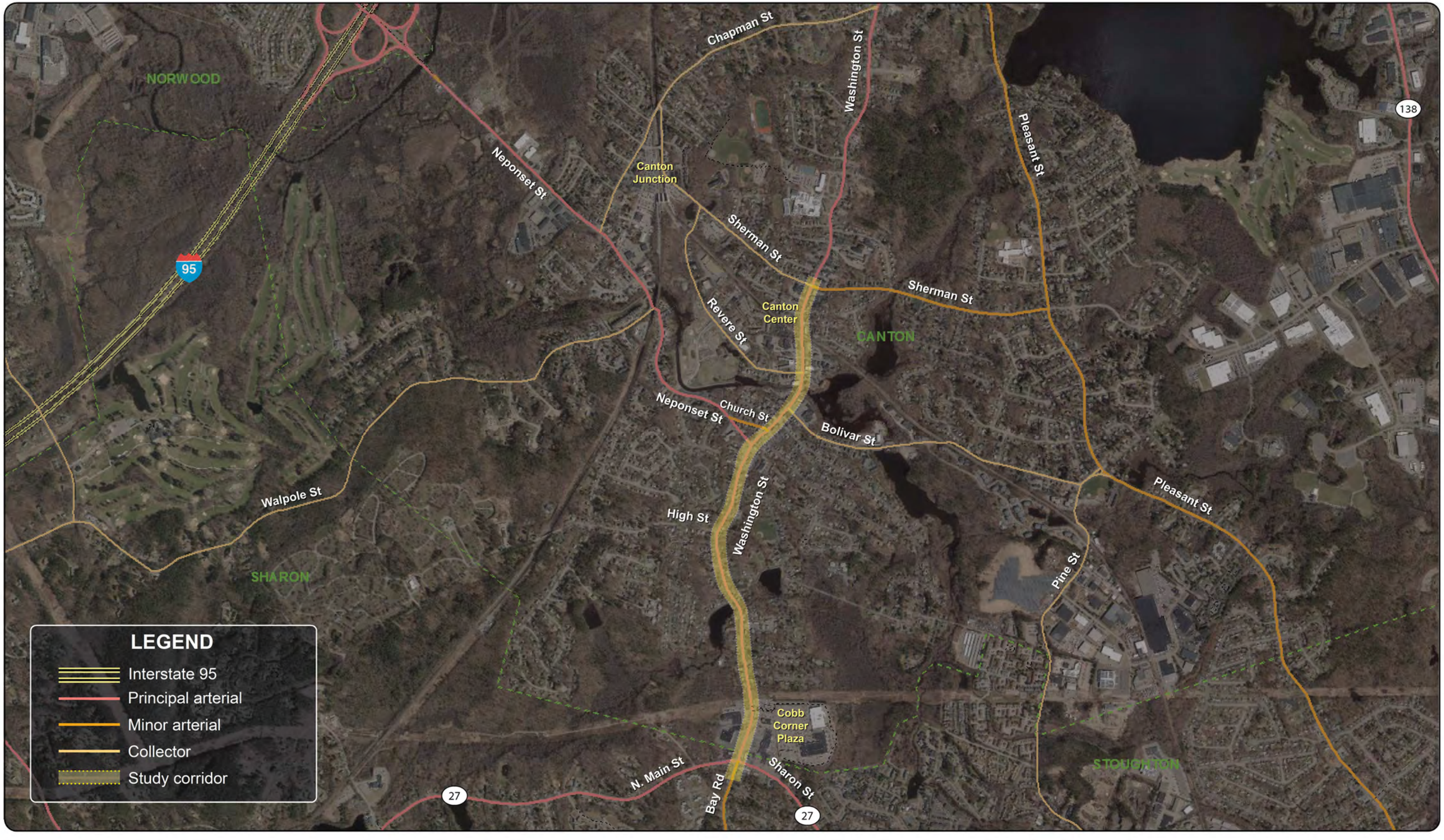

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Figure 1
Study Area Map
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

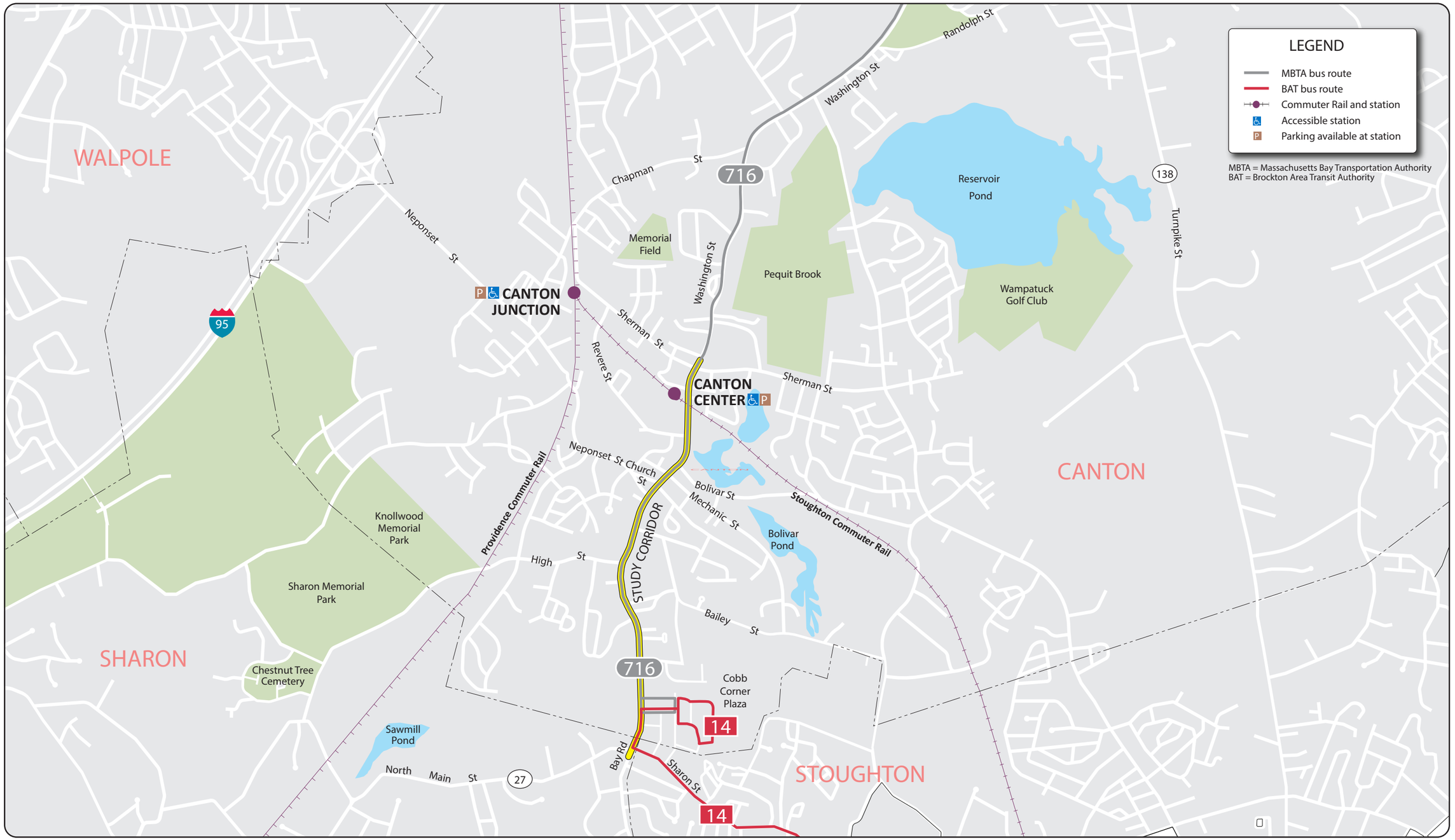

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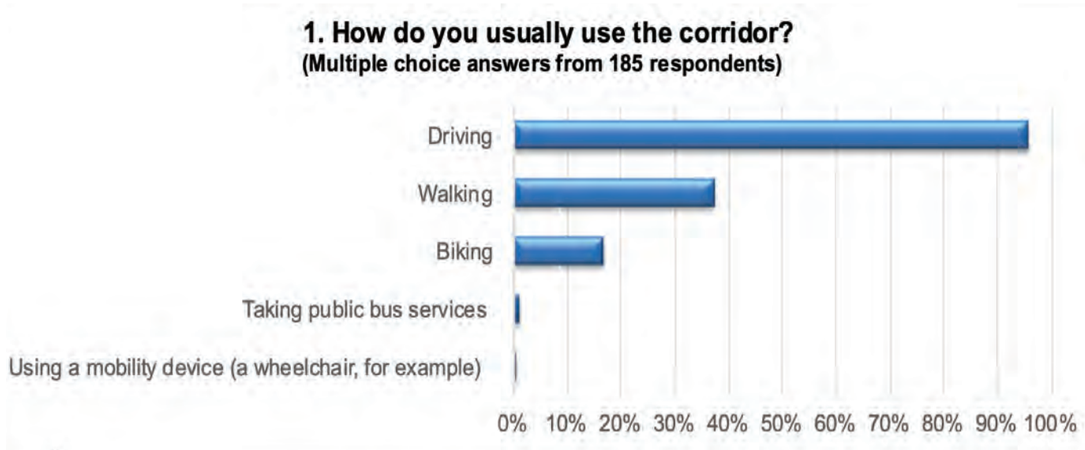
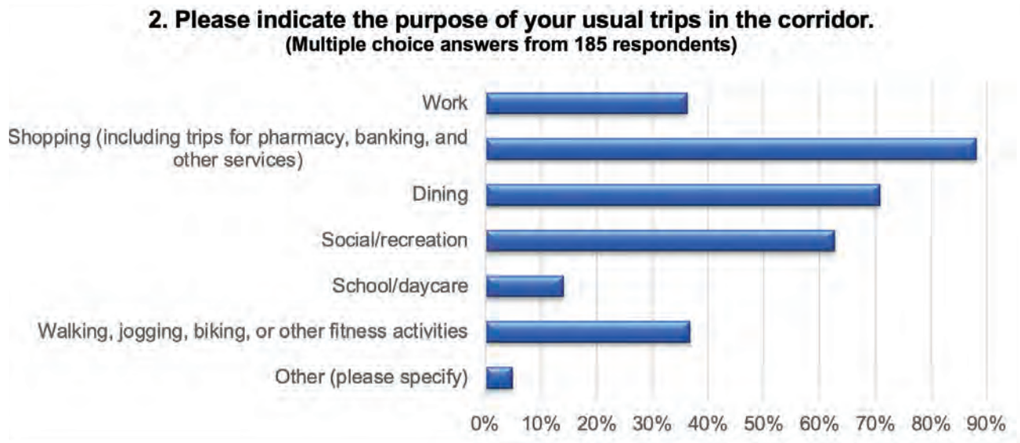
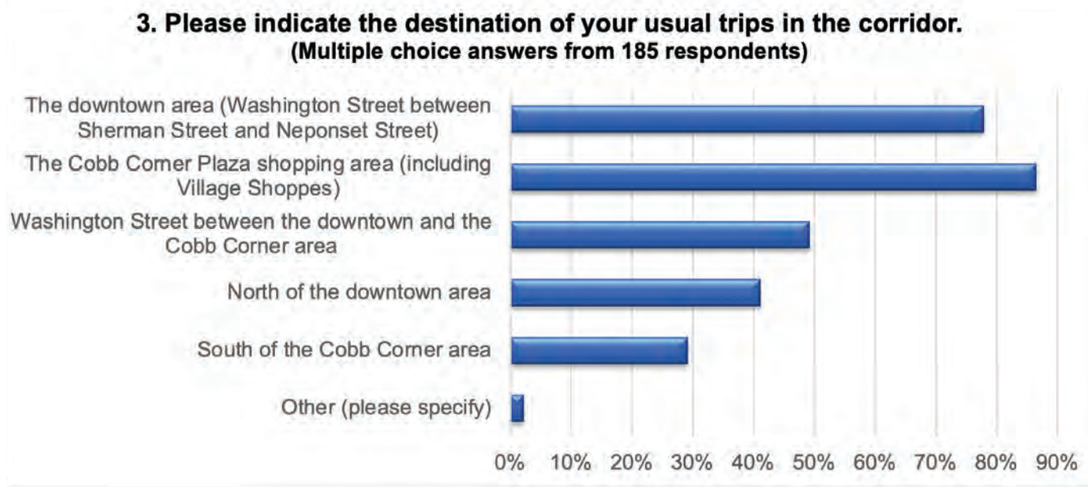
Figure 2
Transit Services in the Area
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways







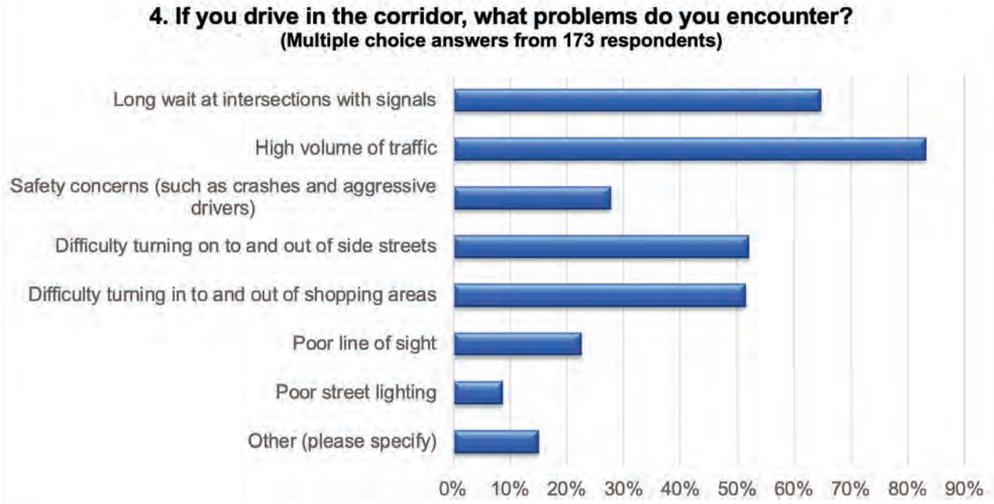
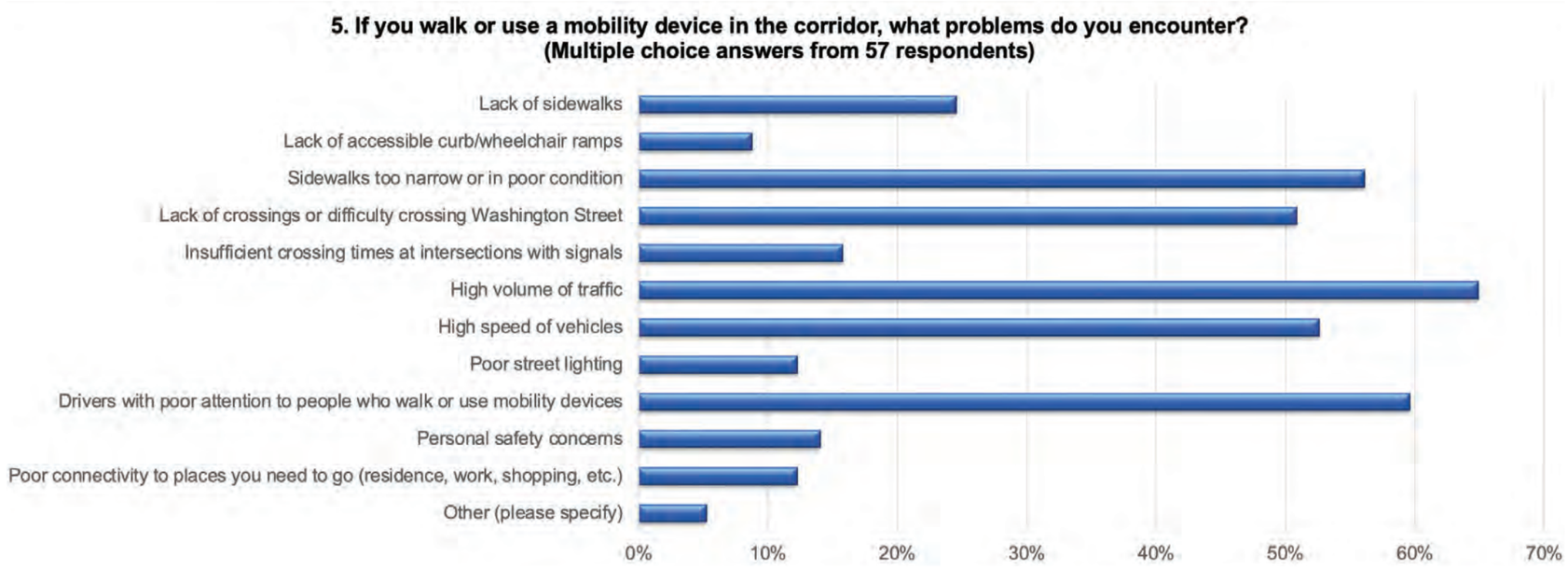
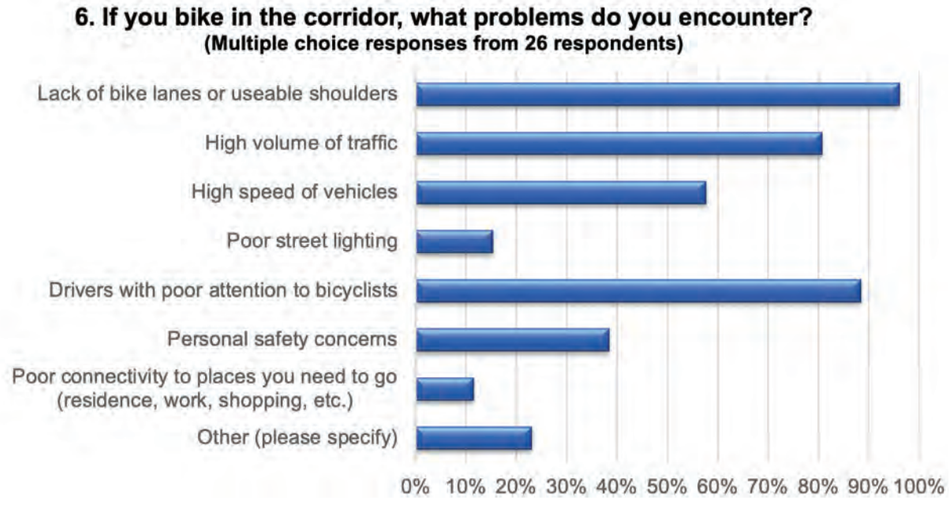


Figure 3
Corridor User Survey Questions and Results: Questions 1 to 4, Part 1
Washington Street Corridor in Canton





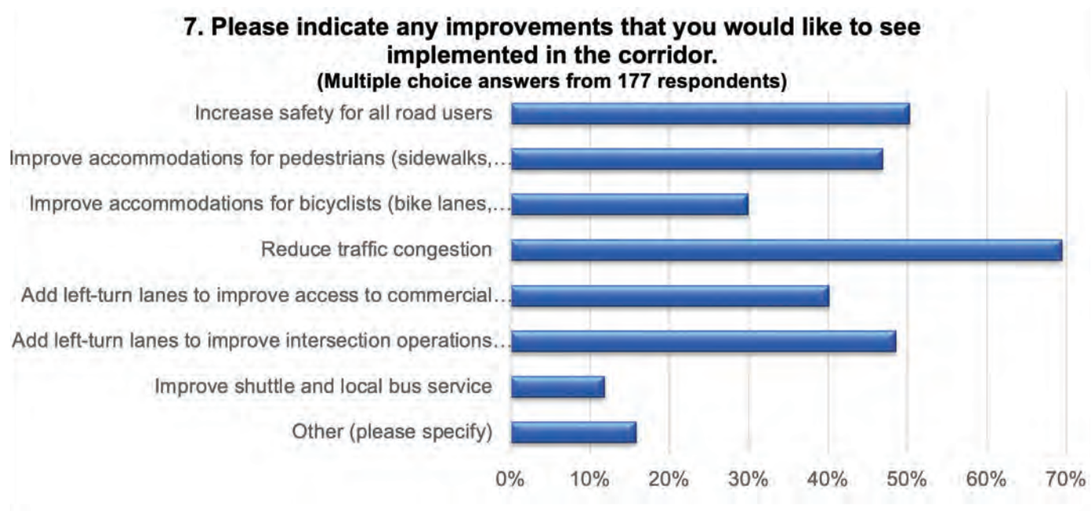


Figure 4
Corridor User Survey Questions and Results: Questions 5 to 7, Part 2
Washington Street in Canton

Washington Street Corridor

Count Location	1	2	3	4	5
Northbound Recorded Volume	6,884	7,286	9,583	10,067	5,374
Southbound Recorded Volume	5,830	6,483	10,732	10,256	5,150
Northbound AAWDT	6,750	7,140	9,390	9,870	5,530
Southbound Estimated AAWDT	5,710	6,350	10,520	10,050	5,300
Northbound Final Adjusted AAWDT	7,100	7,500	9,900	10,400	5,800
Southbound Final Adjusted AAWDT	6,000	6,700	11,000	10,600	5,600
Northbound Split	54%	53%	47%	50%	51%
Southbound Split	46%	47%	53%	50%	49%
Combined AAWDT	13,100	14,200	20,900	21,000	11,400

Adjacent Roadways

Count Location	6	7	8	9	10
Eastbound Recorded Volume	5,319	4,642	2,628	3,222	2,855
Westbound Recorded Volume	4,695	3,714	3,063	3,255	3,349
Eastbound Estimated AAWDT	5,480	4,780	2,710	3,320	2,940
Westbound Estimated AAWDT	4,830	3,820	3,150	3,350	3,450
Eastbound Final Adjusted AAWDT	5,800	5,000	2,800	3,500	3,100
Westbound Final Adjusted AAWDT	5,100	4,000	3,300	3,500	3,600
Eastbound Split	53%	56%	46%	50%	46%
Westbound Split	47%	44%	54%	50%	54%
Combined AAWDT	10,900	9,000	6,100	7,000	6,700

Count Location	11	12	13	14	15
Eastbound Recorded Volume	13,270	1,467	793	8,567	6,989
Westbound Recorded Volume	7,753	1,665	1,372	8,669	6,826
Eastbound Estimated AAWDT	13,000	1,510	820	8,400	6,850
Westbound Estimated AAWDT	7,600	1,710	1,400	8,500	6,690
Eastbound Final Adjusted AAWDT	13,700	1,600	900	8,800	7,200
Westbound Final Adjusted AAWDT	8,000	1,800	1,500	8,900	7,000
Eastbound Split	63%	47%	38%	50%	51%
Westbound Split	37%	53%	63%	50%	49%
Combined AAWDT	21,700	3,400	2,400	17,700	14,200

Notes
Recorded Volume: Average weekday traffic counts collected by automatic traffic recorders in the period of November 29 to December 3, 2021
Estimated AAWDT: Recorded volume adjusted by axle factor and seasonal factor to represent annual average traffic
Final Adjusted AAWDT: Estimated AAWDT factored by COVID-19 traffic adjustment (about five percent increase) to represent normal traffic conditions
AAWDT = Annual Average Weekday Daily Traffic

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Figure 5
Average Weekday Traffic Volumes
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

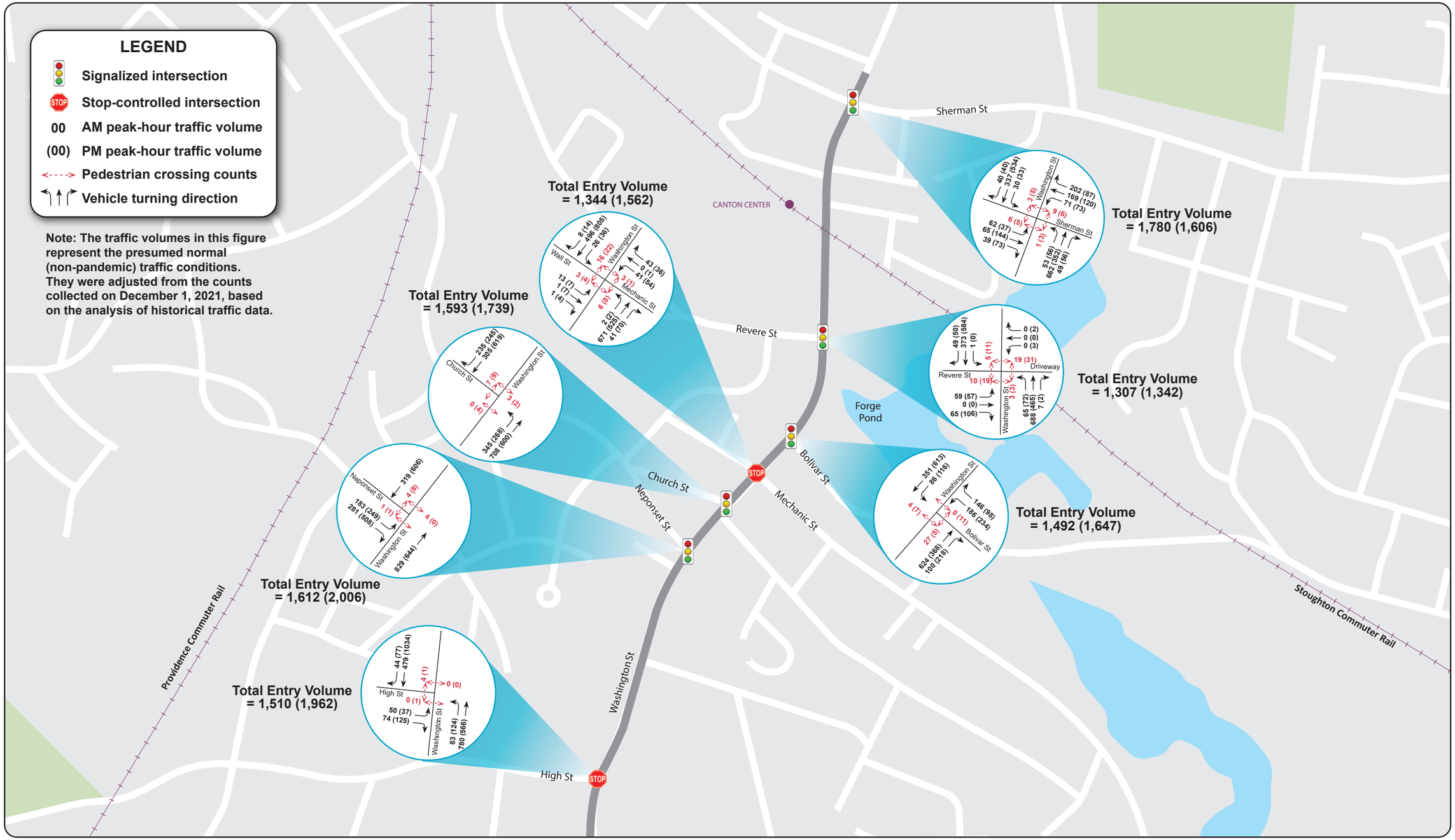

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Figure 6
Estimated 2021 Weekday AM/PM Peak-Hour Intersection Traffic and Pedestrian Volumes, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

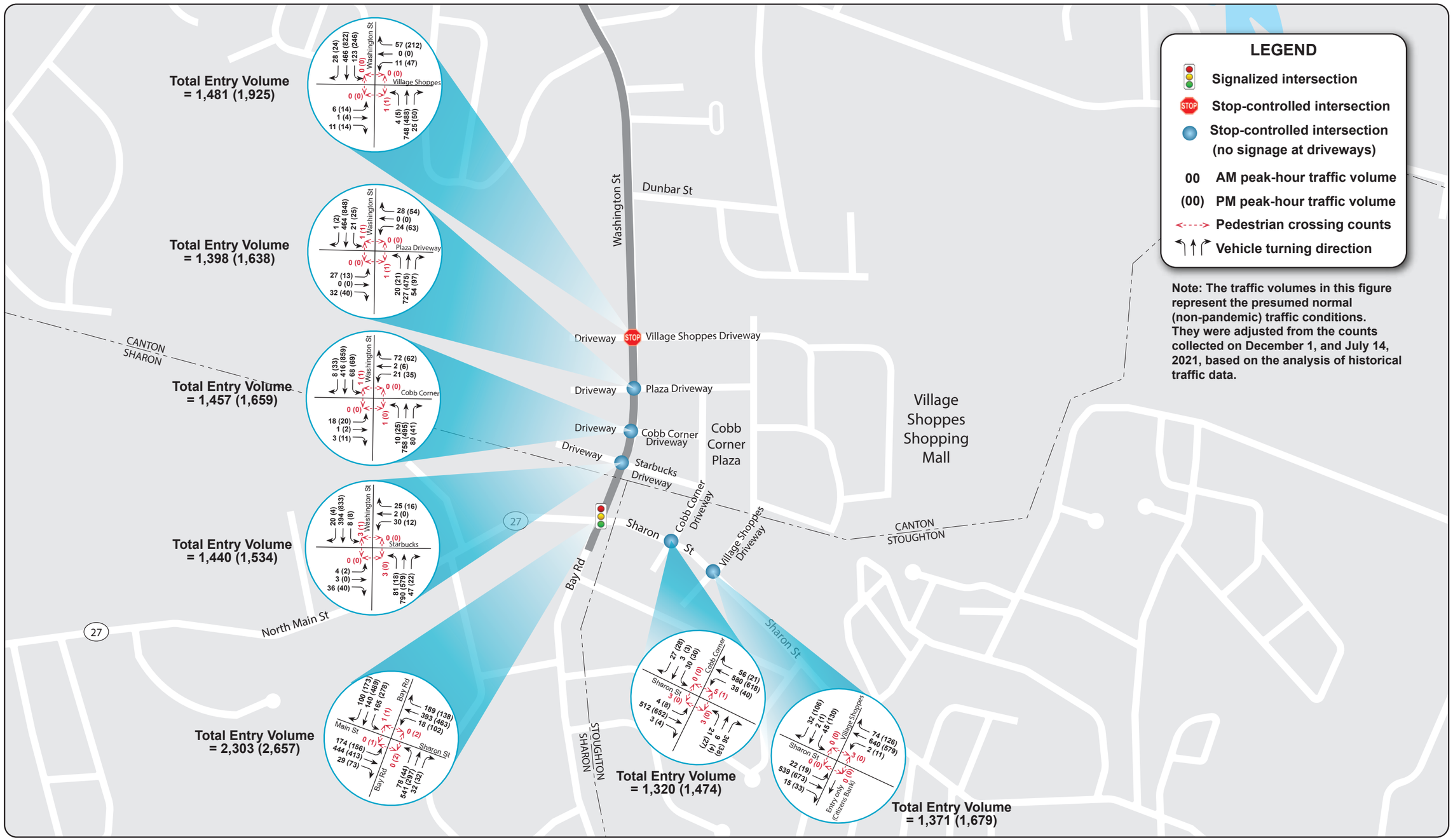

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Figure 7
Estimated 2021 Weekday AM/PM Peak-Hour Intersection Traffic and Pedestrian Volumes, Part 2
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

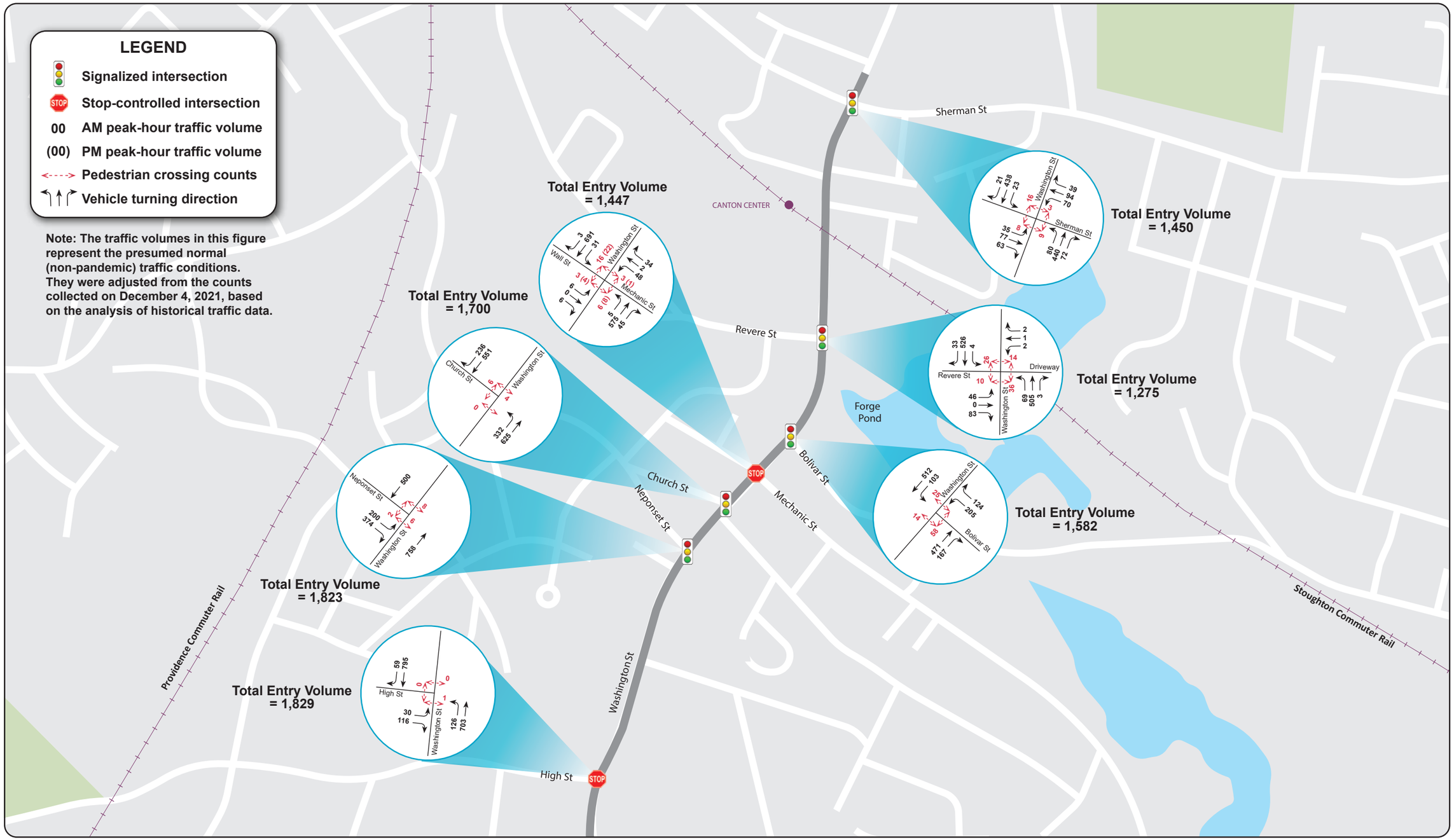

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Figure 8
Estimated 2021 Saturday Peak-Hour Intersection Traffic and Pedestrian Volumes, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

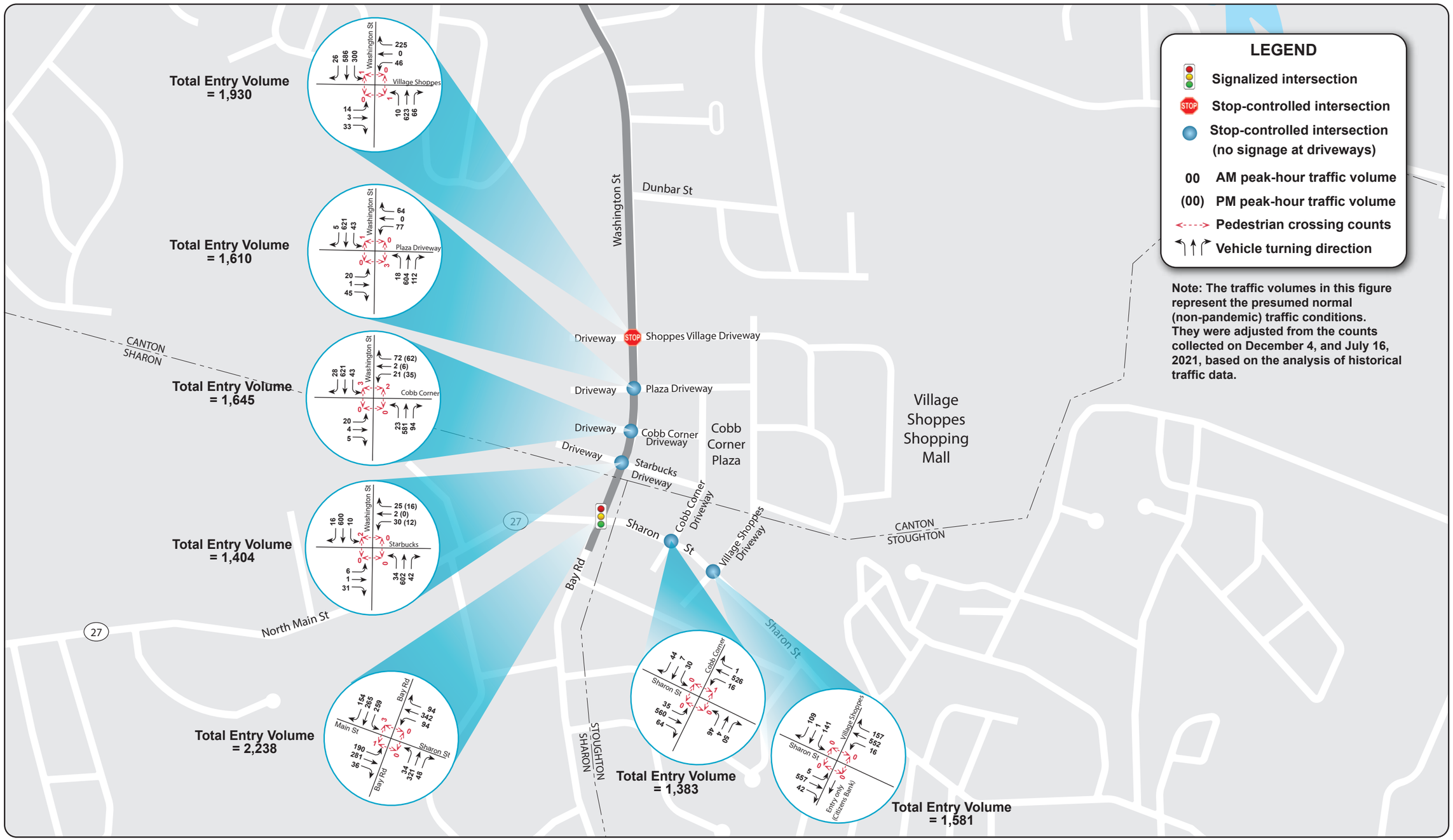

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Figure 9
Estimated 2021 Saturday Peak-Hour Intersection Traffic and Pedestrian Volumes, Part 2
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

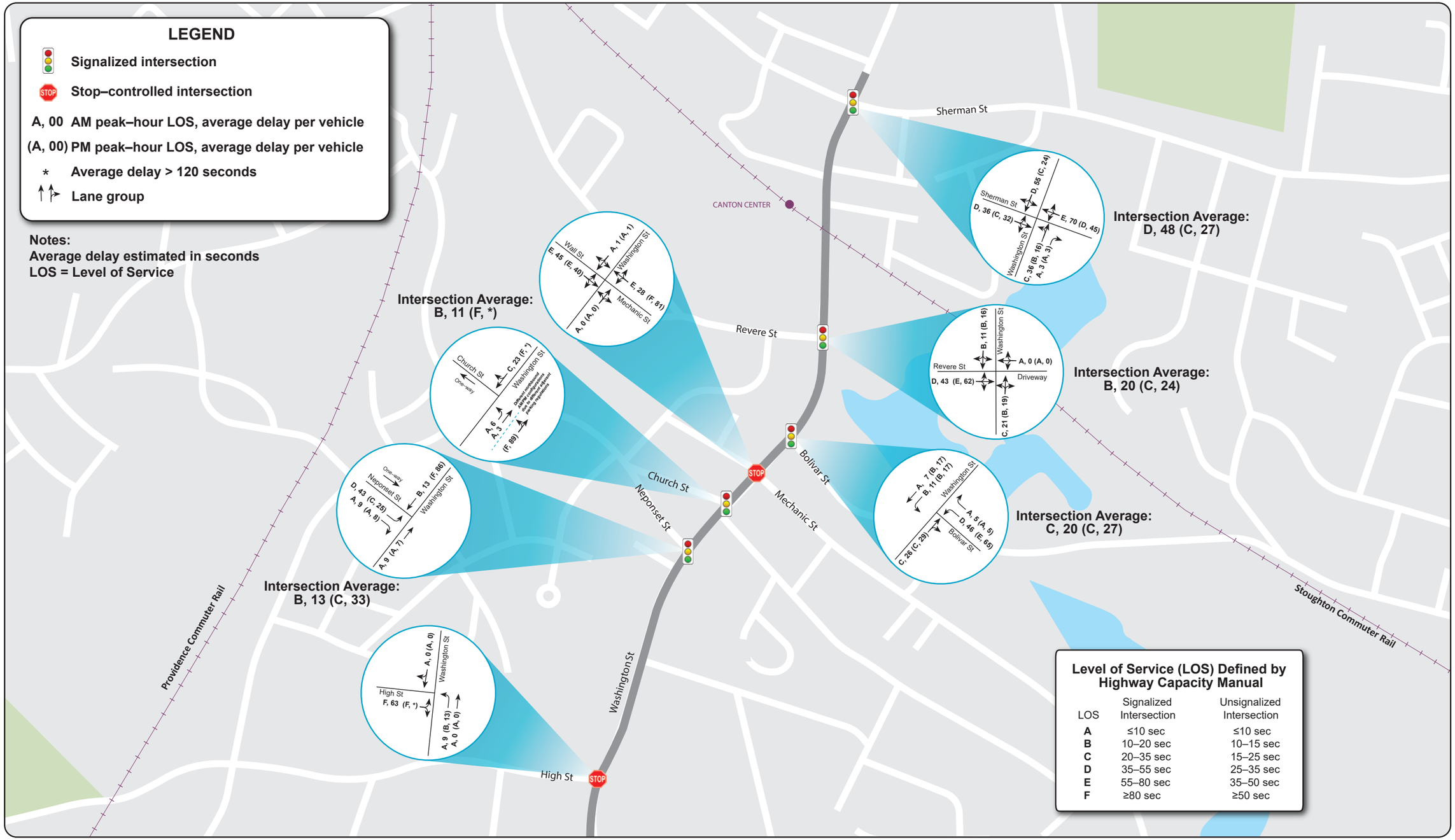

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Figure 10
Weekday AM/PM Peak–Hour Intersection Capacity Analyses: Estimated 2021 Traffic Conditions, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

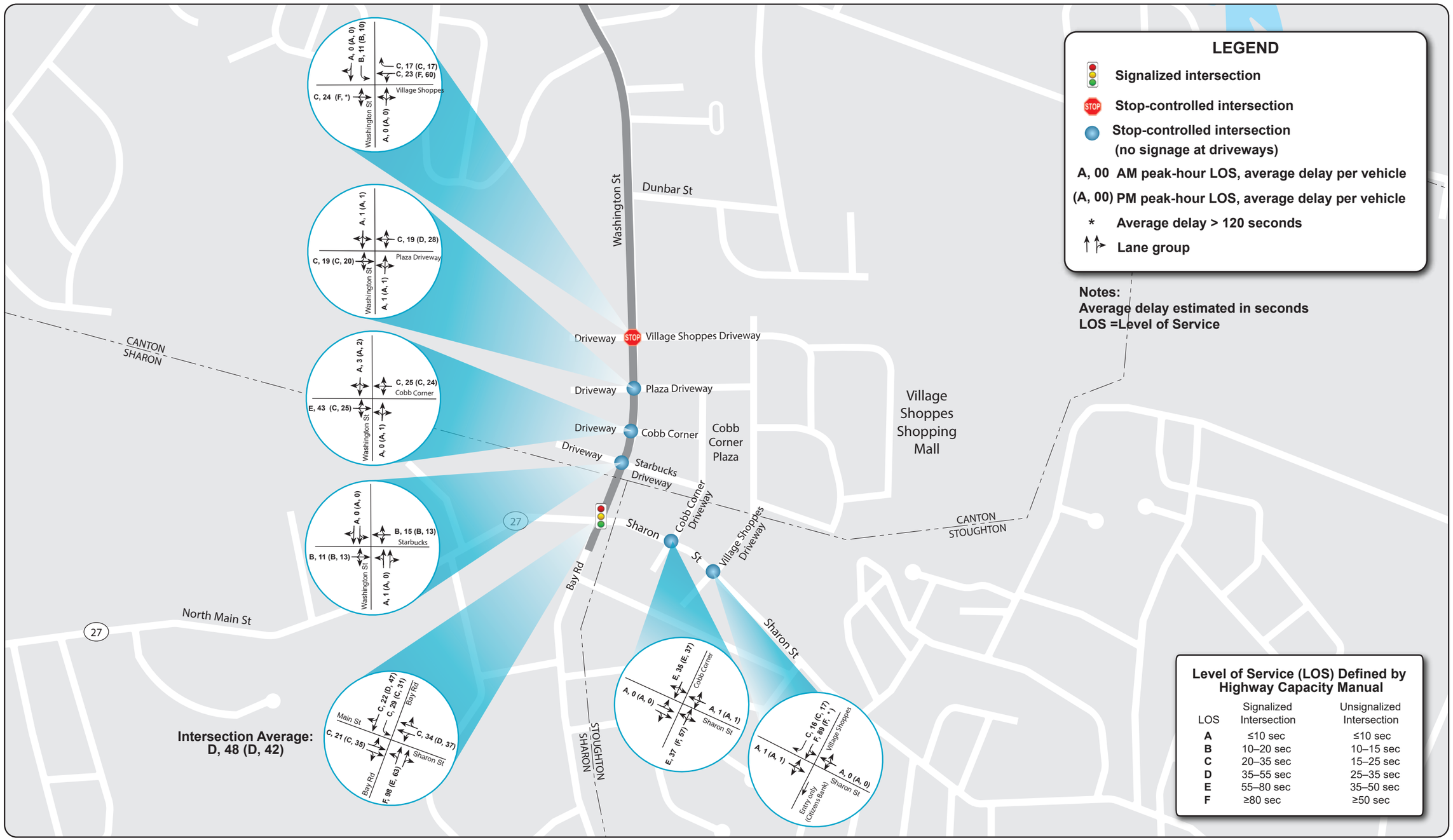

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Figure 11
Weekday AM/PM Peak-Hour Intersection Capacity Analyses: Estimated 2021 Traffic Conditions, Part 2
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

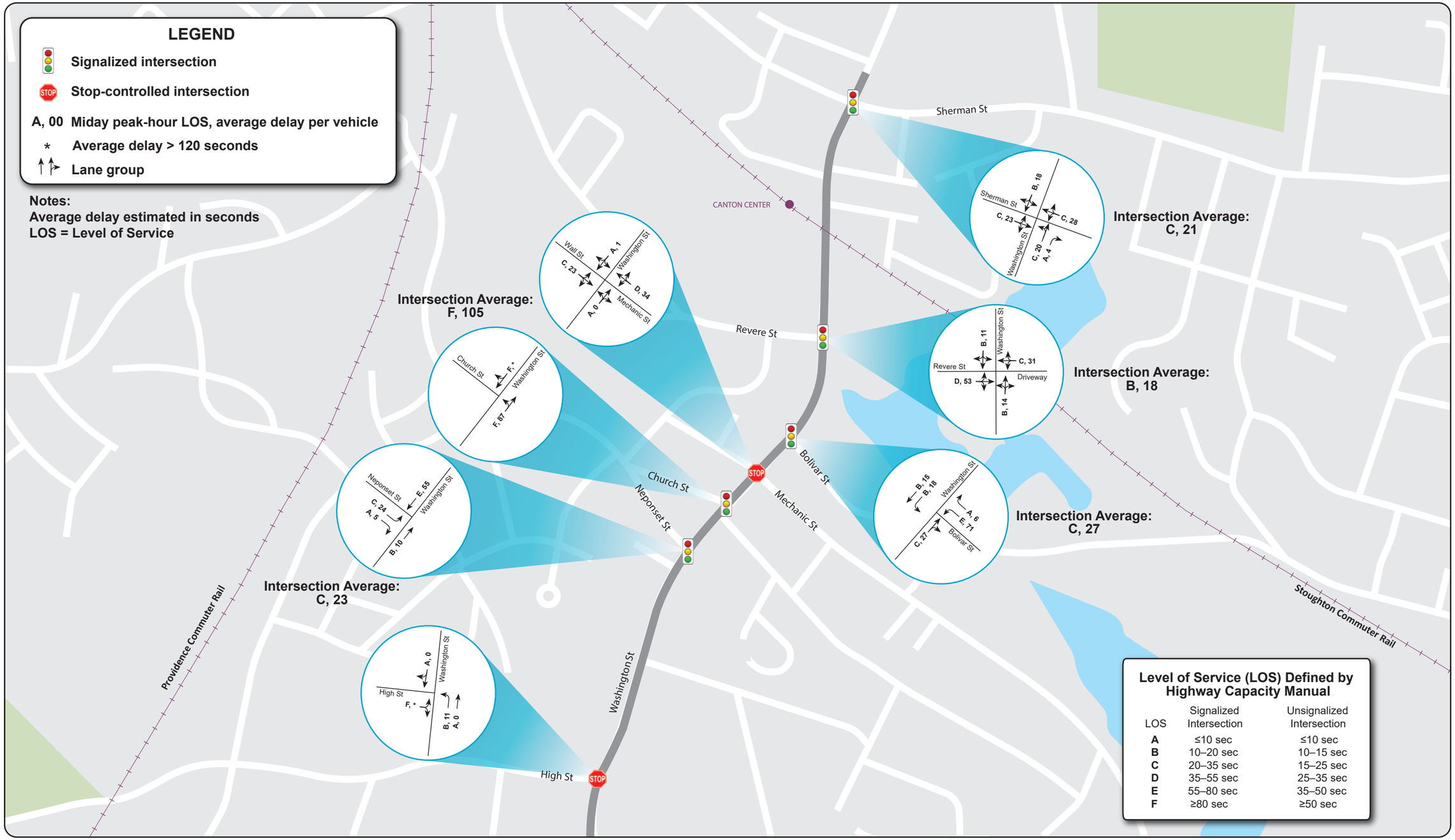

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Figure 12
Saturday Peak-Hour Intersection Capacity Analyses: Estimated 2021 Traffic Conditions, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

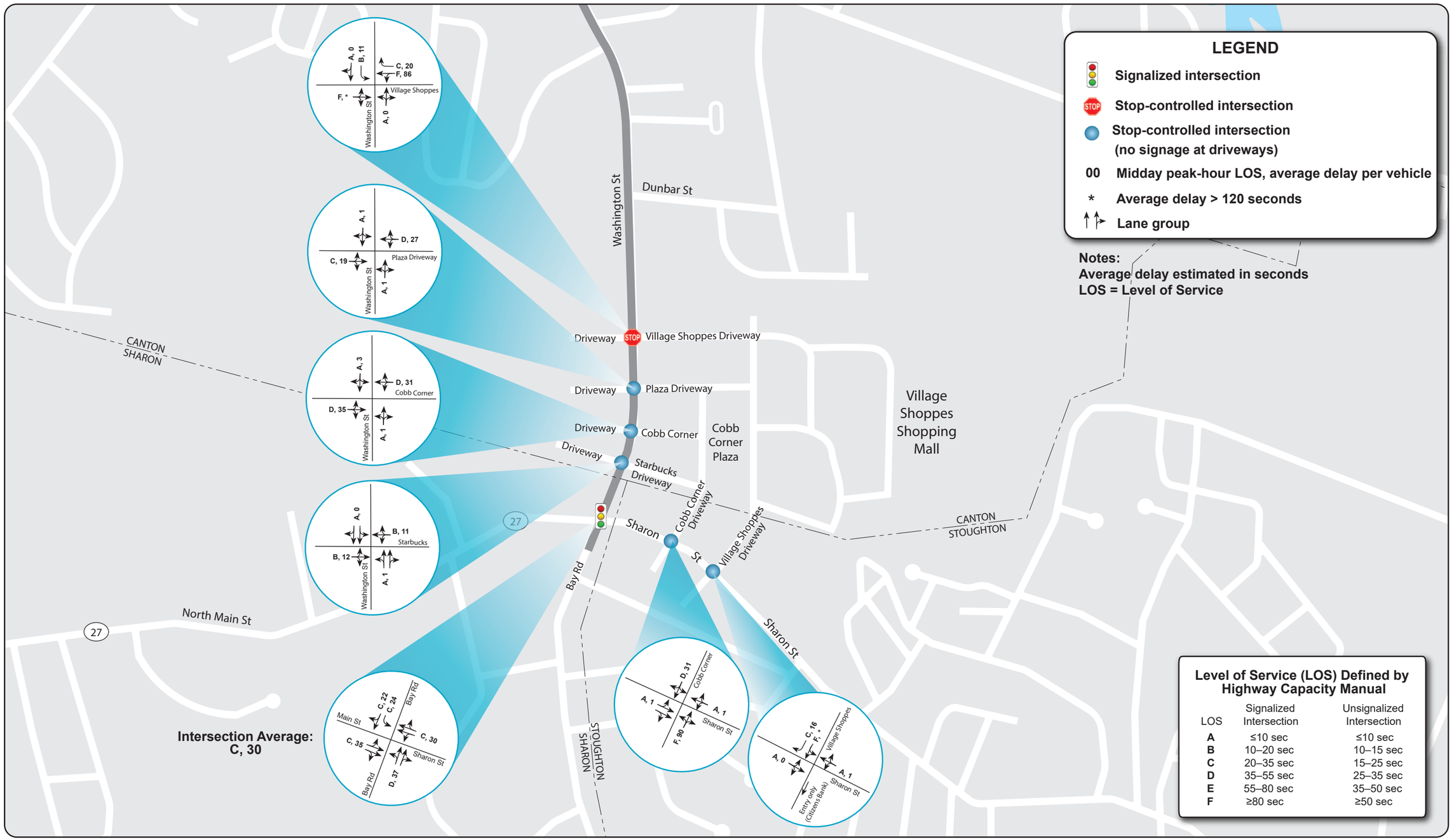

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Figure 13
Saturday Peak-Hour Intersection Capacity Analyses: Estimated 2021 Traffic Conditions, Part 2
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

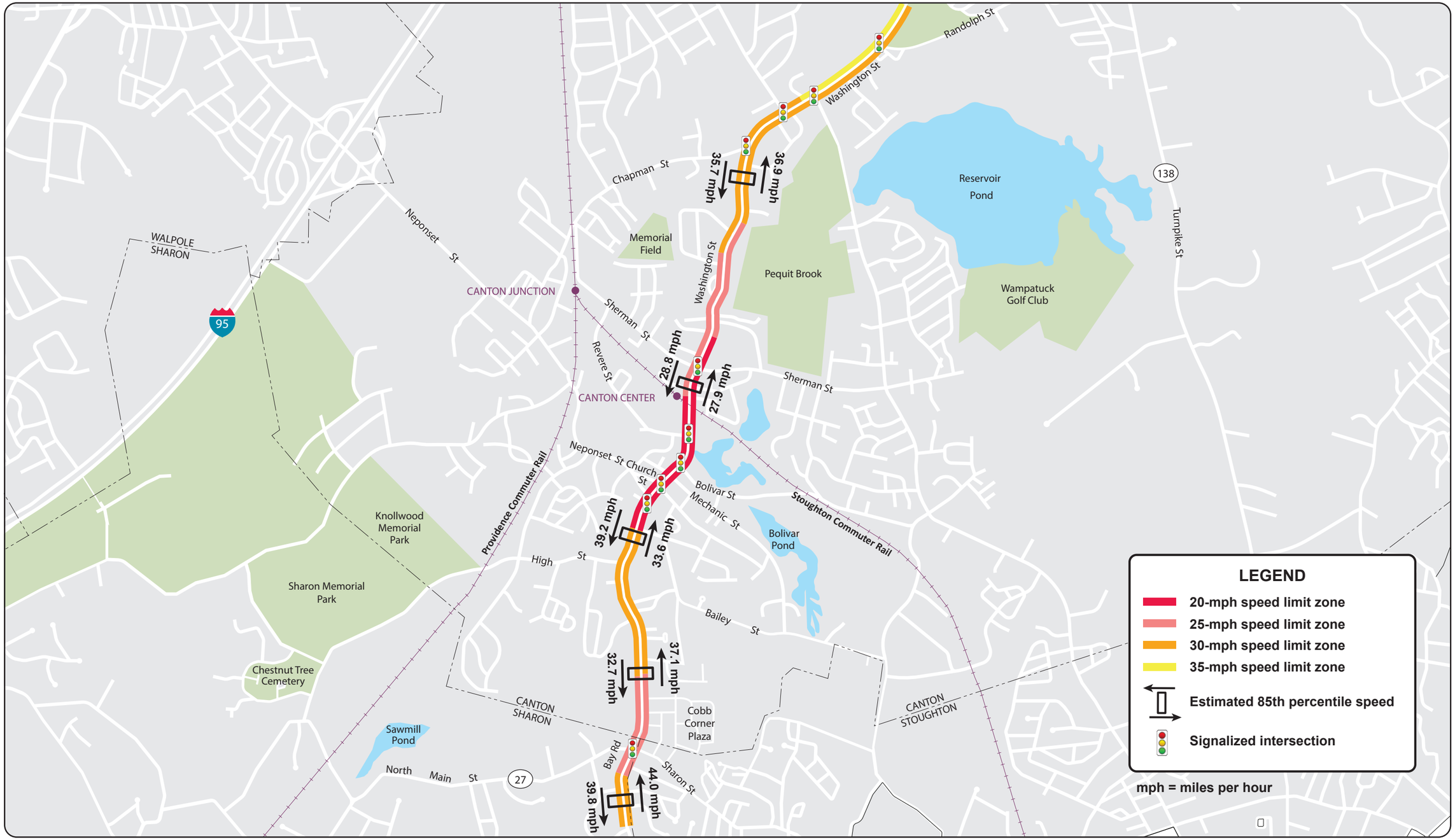

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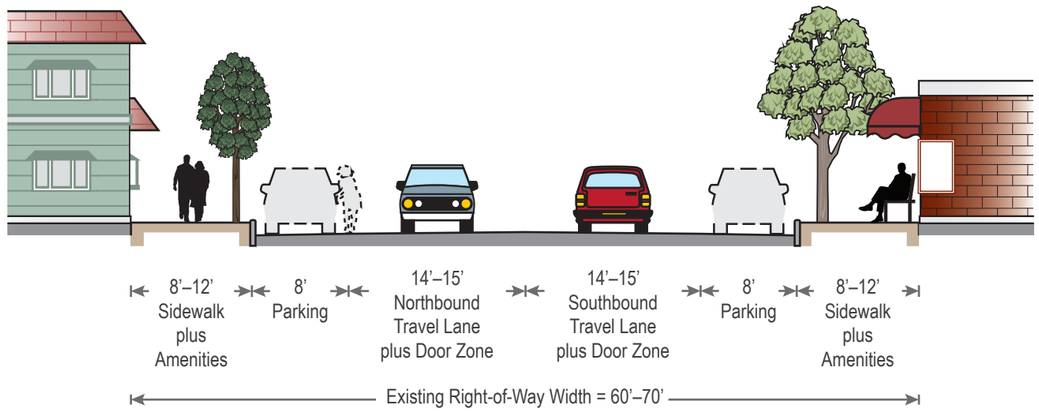
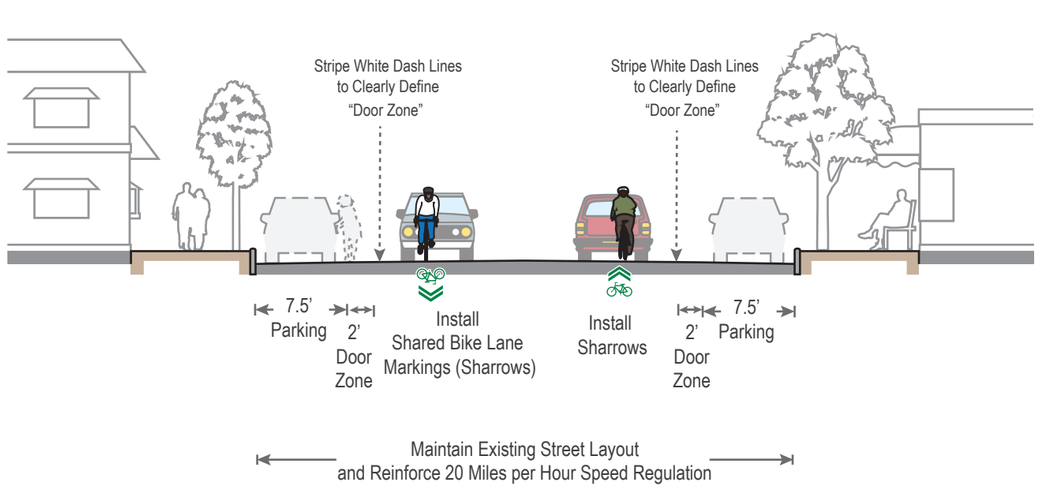
Figure 14
Speed Regulations and Estimated 85th Percentile Speeds
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways



Existing Roadway Cross Section



Proposed Improvements

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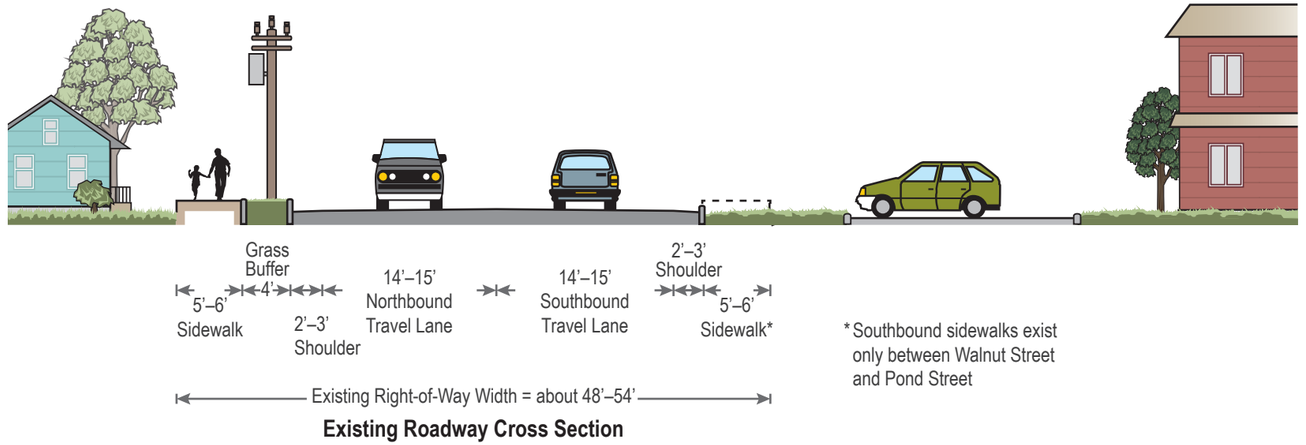
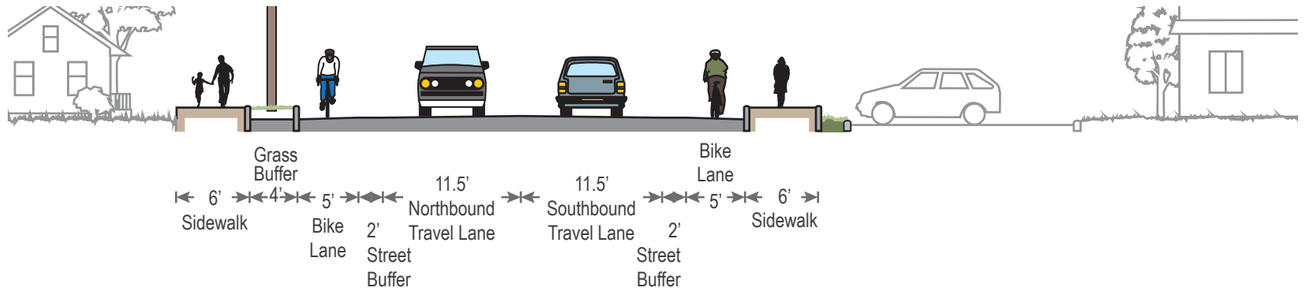
Figure 15
Existing Roadway Cross Section and Proposed Improvements: Canton Center Section
Washington Street in Canton

Addressing Safety,
Mobility, and Access on
Subregional Priority Roadways

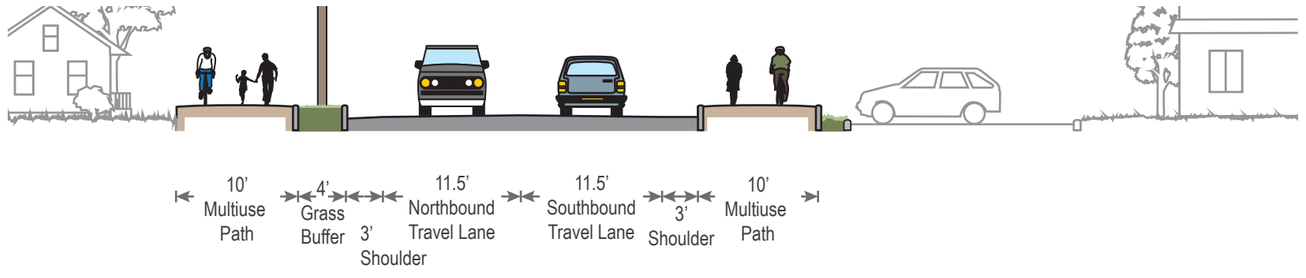


*Southbound sidewalks exist only between Walnut Street and Pond Street

Existing Roadway Cross Section



Proposed Reconfiguration Alternative 1



Proposed Reconfiguration Alternative 2

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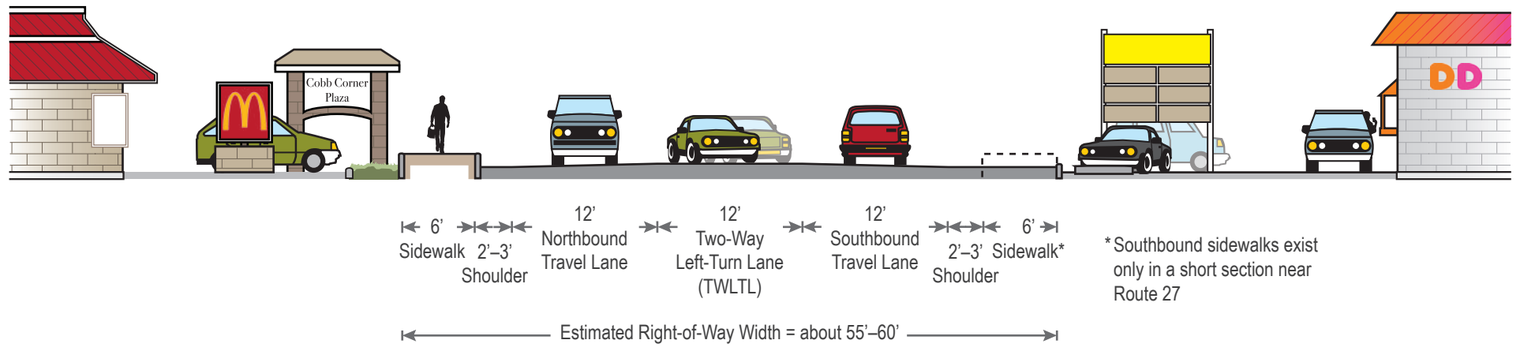
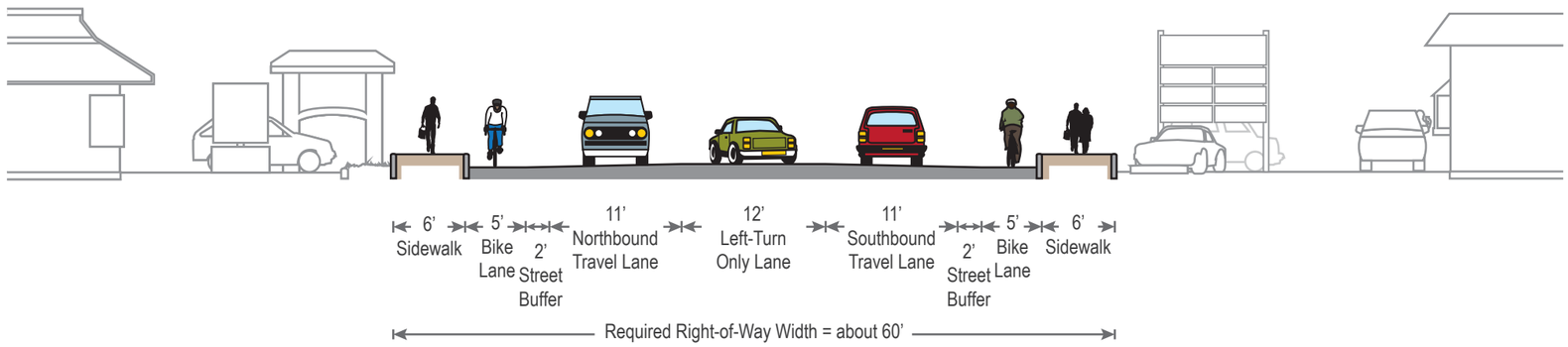
Figure 16
Existing Roadway Cross Section and Proposed Reconfiguration Alternatives: Residential Section
Washington Street in Canton

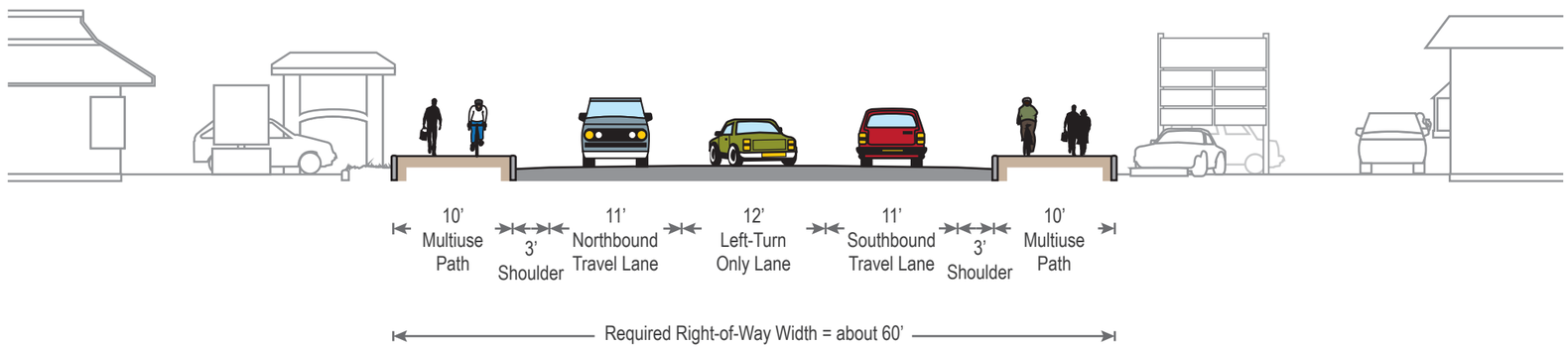
Addressing Safety, Mobility, and Access on Subregional Priority Roadways



Existing Roadway Cross Section



Proposed Reconfiguration Alternative 1



Proposed Reconfiguration Alternative 2

Figure 17
Existing Roadway Cross Section and Proposed Reconfiguration Alternatives: Cobb Corner Commercial District Washington Street in Canton

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Figure 18
Proposed Improvements Conceptual Plan: Canton Center Section, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

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Figure 19
Proposed Improvements Conceptual Plan: Canton Center Section, Part 2
Washington Sreet in Canton

Addressing Safety,
Mobility, and Access on
Subregional Priority Roadways

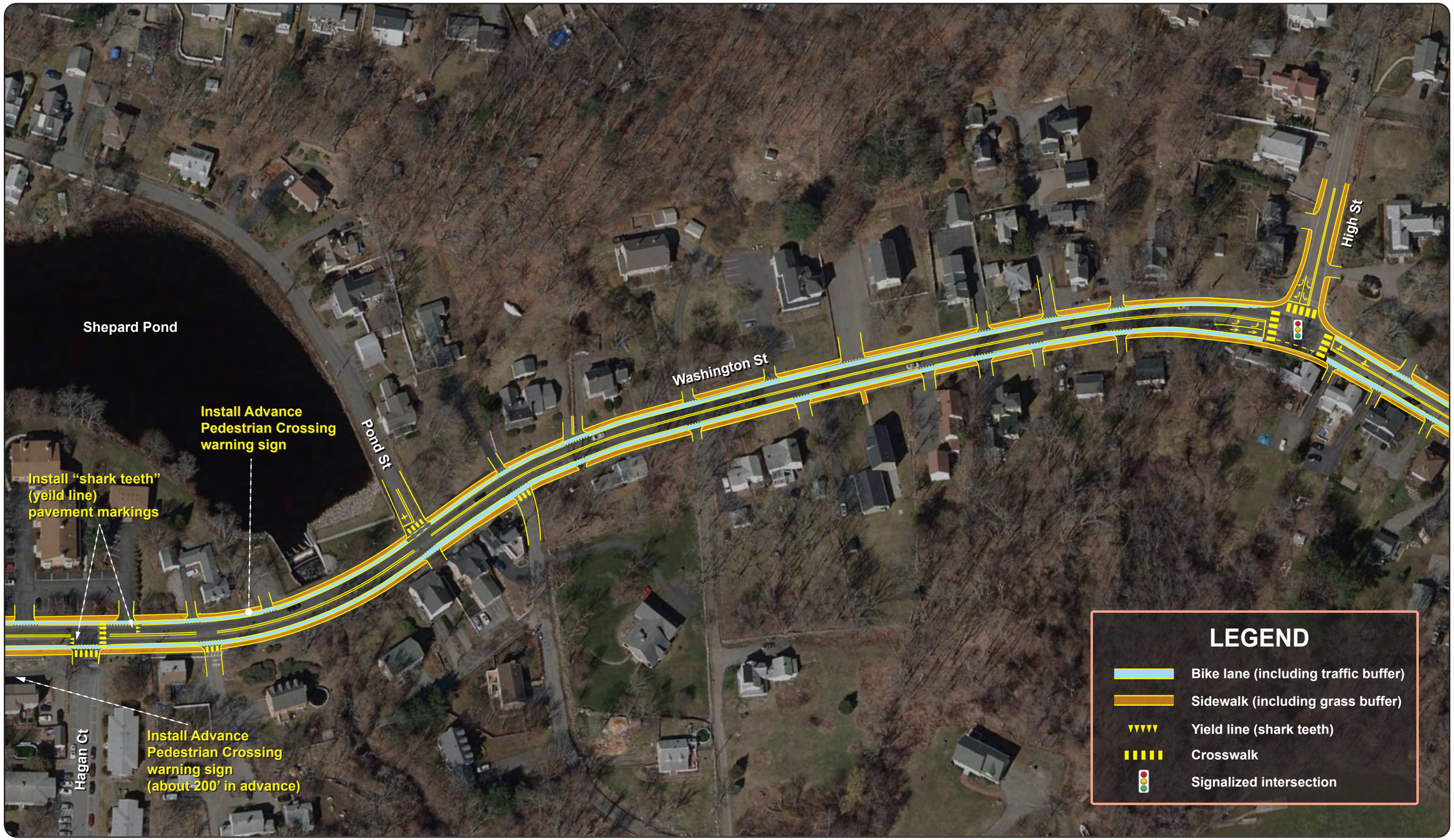

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Figure 20
Proposed Improvements Conceptual Plan: Residential Section
Wshington Street in Canton

Addressing Safety,
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Subregional Priority Roadways

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Figure 21
Proposed Improvements Conceptual Plan: Cobb Corner Commercial District
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

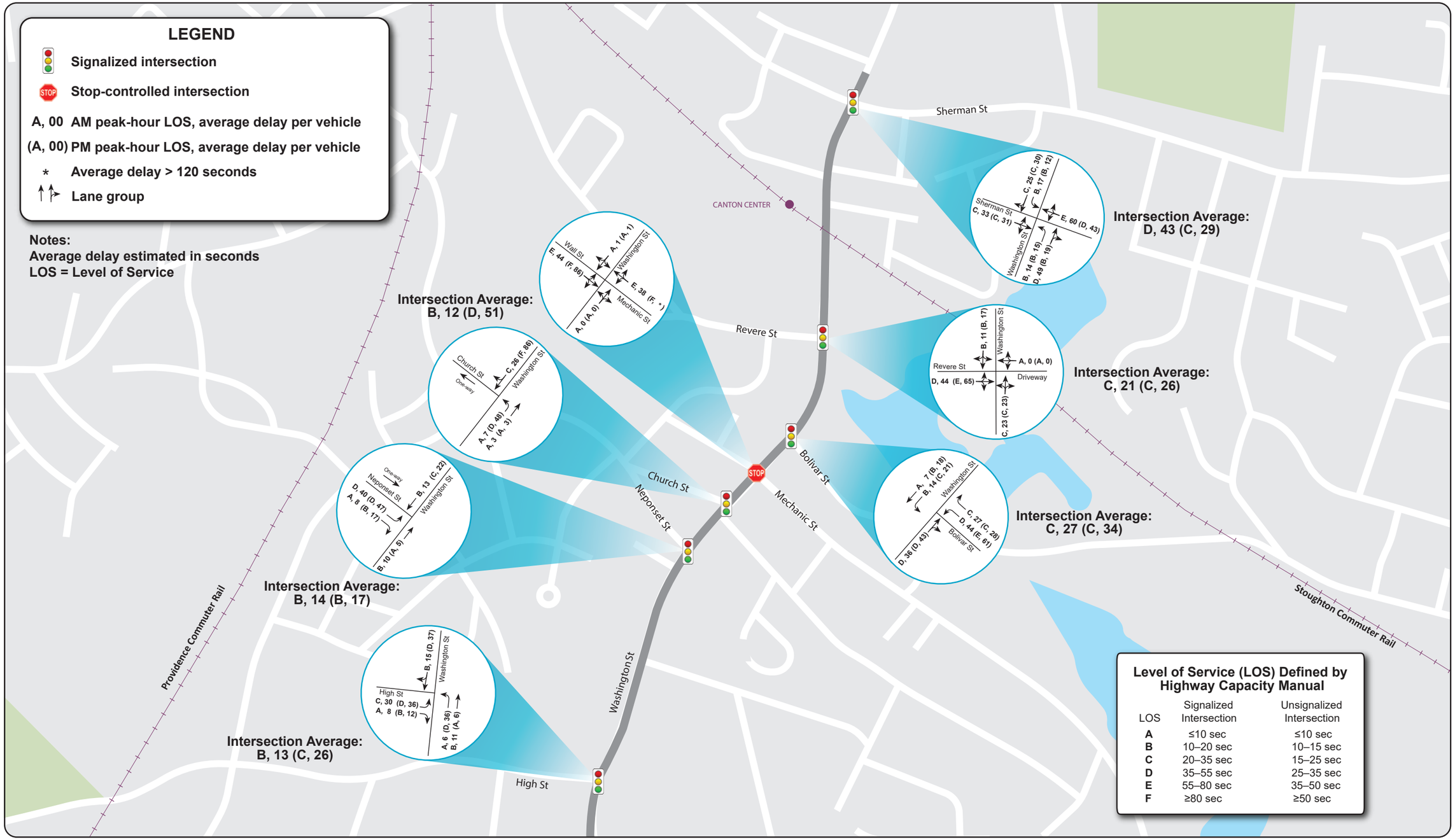

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Figure 22
2030 Weekday AM/PM Peak-Hour Intersection Capacity Analyses with Proposed Improvements, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

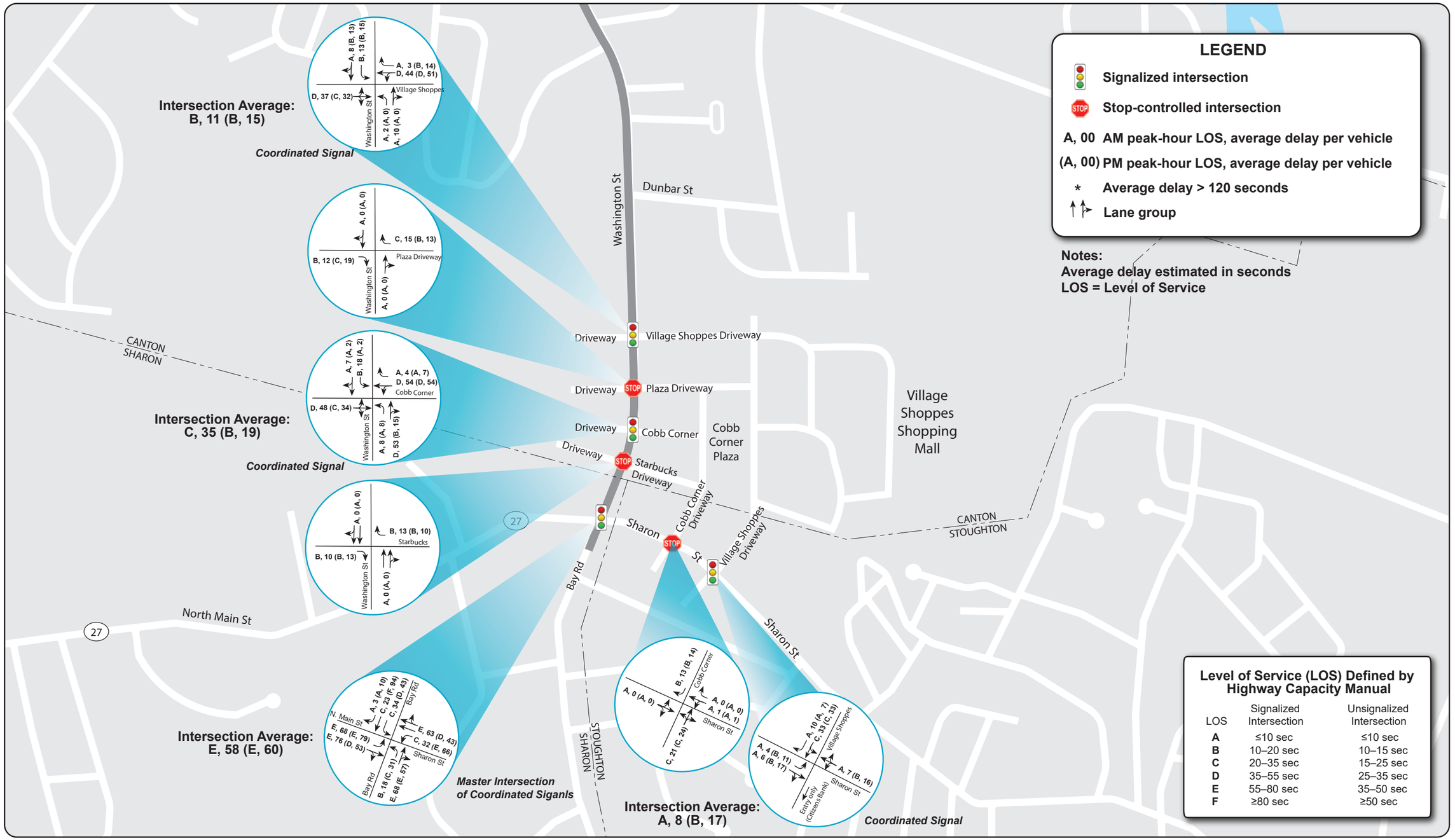

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Figure 23
2030 Weekday AM/PM Peak-Hour Intersection Capacity Analyses with Proposed Improvements, Part 2
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

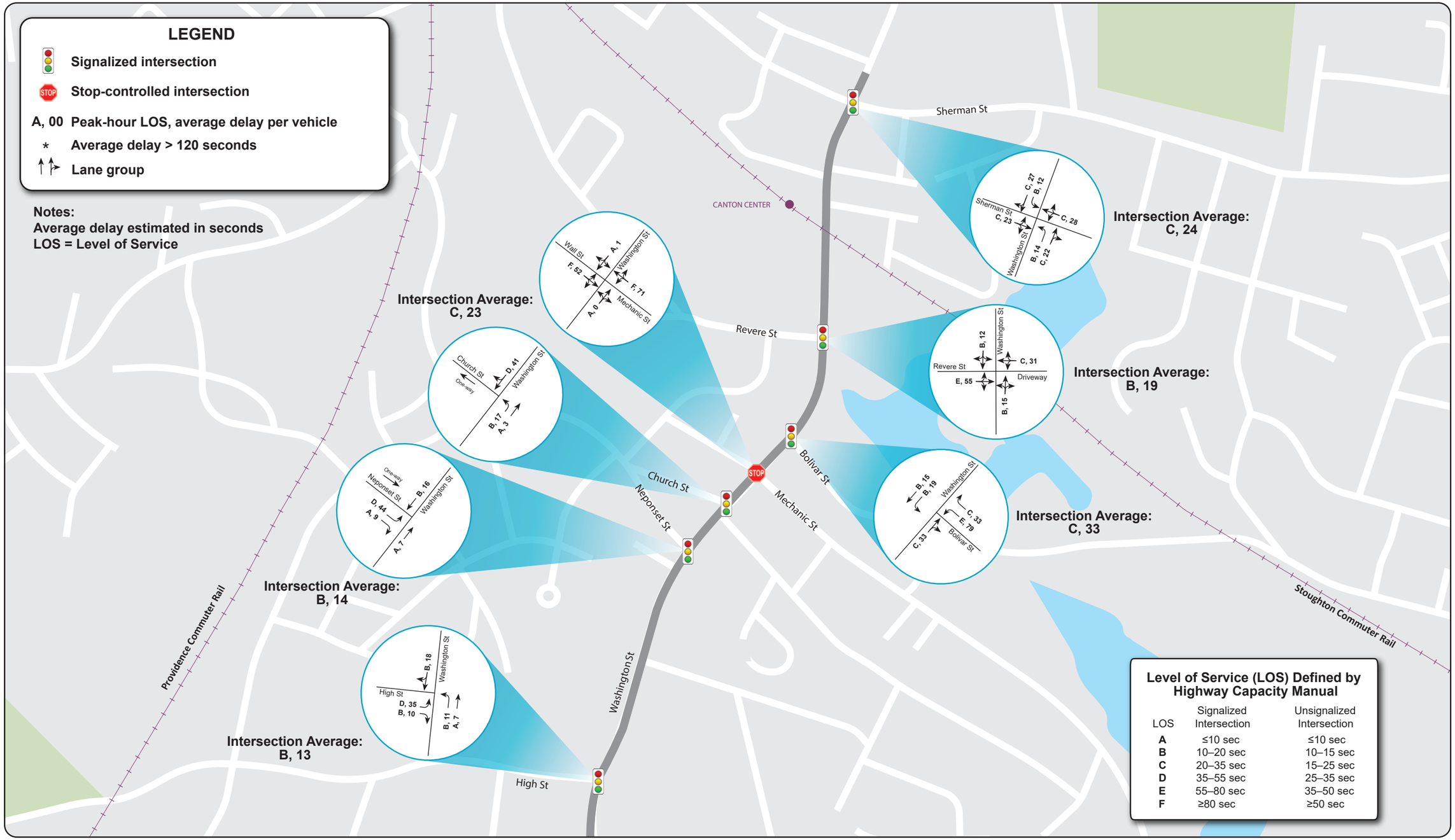

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Figure 24
2030 Saturday Peak-Hour Intersection Capacity Analyses with Proposed Improvements, Part 1
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways

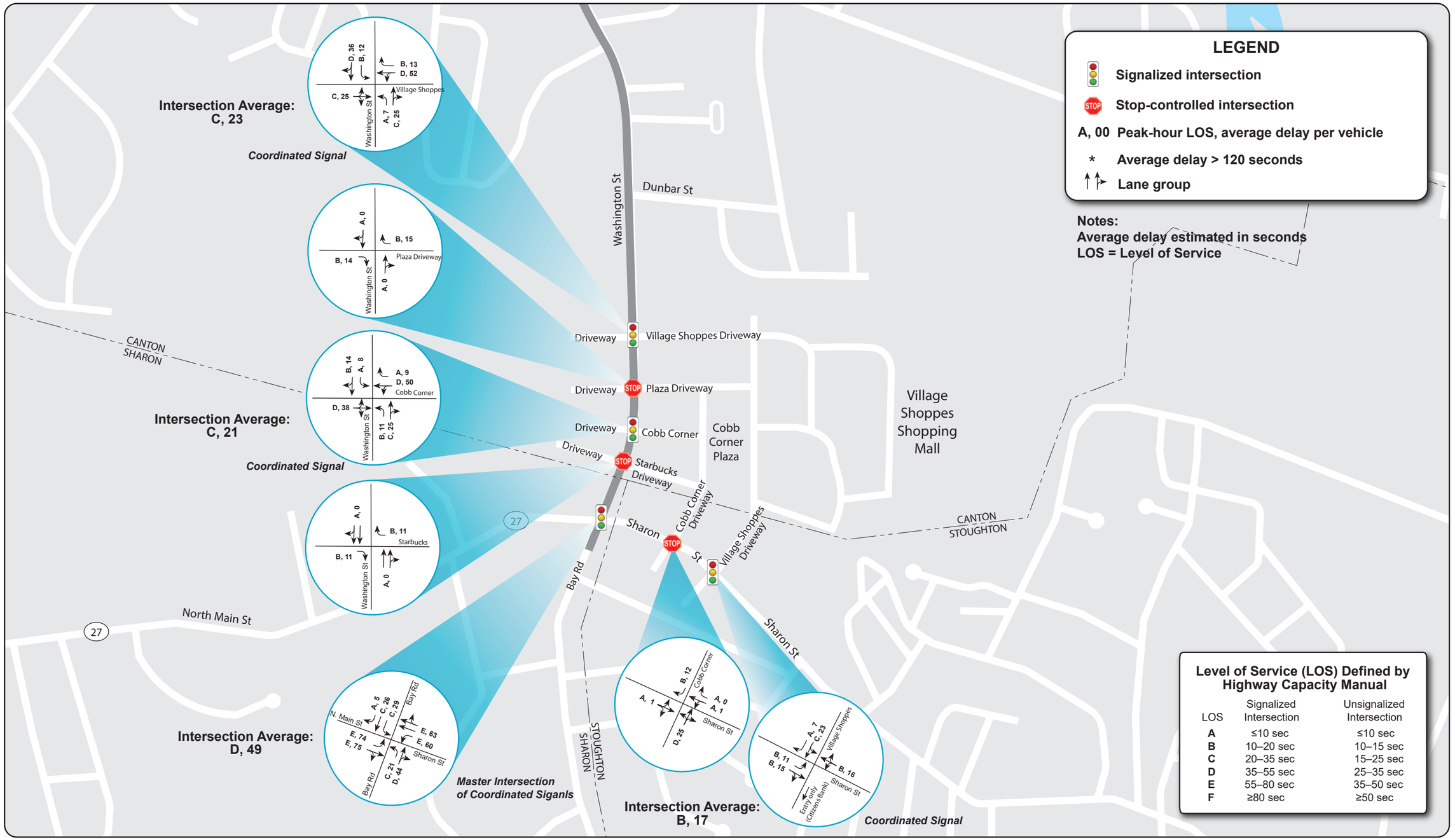

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Figure 25
2030 Saturday Peak-Hour Intersection Capacity Analyses with Proposed Improvements, Part 2
Washington Street in Canton

Addressing Safety, Mobility, and Access on Subregional Priority Roadways