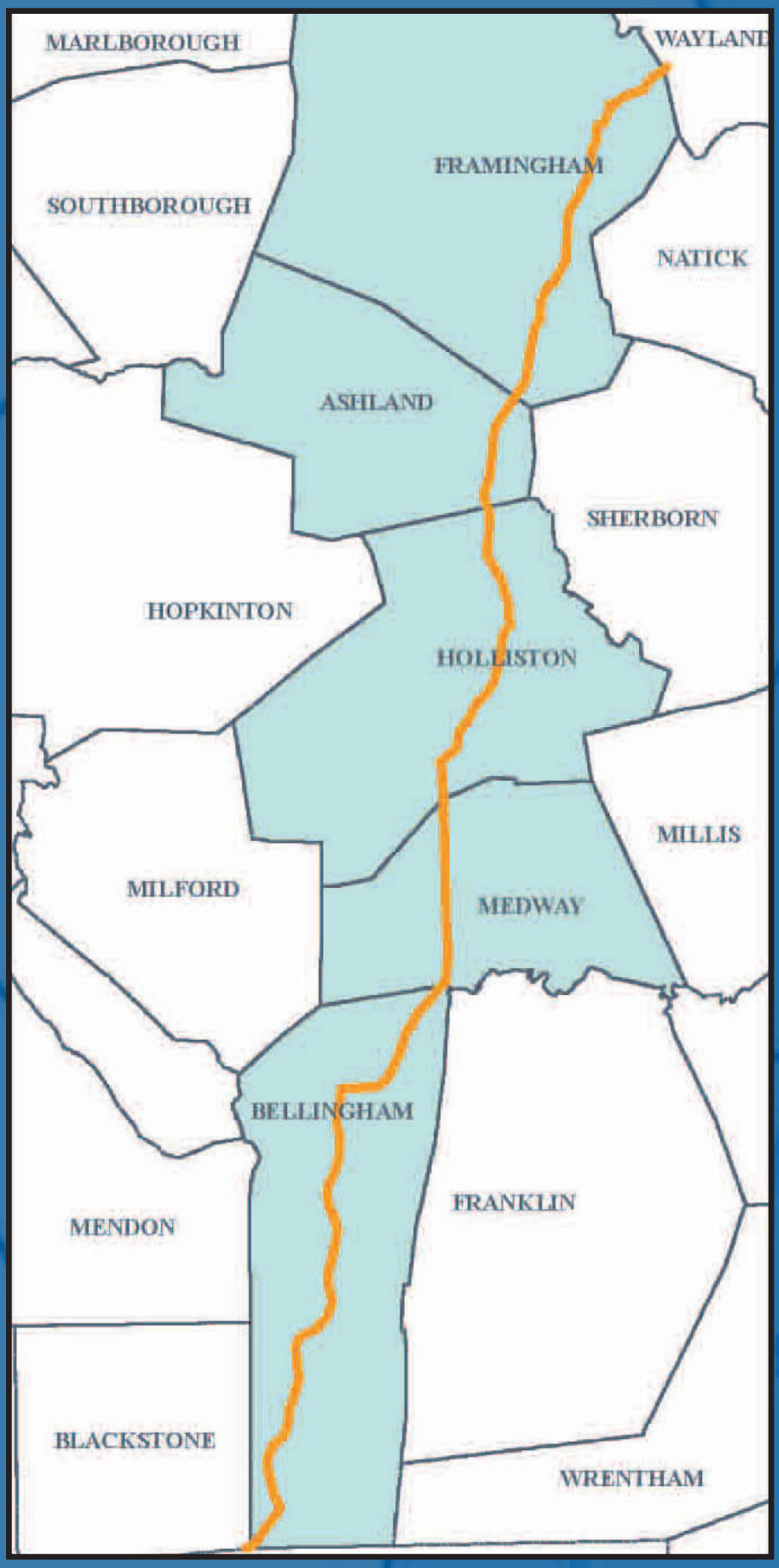
Route 126 Corridor:
Transportation Improvement Study
Bellingham to Framingham



Boston Region Metropolitan Planning Organization

Route 126 Corridor: Transportation Improvement Study

Bellingham to Framingham

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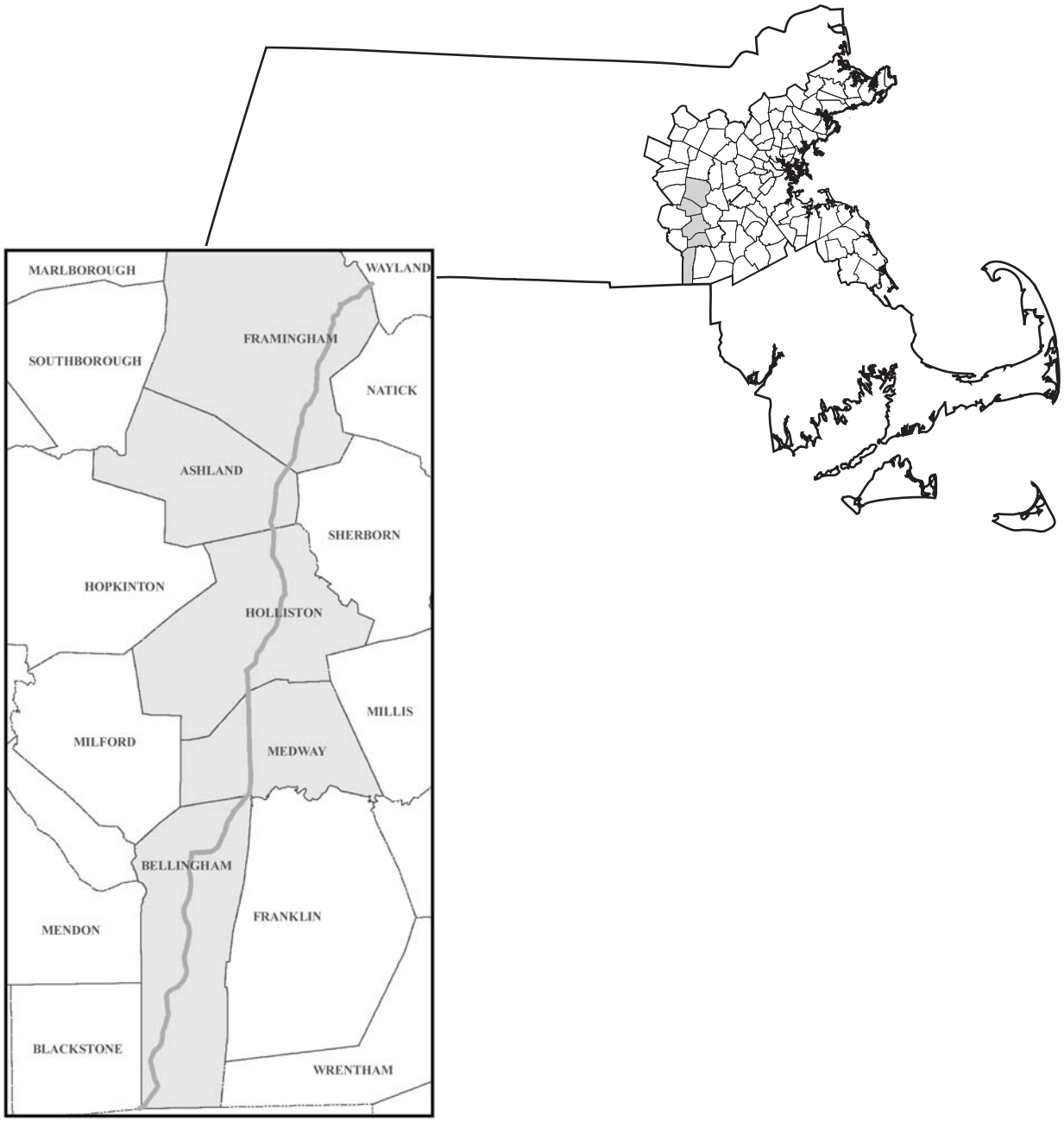

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ABSTRACT

Route 126 is a key arterial corridor serving the communities of Ashland, Bellingham, Framingham, Holliston, and Medway. The study corridor, which extends about 24 miles from Bellingham in the south through Medway, Holliston, and Ashland to Framingham in the north, serves various land uses, including but not limited to residential, commercial, educational, recreational, and religious. The name of the roadway changes at different sections in each of the communities along the corridor.

This north–south roadway is two lanes wide for the majority of its length, and wider, including exclusive turning lanes, in the areas with strip malls and shopping centers, and at major intersections. The average daily traffic ranges from 11,000 vehicles per day in Medway to as high as 30,000 vehicles per day in Framingham, but each of the majority of the sections carries 16,000 vehicles per day. Route 126 is a major commuter route; many of the trips to and from Forge Park Station on the Franklin commuter rail line, Framingham Station on the Worcester commuter rail line, and the employment centers in MetroWest, Boston, and Cambridge use portions of Route 126.

This study was initiated in response to the high traffic volumes and delay, and pedestrian mobility problems, that characterize the corridor, especially at the town centers, areas with strip malls, and at major intersections. The documentation of these problems was based on the following:

- Monitoring activities of the Congestion Management Process (CMP)
- Prior Boston Region Metropolitan Planning Organization (MPO) studies
- Concerns expressed by community officials about pedestrian circulation, bicycle accommodation, and intersections with traffic safety problems.

The study was included in the federal fiscal year (FFY) 2009 and FFY 2010 Unified Planning Work Programs (UPWPs) and was given approval in March 2009 to commence. The objectives of this study were to identify transportation-related problems in the study corridor and to develop and evaluate multimodal transportation solutions to the problems. MPO staff established and worked closely with an advisory task force to guide this study.

Acknowledgments

We wish to thank the task force, the Massachusetts Department of Transportation's Highway Division, the Metropolitan Area Planning Council (MAPC), the 495/MetroWest Partnership, and the towns of Ashland, Bellingham, Framingham, Holliston, and Medway for participating in this study and supplying us with data and information. We also wish to thank all those who participated in this study through meetings, feedback, and reviews.

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KEYWORDS

bicycle
crash
intersection delay
level of service
pedestrian

EXECUTIVE SUMMARY

Route 126 is a key arterial corridor serving the communities of Ashland, Bellingham, Framingham, Holliston, and Medway. It serves various land uses, including residential, commercial, business, educational, recreational, and religious. This north–south roadway is two lanes wide for the majority of its length, and wider, including exclusive turning lanes, in the areas with strip malls, shopping centers, and at major intersections. The average daily traffic on Route 126 ranges from 11,000 vehicles per day in Medway to as high as 30,000 vehicles per day in Framingham, but each of the majority of the sections carries 16,000 vehicles per day.

S.1 IDENTIFIED PROBLEMS

This study identified several sections of the Route 126 corridor in Bellingham, Medway, Holliston, Ashland, and Framingham that experience traffic congestion during the peak travel periods. Field reconnaissance and data analysis conducted by MPO staff indicated that the corridor is characterized by high traffic volumes and delay, and pedestrian mobility problems, especially at the town centers, areas with strip malls, residential areas, and major intersections. The study identified several sections of the corridor in Bellingham, Holliston, and Ashland where residential neighborhoods lack sidewalks.

Traffic congestion in the corridor also impacts the operations of the MetroWest Regional Transit Authority (MWRTA). MWRTA buses, which operate on Route 126 from Framingham, through Ashland, to Holliston, have difficulty meeting on-time performance standards due to traffic congestion.

An analysis of crash data and observations and data from field visits shows that many intersections in the study corridor are high-crash locations or have sight-distance problems. The MPO staff's analysis of the 2006–07 pavement serviceability index for Route 126 indicated that major pavement rehabilitation is needed at various sections of the study corridor in Ashland, Bellingham, Framingham, Holliston, and Medway.

It was also found that there are drainage-related problems in the corridor that impact travel and the pavement condition, especially, in Bellingham and Holliston. Finally, in this study, community officials expressed concern about pedestrian circulation, bicycle accommodation, curb cuts, and intersections with traffic safety problems.

S.2 STUDY OBJECTIVES

The Boston Region Metropolitan Planning Organization (MPO) included the Route 126 Corridor Study in the federal fiscal year (FFY) 2009 and the FFY 2010 Unified Planning Work Programs (UPWPs). The study was approved in March 2009 to identify the transportation problems and propose improvements. The objectives of this study were to identify mobility, safety, and other transportation-related problems at selected locations within the study corridor and to identify and evaluate multimodal transportation solutions to the problems.

In this study, MPO staff established an advisory task force to guide the study. The advisory task force was composed of state elected officials; representatives from the communities of Ashland, Bellingham, Framingham, Holliston, and Medway; the Massachusetts Department of Transportation (MassDOT); the Metropolitan Area Planning Council (MAPC); the 495/MetroWest Partnership; the MetroWest Regional Transit Authority (MWRTA); the MetroWest Regional Collaborative (MWRC); and the SouthWest Advisory Planning Committee (SWAP). MPO staff worked closely with the task force in identifying problems and developing solutions to the problems.

S.3 RECOMMENDED SOLUTIONS

In this study, MPO staff, in conjunction with the task force, developed several categories of improvements to address the problems identified in the corridor. They include improvements related to sidewalks (continuity and connectivity), pedestrian crossings, traffic control (including traffic signal retiming and equipment upgrades), signs and pavement markings, pavement rehabilitation, drainage, and bus service improvements (on-time performance and bus bays). Figures ES-1 through ES-5 summarize the proposed improvements and their construction costs, from Bellingham in the south to Framingham in the north.

S.4 NEXT STEP

The successful implementation of the projects advancing from this study is dependent on coordination among the stakeholders, sufficient public participation, and securing funding for the projects.

This study provides the initial steps required for implementing projects, such as identifying needs and developing possible solutions. These steps include defining the existing context, confirming project need, establishing goals and objectives, initiating public outreach, defining the project, collecting data, developing and analyzing alternatives, making recommendations, and providing documentation.

The next step, following this planning study, is project initiation—a process that requires the proponent to fill out, for each improvement, a Project Initiation Form (PIF), which is reviewed by the MassDOT Highway Division's Project Review Committee (PRC) and the MPO. The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation.

First the PRC reviews and evaluates the proposed project based on the Massachusetts Department of Transportation's statewide priorities and criteria. If the result is positive, the MassDOT Highway Division moves the project forward to the design phase. The programming review by the MPO is generally done during the design phase, but may occur at any time during the process. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes a project evaluation based on the MPO's regional priorities and criteria. The MPO may assign a project evaluation criteria score, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

In addition, the towns may want to advance projects with their own resources or apply to the Boston Region MPO's Congestion Mitigation and Air Quality (CMAQ) program for funding for some of the proposed improvements.

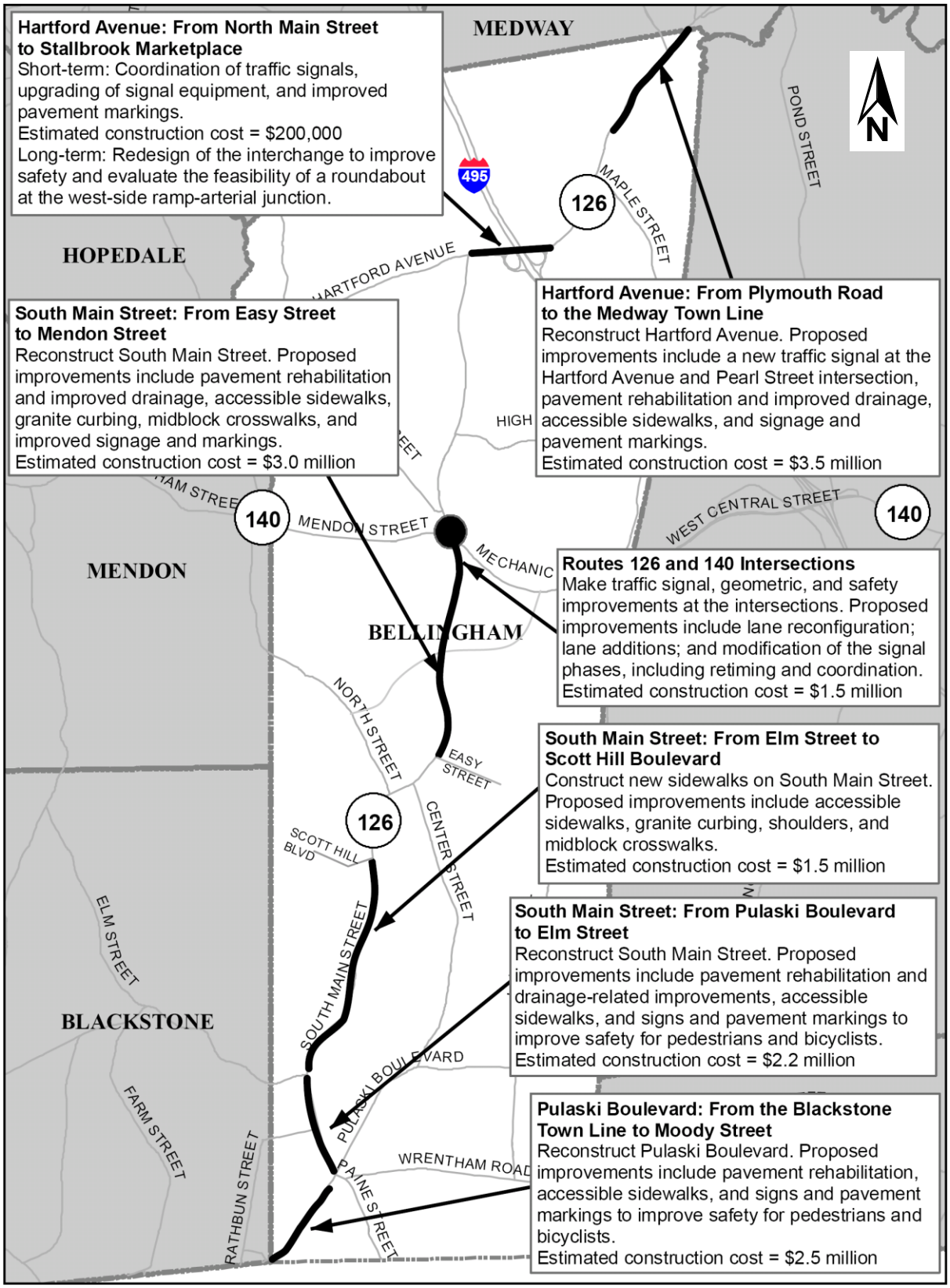

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FIGURE ES-1
Recommendations: Bellingham

Route 126 Corridor Study

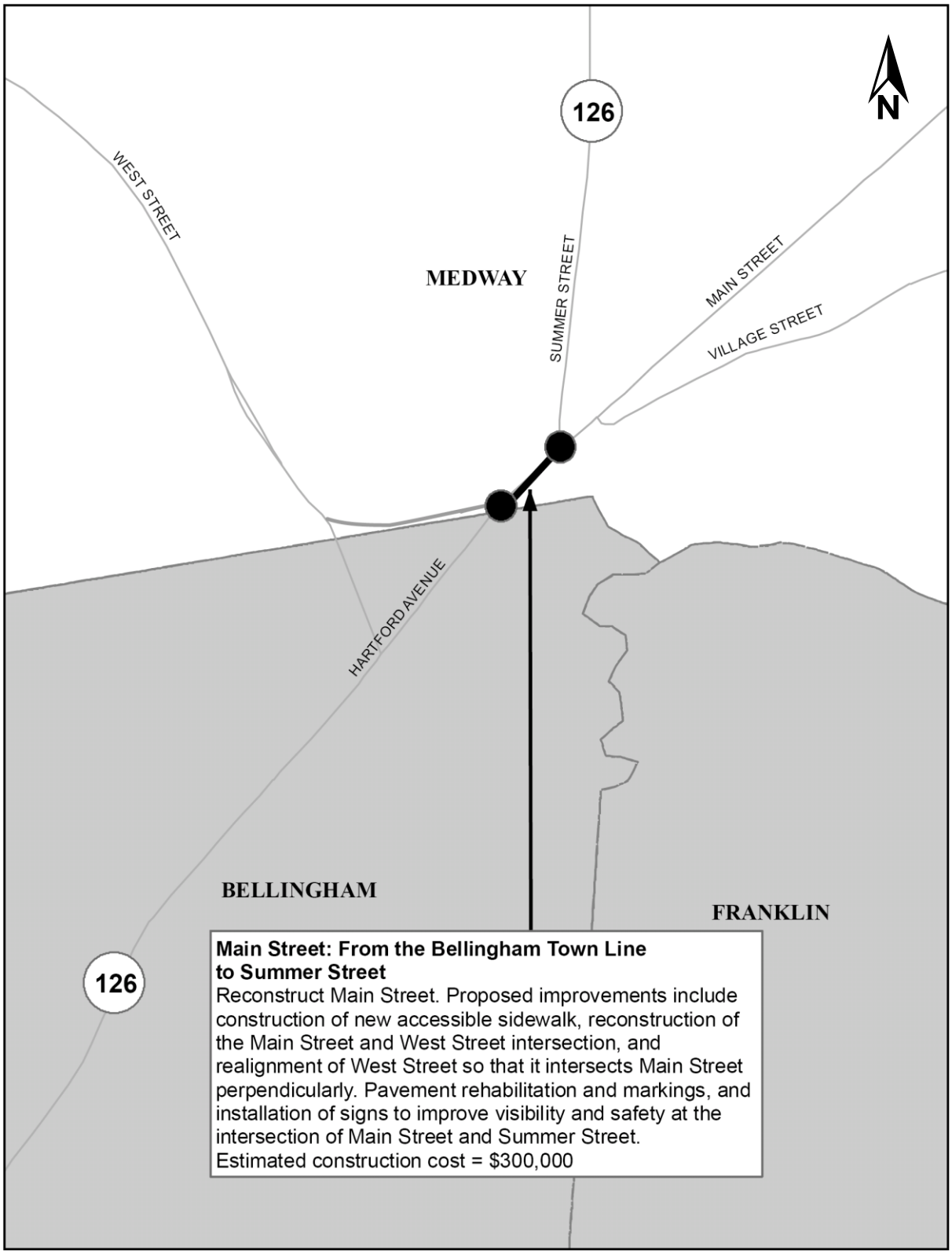

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FIGURE ES-2
Recommendations: Medway

Route 126 Corridor Study

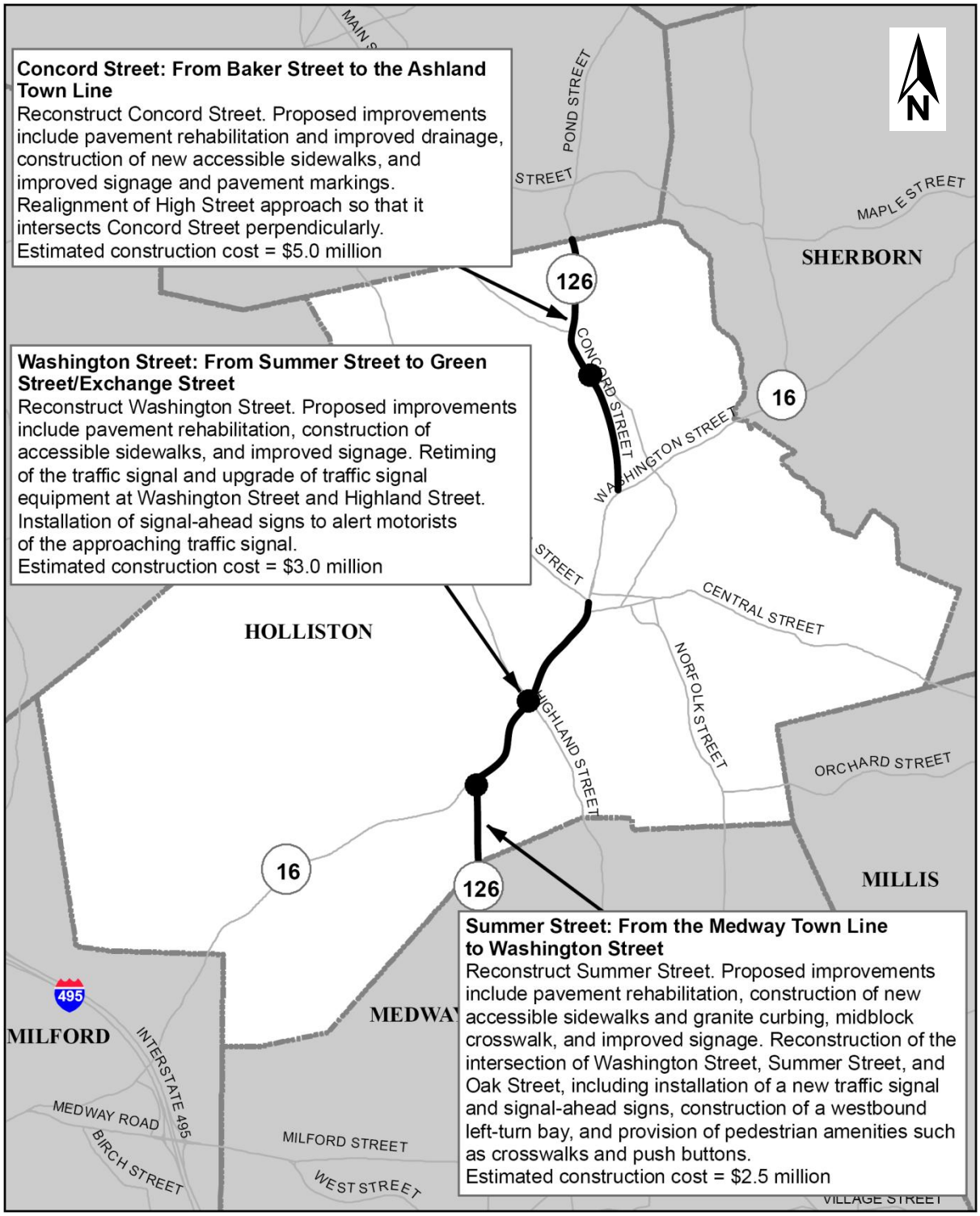

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FIGURE ES-3
Recommendations: Holliston

Route 126 Corridor Study

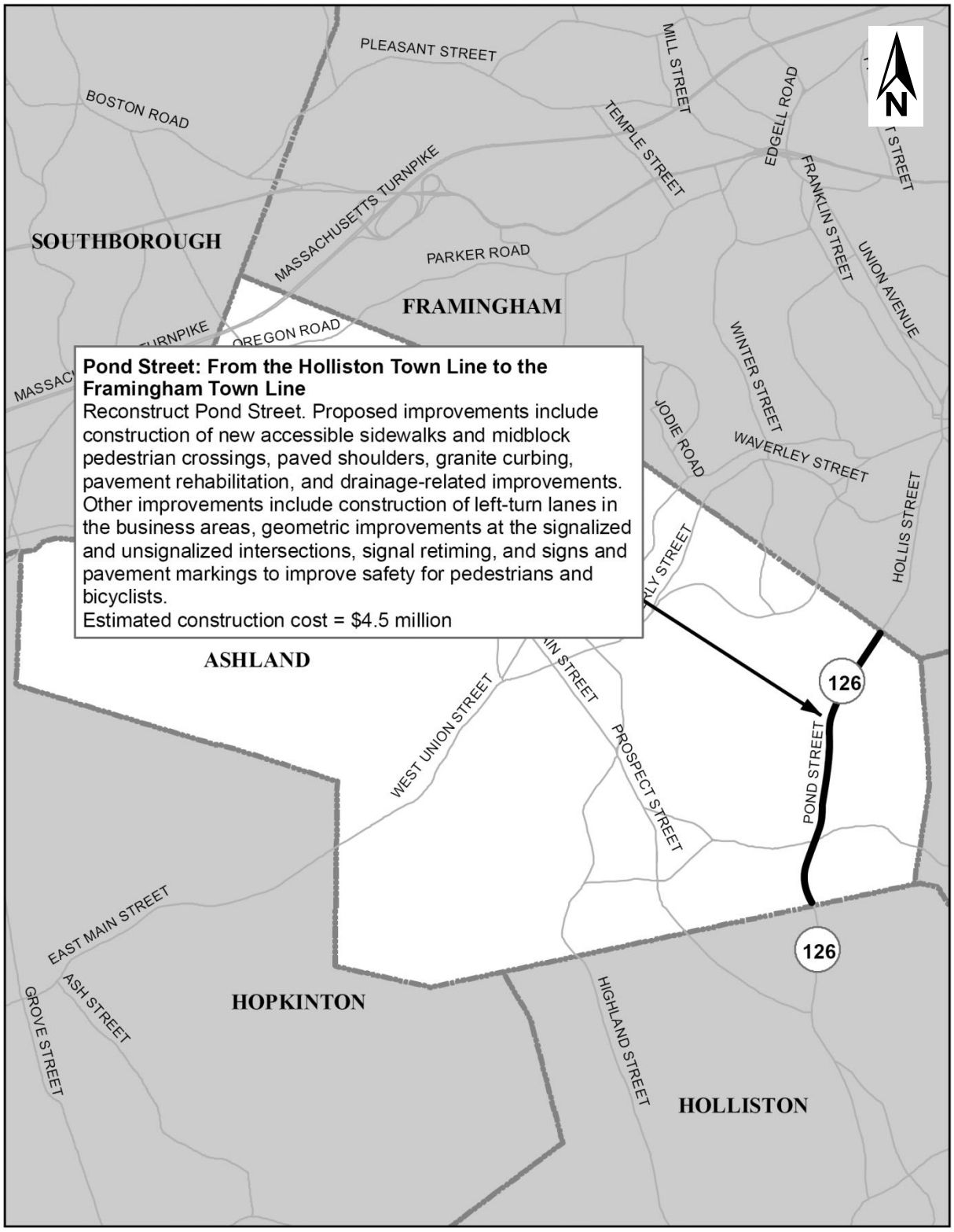

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FIGURE ES-4
Recommendations: Ashland

Route 126 Corridor Study

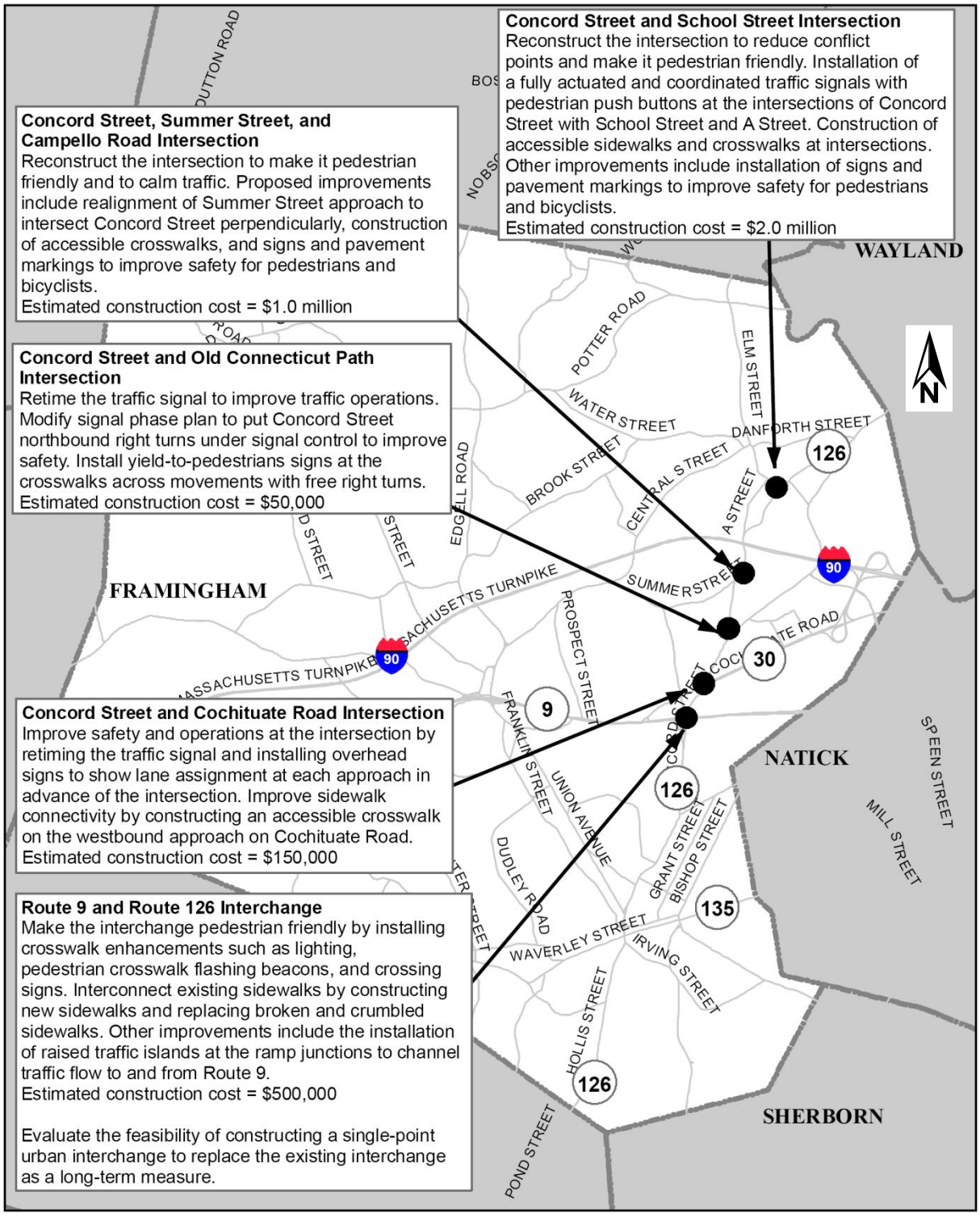

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FIGURE ES-5
Recommendations: Framingham

Route 126 Corridor Study

1 INTRODUCTION

1.1 THE ROUTE 126 CORRIDOR

This chapter gives an overview of this study. The study's origin and objectives and the characteristics of the Route 126 corridor, including jurisdiction, traffic volumes, pavement conditions, travel speeds, right-of-way, and transit routes, are described in general in this chapter. The public-participation efforts that contributed to this study are also presented in this chapter.

1.1.1 ROADWAY JURISDICTION

Route 126 is a key arterial corridor serving the communities of Ashland, Bellingham, Framingham, Holliston, and Medway. It serves various land uses, including but not limited to residential, commercial, business, educational, recreational, and religious. The study corridor extends about 24 miles from Bellingham in the south, through Medway, Holliston, and Ashland, to Framingham in the north (Figure 1-1). Route 126 crosses major roadways including, from south to north, Route 140 (Mechanic Street) and Interstate 495 in Bellingham; Route 109 (Milford Street) in Medway; Route 16 (Washington Street) in Holliston; and Route 135 (Waverley Street), Route 9 (Worcester Street), and Route 30 (Cochituate Road) in Framingham.

The name of the roadway changes at different sections of Route 126 in each of the communities in the corridor. It is called:

- South Main Street, North Main Street, and Hartford Avenue in Bellingham
- Main Street and Summer Street in Medway
- Summer Street, Washington Street, and Concord Street in Holliston
- Pond Street in Ashland
- Concord Street and School Street in Framingham

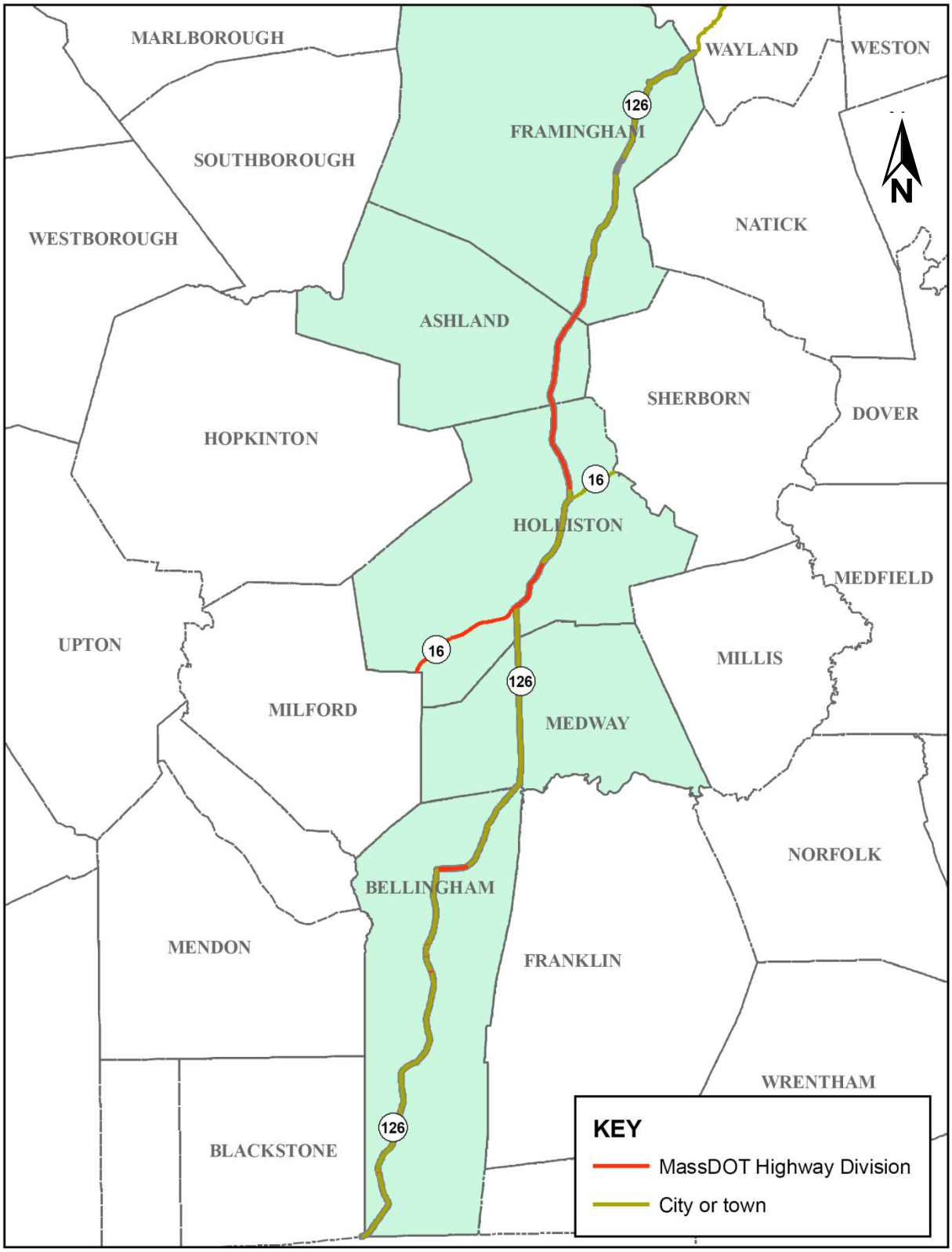

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FIGURE 1-1
Study Corridor and Roadway Jurisdiction

Route 126 Corridor Study

Figure 1-1 shows the study corridor, the communities along the corridor in the study area, and Route 126 roadway jurisdiction. Sections of the roadway are under the town's or MassDOT Highway Division's jurisdiction. The sections under the MassDOT Highway Division's jurisdiction are:

- Bellingham
  - The segment where Routes 126 and 140 are combined
  - Hartford Avenue, from North Main Street to 1,000 feet east of the I-495 underpass
- Holliston
  - Washington Street south of Pine Street/Pearl Street
  - Concord Street north of Baker Street to the Ashland town line
- Ashland
  - The entire segment of Pond Street that is located in Ashland
- Framingham
  - From the Ashland town line to Lincoln Street

1.1.2 TRAFFIC VOLUMES AND SPEEDS

This north–south roadway is two lanes wide for the majority of its length, and it is wider, and includes exclusive turning lanes, in the areas with strip malls, shopping centers, and at major intersections. The average daily traffic ranges from 11,000 vehicles per day on Summer Street in Medway to as high as 30,000 vehicles per day on Concord Street in Framingham, but the majority of the sections each carry 16,000 vehicles per day (Figure 1-2). Figure 1-3 shows the observed travel speeds, with annotations for the congested locations, in Bellingham, Medway, Holliston, Ashland, and Framingham during the peak travel periods, 7:00–9:00 AM and 4:00–6:00 PM. The congested locations are:

- Bellingham
  - The Routes 126 and 140 intersections
  - Hartford Avenue, from North Main Street to Stallbrook Marketplace
- Holliston
  - Washington Street, from Summer Street to Concord Street
- Ashland
  - The intersection of Eliot Street and Pond Street
- Framingham
  - Concord Street, from Winthrop Street to Cochituate Road
  - The intersection of Concord Street and School Street

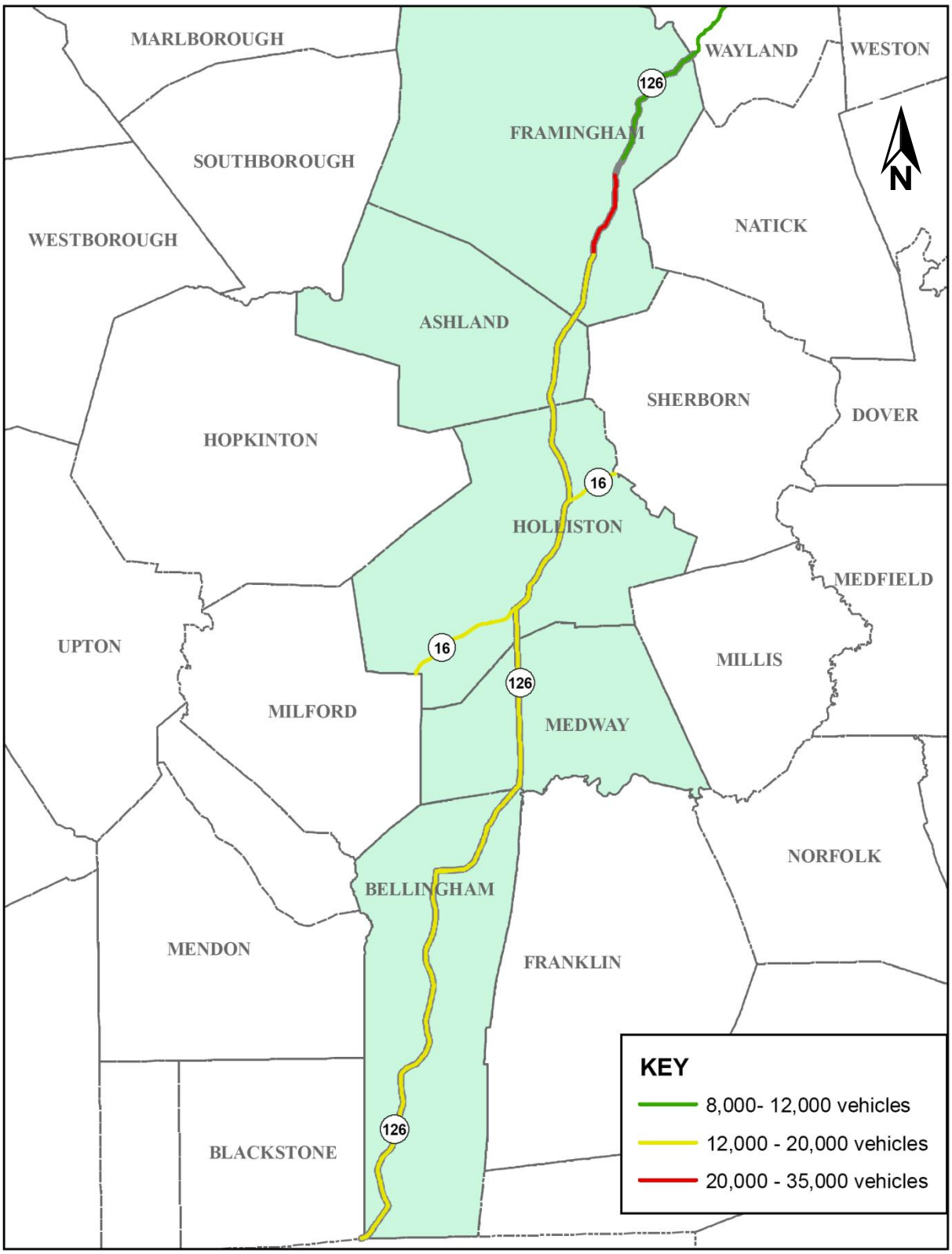

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FIGURE 1-2
Average Daily Traffic (ADT)

Route 126 Corridor Study

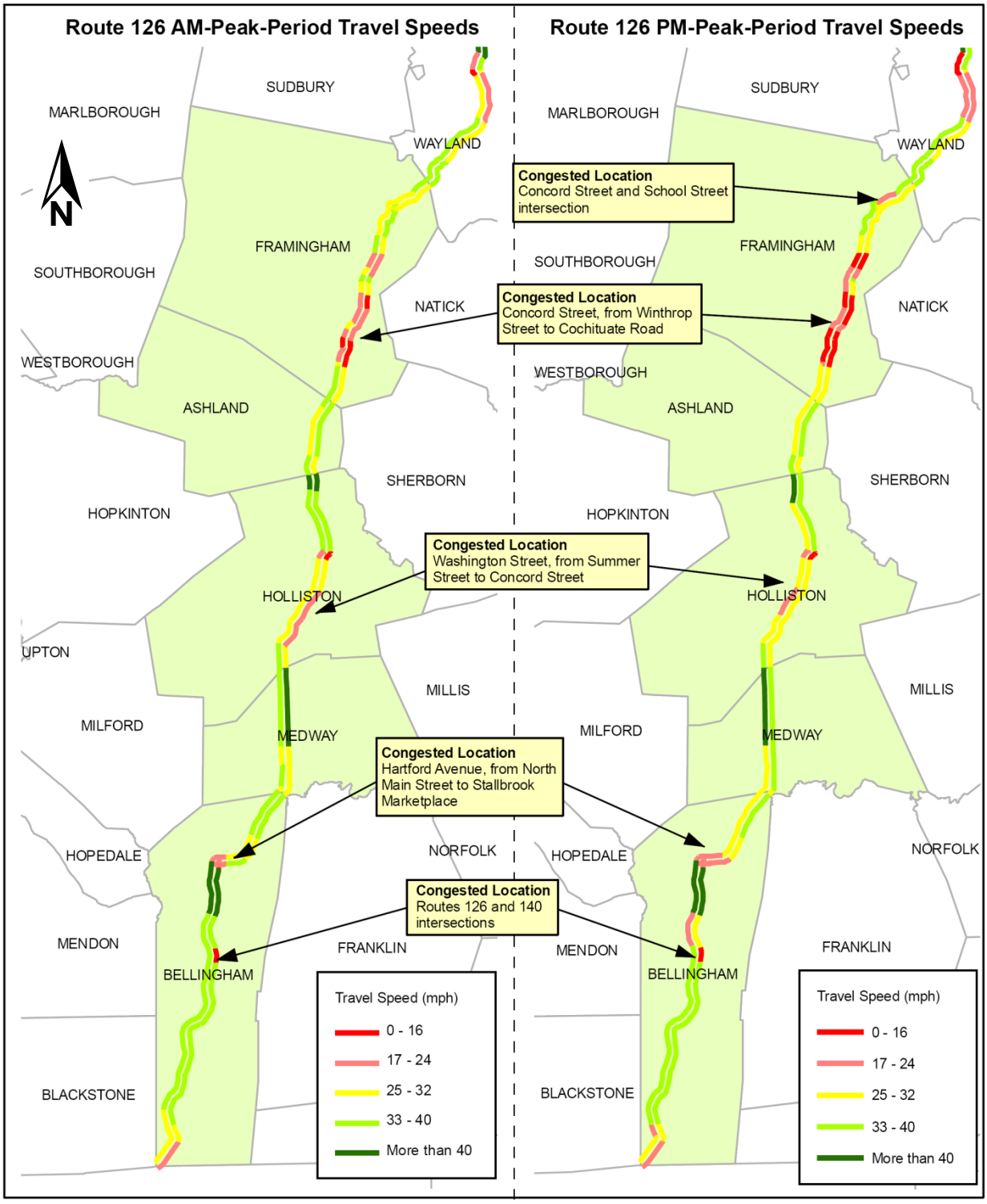

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FIGURE 1-3
Average Travel Speeds

Route 126 Corridor Study

1.1.3 RIGHT-OF-WAY

The existing right-of-way of the roadway varies along the corridor; it is between 37 feet and 48 feet wide for the majority of its length, although there are sections with over 48 feet of right-of-way width (Figure 1-4). The right-of-way includes the pavement width, sidewalks, and space for signs and utilities. The proposed improvements that fit into the existing right-of-way may not require land takings. In general, two 11-foot travel lanes, with a 4-foot shoulder on both sides and a 5.5-foot sidewalk on one side, would require about a 37-foot-wide right-of-way, allowing room for markings.

1.1.4 PAVEMENT CONDITION

The 2006–07 pavement serviceability index for Route 126 is shown in Figure 1-5.[1] The index shows the extent of repairs needed at various sections of the study corridor. Based on measurements of roughness, surface distress, skid resistance, and deflection, pavement is assigned a score that reflects its overall condition. This score, which is based on a scale of 0 to 5, is called a pavement serviceability index (PSI). It quantifies the overall performance of pavement and can be used to trigger treatment, such as scheduled maintenance or rehabilitation, or to determine the extent and cost of repair. A pavement serviceability index greater than or equal to 3.0 is classified as good, while a serviceability index of less than 3.0 requires various forms of maintenance or rehabilitation. In Figure 1-5, the maintenance and rehabilitation categories relate to the following PSI ratings:

- Total reconstruction = a PSI rating of less than 1.75
- Structural overlay = a PSI rating of 1.75 to 2.50
- Thin overlay = a PSI rating of 2.51 to 2.75
- Routine maintenance = a PSI rating of 2.76 to 3.00
- Good pavement = a PSI rating greater than 3.00

1.1.5 COMMUTERS USING ROUTE 126 TO ACCESS TRANSIT AND COMMUTER RAIL

Route 126 is a major commuter route; many of the trips to and from Forge Park/495 Station on the Franklin commuter rail line, Framingham Station on the Worcester commuter rail line, and the employment centers in MetroWest use portions of Route 126. Figure 1-6 shows the transit routes that serve communities in the Route 126 corridor. The MetroWest Regional Transit Authority (MWRTA) operates bus Route 6 on a substantial section of Route 126 from Framingham to Mission Springs Housing in Holliston. The Medway

[1] The 2006–07 pavement serviceability index was obtained from the MassDOT Highway Division.

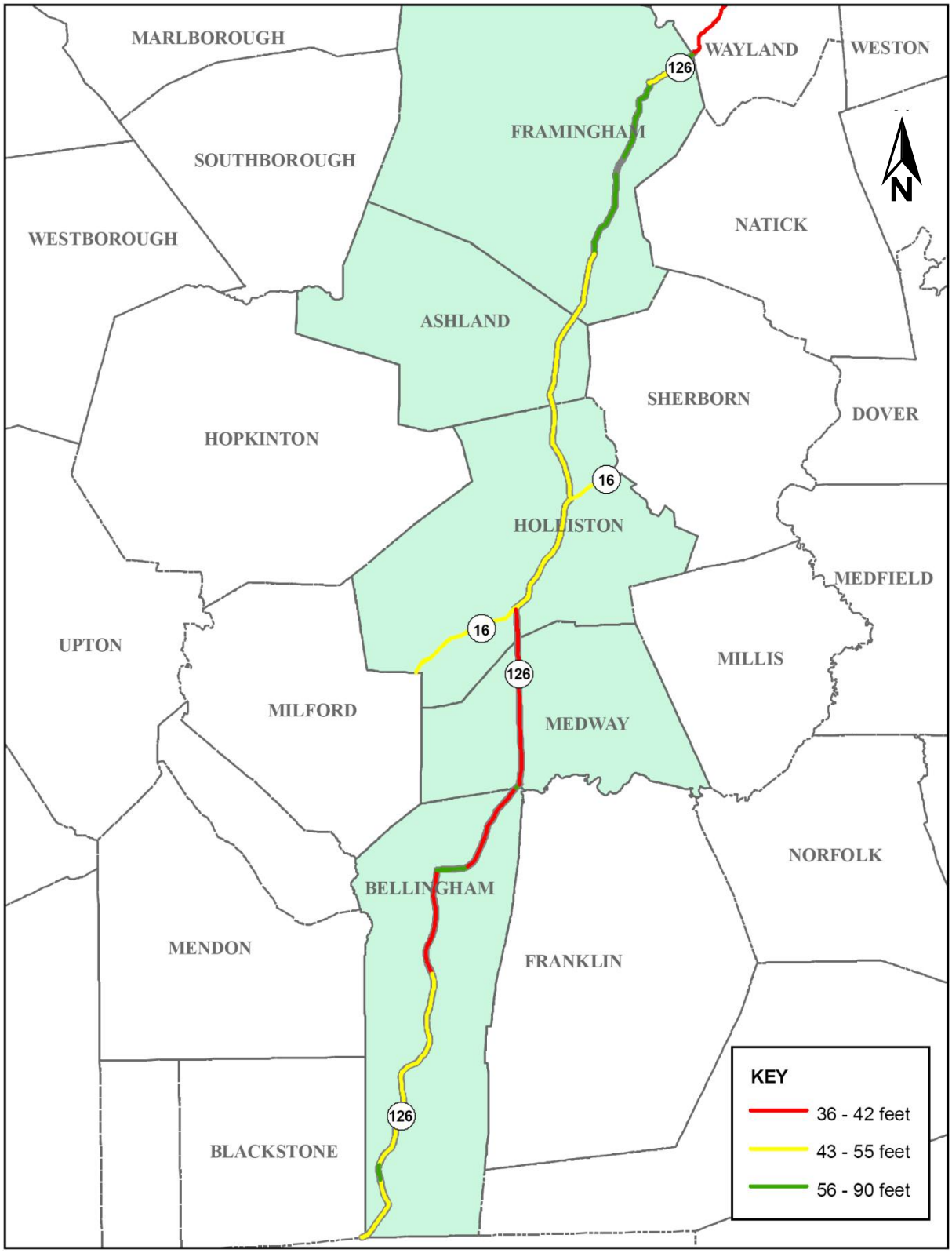

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FIGURE 1-4
Right-of-Way Width

Route 126 Corridor Study

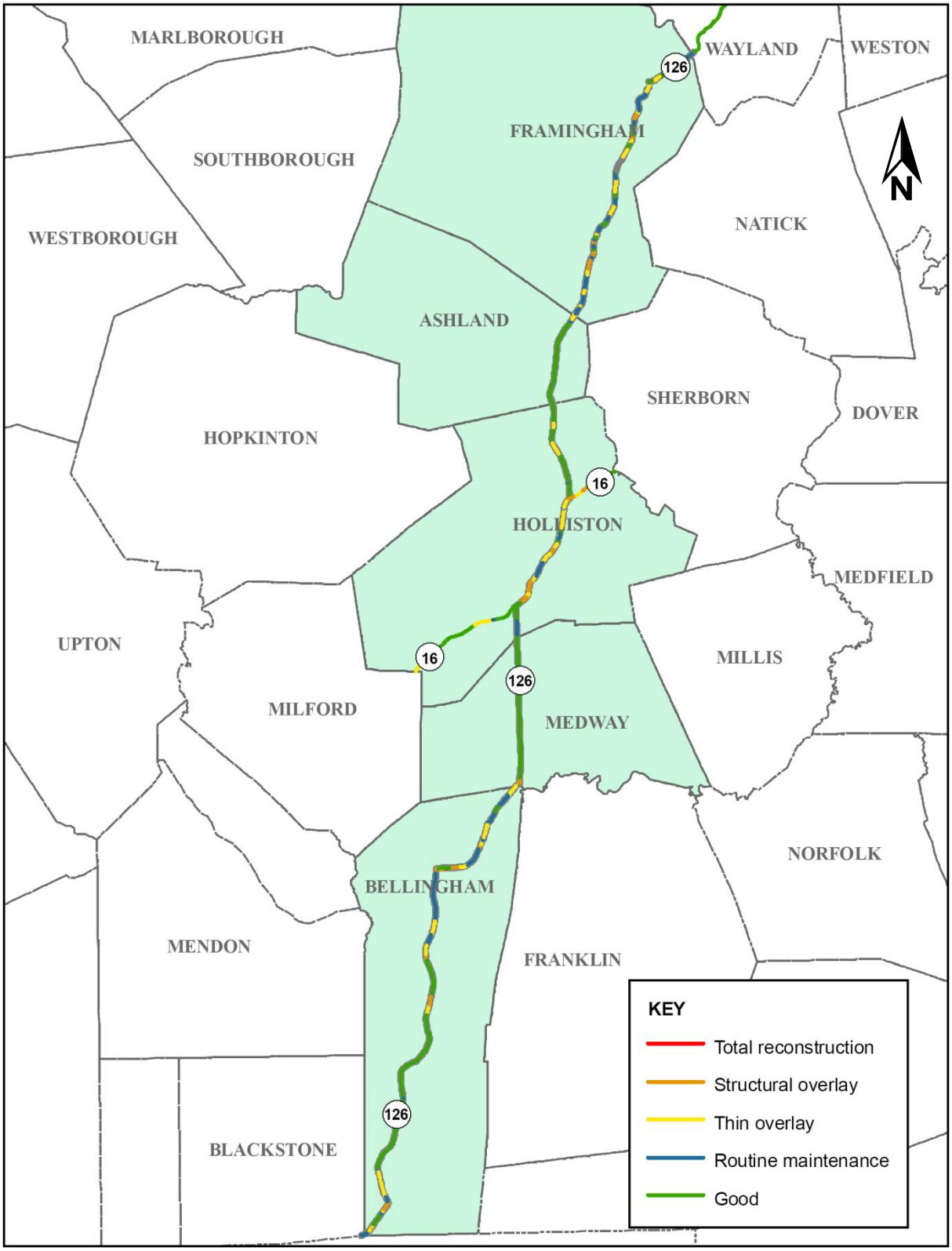

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FIGURE 1-5
2006-07 Pavement Serviceability Index

Route 126 Corridor Study

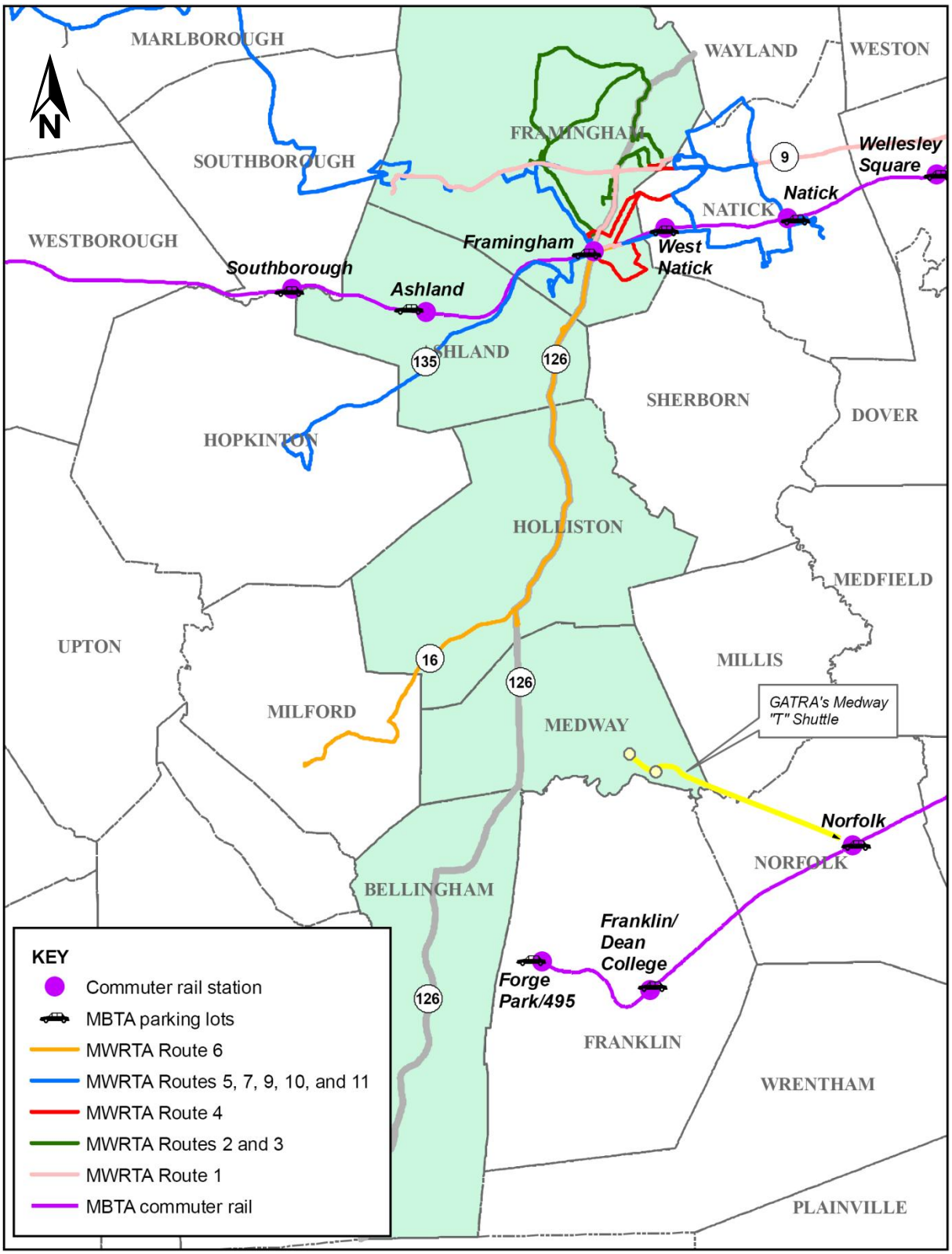

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FIGURE 1-6
Public Transit Serving the Route 126 Corridor

Route 126 Corridor Study

"T" service, operated by the Greater Attleboro Taunton Regional Transit Authority (GATRA) from Medway to the Norfolk commuter rail station, is close to Route 126.

1.2 BACKGROUND OF THE STUDY

This corridor is characterized by high traffic volumes and delay, and pedestrian mobility problems, especially at the town centers, areas with strip malls, residential areas, and major intersections. The documentation of these problems was based on the monitoring of Route 126 that was performed as part of the Congestion Management Process (CMP) of the Boston Region Metropolitan Planning Organization (MPO); on prior Boston Region MPO studies; and on staff knowledge of the area. In addition, community officials have expressed concern about pedestrian circulation, bicycle accommodation, curb cuts and access management, and intersections with traffic safety problems.

Based on the above information, the Boston Region MPO included the Route 126 Corridor Study in the federal fiscal year (FFY) 2009 and FFY 2010 Unified Planning Work Programs (UPWPs). The work scope for the study was approved in March 2009 to identify transportation problems and propose improvements for this corridor.

1.3 OBJECTIVES OF THE STUDY

The objectives of this study were to identify mobility, access, safety, and other transportation-related problems at selected locations within the study corridor and to identify and evaluate multimodal transportation solutions to the problems. To meet these objectives, staff first established an advisory task force to guide the study. The advisory task force was composed of state elected officials; representatives from the communities of Ashland, Bellingham, Framingham, Holliston, and Medway; the Massachusetts Department of Transportation (MassDOT); the Metropolitan Area Planning Council (MAPC); the 495/MetroWest Partnership; the MetroWest Regional Transit Authority (MWRTA); the MetroWest Regional Collaborative (MWRC); and the SouthWest Advisory Planning Committee (SWAP).

MPO staff, in conjunction with the task force, identified several sections of Route 126 that experience problems related to pedestrian mobility, traffic safety and operations, pavement deterioration, drainage, and bus transit service in order to evaluate multimodal transportation solutions to address the problems. The locations selected for analysis were the ones that could benefit from improvements related to pedestrian crossings, sidewalks (continuity and connectivity), access management, traffic control (including traffic signal upgrades and coordination), signs and pavement markings, pavement rehabilitation, and bus service improvements (on-time performance and bus bays).

1.4 COMMUNITY INVOLVEMENT

In order to receive input to this study, MPO staff met with the task force at the following times and locations:

- September 2008 in Medway at the Town Hall to discuss the work scope of this study and to identify problem locations to be included in the study. SWAP members and town officials were present at the meeting.
- December 2008 in Framingham at MWRTA's office to discuss the work scope of this study and to identify problem locations to be included in the study. MWRC and MWRTA members and town officials were present at the meeting.
- June 25, 2009, in Bellingham to finalize the identification of problem locations and how data collection would be performed for an analysis of existing conditions. SWAP and MWRC members, and town officials, were present this meeting (see appendix for attendance).
- February 9, 2010, in Ashland to present the results of the existing-conditions study and proposed improvements for feedback. SWAP and MWRC members, and town officials were present this meeting (see appendix for attendance).

At the first two meetings, the focus was primarily on safety, capacity, and pedestrian movements at major intersections in the corridor. The task force was also concerned with bus mobility and service issues, including access and connectivity. Furthermore, the task force wanted a long-term vision for the Route 126 corridor that would be compatible with the expected land use and economic development in the area. MPO staff collected data and assembled already-existing data on traffic volumes, pedestrian volumes, travel time, travel speed, and crashes to determine the existing travel conditions in the corridor. In addition, MPO staff conducted field reconnaissance to verify the magnitude of the problems.

On August 30, 2010, MPO staff forwarded the draft report to the task force for a final review and comment. Comments from the task force were addressed and incorporated into the final report.

The following chapter describes the scope of analysis that was conducted to evaluate the existing conditions and the proposed improvements for addressing the problems identified by MPO staff.

SCOPE OF ANALYSIS

In this chapter, we present the scope of the analyses that were used in this study to analyze, both quantitatively and qualitatively, the safety, traffic operations, and pedestrian and bicycle mobility problems in the corridor. Several types of data were collected from the field or obtained from other sources and used to evaluate the existing traffic operations, safety conditions, and proposed improvements.

2.1 DATA COLLECTION

2.1.1 TRAFFIC COUNTS

Turning-movement counts were collected in the field in June and September 2009. These counts were conducted during the morning peak travel period (7:00 AM to 9:00 AM) and the afternoon peak travel period (4:00 PM to 6:00 PM) on weekdays. The turning-movement counts were recorded in 15-minute intervals.

The MassDOT Highway Division conducted automatic traffic recorder (ATR) counts for this study at selected locations. The ATR counts are 24-hour counts conducted at a location for two or more consecutive days. These counts were used for intersection capacity analysis, the assessment of traffic signal warrants, and the calculation of crash rates.

2.1.2 PEDESTRIAN COUNTS

The pedestrian counts were conducted simultaneously with the traffic counts at the same locations. MPO staff also took inventory of the pedestrian and bicycle amenities provided at the intersections, such as curb cuts for wheelchairs, crosswalks, sidewalks, and pedestrian-activated push buttons. The pedestrian counts were used in determining the need for intersection crosswalks, sidewalks, and midblock pedestrian crossings.

2.1.3 SAFETY DATA

MPO staff obtained crash data and reports from the MassDOT Highway Division and from the towns. The MassDOT Highway Division uses crash data for a number of functions. The primary function, however, is to provide the foundation for developing safety improvement projects. Given the fact that vehicle collisions are somewhat random events, it is difficult to draw inferences from year-to-year trends in the data, and this is the primary reason why the MPO staff traditionally reviews a combined average of three consecutive years of data. By using crash data over a three-year period, the effects of anomalies in the data are minimized.

2.1.4 TRANSIT DATA

The transit data used in this study were obtained from a recent MPO study carried out for the MWRTA. [2] That study collected data on bus ridership, on-time performance, the location of bus stops, and route information. Information on the Medway "T" shuttle was obtained from the Town of Medway's website. The data and other information gathered were used to determine areas where buses experience excessive delay, and where there is a need for bus shelters and bays.

2.2 TYPES OF ANALYSIS

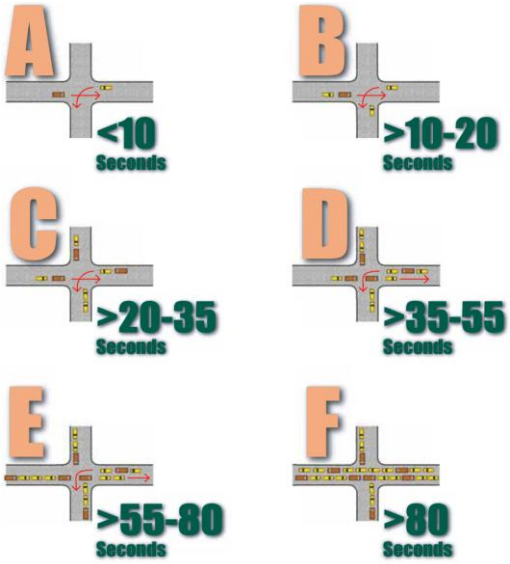
The analyses in this study were focused on identifying and defining the problems at each study location, as well as identifying potential improvements. Both quantitative and qualitative analyses were conducted to evaluate traffic operations and safety, pedestrian and bicycle safety, and potential improvements for bus transit service. The following section describes the types of analysis that were conducted in this study.

2.2.1 TRAFFIC OPERATIONS ANALYSIS

For traffic operations analyses, the performance measures used in defining problems include control delay and associated levels of service, and queue lengths. Control delay, measured in seconds per vehicle, is the component of delay that results from a traffic control at an intersection (including a traffic signal, a two-way or four-way stop sign, and roundabouts). It is the difference between the travel time that would have occurred in the absence of the intersection control and the travel time that results because of the presence of the intersection control.

[2] Jonathan Belcher, of the Central Transportation Planning Staff, "Evaluation of MWRTA Fixed Route Network," a memorandum to the MPO's Transportation Planning and Programming Committee, dated November 24, 2009.

The concept of level of service (LOS) is used to rate the performance of traffic operating conditions at intersections, and it is directly related to control delay. A level-of-service (LOS) rating summarizes the quality of traffic flow using a grading system of six levels of service. LOS A is the optimal condition, where intersection operations are at their best, with LOS F indicating congested conditions. The range of LOS A through LOS D is considered acceptable; LOS E and LOS F are considered unacceptable—the facility is either at capacity or unable to handle traffic demands.



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2.2.2 TRAFFIC SIGNAL WARRANT ANALYSIS

A traffic signal warrant analysis is a process where the Manual on Uniform Traffic Control Devices (MUTCD)[3] is followed to determine whether an intersection meets the criteria that have been set forth in the MUTCD for the installation of a traffic signal. The investigation of the need for a traffic signal includes an analysis of applicable factors contained in the following traffic signal warrants and other factors related to the existing operations and safety of the study location:

- **Warrant 1 – Eight-Hour Vehicular Volume** is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal (Condition A), or where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street (Condition B).
- **Warrant 2 – Four-Hour Vehicular Volume** is intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic signal.
- **Warrant 3 – Peak Hour** is intended to be applied where traffic conditions are such that for a minimum of one hour of an average day, the traffic on the minor street at its intersection with a major street suffers undue delay when entering the major street. This warrant is usually applied only in the vicinity of facilities that attract or discharge large numbers of vehicles over a short time, such as schools, malls, and business and industrial parks.

[3] U.S. Department of Transportation, Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition, Washington, D.C., December 2009.

- **Warrant 4 – Pedestrian Volume** is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.
- **Warrant 5 – School Crossings** is intended for application where the principal reason to install a traffic signal is that school children need to cross a major street. To meet Warrant 5 there must be a minimum of 20 students during the highest-volume crossing hour across the major street.
- **Warrant 6 – Coordinated Signal System** is applicable in situations where a coordinated signal system necessitates the installation of a traffic signal to maintain proper platooning of vehicles.
- **Warrant 7 – Crash Experience** is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic signal. To meet Warrant 7, there must be at least five crashes within the past year resulting in personal injury or property damage above the reporting thresholds that could be corrected by the installation of a traffic signal. An adequate trial of alternatives must also have been attempted, along with increased enforcement. In addition to meeting these criteria, a certain amount of vehicular and pedestrian volumes must be present for eight hours of the day.
- **Warrant 8 – Roadway Network** is intended for application at locations where installing a traffic signal might be justified in order to encourage the concentration and organization of traffic flow on the roadway network.
- **Warrant 9 – Intersection Near a Grade Crossing** is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met; the proximity to the intersection of a grade crossing on an intersection approach controlled by a stop or yield sign is the principal reason to consider installing a traffic control signal.

A traffic signal should not be installed unless one or more of the nine warrants are met. The installation of a traffic signal must improve the overall safety and operations of the intersection. Satisfying one or more warrants alone does not in itself provide sufficient justification to consider a signal. A thorough analysis that considers crash history, field conditions such as sight distances and speed limits, and good engineering judgment must be undertaken before the installation of a traffic signal is proposed. As a part of the study, MPO staff analyzed traffic, crash, and pedestrian data for selected unsignalized intersections to determine if those intersections could be improved with a change in, or addition of a traffic-control device.

2.2.3 TRAFFIC SAFETY ANALYSIS

For a safety analysis, the performance measures used for defining the problems are the crash frequency and crash rate. A high crash frequency may be an indication of a problem; however, information on detailed characteristics of

collisions, such as type, severity, roadway condition, light condition, and time of occurrence, is needed to provide insight into the nature of the safety problems for the development of appropriate improvements. Collision diagrams are used to determine any underlying collision patterns.

Another way of analyzing collisions is to calculate the crash rate in order to rank an intersection or a roadway segment for safety, normalized by the volume of vehicular traffic that passes through. A crash rate is the average number of crashes on an annual basis (a three-year average was used in this study) at an intersection, divided by the annual average daily traffic volume. The formula for calculating the crash rate for an intersection is presented below. The crash rate (R) is expressed in million-entering-vehicles (MEV), which is a standard practice.

$$\text{Crash rate (R)} = \frac{A * 1{,}000{,}000}{V * T}$$

A = Annual average number of collisions at the intersection

V = Annual average daily traffic volume entering the intersection

T = Time, as number of days in a year (365)

The calculated crash rates were compared to the average rates for the MassDOT Highway Division's District 3 (Table 2-1).

TABLE 2-1
MassDOT Highway Division's
Average Crash Rates for Intersection
Crashes per Million Entering Vehicles

MassDOT Highway Division District	Signalized Intersection	Unsignalized Intersection
Statewide	0.80	0.60
District 1	0.92*	0.40*
District 2	0.85	0.67
District 3	0.87	0.69
District 4	0.78	0.58
District 5	0.75	0.58

* For District 1, statewide rates are used due to low sample size.
Note: Shading denotes the MassDOT Highway Division's district for the communities in the study corridor.

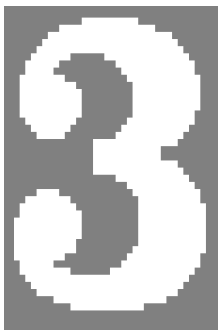
2.2.4 PEDESTRIAN AND BICYCLE MOBILITY

Pedestrian and bicycle mobility is defined as the ease or difficulty that a pedestrian or a bicyclist experiences while traveling along a corridor, including through intersections, and the facilities provided to help them navigate through that corridor, such as continuous sidewalks, crosswalks, bike lanes and signs, ramps for wheelchairs, buffer and median spaces, pedestrian signals, and pedestrian-related signs. Also taken into account are right-turn-on-red and left-turn conflicts with vehicular traffic, which hinder pedestrian and bicycle mobility. In this study, the level of support provided to facilitate pedestrian and bicycle mobility at and between intersections was assessed qualitatively for deficiencies, for being absent, and for potential improvements.

2.2.5 BUS TRANSIT SERVICE

For bus transit service, the objective of this study was to develop potential improvements to service conditions and performance, especially schedule adherence and accessibility in the study corridor. The focus was to reduce traffic-signal delay (congestion) through improved traffic-signal timing to improve bus operations in the corridor, to examine locations to assess the need for bus shelters or stops or bus bays, and to examine the possibility of connectivity between MWRTA's Route 6 and GATRA's Medway "T."

Chapters 3, 4, 5, 6, and 7 describe, from the south to the north, the roadway characteristics, previously proposed projects, problems identified, and proposed improvements in the towns of Bellingham, Medway, Holliston, Ashland, and Framingham, respectively.



BELLINGHAM

3.1 INTRODUCTION

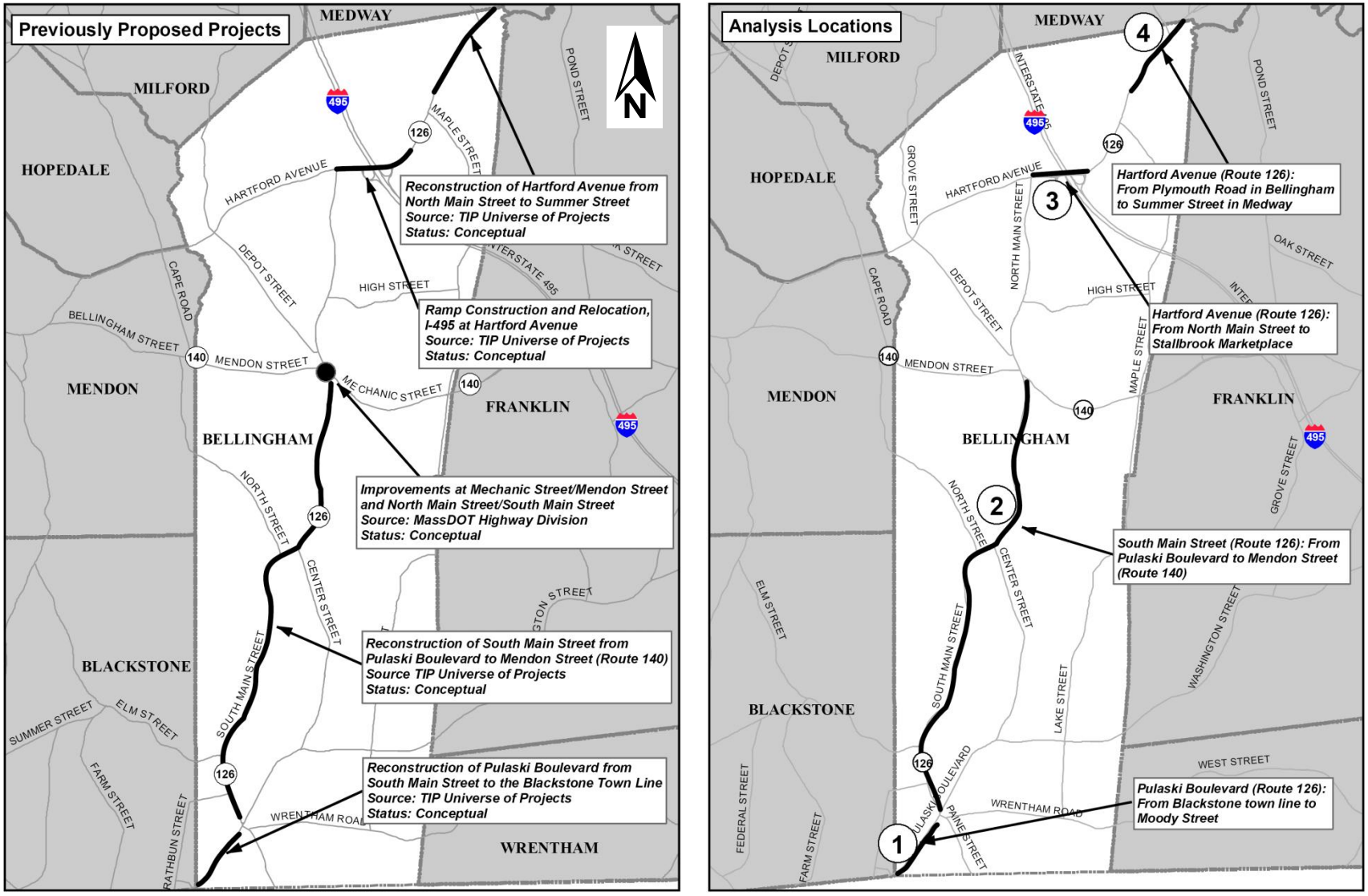
This section describes the problem locations, selection of study locations, analysis of existing conditions, and development of improvement alternatives for the Town of Bellingham.

Route 126 in Bellingham is a two-way, two-lane rural arterial route that extends from south to north from the Blackstone town line to the Medway town line. The majority of Route 126 in Bellingham is under the town's jurisdiction (Figure 1-1, in Chapter 1). MassDOT's Highway Division has jurisdiction over the segment where Route 126 and Route 140 are combined and the portion of Hartford Avenue between Rawson Road and just east of the entrances to Stallbrook Marketplace and the Charles River Center.

In Bellingham, Route 126 is the most traveled roadway. It serves different land uses, including but not limited to educational, residential, commercial, religious, and recreational. It carries an average of 16,000 vehicles per day for the majority of its length (Figure 1-2, in Chapter 1). The posted speed limit ranges from 30 mph to 45 mph. The existing right-of-way width varies from 37 to 70 feet (Figure 1-4, in Chapter 1).

3.2 PREVIOUSLY PROPOSED PROJECTS

Figure 3-1 shows the previously proposed projects listed in the Boston Region MPO's Transportation Improvement Program (TIP) Universe of Projects (Appendix A of the FFYs 2006–10 TIP) or the MassDOT Highway Division's project information database. All of the projects were in conceptual stages as of August 2010. A review of the projects indicated that the town is interested in initiating those proposed projects. Although the projects were included in the TIP Universe of Projects or other source, no study has been conducted to assess the transportation needs at these project locations. Hence, those projects were candidate locations for this study.



BOSTON REGION MPO

FIGURE 3-1
Previously Proposed Projects and Analysis Locations in Bellingham

Route 126 Corridor Study

3.3 ANALYSIS LOCATIONS

Based on the status of the proposed projects, town officials, the task force, and MPO staff selected the following four analysis locations for this planning study (shown in Figure 3-1). They are:

1. Pulaski Boulevard, from the Blackstone town line to Moody Street
2. South Main Street, from Pulaski Boulevard to Route 140 (Mendon Street)
3. Hartford Avenue, from North Main Street to Stallbrook Marketplace
4. Hartford Avenue, from Plymouth Street to the Medway town line

The following sections present the problems identified in each of the four analysis locations, the analysis of existing conditions, and the proposed improvements for addressing those problems.

3.4 PULASKI BOULEVARD: FROM THE BLACKSTONE TOWN LINE TO MOODY STREET

This section, shown in Figure 3-2, is about 0.75 miles long. The land uses include small retail stores, restaurants, and residences. Pulaski Boulevard is a two-way, two-lane roadway; the speed limit in this section is 30 mph. An automatic traffic recorder (ATR) count taken in September 2009 by the MassDOT Highway Division indicates that the average daily traffic on Pulaski Boulevard is about 16,000 vehicles.

3.4.1 IDENTIFIED PROBLEMS

Pavement Condition

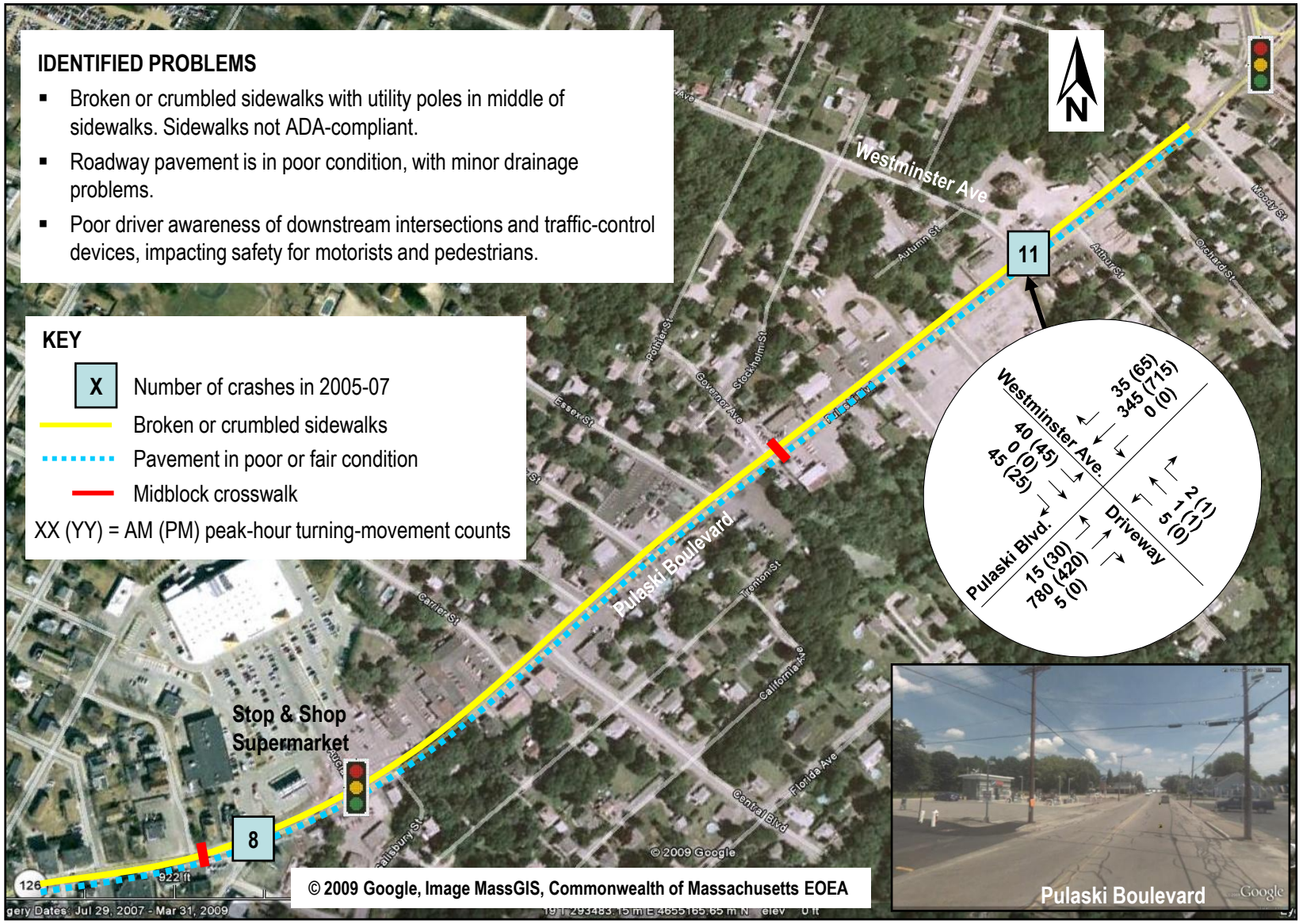
The pavement condition of the roadway is fair to poor, with surface distress such as deflection, cracking, and rutting. The 2006–07 pavement serviceability index indicated that this section requires some form of pavement rehabilitation (Figure 1.5, in Chapter 1).

Sidewalks

The bituminous sidewalks that are on both sides of Pulaski Boulevard are in poor condition— broken and crumbled at various sections—could pose problems and barriers to people in wheelchairs. There are utility poles in the middle of the sidewalks, creating potential obstacles for pedestrians and wheelchair users, as they do not meet the four-foot minimum clearance standard to be ADA-compliant.

Traffic Operations

The intersection of Pulaski Boulevard and Westminster Avenue was identified as a problem intersection at this analysis location. It is an unsignalized



BOSTON REGION MPO

FIGURE 3-2
Pulaski Boulevard: From the Blackstone Town Line to Moody Street: Identified Problems

Route 126 Corridor Study

intersection, with Westminster Avenue under stop-sign control, carrying about 1,500 vehicles per day. The existing AM and PM peak-hour turning-movement counts are shown in Figure 3-2. Six pedestrians were observed at the intersection during the AM peak period (7:00–9:00 AM) and eight pedestrians during the PM peak period (4:00–6:00 PM).

During peak periods, this intersection is frequently blocked by a traffic queue from the signalized intersection of Pulaski Boulevard and South Main Street, which is about 500 feet north of this intersection. This situation causes left turns out of Westminster Avenue to be difficult. An intersection capacity analysis indicated that the Westminster Avenue approach operates at LOS E or F during peak-hour conditions (Table 3-1), while traffic in both directions on Pulaski Boulevard operates at LOS A.

There are many closely spaced side streets and driveways that serve the residential and business areas on Pulaski Boulevard. A substantial amount of traffic on Pulaski Boulevard turns into and turns out of the side streets and driveways. Driver awareness of both downstream intersections and traffic control devices is essential for driver and pedestrian safety in this analysis location.

Traffic Signal Warrant Analysis

A traffic signal warrant analysis was performed for the intersection of Westminster Avenue and Pulaski Boulevard. The results of the signal warrant analysis indicated that the intersection meets MUTCD's Warrant 3 criteria for peak-hour traffic delay.

Safety Analysis

The crash frequency and characteristics at the intersection of Pulaski Boulevard and Westminster Avenue are presented in Table 3-2. The intersection of Westminster Avenue and Pulaski Boulevard had 11 crashes between 2005 and 2007, resulting in an average of 3.67 crashes per year and a crash rate of 0.61 crashes per million entering vehicles (MEV) (Table 3-3). This crash rate is lower than the average of 0.69 crashes per MEV for District 3 unsignalized intersections.

3.4.2 PROPOSED IMPROVEMENTS

Staff recommend the reconstruction of Pulaski Boulevard from the Blackstone town line to Moody Street for approximately 0.75 miles to improve traffic safety and operations for pedestrians, bicyclists, and motorists. Proposed improvements, which are estimated to cost $2.5 million, include:

- Pavement rehabilitation, including excavation and milling necessary for regaining curb reveal and improving drainage from abutting properties, driveways, and the roadway.

- Replacement of existing sidewalks with accessible sidewalks and removal of utility poles from the sidewalks or provision of at least a 4-foot clearance around the utility poles. Installation of granite curbing and crosswalks.
- Construction of four-foot shoulders that could be used by bicyclists.
- Installation of signs and pavement markings to improve safety for pedestrians, bicyclists, and motorists. Installation of nonvehicular warning signs (types W11-2 and W16-7), in-street pedestrian crossing signs (type R1-6), and bicycle-warning signs (types W11-1 and W16-1) in this corridor to alert motorists to the presence of pedestrians and bicyclists.

R1-6


W11-2 and W16-7

MUTCD

W11-1 and W16-1

- Installation of advance street name signs (type D3-2) and street name plaques to improve awareness of intersections on Pulaski Boulevard and help drivers navigate through this section safely.

D3-2 MUTCD

Staff do not recommend installing a new traffic signal at the intersection of Westminster Avenue and Pulaski Boulevard because it meets only Warrants 3, it has a low crash rate, and it is very close to the traffic signal at Pulaski Boulevard and South Main Street/Wrentham Street. The reconstruction of the intersection of Pulaski Boulevard and South Main Street/Wrentham Street (currently in progress) is expected to increase capacity and safety and to reduce queues at the intersection. It will also reduce the traffic queue that extends into the intersection of Westminster Avenue and Pulaski Boulevard and improve traffic operations at that intersection during peak hours.

TABLE 3-1
Intersection Capacity Analysis: Bellingham

	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Intersection	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**
Pulaski Boulevard and Westminster Avenue												
Pulaski Boulevard NB	A	0.6	0	A	1.1	0	No improvement proposed at this intersection					
Pulaski Boulevard SB	A	0	0	A	0	0						
Westminster Avenue EB	E	40	63	F	53	67						
South Main Street and Center Street												
South Main Street NB	A	0	0	A	0	0	No improvement proposed at this intersection					
South Main Street SB	A	3.5	11	A	3.7	11						
Center Street EB	F	98	228	F	81	183						
North Main Street and Mendon Street												
Mendon Street EB L	C	29	#295	D	38	#330	C	28	66	C	34	76
Mendon Street EB R	C	29	#295	D	38	#330	C	29	74	C	34	76
North Main Street SB T+R	C	24	127	D	48	#495	B	17	128	C	21	#335
Mechanic Street NB L	C	29	m132	F	177	#558	B	16	m#147	E	69	#464
Mechanic Street NB T	D	30	m#580	B	19	#316	A	8	151	A	6	92
South Main Street and Mechanic Street												
South Main Street EB L	E	70	#582	D	50	#451	D	44	#252	D	45	201
South Main Street EB T+R	C	22	28	C	28	#28	D	42	245	D	45	201
Common Street WB L	D	39	25	D	43	#47	D	38	22	D	42	42
Common Street WB T+R	D	38	25	D	43	#58	D	38	22	D	42	52
Mechanic Street NB L+T+R	C	24	#433	C	21	#444	B	14	157	B	11	155
Mechanic Street SB L	C	18	20	C	23	m18	B	18	20	B	19	m29
Mechanic Street SB T	E	74	#584	C	25	#m327	C	27	#543	C	21	#392

(Cont.)

* 95% queue length

Note: T = through, R = right turn, L = left turn.
# = 95th percentile volume exceeds capacity.
m = Volume for 95th percentile queue is metered by upstream signal.

TABLE 3-1 (cont.)

Intersection	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)
North Main Street, Hartford Avenue, and Cedar Hill Road												
North Main Street NB R	C	21	#305	B	14	33	C	29	266	A	10	#152
North Main Street NB L	D	41	89	F	153	#155	D	42	#89	F	98	22
Hartford Avenue EB T+R	D	41	361	D	41	264	B	19	#371	F	104	#377
Hartford Avenue WB L	B	13	154	D	40	#853	A	9	41	A	2	#793
Hartford Avenue WB T	A	6	173	A	7	505	A	3	58	A	5	673
Cedar Hill Road SB L	D	40	36	D	46	44	D	37	33	D	44	43
Cedar Hill Road SB T+R	D	40	30	D	45	33	D	37	28	D	44	34
Hartford Avenue and Rawson Road/Crossroads Shopping Center												
Hartford Avenue EB L	D	47	14	D	42	12	E	57	20	D	42	m6
Hartford Avenue EB T+R	C	23	#630	D	19	343	B	15	m#596	B	16	m70
Hartford Avenue WB L	C	25	50	D	19	112	C	23	m53	B	12	m25
Hartford Avenue WB T+R	A	8	147	B	17	#764	A	6	141	A	8	m233
Rawson Road SB L+T+R	D	41	18	D	40	9	D	41	20	D	48	9
Crossroads Center NB L+T	C	30	23	D	35	72	C	31	24	D	40	86
Crossroads Center NB R	C	31	6	B	22	22	C	28	20	C	28	32
Hartford Avenue and Deerfield Road/I-495 Ramps												
Hartford Avenue EB L	D	46	14	C	30	m7	C	36	20	E	71	m9
Hartford Avenue EB T	B	15	368	C	37	325	A	4	33	B	11	238
Hartford Avenue EB R	B	12	60	F	109	189	A	2	20	A	1	113
Hartford Avenue WB T+R	A	3	55	F	177	#722	A	6	45	F	93	895
Deerfield Road SB L+T+R	D	41	23	D	44	15	D	42	23	D	48	16
I-495 Ramp NB L+T	D	42	115	D	38	#391	D	44	118	E	68	#434
I-495 Ramp NB R	C	31	20	B	18	64	C	29	23	C	21	92

(Cont.)

* 95% queue length

Note: T = through, R = right turn, L = left turn.
# = 95th percentile volume exceeds capacity.
m = Volume for 95th percentile queue is metered by upstream signal.

TABLE 3-1 (cont.)

Intersection	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)
Hartford Avenue and I-495 Ramps												
Hartford Avenue EB T R	A	1	1	C	30	285	A	2	0	A	7	140
Hartford Avenue WB L	B	17	98	C	22	#129	B	9	68	B	19	m39
Hartford Avenue WB T	A	3	34	B	14	260	A	1	20	A	7	312
I-495 Ramp NB L	D	45	102	C	23	143	D	39	92	D	37	190
I-495 Ramp NB R	C	28	72	B	18	197	C	23	98	C	31	221
Hartford Avenue and Stallbrook Marketplace												
Hartford Avenue EB L	C	27	105	E	51	279	C	27	106	D	42	#203
Hartford Avenue EB T	A	2	65	D	46	328	A	6	59	C	28	264
Hartford Avenue EB R	A	1	m1	D	37	18	A	3	20	B	12	m99
Hartford Avenue WB L	D	43	30	D	50	266	D	44	30	D	33	190
Hartford Avenue WB T+R	B	13	155	D	50	450	C	22	155	D	46	311
Stallbrook SB L+T	D	46	69	F	92	321	D	46	69	E	62	240
Stallbrook SB R	B	19	13	D	35	48	B	19	20	C	24	46
Stallbrook NB L+ T	D	37	29	E	93	323	D	37	29	E	62	#264
Stallbrook NB R	C	31	7	C	32	33	C	21	20	C	21	28
Hartford Avenue and Pearl Street												
Hartford Avenue EB T+R	A	0	0	A	0	0	A	9	#567	A	8	314
Hartford Avenue WB L	A	4	11	A	6	18	A	5	54	A	7	#124
Hartford Avenue WB T	A	4	11	A	6	18	A	3	101	B	11	#508
Pearl Street NB L + R	F	102	179	F	180	208	B	18	60	B	20	101

* 95% queue length

Note: T = through, R = right turn, L = left turn.

= 95th percentile volume exceeds capacity.

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

TABLE 3-2
Crash Characteristics and Frequency, 2005–07:
Pulaski Boulevard and South Main Street Analysis Locations

	Number of Crashes			
Crash Characteristic	**Pulaski Blvd. and Westminster Ave.**	**South Main St. and Center St.**	**South Main St. and Mechanic St.**	**North Main St. and Mendon St.**
Crash Severity				
Fatality	0	0	0	0
Injury	1	3	6	5
Property damage only	10	5	38	9
Not reported	0	1	0	1
Unknown	0	0	0	0
Total	*11*	*9*	*44*	*15*
Collision Type				
Rear-end	3	4	23	7
Angle/sideswipe	7	5	17	5
Head-on	0	0	0	0
Single-vehicle crash	1	0	1	0
Not reported	0	0	1	3
Unknown	0	0	2	0
Total	*11*	*9*	*44*	*15*
Roadway Condition				
Dry	9	6	30	9
Wet	2	2	12	4
Snow	0	1	1	1
Not reported	0	0	1	1
Other	0	0	0	0
Total	*11*	*9*	*44*	*15*
Light Condition				
Daylight	9	6	32	13
Dawn	1	0	0	0
Dusk	0	0	0	0
Dark road, lighted	1	1	10	1
Dark road, unlighted	0	1	0	0
Not Reported	0	1	1	1
Other	0	0	1	0
Total	*11*	*9*	*44*	*15*
Year				
2005	4	2	17	5
2006	3	6	12	6
2007	4	1	15	4
Total	*11*	*9*	*44*	*15*

TABLE 3-3
Crash Rates for Bellingham Intersections

Intersection	Number of Crashes		Total Daily Approach Traffic	Crash Rate*
	3-Year Total	Annual Average		
Analysis location: Pulaski Boulevard, from Blackstone town line to Moody Street				
Pulaski Boulevard and Westminster Avenue	11	3.67	16,463	0.61
Analysis Location: South Main Street, from Pulaski Boulevard to Mendon Street				
South Main Street and Center Street	9	3.00	21,563	0.38
Routes 126 and 140 intersections (total for both)	59	19.67	26,188	2.06
Analysis location: Hartford Avenue, from North Main Street to Stallbrook Marketplace				
Hartford Avenue and North Main Str eet	63	21.00	26,900	2.14
Hartford Avenue and Rawson Road	38	12.67	29,613	1.17
Hartford Avenue and Deerfield Road/I-495 Ramp	57	19.00	32,100	1.62
Hartford Avenue and I-495 Ramps	16	5.33	27,288	0.54
Hartford Avenue and Stallbrook Marketplace	10	3.33	18,075	0.51
Analysis location: Hartford Avenue, from Plymouth Road to Medway town line				
Hartford Avenue and Pearl Street	12	4.00	22,750	0.48
MassDOT Highway Division District 3 average crash rate for signalized intersections				0.87
MassDOT Highway Division District 3 Average crash rate for unsignalized intersections				0.69

* Crashes per million entering vehicles
Note: The shading denotes an intersection with a higher crash rate than the MassDOT Highway Division District 3 average crash rate (for a signalized or an unsignalized intersection, respectively).

3.5 SOUTH MAIN STREET: FROM PULASKI BOULEVARD TO MENDON STREET

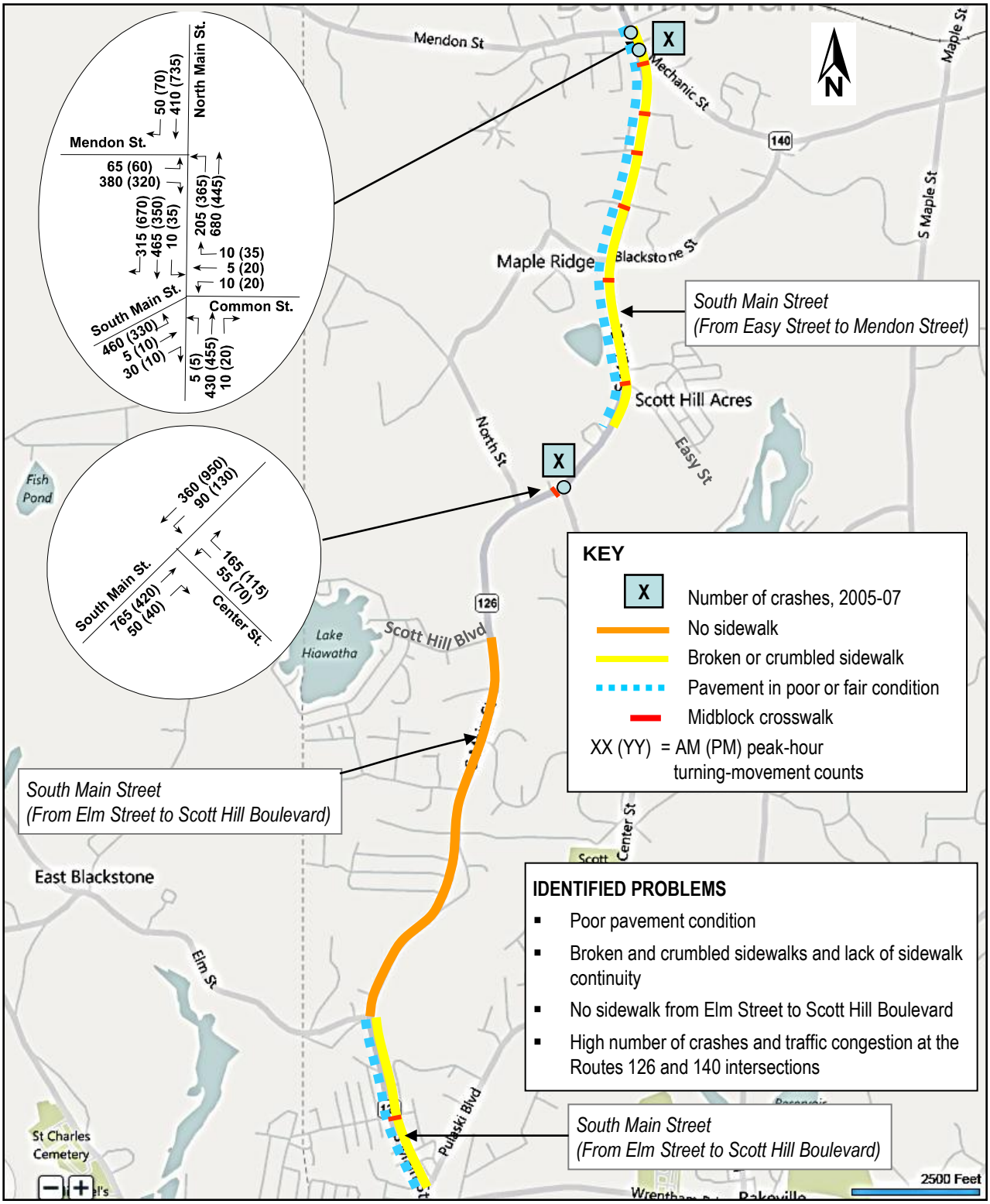
This analysis location is five miles long and serves mixed land uses, although the use is primarily residential. In this analysis location, there are automobile service garages, garden centers, strip malls, schools, churches, and gas stations. An automatic traffic recorder (ATR) count taken in September 2009 indicates that annual average daily traffic on South Main Street is about 16,000 vehicles.

3.5.1 IDENTIFIED PROBLEMS

The following problems were identified on South Main Street from Pulaski Boulevard to Mendon Street. These problems, which are described below, are also shown in Figure 3-3.

Pavement Condition

The pavement condition of the roadway in this analysis location is generally good. However, there are there two segments where the pavement is in poor



BOSTON REGION MPO

FIGURE 3-3
South Main Street: From Pulaski Boulevard to Mendon Street: Identified Problems

Route 126 Corridor Study

condition, as a result of pavement distress such as cracking, disintegration, and deteriorations from poor drainage. The two segments are:

- South Main Street, from Pulaski Boulevard to Elm Street (0.7 miles)
- South Main Street, from Easy Street to Mendon Street (1.5 miles)

The 2006–07 pavement serviceability index for these segments indicates that some form of pavement rehabilitation is necessary.

Sidewalks

The sidewalks on South Main Street are not continuous and lack connectivity. This lack of connectivity between the sidewalks prevents pedestrians from using sidewalks and discourages walking in general. The following sections of South Main Street have sidewalk problems:

- ***South Main Street, from Pulaski Boulevard to Elm Street***

  There are sidewalks on both sides of South Main Street, but they are broken and crumbled at many areas.

- ***South Main Street, from Elm Street to Scott Hill Boulevard***

  There is no sidewalk along this two-mile section, although it has residences and small businesses located along it. Some areas have foot paths outside of the paved roadway, indicating the need for sidewalks.

- ***South Main Street, from Easy Street to Mendon Street***

  There are sidewalks on one side of South Main Street, but they are broken and crumbled in many areas.

Traffic Operations

Two intersections within this analysis location were identified as having traffic operations problems. They are:

Center Street and South Main Street Intersection

Center Street intersects South Main Street from the east to form a T-intersection (Figure 3-3). It is under stop-sign control. ATR counts taken in September 2009 indicate that the annual average daily traffic is about 16,000 vehicles on South Main Street and 4,000 vehicles on Center Street. The existing AM and PM peak-hour turning-movement counts at the intersection are shown in Figure 3-3. Five pedestrians were observed at this intersection during the AM peak period and two pedestrians during the PM peak period. Intersection capacity analysis indicates that the Center Street approach operates at LOS F during peak periods (Table 3-1). There is no traffic delay on South Main Street because traffic there is uncontrolled.

Traffic signal warrant analyses were performed for this intersection. The analyses indicated that the intersection meets MUTCD Warrants 1, 2, and 3.

Route 126 and Route 140, Two Intersections

South Main Street, Mechanic Street, North Main Street, and Mendon Street form two closely spaced signalized intersections, shown in the insert at the right. The existing AM and PM peak-hour turning-movement counts are shown in Figure 3-3. Four pedestrians were observed at this intersection during the AM peak period and two pedestrians during the PM peak period. Analysis of the AM and PM peak-hour traffic presented in Table 3-1 indicated that some movements at the approaches of South Main Street and Mechanic Street operate at LOS E or F during the AM or PM peak hours, confirming field observations of queues on these approaches during peak hours.

Routes 126 and 140 intersections

Safety Analysis

The crash history of the South Main Street and Center Street intersection, as well as the two intersections of Routes 126 and 140, were evaluated to identify safety deficiencies and to determine if any of these intersections experience high annual crash rates. Tables 3-2 and 3-3 present the crash characteristics and rates, respectively.

The intersection of Center Street and South Main Street had 9 crashes between 2005 and 2007, resulting in an average of 3 crashes per year and a crash rate of 0.38 crashes per million entering vehicles (MEV). This crash rate is lower than the average of 0.69 crashes per MEV for MassDOT Highway Division's District 3 unsignalized intersections.

The two intersections of Route 126 and Route 140 were treated as a cluster because of their close proximity and their impact on each other. Together the two intersections had 59 crashes between 2005 and 2007, resulting in an average of 19.67 crashes per year and a crash rate of 2.06 crashes per million entering vehicles (MEV). This crash rate is higher than the average of 0.87 crashes per MEV for MassDOT Highway Division's District 3 signalized intersections. Many of the crashes were rear-end crashes (50 percent) and angle/sideswipe crashes (37 percent.)

3.5.2 PROPOSED IMPROVEMENTS

Staff recommend reconstruction of the sections of South Main Street shown in Figure 3-4 in order to address the problems identified. The improvements recommended for each section are described in detail below.

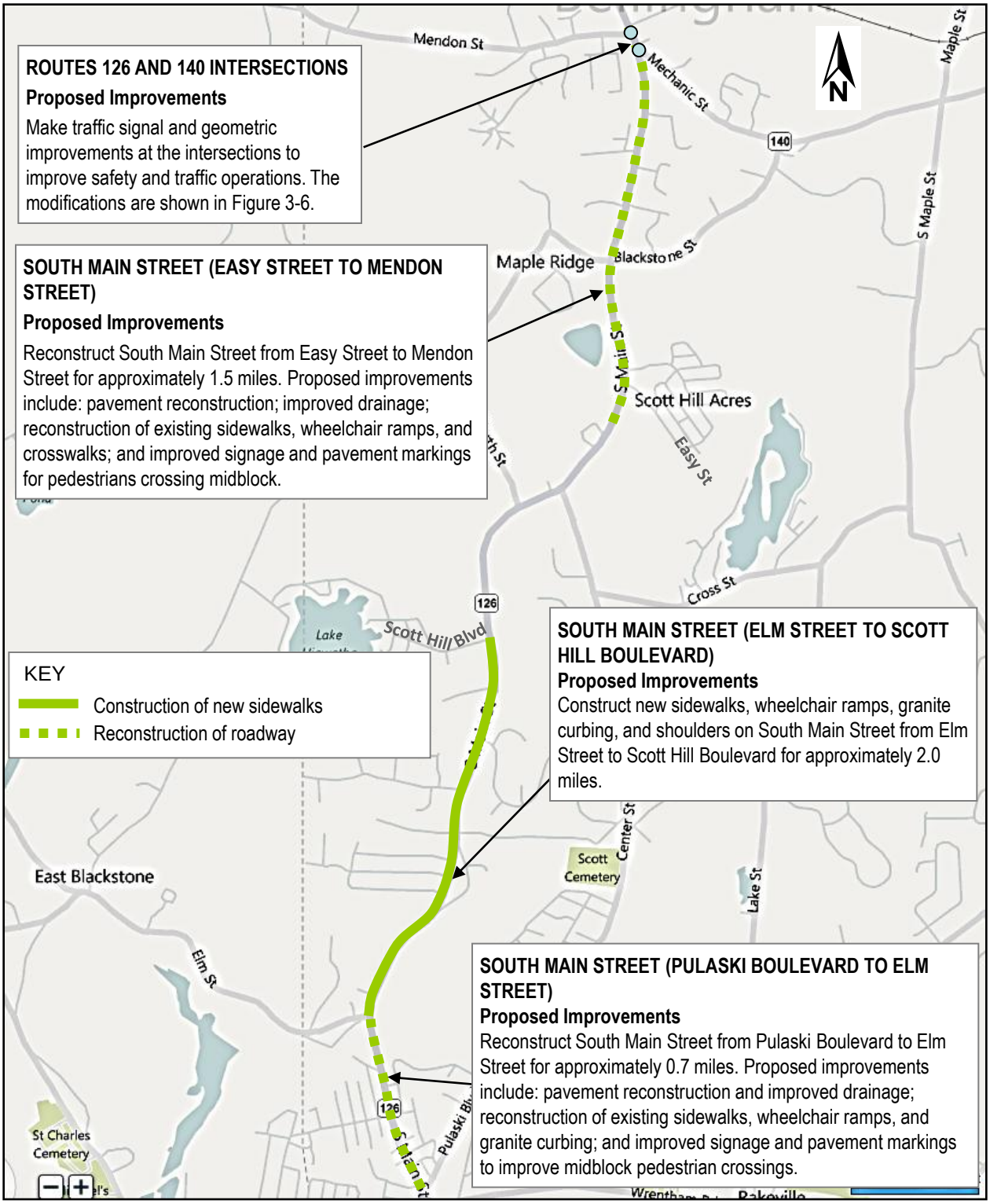


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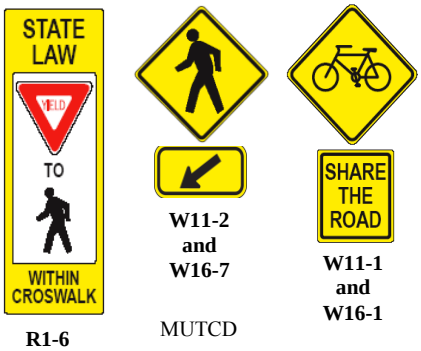
FIGURE 3-4
South Main Street: From Pulaski Boulevard to Mendon Street: Proposed Improvements

Route 126 Corridor Study

South Main Street, from Pulaski Boulevard to Elm Street

Staff recommend reconstruction of South Main Street from Pulaski Boulevard to Elm Street for approximately 0.7 miles. Proposed improvements, which are estimated to cost $2.2 million, include:

- Pavement rehabilitation and excavation/milling necessary for regaining curb reveal and improving drainage from abutting properties and the roadway.
- Replacement of the existing sidewalks with accessible sidewalks and granite curbing.
- Construction of four-foot shoulders that could be used by bicyclists.
- New signs and pavement markings to improve pedestrian and bicycle safety, such as nonvehicular warning signs (type W11-2 and W16-7) and in-street pedestrian crossing signs (type R1-6). Bicycle-warning signs (types W11-1 and W16-1) would increase awareness of the presence of bicyclists in the corridor and the need to share the road with bicyclists.



R1-6 **W11-2 and W16-7** MUTCD **W11-1 and W16-1**

South Main Street, from Elm Street to Scott Hill Boulevard

Staff recommend several mobility and safety improvements for pedestrians and bicyclists on South Main Street from Elm Street to Scott Hill Boulevard. Proposed improvements, which are estimated to cost $1.5 million, include:

- Construction of accessible sidewalks on at least one side of South Main Street from Elm Street to Scott Hill Boulevard. Construction of four-foot shoulders that could be used by bicyclists.
- Installation of midblock pedestrian crossings and signage and pavement markings at locations where the sidewalk changes from one side of the roadway to the other to improve safety for pedestrians (type W11-2 with supplemental plaque W16-7) and signs alerting motorists to the presence of bicyclists (type W11-1 with supplemental plaque W16-1).

W11-2 and W16-7 MUTCD **W11-1 and W16-1**

South Main Street and Center Street Intersection

Although the analysis indicated that the South Main Street and Center Street intersection meets traffic signal Warrants 1, 2, and 3, staff do not recommend it for signalization because of lower crash rates and a horizontal "S" curve in the

vicinity. Signalization has the potential of causing an increase in rear-end crashes at this location.

South Main Street, from Easy Street to Mechanic Street

Staff recommend reconstruction of South Main Street from Easy Street to Mechanic Street for approximately 1.5 miles. Proposed improvements, which are estimated to cost 3.0 million, include:

- Pavement rehabilitation of full-depth road reconstruction and excavation to lower the grade of the road at least six inches, necessary to regain curb reveal and improve drainage from abutting properties and driveways.
- Replacement of the existing sidewalks with accessible sidewalks and granite curbs.
- Construction of four-foot shoulders that could be used by bicyclists.
- Improved signage for pedestrian and bicyclists as described above.

Route 126 and Route 140, Two Intersections

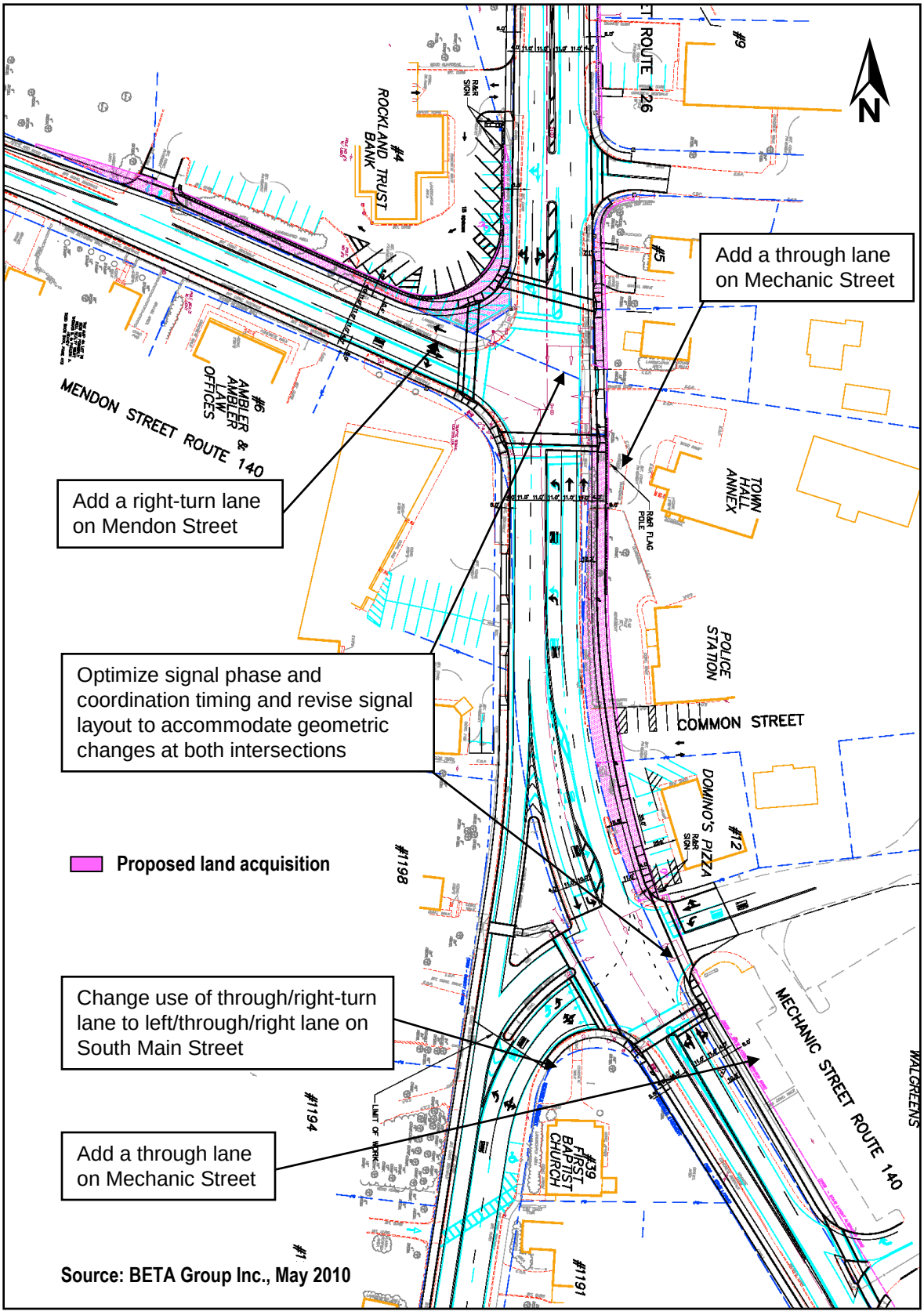
Staff recommend implementing the traffic signal, geometric, and safety improvements proposed by BETA Group Inc. for the two locations where Route 126 and Route 140 intersect. The proposed improvements, which are shown in Figure 3-5, would reduce traffic delays at both intersections (Table 3-1). MPO staff reviewed the proposed improvements and concluded that they would provide sufficient traffic capacity and safety improvements. The proposed improvements, which are estimated to cost $1.5 million, include the following:

North Main Street/Mendon Street

- Add a right-turn lane on the eastbound approach of Mendon Street
- Add a through lane on the northbound approach of Mechanic Street
- Modify the signal phase to add an overlapping phase for eastbound right turns from Mendon Street onto Mechanic Street
- Revise the signal layout to accommodate geometric changes
- Optimize signal phase and coordination timing

South Main Street/Mechanic Street

- Change the use of the through/right lane to a left/through/right lane on the South Main Street approach
- Add a through lane on the northbound approach of Mechanic Street
- Revise the signal layout to accommodate geometric changes
- Optimize signal phase and coordination timing



BOSTON REGION MPO	**FIGURE 3-5** **Routes 126 and 140 Intersections: Proposed Improvements**	*Route 126 Corridor Study*

Origin and Destination Study

Conduct an origin-destination study to evaluate the potential of North Street, Lake Street, and Maple Street to relieve congestion on South Main Street.

3.6 HARTFORD AVENUE: FROM NORTH MAIN STREET TO STALLBROOK MARKETPLACE

This analysis location is a 0.6-mile section of Hartford Avenue located in North Bellingham where Route 126 crosses I-495 (Figure 3-6). In this analysis location, Hartford Avenue is a two-way, four-lane roadway (two lanes in each direction) with exclusive left-turn and right-turn bays at the intersections. The land use in the vicinity is primarily commercial, except in the northwest quadrant of the I-495/Route 126 interchange, where it is mostly residential. Hartford Avenue provides access to the I-495 corridor, Crossroads Shopping Center, Stallbrook Marketplace, and Charles River Center.

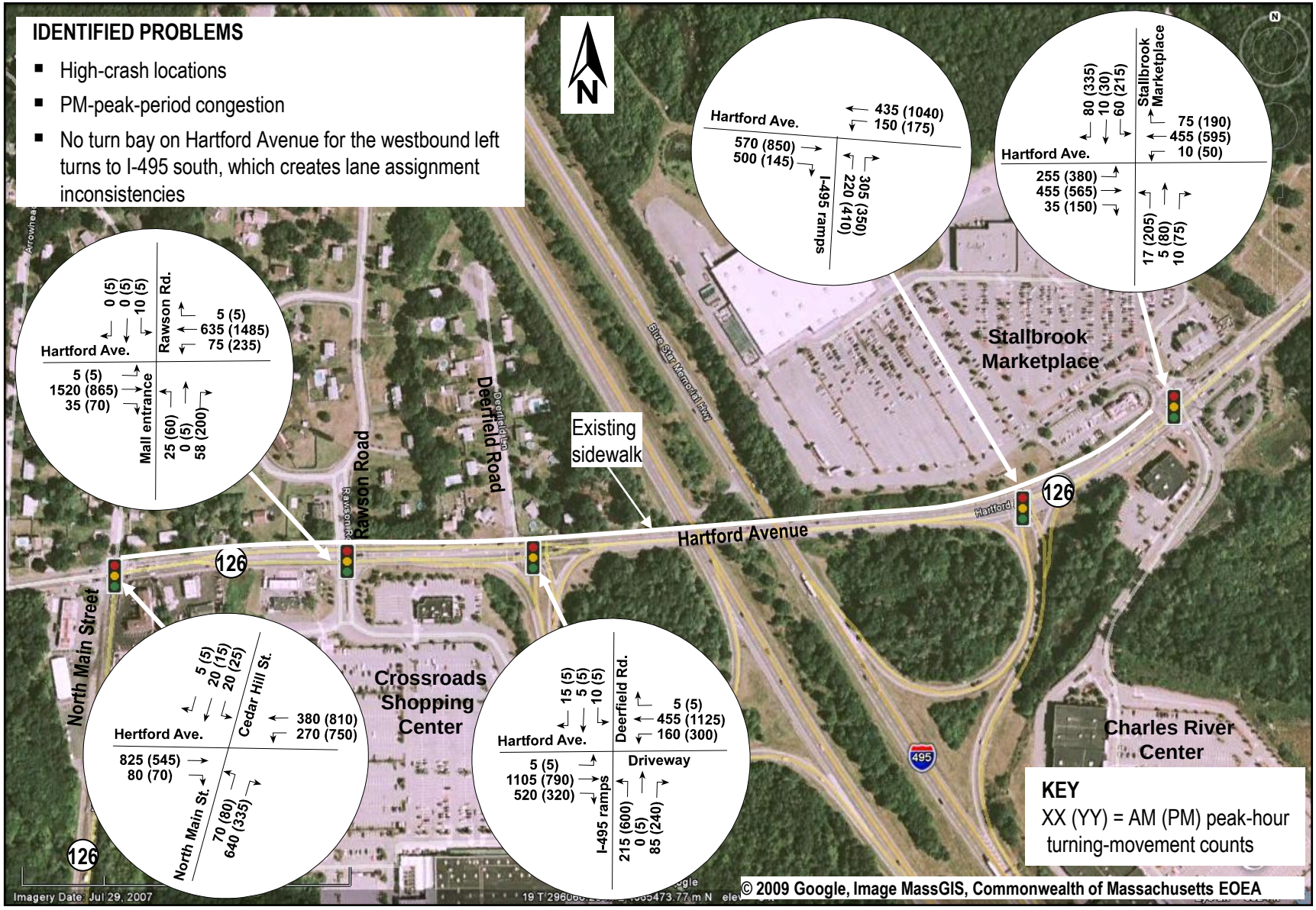
This analysis location on Hartford Avenue has five closely spaced and high-volume signalized intersections. There is a sidewalk on the north side of Hartford Avenue throughout the analysis area, and it is in good condition, as is the roadway pavement. The problems in this analysis location are two-fold: traffic operations and safety.

3.6.1 IDENTIFIED PROBLEMS

Traffic Operations

Figure 3-6 shows the existing AM and PM peak-hour turning-movement counts at the intersections. Table 3-1 presents the results of the intersection capacity analysis, which indicate that the Hartford Avenue intersections operate at LOS D or better during the AM peak hour. During the PM peak hour, the analysis indicates that some movements at the Hartford Avenue/Deerfield Road/I-495 ramp junction, Hartford Avenue/North Main Street/Cedar Hill Road intersection, and the intersection of Hartford Avenue, Stallbrook Marketplace, and the Charles River Center operate at LOS F, impacting traffic flow at the adjacent intersections. Field observations show that during the PM peak period there is traffic congestion in the area due to high volumes of shopping and commuter traffic.

In addition, at the westbound approach of the Hartford Avenue/Deerfield Road/I-495 ramp junction, there is no left-turn bay for the westbound left-turn movement to southbound I-495, as this movement shares the travel lane with the through movement. The absence of a left-turn bay and the sharing of a lane create lane assignment inconsistency at the westbound approach, as the left-turn vehicles trap the straight-through vehicles in the shared lane, causing motorists to change lanes.



BOSTON REGION MPO

FIGURE 3-6
Hartford Avenue: From North Main Street to Stallbrook Marketplace: Identified Problems

Route 126 Corridor Study

Safety Analysis

The crash history of the five signalized intersections within the analysis location was evaluated to identify safety deficiencies. Table 3-3 presents the crash frequencies and crash rates; the shading denotes intersections with higher crash rates than the MassDOT Highway Division's District 3 average for comparable intersections. Three of the five intersections in this analysis location had crash rates that exceeded the District 3 average. Table 3-4 presents the characteristics of crashes at the five intersections. None of the crashes involved a fatality; they were mostly property-damage-only crashes (75–85 percent.) Rear-end and angle/sideswipe crashes composed the majority of the collisions (80–90 percent.)

3.6.2 PROPOSED IMPROVEMENTS

Staff recommend the following improvements for the signalized intersections on Hartford Avenue from North Main Street to Stallbrook Marketplace.

Short-Term Improvements

Coordinate the five signals and repaint faded pavement markings within the section. Analysis indicated that coordination could reduce the critical (peak-direction) westbound PM-peak-hour signal delay by 43 percent and travel times by 29 percent, and could increase arterial speed by 40 percent (Table 3-5). Although the five signals operate adequately during the AM-peak-hour, analysis indicated that coordination could reduce the eastbound (peak-direction) AM-peak-hour signal delay by 45 percent, travel time by 20 percent, and arterial speed by 25 percent. The short-term improvements are expected to cost about $200,000.

Long-Term Improvements

Staff recommend redesigning the Route 126/I-495 ramp junctions to improve safety. The west side ramp-arterial junction (Route 126/I-495/Deerfield Road) is the critical intersection in the analysis location because it has an adverse impact on the operations of the other intersections. (During the study, the MassDOT Highway Division was in the process of engaging the services of a consultant for the redesign of the Route 126/I-495 ramp-arterial junctions.)

Staff also recommend evaluating the possibility of constructing a roundabout at this location to prevent the left-turning vehicles from trapping the straight-through vehicles in the westbound shared lane and preventing motorists from changing lanes.

3.7 HARTFORD AVENUE: FROM PLYMOUTH ROAD TO THE MEDWAY TOWN LINE

This analysis location is a one-mile section of Hartford Avenue located in North Bellingham. In this analysis location, Hartford Avenue is a two-way, two-lane roadway (one lane in each direction.) The land use in the vicinity is

TABLE 3-4
Crash Characteristics and Frequency, 2005–07:
Hartford Avenue Analysis Locations

	Number of Crashes at Intersection					
Crash Characteristics	**Hartford Ave. and North Main St.**	**Hartford Ave. and Rawson Rd.**	**Hartford Ave. and Deerfield Rd.**	**Hartford Ave. and I-495 Ramps**	**Hartford Ave. and Stallbrook**	**Hartford Ave, and Pearl St.**
Crash Severity						
Fatality	0	0	0	0	0	0
Injury	5	8	9	2	1	1
Property damage only	51	29	46	11	11	11
Not reported	7	1	2	2	0	0
Unknown	0	0	0	1	0	0
Total	*63*	*38*	*57*	*16*	*12*	*12*
Collision Type						
Rear-end	22	18	35	9	3	3
Angle/sideswipe	33	18	20	5	7	8
Head-on	0	1	1	0	0	0
Single-vehicle crash	3	1	1	0	1	1
Not reported	4	0	0	2	1	0
Unknown	1	0	0	0	0	0
Total	*63*	*38*	*57*	*16*	*12*	*12*
Roadway Condition						
Dry	50	31	44	12	9	12
Wet	8	7	13	3	2	0
Snow	4	0	0	0	0	0
Not reported	1	0	0	1	1	0
Other	0	0	0	0	0	0
Total	*63*	*38*	*57*	*16*	*12*	*12*
Light Condition						
Daylight	55	34	48	13	8	8
Dawn	1	1	1	0	0	0
Dusk	0	1	2	1	0	0
Dark road, lighted	6	2	6	2	3	4
Dark road, unlighted	1	0	0	0	0	0
Not Reported	1	0	0	0	1	0
Other	0	0	0	0	0	0
Total	*63*	*38*	*57*	*16*	*12*	*12*
Year						
2005	15	16	29	7	5	5
2006	19	12	14	6	5	4
2007	29	10	14		2	3
Total	*63*	*38*	*57*	*16*	*12*	*12*

TABLE 3-5
Level of Service for Hartford Avenue
from North Main Street to Stallbrook Marketplace

Roadway	Peak Hour	Scenario	Running Time (sec.)	Signal Delay (sec.)	Travel Time (sec.)	Distance (mi.)	Travel Speed (mph)	LOS
Hartford Avenue EB	AM	Existing	95.5	74.7	170.2	0.70	14.9	D
		Optimized	95.5	40.6	136.1	0.70	18.6	C
		Improvement		45.6%	20%		24.8%	
Hartford Avenue WB	AM	Existing	112.7	33.9	146.6	0.85	20.9	C
		Optimized	112.7	31.7	144.4	0.85	21.3	C
		Improvement		6.4%	1.5%		1.9%	
Hartford Avenue EB	PM	Existing	95.5	162.4	257.8	0.70	9.8	F
		Optimized	95.5	108.8	204.2	0.70	12.4	E
		Improvement		33.0%	20.8%		20.1%	
Hartford Avenue WB	PM	Existing	112.7	229.3	341.9	0.85	9.0	F
		Optimized	112.7	130.8	243.4	0.85	12.6	E
		Improvement		42.9%	28.8%		40%	

mixed, although it is primarily residential. There are automobile repair shops, gas stations, schools, and churches located along this section of Route 126. The following section describes the problems in the corridor.

3.7.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement is in poor condition, with surface distress such as deflection, cracking, and rutting. The 2006–07 pavement serviceability index indicates that this section requires some form of pavement rehabilitation (Figure 1.5, in Chapter 1). Poor drainage in this analysis location is also a major cause of pavement deterioration.

Sidewalk

There is a sidewalk on the south side of Hartford Avenue, but it is in very poor condition. There are sections of the sidewalk that are broken and need wheelchair ramps. In addition, sections of the sidewalk in this analysis location have utility poles in the middle of the sidewalk and the clearances around them do not meet the standard of a four-foot minimum clearance.

Traffic Operations

There is one problem intersection in this analysis location—the Hartford Avenue and Pearl Street intersection. This unsignalized intersection gets busy

during peak travel periods. Figure 3-7 shows the peak-hour traffic volumes at the intersection. Two pedestrians were observed crossing the intersection during the AM peak period and 15 during the PM peak period. Table 3-1 presents the results of the intersection capacity analysis. The analysis shows that while traffic on Hartford Avenue operates at LOS A because traffic there is uncontrolled, traffic on Pearl Street operates at LOS F during the AM and PM peak hours, due to the high peak-hour traffic volumes on Hartford Avenue.

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were performed for the intersection of Hartford Avenue and Pearl Street. The results of the analysis indicated that the Hartford Avenue and Pearl Street intersection meets MUTCD's Warrants 1, 2, and 3 criteria.

Safety Analysis

The majority of the crashes in this analysis location are concentrated at the intersections. Table 3-3 shows the crash frequency and rate for the intersection of Hartford Avenue and Pearl Street. The intersection had 12 crashes between 2005 and 2007 and a crash rate of 0.48 crashes per MEV. This crash rate is lower than the MassDOT Highway Division District 3 average for comparable unsignalized intersections. Table 3-4 presents the crash characteristics for the Hartford Avenue and Pearl Street intersection. Angle/sideswipes and rear-end crashes were the predominant crashes types. In addition, many of the crashes (80 percent) at the intersection were property-damage-only crashes.

3.7.2 PROPOSED IMPROVEMENTS

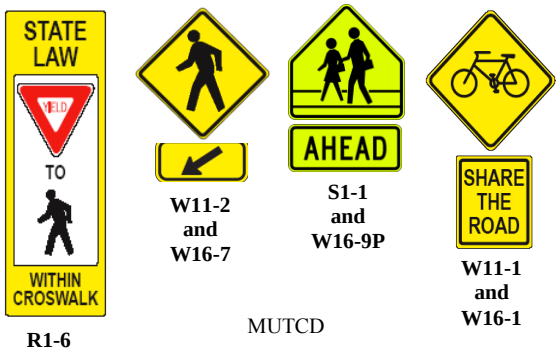
Staff recommend reconstructing of Hartford Avenue from Plymouth Road to the Medway town line approximately 1.0 miles. The proposed improvements, which are estimated to cost $3.5 million, include:

- Pavement rehabilitation of full-depth road reconstruction and excavation to lower the grade of the roadway by at least six inches, necessary for regaining curb reveal and improving drainage from abutting properties and driveways.
- Replacement of the existing sidewalks with accessible sidewalks, possible removal of utility poles from the middle of the sidewalk, and granite curbing. Construction of four-foot shoulders that could also be used by bicyclists.
- Installation of a new, fully actuated traffic signal with pedestrian push buttons at the Hartford Avenue and Pearl Street intersection, and construction of a westbound left-turn bay at the intersection (Figure 3-8.) Heading westbound on Hartford Avenue, the new signal would be the first in Bellingham, so staff recommend installing signal-ahead signs to alert motorists to the

W3-3 MUTCD

presence of a traffic signal ahead. Making these improvements would improve traffic operations at the intersection: it would reduce the AM peak-hour intersection delay to 8.5 seconds from 11.8 seconds, and the PM peak-hour intersection delay to 10.8 seconds from 20.6 seconds.

- Installation of signs to improve safety of midblock and school crossings in this section. Some examples of nonvehicular signs are type R1-6, type W11-2 with supplemental plaque type W16-7, type S1-1 with supplemental plaque type W16-9P, and sign type W11-1 with supplemental plaque W16-1, which would increase awareness of bicyclists in the corridor.



R1-6 W11-2 and W16-7 S1-1 and W16-9P W11-1 and W16-1

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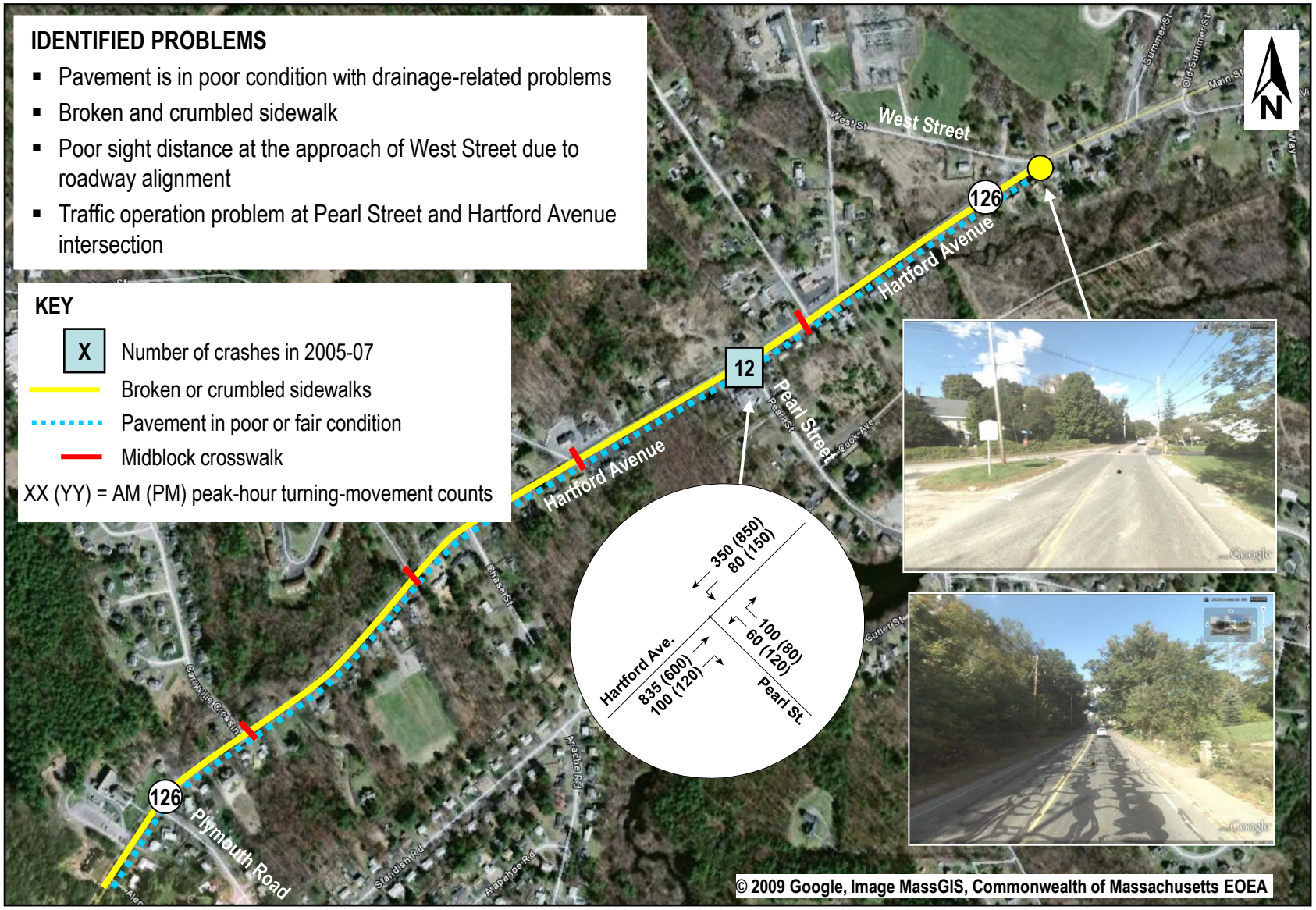

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FIGURE 3-7
Hartford Avenue: From Plymouth Road to the Medway Town Line: Identified Problems

Route 126 Corridor Study

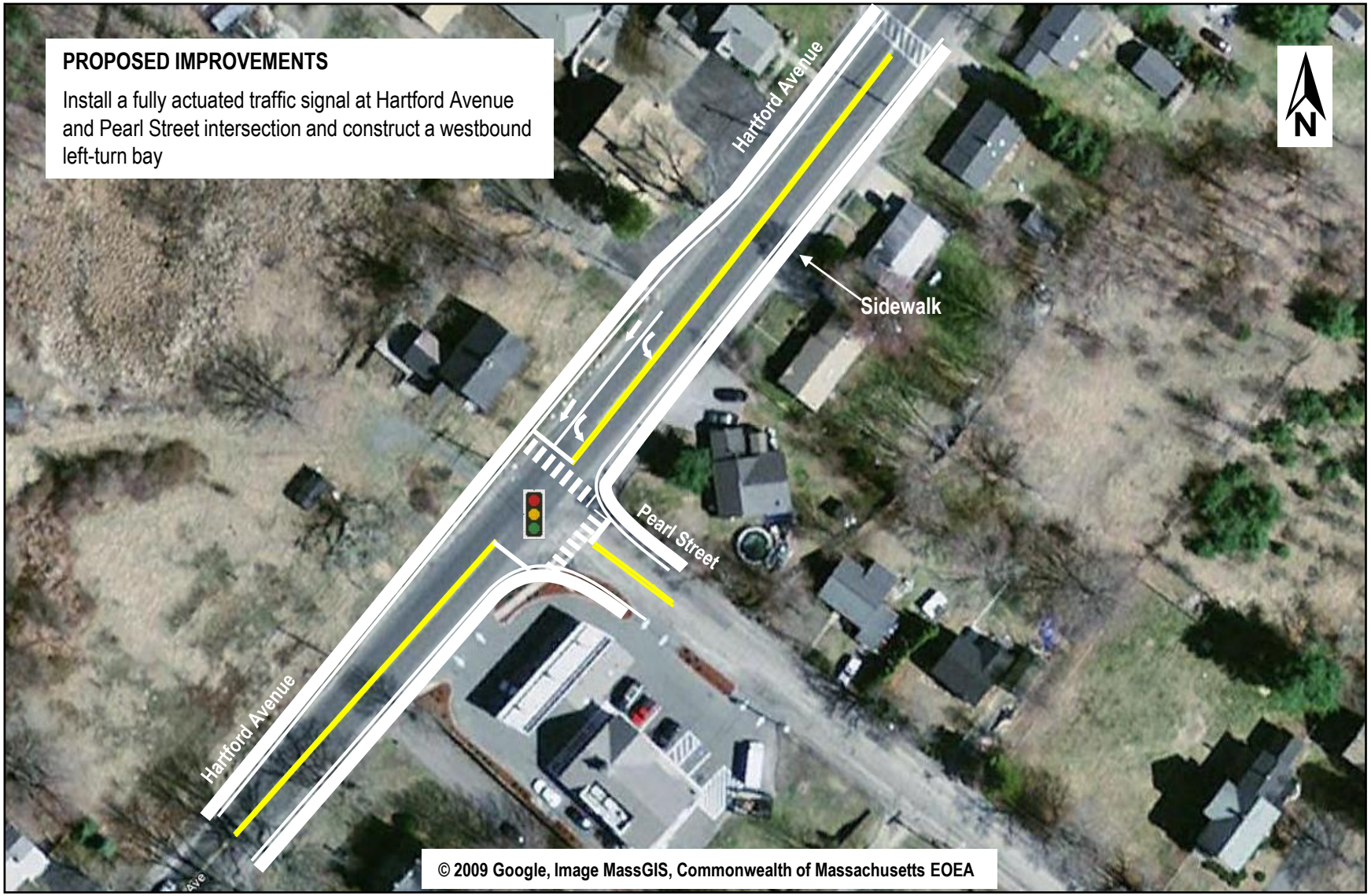

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FIGURE 3-8
Hartford Avenue and Pearl Street Intersection: Proposed Improvements

Route 126 Corridor Study

4 MEDWAY

4.1 INTRODUCTION

Route 126 in Medway is popularly known as Summer Street, but the short section of Route 126 between the Bellingham town line and its intersection with Summer Street is called Main Street—Summer Street ends at its intersection with Main Street (Figure 4-1.) In Medway, this roadway is a two-way, two-lane road, running between the Bellingham town line and the Holliston town line. The entire roadway in Medway is under town jurisdiction. The roadway serves different land uses in Medway: schools, residential, religious, and commercial. It carries an average of 11,000 vehicles per day for the majority of its length.

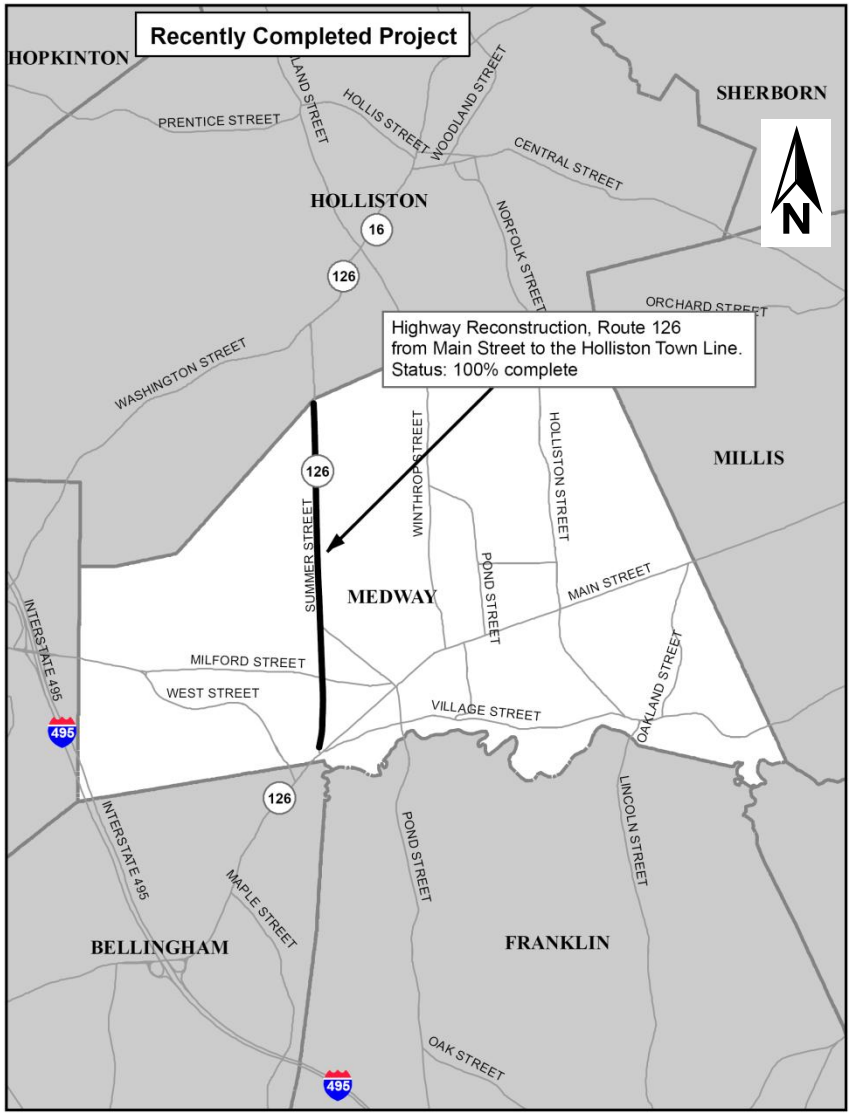
A major portion of Route 126 (Summer Street) in Medway was recently reconstructed; it was completed in 2010. The total length of this full-depth roadway reclamation and signal improvement project is approximately 2.65 miles, between Main Street and the Holliston town line. This project resulted in the construction of two 12-foot travel lanes, with 4-foot paved usable shoulders. A five-foot bituminous concrete accessible sidewalk was constructed on the west side of Summer Street for the entire length of the project. Sidewalks were constructed along several sections on the east side, for an approximate total length of 7,000 feet. New signals were proposed for the intersection of Summer Street and Milford Street (Route 109).

4.2 RECENTLY COMPLETED PROJECT

Presently, there is no project in a conceptual stage on Route 126 in Medway. The reconstruction of Summer Street, which was completed in 2010, addressed most of the transportation problems on Route 126 in Medway, except for the Main Street section described below (Figure 4-1).

4.3 ANALYSIS LOCATION

The Summer Street reconstruction project did not address the problems on the Main Street section of Route 126, including the intersection of Summer Street and Main Street. For that reason, town officials and MPO staff agreed to focus this study on the short section of Main Street from the Bellingham town line to Summer Street (Figure 4-1).



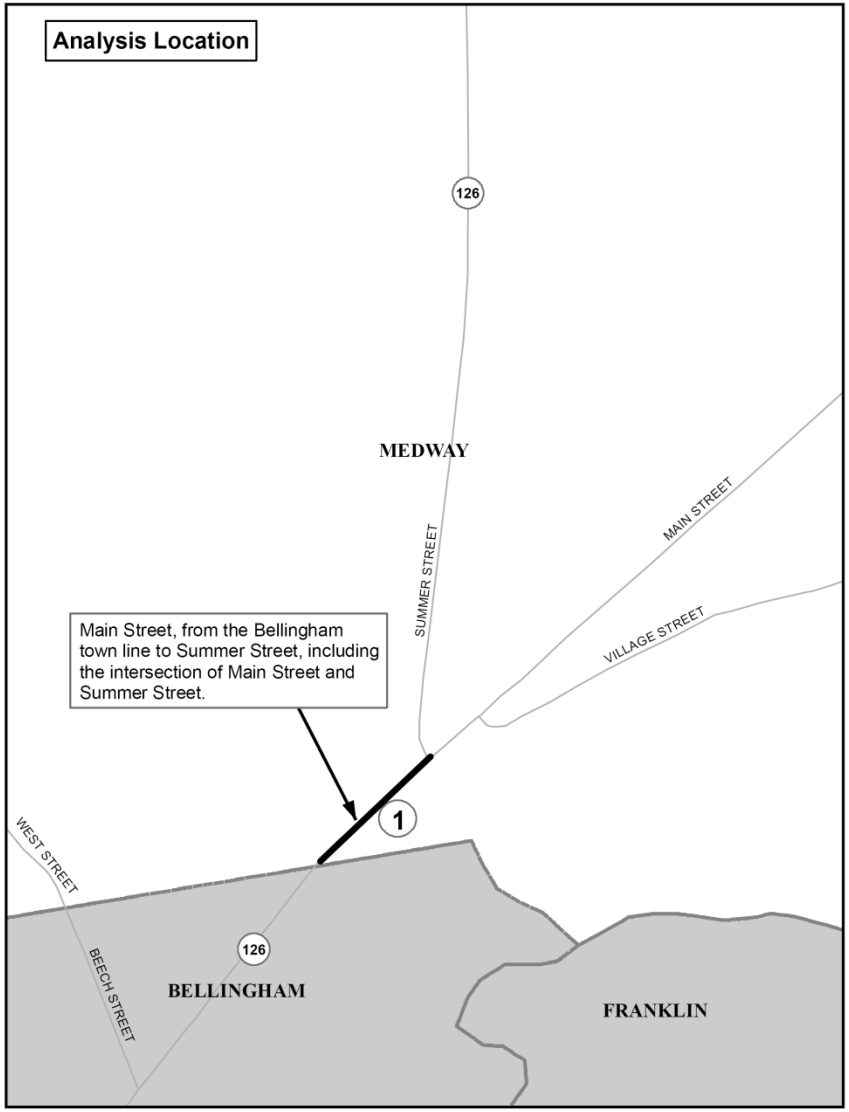


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FIGURE 4-1
Recently Completed Project and Analysis Location in Medway

Route 126 Corridor Study

4.4 MAIN STREET: FROM THE BELLINGHAM TOWN LINE TO SUMMER STREET

This analysis location is a 0.15-mile segment of roadway in Medway extending from the Bellingham town line to Summer Street. In this analysis location, Main Street is a two-way, two-lane roadway (one lane in each direction). The land use in the vicinity is primarily residential. The following section describes the problems identified in the analysis location.

4.4.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement condition of the roadway is fair and shows signs of distress, including cracking and disintegration. The pavement serviceability index of the analysis location indicates a need for rehabilitation (see Figure 1-5, in Chapter 1).

Sidewalks

There is no sidewalk on Main Street in this analysis location, creating a discontinuity between the sidewalks on Hartford Avenue in Bellingham and the recently constructed sidewalks on Summer Street in Medway. Hartford Avenue and Main Street are the same roadway; the name changes at the town line. This lack of connectivity and continuity of the sidewalk presents safety problems for pedestrians.

Traffic Operations

There are two problem intersections in this analysis location: Main Street and West Street, and Main Street and Summer Street.

Main Street and West Street Intersection

West Street intersects Main Street from the east at an oblique angle to form an unsignalized T-intersection" (Figure 4-2). West Street is the minor road and is under stop-sign control; Main Street is the major road and its traffic is uncontrolled. The alignment of West Street creates a sight distance problem on its approach to Main Street, as motorists approaching on West Street would have to twist their heads in order to get a good view of the traffic on Main Street. Figure 4-2 shows the AM and PM peak-hour turning-movement counts at the intersection. The volume of traffic on West Street is very light, so the intersection does not experience any traffic congestion. No pedestrians were observed crossing at the intersection during the AM and PM peak periods; the lack of sidewalks in this analysis location might be an explanation for this observation. Table 4-1 shows the results of the intersection level-of-service (LOS) analysis. The results indicate that traffic on the stop-controlled West Street approach operates at LOS D during the AM and PM peak hours.

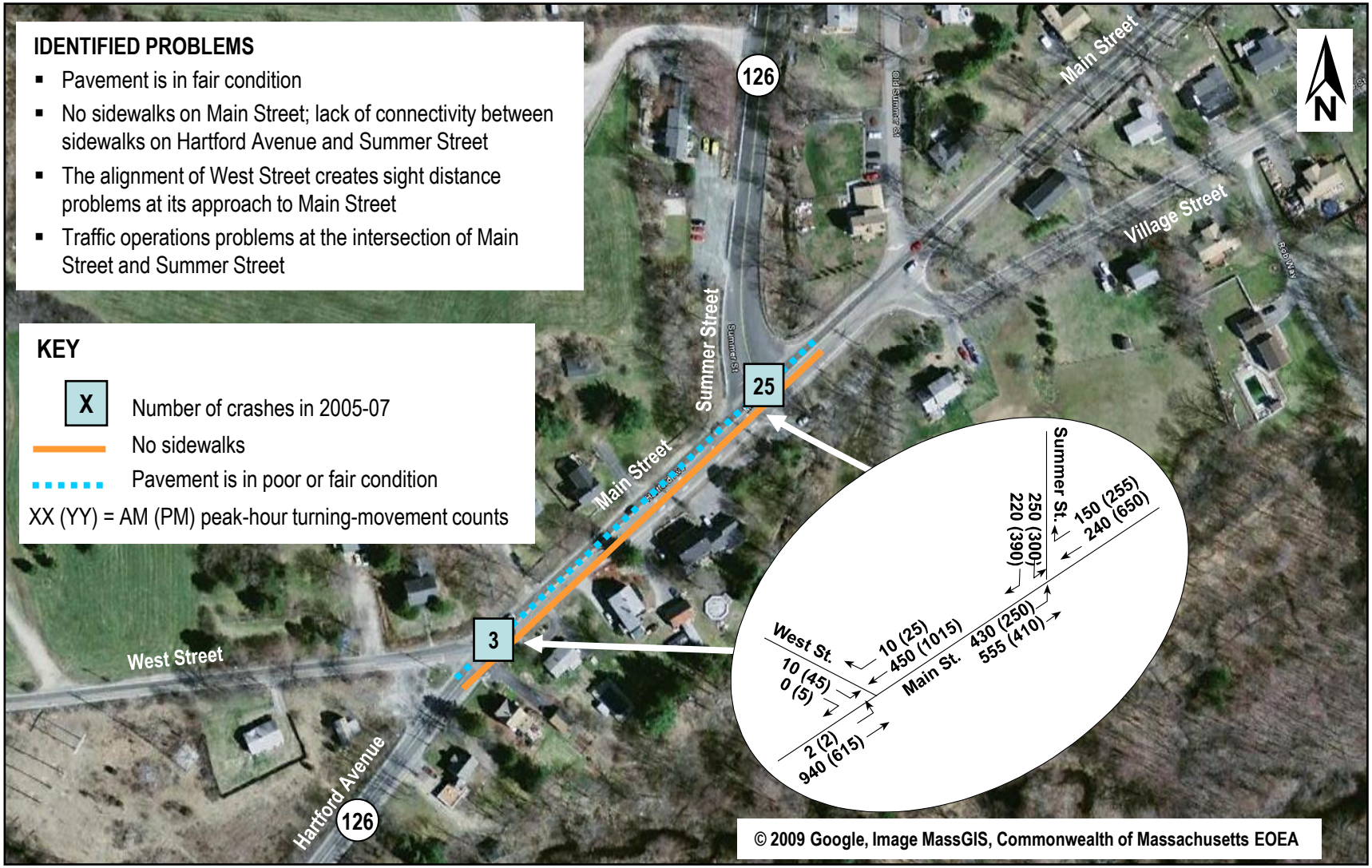

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FIGURE 4-2
Main Street: From the Bellingham Town Line to Summer Street: Identified Problems

Route 126 Corridor Study

TABLE 4-1
Intersection Capacity Analysis: Medway

	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Intersection	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**
Main Street and West Street												
Main Street EB T + L	A	0	0	A	0	0	A	0	0	A	0	0
Main Street WB T + R	A	0	0	A	0	0	A	0	0	A	0	0
West Street L + R	D	34	6	D	35	35	D	34	6	D	35	35
Main Street and Summer Street												
Main Street EB L	B	11	48	B	13	42	B	11	48	B	13	42
Main Street EB T	A	0	0	A	0	0	A	0	0	A	0	0
Main Street WB T + R	A	0	0	A	0	0	A	0	0	A	0	0
Summer Street SB L	F	151	513	F	180	559	F	151	513	F	180	559
Summer Street SB R	F	151	513	F	180	559	F	151	513	F	180	559

* 95% queue length

Note: T = through, R = right turn, L = left turn.
# = 95th percentile volume exceeds capacity.
m = Volume for 95th percentile queue is metered by upstream signal.

Main Street and Summer Street Intersection

The intersection of Main Street and Summer Street is an unsignalized T-intersection (Figure 4-2). Summer Street intersects Main Street from the north; it is the minor street so it has a stop-sign control. Although the sight distances at the approaches are good, the T-intersection creates an abrupt ending for traffic on Summer Street because of its 3.0-mile straight-line alignment. The recent reconstruction project on Summer Street did not address the problems at the intersection of Main Street and Summer Street. Figure 4-2 shows the AM and PM peak-hour turning-movement counts at the Main Street and Summer Street intersection. No pedestrians were observed crossing at this intersection during the AM or PM peak period. Analysis shows that traffic on the stop-controlled Summer Street approach operates at LOS F during the AM and PM peak hour, while traffic in both directions on Main Street operates at LOS A or B (Table 4-1).

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were performed for the intersection of Main Street and Summer Street. The results of the analysis indicated that the Main Street and Summer Street intersection meets MUTCD's Warrants 1, 2, and 3 criteria.

A traffic signal warrant analysis was not conducted for the intersection of Main Street and West Street because of the low number of crashes and low traffic volume on West Street. Staff believe that the existing problem could be corrected without installing a traffic signal.

Safety Analysis

The crash frequency and characteristics for the problem intersections in this analysis location are presented in Table 4-2.

Main Street and West Street Intersection

There were three crashes, two of which involved injuries, at the intersection of Main Street and West Street during the three-year period 2005–07. The crash rate for the intersection was 0.13 crashes per MEV, which was lower than the MassDOT Highway Division District 3 average for comparable unsignalized intersections.

Main Street and Summer Street Intersection

There were 25 crashes at the Main Street and Summer Street intersection during the three-year period 2005–07. Eighty percent of the crashes at the intersection were angle/sideswipe or rear-end crashes. The intersection had a crash rate of 1.03 per million entering vehicles (MEV), which is much higher than the MassDOT Highway Division District 3 average for comparable unsignalized intersections.

TABLE 4-2
Crash Characteristics and Frequency, 2005–07:
Main Street Analysis Locations

Crash Characteristics	Number of Crashes at Intersection	
	Main Street and West Street	Main Street and Summer Street
Crash Severity		
Fatality	0	0
Injury	2	7
Property damage only	1	16
Not reported	0	1
Unknown	0	1
Total	*3*	*25*
Collision Type		
Rear-end	1	9
Angle/sideswipe	2	11
Head-on	0	1
Single-vehicle crash	0	4
Not reported	0	0
Unknown	0	0
Total	*3*	*25*
Roadway Condition		
Dry	3	17
Wet	0	7
Snow	0	0
Not reported	0	1
Other	0	0
Total	*3*	*25*
Light Condition		
Daylight	3	17
Dawn	0	0
Dusk	0	2
Dark road, lighted	0	5
Dark road, unlighted	0	0
Not Reported	0	1
Other	0	0
Total	*3*	*25*
Year		
2005	1	6
2006	1	12
2007	1	7
Total	*3*	*25*

4.4.2 PROPOSED IMPROVEMENTS

Staff recommend reconstructing Main Street from the Bellingham town line to Summer Street, approximately 0.15 miles. Proposed improvements, which are estimated to cost $300,000, include the following modifications:

- Construction of accessible sidewalks and granite curbing on Main Street to provide continuity with the existing sidewalk in Bellingham. Installation of a crosswalk on Main Street to connect with the sidewalk on Summer Street.
- Reconstruction of the intersection of Main Street and West Street and realignment of West Street to intersect Main Street perpendicularly in order to improve visibility, and therefore safety (Figure 4-3).
- Installation of signs and pavement markings on the approaches to the intersection, especially for the southbound motorists on Summer Street, in order to improve the ability of approaching drivers to view the intersection of Main Street and Summer Street. Figure 4-3 illustrates the various signs that staff propose for this intersection; they are especially important on Summer Street.
- Pavement rehabilitation

Additional Improvements

In addition, staff recommend that the Main Street and Summer Street intersection be studied together with the Main Street and Village Street intersection to examine the possibility of installing coordinated signals at both intersections to improve safety and traffic flow.

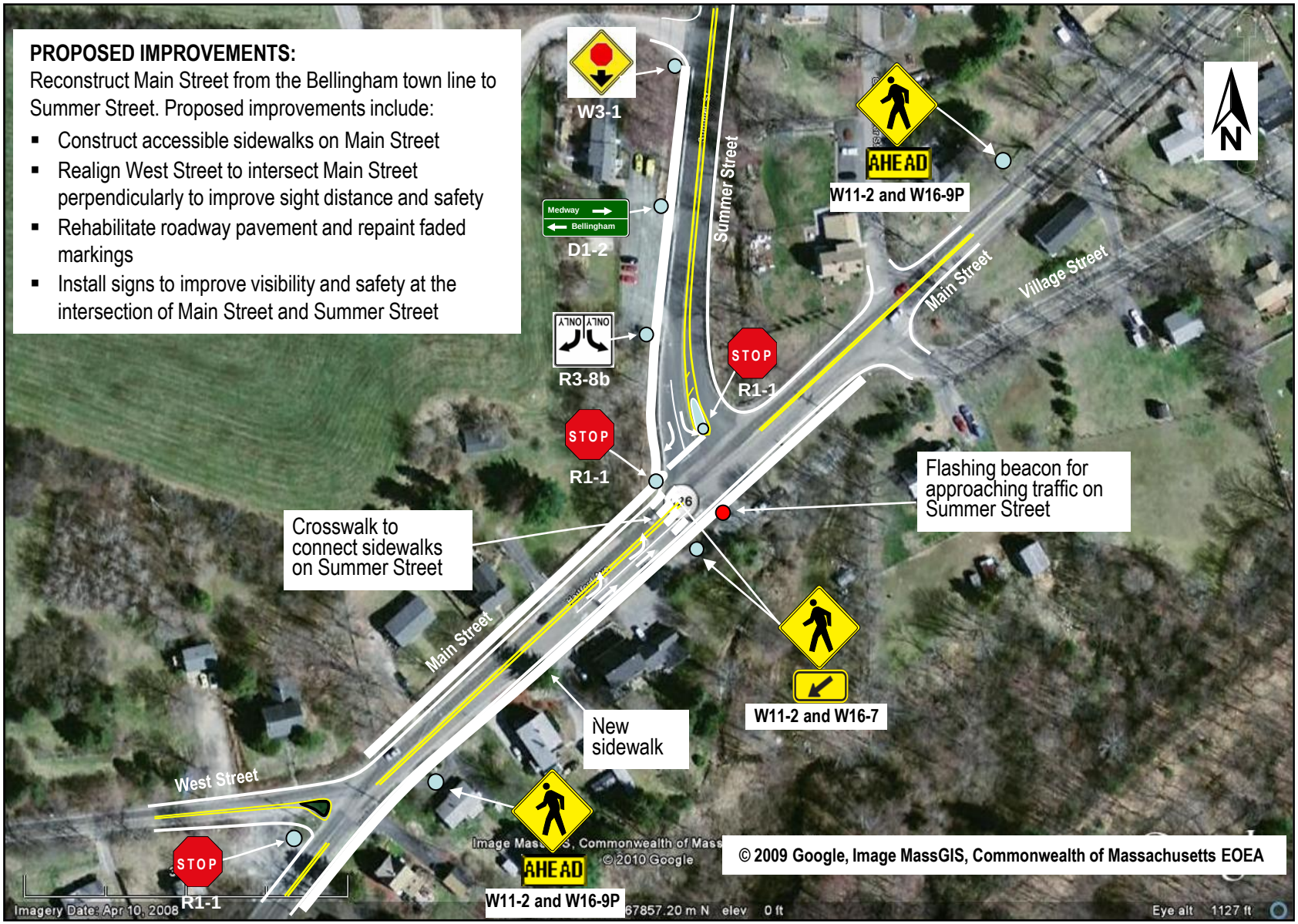

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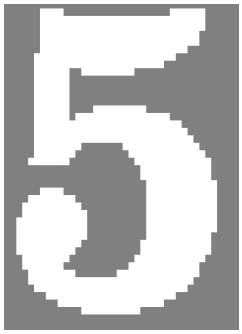
FIGURE 4-3
Main Street: From the Bellingham Town Line to Summer Street: Proposed Improvements

Route 126 Corridor Study



HOLLISTON

5.1 INTRODUCTION

Route 126 in Holliston is a two-way, two-lane arterial that runs between the Medway town line and the Ashland town line. Route 126, which is combined with Route 16 through the downtown area, and Route 16, the principal roads serving Holliston, serve many land uses: schools, residential, commercial, religious, and recreational. Figure 1-1, in Chapter 1, shows the Route 126 roadway jurisdiction in Holliston. The section of Route 16 south of Pine Street/Pearl Street to the Milford town line and the section of Route 126 (Concord Street) north of Baker Street to the Ashland town line are under the MassDOT Highway Division's jurisdiction. The portion of Washington Street between the two sections controlled by the MassDOT Highway Division is under town jurisdiction.

Route 126 carries an average of 16,000–19,600 vehicles per day for the majority of its length (Figure 1-2, in Chapter 1). The posted speed limit ranges from 25 mph to 35 mph; Figure 1-3, in Chapter 1, shows the average travel speeds on Route 126 in Holliston during the peak travel periods. Figure 1-4, in Chapter 1, shows the existing right-of-way width; it varies from 43 to 55 feet. The existing roadway width is approximately 24 to 36 feet.

The portion of Washington Street in the town center area had undergone improvements to make it more pedestrian friendly and increase safety and mobility in the downtown area. In addition, the intersection of Washington Street and Concord Street was reconstructed in 2002 to enhance safety and improve efficiency—the traffic signal and related equipment were upgraded and the roadways realigned and resurfaced.

A recent Boston Region MPO study evaluated safety and operational improvements at the Washington Street and Hollis Street intersection and recommended the following improvements:[4]

- Consider the installation of a new traffic signal or a modern roundabout

[4] Robert Sievert, of the Central Transportation Planning Staff, "Safety and Operational Improvements at Selected Intersections," a memorandum to the Boston Region MPO's Transportation Planning and Programming Committee on October 16, 2008.

- Construct bulb-outs, medians, and/or islands to channelize the intersection area; repaint faded crosswalks and lane markings
- Redesign and move the church driveway farther west on Hollis Street, away from the intersection
- Consider the addition of a bicycle lane on this portion of Washington Street through Holliston

5.2 PREVIOUSLY PROPOSED PROJECTS

Presently, the Town of Holliston is interested in advancing some previously proposed projects on Route 126 that are in conceptual stages. Presently, there are two previously proposed projects that are listed in the Boston Region MPO's Transportation Improvement Program (TIP) Universe of Projects (Appendix A of the FFYs 2006–10 TIP) or MassDOT Highway Division's project information database. They are shown in Figure 5-1 and described below:

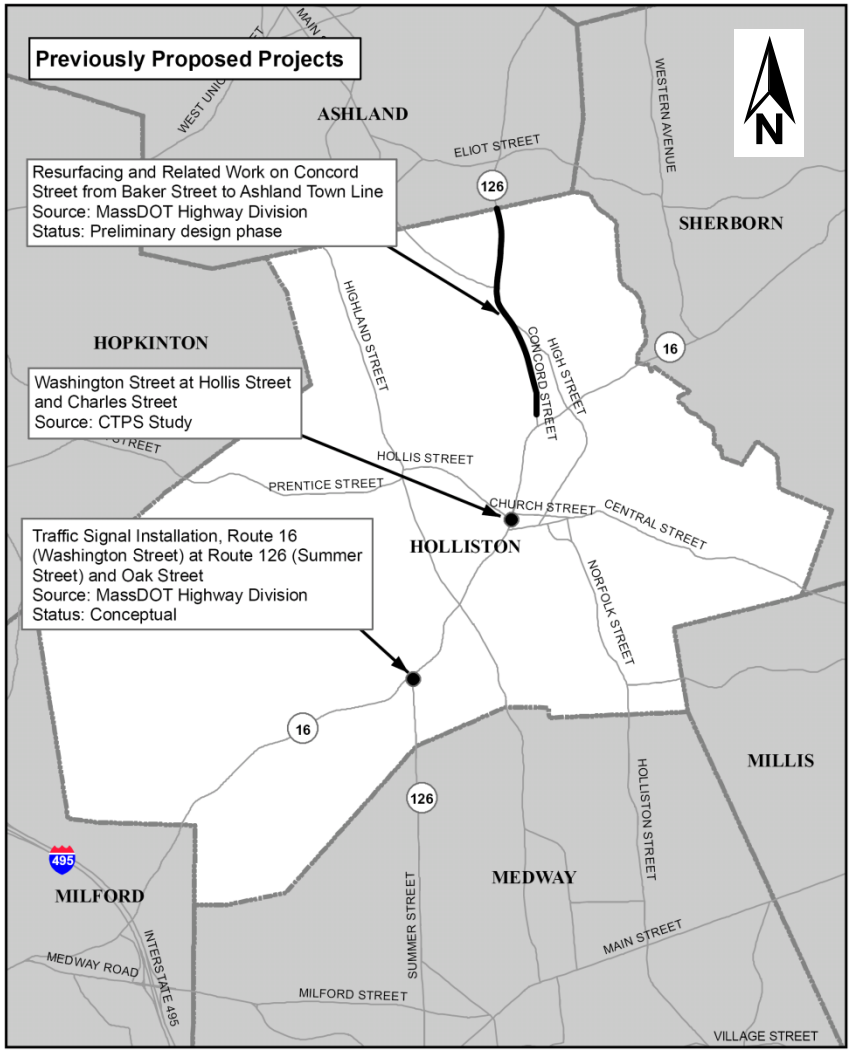
- The resurfacing and drainage-related improvements on Route 126 (Concord Street) from Baker Street to the Ashland town line. The project, which is in conceptual stages, includes pavement rehabilitation, drainage work, construction of new sidewalks, and replacement of existing sidewalks in the 2.0-mile section. This project has been stalled for many years.
- The reconstruction of the Washington Street and Summer Street/Oak Street intersection. The project, which is in conceptual stages, would include installing a traffic signal and making geometric and safety improvements at the intersection. This project has been stalled for many years.

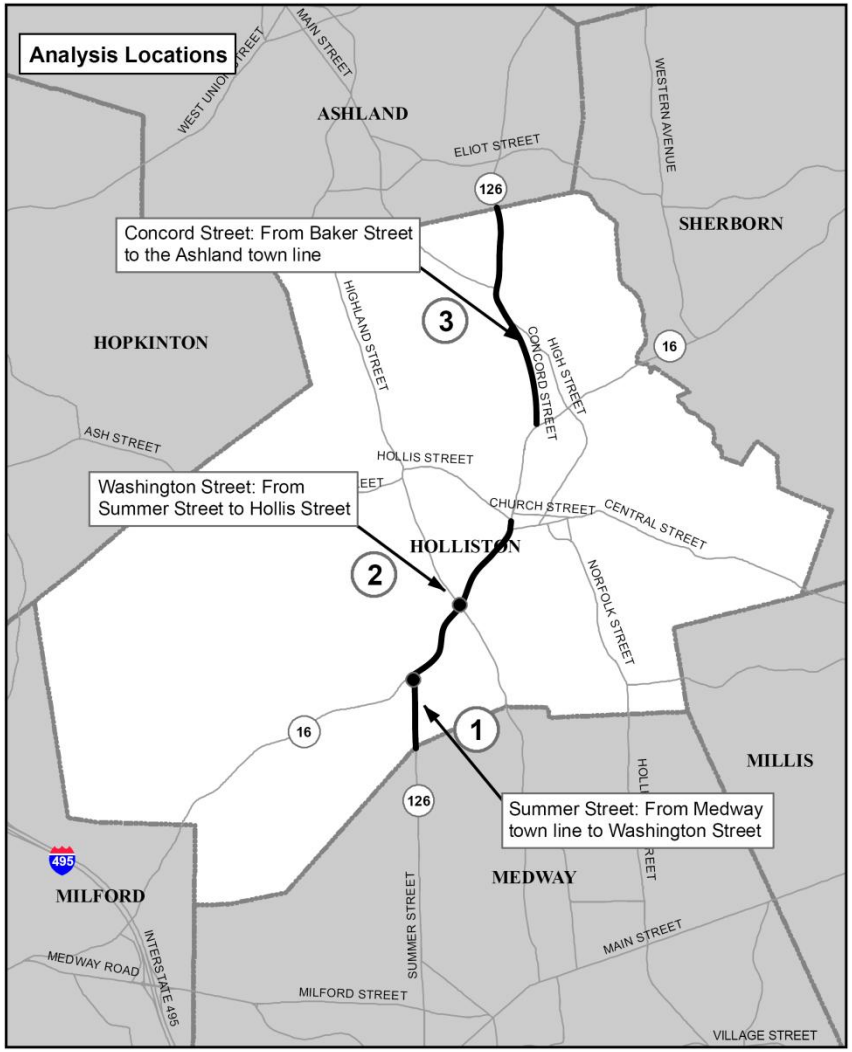
5.3 ANALYSIS LOCATIONS

Based on the previous project proposals described above and field reconnaissance, MPO staff, in conjunction with the task force and Holliston town officials, decided to include the following three analysis locations in the study (Figure 5-1).

1. Summer Street, from the Medway town line to Washington Street
2. Washington Street, from Summer Street to Green Street/Exchange Street
3. Concord Street, from Baker Street to the Ashland town line

The following sections describe the existing conditions at the analysis locations and the proposed improvements suggested for addressing the problems.





BOSTON REGION MPO

FIGURE 5-1
Previously Proposed Projects and Analysis Locations in Holliston

Route 126 Corridor Study

5.4 SUMMER STREET: FROM THE MEDWAY TOWN LINE TO WASHINGTON STREET

This analysis location is 0.6 miles long, beginning just north of the Medway town line. The land uses in the vicinity along Summer Street comprise residential, educational, and religious purposes. Summer Street is a two-way, two-lane (one in each direction) roadway. It intersects Washington Street from the south and forms a T-intersection (Figure 5-2). It is under stop-sign control. Its present geometric layout creates many conflict points. An automatic traffic recorder (ATR) count taken in September 2009 indicated an average daily traffic of 19,600 vehicles north of the intersection and 14,700 vehicles south of the intersection on Washington Street. The ATR data also indicated average daily traffic of 11,000 vehicles on Summer Street.

5.4.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement condition is fair and beginning to show signs of distress. The pavement serviceability index for this analysis location indicates that some form of pavement rehabilitation is necessary (Figure 1-4), in Chapter 1.

Sidewalks

There are no sidewalks on Summer Street in this section, although there are residences located on Summer Street, which also provides access to Mission Springs and a senior center. The recent reconstruction of the portion of Summer Street located in Medway included adding sidewalks and shoulders, but these sidewalks and shoulders end just at the Holliston town line.

The MetroWest Regional Transit Authority operates Route 6 bus service to Mission Spring via Summer Street during peak and off-peak hours. In addition, the proposed Upper Charles Trail would cross Summer Street in Holliston near the Mission Spring area. Connectivity between the trail and pedestrian and bicycle facilities on Summer Street is essential. Presently, there is no bike lane or usable shoulders for bicyclists in the vicinity or signs telling motorists to share the road with bicyclists.

Traffic Operations

Figure 5-2 shows the existing AM and PM peak-hour turning-movement counts at the Washington Street, Summer Street, and Oak Street intersection. No pedestrians were observed at the intersection during the AM and PM peak periods when the traffic counts were conducted. The lack of sidewalks in the vicinity of this intersection may explain why no pedestrians were observed at the intersection. Table 5-1 presents the results of the intersection capacity analysis for the intersection of Washington Street and Summer Street. The analysis indicated that traffic northbound on Summer Street operates at LOS E during peak hours.

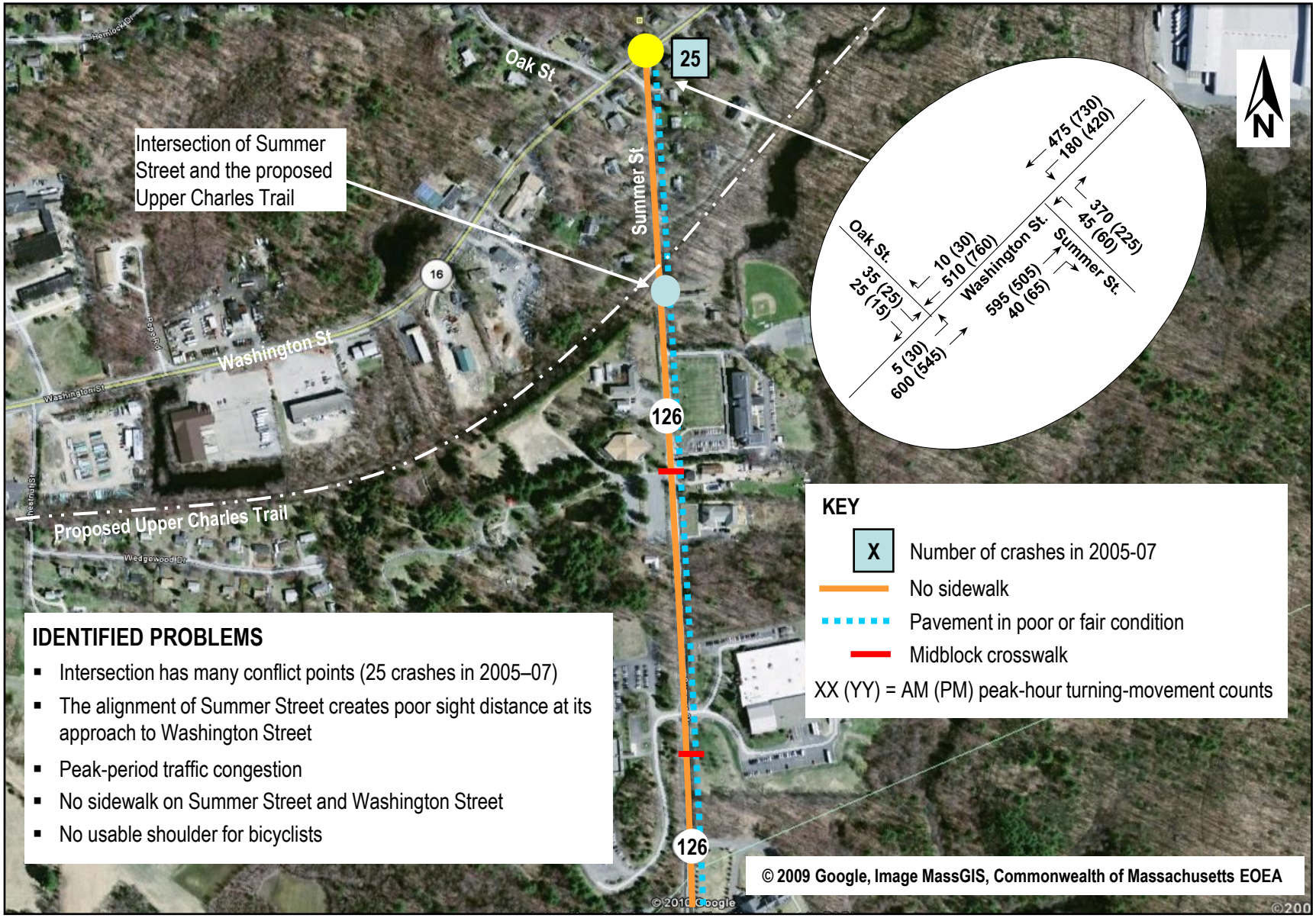


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FIGURE 5-2
Summer Street: From the Medway Town Line to Washington Street: Identified Problems

Route 126 Corridor Study

TABLE 5-1
Intersection Capacity Analysis: Holliston

	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Intersection	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**
Route 16 (Washington Street) and Route 126 (Summer Street)												
Summer Street NB L	E	34	201	D	33	116	C	30	49	D	37	67
Summer Street NB R	E	43	76	E	40	118	B	13	74	B	13	62
Washington Street WB L	A	5	20	B	11	59	C	22	#154	D	45	#409
Washington Street WB T	A	5	20	B	11	59	B	10	260	B	11	431
Washington Street EB T+R	A	2	20	A	2	20	C	31	#552	D	42	#577
Oak Street SB L+R	C	23	24	D	33	24	C	26	54	D	36	38
Route 16 (Washington Street) and Highland Street												
Washington Street EB L	D	35	165	D	42	140	D	41	172	D	52	#166
Washington Street EB T+R	E	71	#836	B	16	477	D	38	#822	B	16	#506
Washington Street WB L	D	37	55	D	41	84	E	79	#59	D	41	83
Washington Street WB T+R	C	23	351	D	51	#880	C	21	353	D	46	#852
Highland SB L+T	C	27	87	E	55	#246	C	27	81	D	48	#219
Highland SB R	A	9	46	C	34	64	C	31	48	D	35	65
Highland NB L+T	D	40	63	D	46	#157	D	52	#328	D	39	130
Highland Street NB R	C	22	#363	C	31	34	C	25	52	C	30	32

* 95% queue length

Note: T = through, R = right turn, L = left turn.

= 95th percentile volume exceeds capacity.

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

Although the analysis shows that traffic on Washington Street operates at LOS A under the current uncontrolled (free-flow) condition, the results are misleading because there are traffic queues on Washington Street during the peak hours.

The discrepancy between field and calculated delays and LOS can be attributed to the operating conditions, where motorists northbound on Summer Street usually ignore the stop sign due to a long wait on that approach during the AM peak hours, and instead merge with the eastbound traffic on Washington Street. Also during the PM peak period, Washington Street westbound motorists turning left onto Summer Street block the through traffic while waiting for a gap to turn. Both situations cause intersection blockages and long queues on Washington Street. These cannot be reflected in the specific analysis we performed.

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were performed for the intersections of Washington Street with Summer Street and the nearby intersection of Washington Street with Oak Street (Figure 5-2), which, for the purposes of this study, were considered a single intersection. The results of the analysis indicated that the intersection meets MUTCD's Warrants 1, 2, and 3 criteria.

Safety Analysis

The crash history of this intersection was evaluated to identify safety deficiencies and to determine if the location experiences a high crash rate (Table 5-2). This intersection experienced 25 crashes between 2005 and 2007, resulting in an average of 8.33 crashes per year and a crash rate of 0.89 crashes per million entering vehicles (MEV), which is higher than the average of 0.69 crashes per MEV for MassDOT Highway Division's District 3 unsignalized intersections. About 36 percent of the crashes at this intersection resulted in injury and 64 percent in property damage only. Both rear-end and angle/sideswipe collisions accounted for 80 percent of the crashes (40 percent for each collision type.)

5.4.2 PROPOSED IMPROVEMENTS

Staff recommend reconstructing Summer Street from the Medway town line to the Washington Street, Summer Street, and Oak Street intersections to improve safety and traffic operations, and mobility for pedestrians and bicyclists. Proposed improvements for the 0.6-mile roadway, estimated to cost about $2.5 million, include the following:

- Rehabilitation of the pavement and drainage-related improvements
- Construction of accessible sidewalks and curbing on Summer Street that would connect with the sidewalks recently constructed on Summer Street in Medway
- Provision of four-foot-wide paved usable shoulders on Summer Street to accommodate bicycles
- Construction of more sidewalks to create connectivity of the proposed

sidewalks with the proposed Upper Charles Trail, which crosses Summer Street in Holliston

- Installation of a midblock pedestrian crosswalk with a pedestrian crosswalk flashing beacon on Summer Street to improve safety for pedestrians and bicyclists.

  Installation of bicycle-warning signs reminding motorists to share the roadway with bicyclists: bicycle-warning signs (types W11-1 and W16-1), supplemented with pavement markings

Solar pedestrian crosswalk flashing beacon

- Installation of a new traffic signal with pedestrian signals that are activated by push buttons at the intersection of Washington Street, Summer Street, and Oak Street. Installation of signal-ahead signs (type W3-3) in advance of the intersection to alert motorists of the presence of a traffic signal ahead that is obscured by the horizontal and vertical curves in the vicinity that might the limit approach sight distance. Installing a traffic signal at the intersection would reduce congestion, as all movements at the intersection would operate at LOS D or better (Table 5-1).

W11-1 and W16-1

W3-3 MUTCD

- Design of geometric improvements at the intersection of Washington Street and Summer Street, including the addition of a westbound left-turn lane on Washington Street and an exclusive right-turn lane on Summer Street, to improve safety and traffic operation (Figure 5-3).

5.5 WASHINGTON STREET: FROM SUMMER STREET TO GREEN STREET/EXCHANGE STREET

This analysis location on Washington Street is about 1.5 miles long. Washington Street is a two-way, two-lane roadway and passing through downtown Holliston. The land use along the corridor is primarily residential, with commercial uses in the downtown area, which is located just east of this analysis location. The improvements that had already been made on Washington Street in the downtown area, which included traffic calming and pedestrian-friendly improvements, did not mitigate the problems in this analysis location. Automatic traffic recorder counts taken in June 2009 indicated an average daily traffic of 19,600 vehicles on Washington Street.

TABLE 5-2
Crash Characteristics and Frequency, 2005–07:
Holliston Analysis Locations

Crash Characteristic	Number of Crashes at Intersection	
	Washington St. and Summer St.	Washington St. and Highland St.
Crash Severity		
Fatality	0	0
Injury	7	6
Property damage only	16	19
Not reported	1	0
Unknown	1	0
Total	*25*	*25*
Collision Type		
Rear-end	10	15
Angle/sideswipe	10	6
Head-on	1	0
Single-vehicle crash	2	4
Not reported	2	0
Unknown	0	0
Total	*25*	*25*
Roadway Condition		
Dry	18	20
Wet	7	4
Snow	0	1
Not reported	0	0
Other	0	0
Total	*25*	*25*
Light Condition		
Daylight	16	19
Dawn	2	0
Dusk	0	1
Dark road, lighted	5	4
Dark road, unlighted	1	1
Not Reported	0	0
Other	1	0
Total	*25*	*25*
Year		
2005	6	9
2006	12	6
2007	7	10
Total	*25*	*25*

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FIGURE 5-3
Washington Street, Summer Street, and Oak Street Intersection: Proposed Improvements

Route 126 Corridor Study

5.5.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement condition in this analysis location range from fair to poor, and there are sections that are showing signs of pavement distress, such as cracking, rutting, and disintegration. Some areas in this analysis location have drainage problems. The 2006–07 pavement serviceability index for this analysis location indicates the need for some kind of rehabilitation.

Sidewalks

There is a sidewalk with a grass buffer on at least one side of Washington Street throughout the analysis section. However, there are four major problems with the sidewalks, which are listed below:

1. Some areas of the sidewalks are not walkable because the sidewalk is broken, crumbled, or overgrown with weeds.
2. The walkable portion of the sidewalk does not meet the minimum four-foot-wide standard at some locations. At some locations, it is impossible for two people to walk side by side.
3. The existing sidewalks are not ADA-compliant (they lack ramps for wheelchairs and curb cuts).
4. There are no crosswalks in locations where the sidewalk switches to the opposite side of Washington Street.

Traffic Operations

The intersection of Washington Street and Highland Street is the most problematic intersection in this analysis location. This signalized intersection, with exclusive left-turn bays on the Washington Street and exclusive right-turn bays on Highland Street, is congested mostly during the AM and PM peak periods. Figure 5-4 shows the existing AM and PM peak-hour turning-movement counts at the intersection. The counts were conducted in June 2009, when schools were in session. Table 5-1 presents the results of the intersection capacity analysis. The analysis indicated that traffic on Washington Street operates at LOS E and has long traffic queues in the peak direction during the AM and PM peak hours (eastbound during the AM peak hour and westbound during the PM peak hour). Traffic on Highland Street operates at an acceptable level, LOS D or better.

Safety Analysis

The intersection of Washington Street and Highland Street is the intersection in the analysis location with the most crashes; hence it was evaluated to identify safety deficiencies. Table 5-2 presents the crash characteristics of the Washington Street and Highland Street intersection. This intersection experienced 25 crashes between 2005 and 2007, which resulted in an average

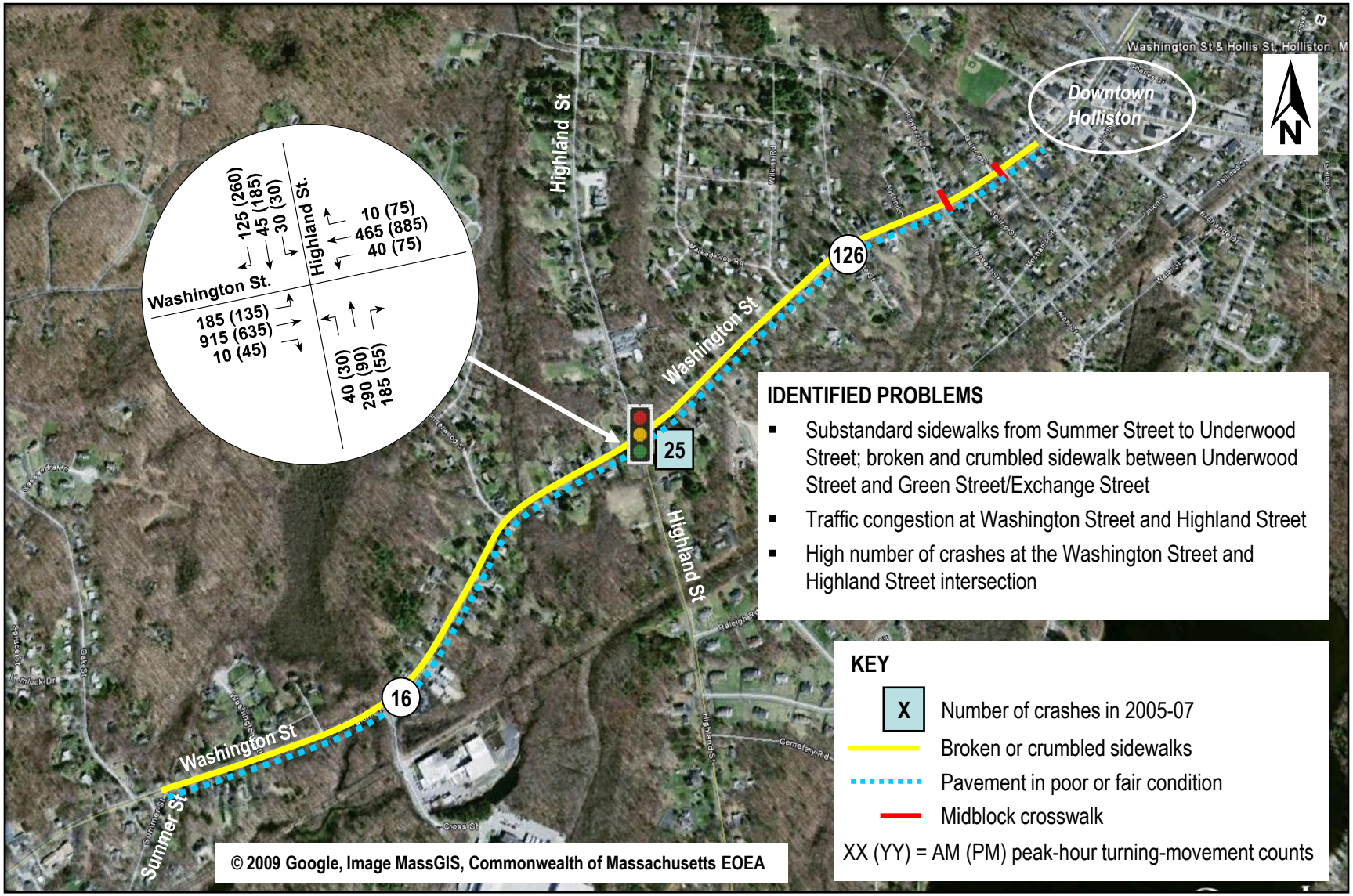

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FIGURE 5-4
Washington Street: From Summer Street to Green Street/Exchange Street: Identified Problems

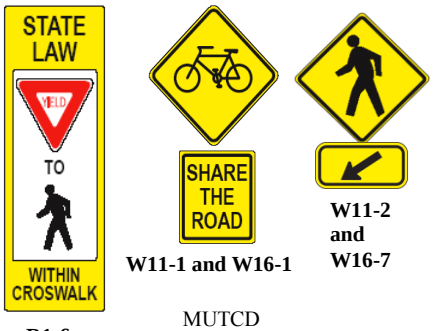
Route 126 Corridor Study

of 8.33 crashes per year and a crash rate of 0.73 crashes per million entering vehicles. The crash rate of this intersection is lower than the average crash rate for MassDOT Highway Division's District 3 signalized intersections. About 76 percent of the crashes at this intersection, most of which were rear-end collisions, resulted in property damage only.

5.5.2 PROPOSED IMPROVEMENTS

Staff recommend several roadway improvements for the section of Washington Street between Summer Street and Green Street/Exchange Street. The project length is approximately 1.5 miles, and the construction cost is estimated at $3.0 million. The improvements recommended by staff include the following modifications:

- Rehabilitation of the pavement with milling and overlay and construction of drainage-related improvements.
- Replacement of the existing sidewalks with accessible sidewalks and connecting them to the existing sidewalks in the downtown area.
- Construction of midblock crosswalks where the sidewalk changes to the other side of the roadway.
- Installation of signs to improve safety for pedestrians at midblock crosswalks (type R1-6 and type W11-2 with supplemental plaque type W16-7), and for bicyclists (types W11-1 and W16-1).



R1-6 W11-1 and W16-1 W11-2 and W16-7

MUTCD

- Construction of four-foot-wide paved shoulders that could be used by bicyclists.
- Retiming of the traffic signal at Washington Street and Highland Street to improve traffic operations. Analysis indicates that retiming the traffic signal to respond to current traffic demands could reduce the AM peak-hour intersection delay to 34 seconds per vehicle from 43 seconds, and the PM peak-hour delay to 38 seconds per vehicle from 40 second.
- Installation of signal-ahead signs in advance of the intersection to alert motorists of the presence of a traffic signal ahead and to address the horizontal and vertical curves in the vicinity that limit the sight distance from the approach.

W3-3

Finally, staff recommend that the Town of Holliston implement the recommendations for the Washington Street and Hollis Street intersection from a previous study conducted by CTPS, described in section 5-2.[5]

[5] Robert Sievert, of the Central Transportation Planning Staff, "Safety and Operational Improvements at Selected Intersections," a memorandum to the Boston Region MPO's Transportation Planning and Programming Committee on October 16, 2008.

5.6 CONCORD STREET: FROM BAKER STREET TO THE ASHLAND TOWN LINE

This analysis location on Concord Street is about two miles long (Figure 5-5). Concord Street is a two-way, two-lane roadway. Its land uses are primarily residential, but that is mixed with commercial and industrial land uses. Concord Street's average daily traffic is 13,600 vehicles. The MassDOT Highway Division has jurisdiction over this analysis location—the section of Concord Street between Baker Street and the Ashland town line.

To the south of the analysis location is the intersection of Washington Street and Concord Street, which was reconstructed in 2002 with traffic signal and geometric improvements and curbed sidewalks; the project locations were the segment of Washington Street from Winter Street to Curve Street and Concord Street south of Baker Street.

5.6.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement condition is poor to fair; there are sections showing signs of pavement distress and areas with drainage problems. The 2006–07 pavement serviceability index indicated the need for some form of pavement rehabilitation in the area. Drainage problems in this analysis location have been a major concern of the town, which is looking for a permanent fix for the problem.

Sidewalks

Field reconnaissance indicated the following pedestrian problems in the analysis location.

Concord Street, from Baker Street to Colonial Way

The width of the sidewalk does not meet the minimum four-foot-wide Highway Division standard, and it does not meet ADA requirements for sidewalks. At some locations, it is impossible for two people to walk side by side. Although a sidewalk that on the east side has a grass buffer between the curb and the sidewalk, there are sections where the sidewalk is broken and crumbled that may pose a danger to pedestrians.

Concord Street, from Colonial Way to the Ashland Town Line

There are no sidewalks in this section, although there are residences along both sides of Concord Street throughout the section.

Traffic Operations

Field observations indicated that northbound traffic on Concord Street turning left onto Ashland Street occasionally blocks the through traffic during peak periods, but it is not a problem. There are enough gaps of sufficient length in the opposing traffic flow to allow left turns; therefore, the impact on through traffic delay and safety is minimal.

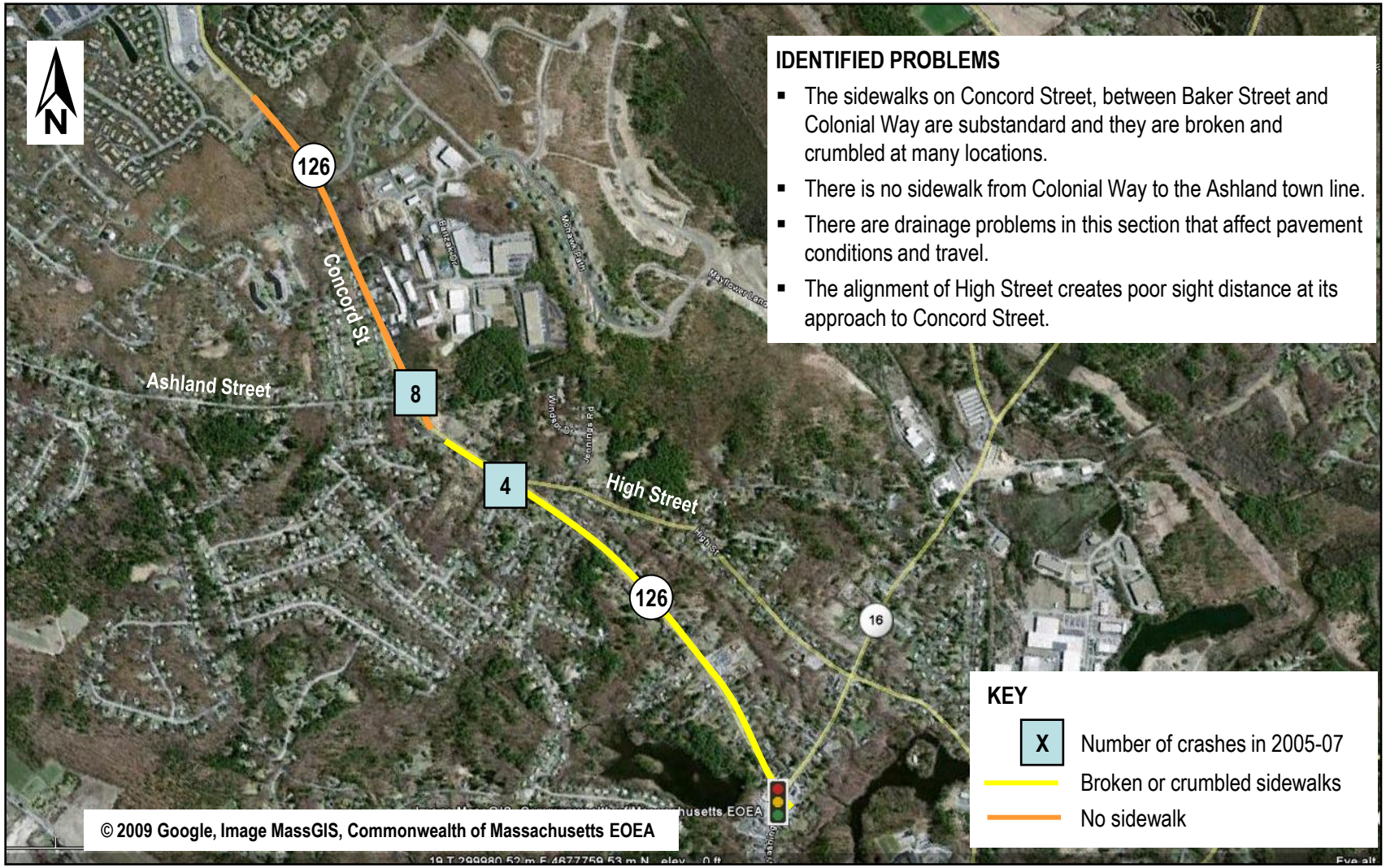


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FIGURE 5-5
Concord Street: From Baker Street to the Ashland Town Line: Identified Problems

Route 126 Corridor Study

At the intersection of Concord Street and High Street, the sight distance from the High Street approach to Concord Street is limited. High Street intersects Concord Street from the east at an oblique angle, and it is under stop-sign control. Motorists approaching Concord Street on High Street would have to strain their neck in order to get a good view of the traffic on Concord Street.

Safety Analysis

There was no high-crash location in this analysis location. All of the intersections in this analysis location had eight or fewer crashes during the three-year period 2005–07. Their crash rates were all lower than the average crash rate for MassDOT Highway Division's District 3 unsignalized intersections.

5.6.2 PROPOSED IMPROVEMENTS

Staff recommend reconstructing Concord Street from Baker Street to the Ashland town line, approximately 2.0 miles. The improvements proposed for this analysis location are estimated to cost about $5.0 million. They include:

- Rehabilitation and resurfacing of the roadway and construction of drainage-related improvements to permanently address the recurring drainage problem.
- Construction of new accessible sidewalks from Colonial Way to the Ashland town line. Replacement of the existing sidewalk from Baker Street to Colonial Way with accessible sidewalks, and provision of granite curbing.
- Construction of midblock crosswalks where the sidewalk changes to the other side of the roadway.
- Construction of four-foot-wide paved shoulders that could also be used by bicyclists.
- Installation of signs to improve safety for pedestrians and bicyclists. Examples of such signs are nonvehicular warning signs (types W11-2 and W16-7) and bicycle-warning signs (types W11-1 and W16-1).

W11-1 and W16-1

W11-2 and W16-7

MUTCD

- Realignment of the approach of High Street so that it intersects Concord Street perpendicularly in order to improve sight distance for motorists (see Figure 5-6).

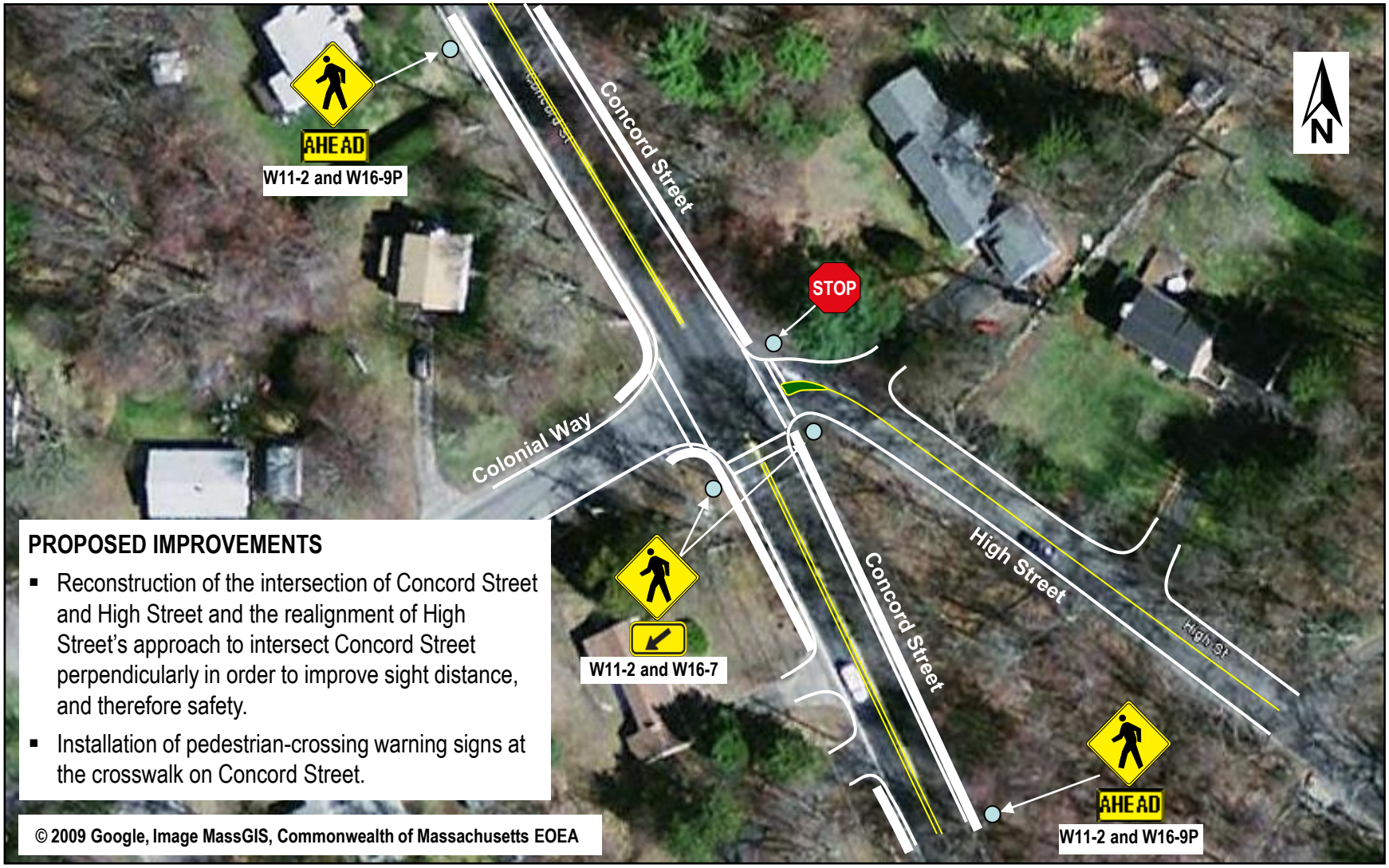

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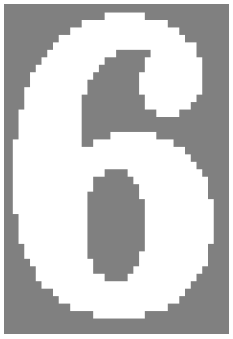
FIGURE 5-6
Concord Street and High Street Intersection: Proposed Improvements

Route 126 Corridor Study



ASHLAND

6.1 INTRODUCTION

Route 126 in Ashland is a two-way, two-lane arterial roadway that runs between the Holliston town line and the Framingham town line. The MassDOT Highway Division has jurisdiction over all of Route 126 (Pond Street) in Ashland (Figure 1-1, in Chapter 1). In Ashland, Pond Street serves different land uses: residential, commercial, educational, and recreational. It carries on the average about 16,000 vehicles per day for the majority of its length. Figure 1-3, in Chapter 1, shows the average travel speeds on Pond Street in Ashland during the peak travel periods; the posted speed limit is 35 mph. Figure 1-4, in Chapter 1, shows the existing right-of-way width; it varies from 43 to 55 feet. The existing roadway, which is approximately 24 to 50 feet wide, has two 12-foot-wide travel lanes, exclusive turn lanes at major intersections, and 2-to-5-foot-wide shoulders. There are no sidewalks on Pond Street in Ashland.

6.2 PREVIOUSLY PROPOSED PROJECT

The Town of Ashland is interested in improving Pond Street to accommodate the needs of pedestrians and bicyclists, as well as to serve to businesses on Pond Street. The project is listed in the Boston Region MPO's Transportation Improvement Program's (TIP) Universe of Projects (Appendix A of the FFYs 2006–10 TIP) and in the MassDOT Highway Division's project information database. The project, which is at preliminary engineering stages, extends from the Holliston town line to the Framingham town line, a distance of 1.7 miles, and covers all of Pond Street in Ashland (Figure 6-1). The project is still evolving; the town of Ashland had completed a survey of the project area and is preparing to proceed with the engineering design of the project. Some of the proposed concepts that were developed by Greenman Pedersen Incorporated (GPI) for the Town of Ashland are:

- Minor box widening (widening the roadway at some sections to install shoulders or sidewalks or guardrails).
- Construction of sidewalks and shoulders.

- Traffic improvements at the intersection of Pond Street and Eliot Street and at a number of unsignalized intersections in the corridor.
- Minor drainage improvements and milling and resurfacing of the roadway.

6.3 ANALYSIS LOCATION

For planning purposes, the task force and MPO staff decided to include all of Pond Street in Ashland as an analysis location in this study (Figure 6-1). Incorporating this section of Pond Street in the study allows for a review of the proposed concepts, develops improvements, and provides a clearer picture of improvements expected in the Route 126 corridor.

6.4 POND STREET: FROM THE HOLLISTON TOWN LINE TO THE FRAMINGHAM TOWN LINE

The following sections describe the problems in this analysis location that were identified by staff.

6.4.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement is in poor to fair condition and there are areas showing signs of distress. The pavement serviceability index indicates the need for some form of pavement rehabilitation. In addition, there are areas with drainage problems that affect pavement and travel conditions.

Sidewalks

The section of Pond Street in Ashland has no sidewalks and no crosswalks, although there are residences and retail businesses along both sides of the roadway. All of the intersections in this analysis location lack pedestrian amenities.

Traffic Operations

There are four intersections in this analysis location with both traffic operations problems and pedestrian and bicyclist problems.

Eliot Street and Pond Street Intersection

A number of businesses are located in the vicinity of the intersection, including Shaw's Supermarket, retail stores, and restaurants. Field observations indicated that this intersection is not pedestrian friendly; it lacks crosswalks, pedestrian push buttons, and pedestrian crossing signals. Figure 6-2 shows the turning-movement counts at the intersection, which were conducted in 2007.

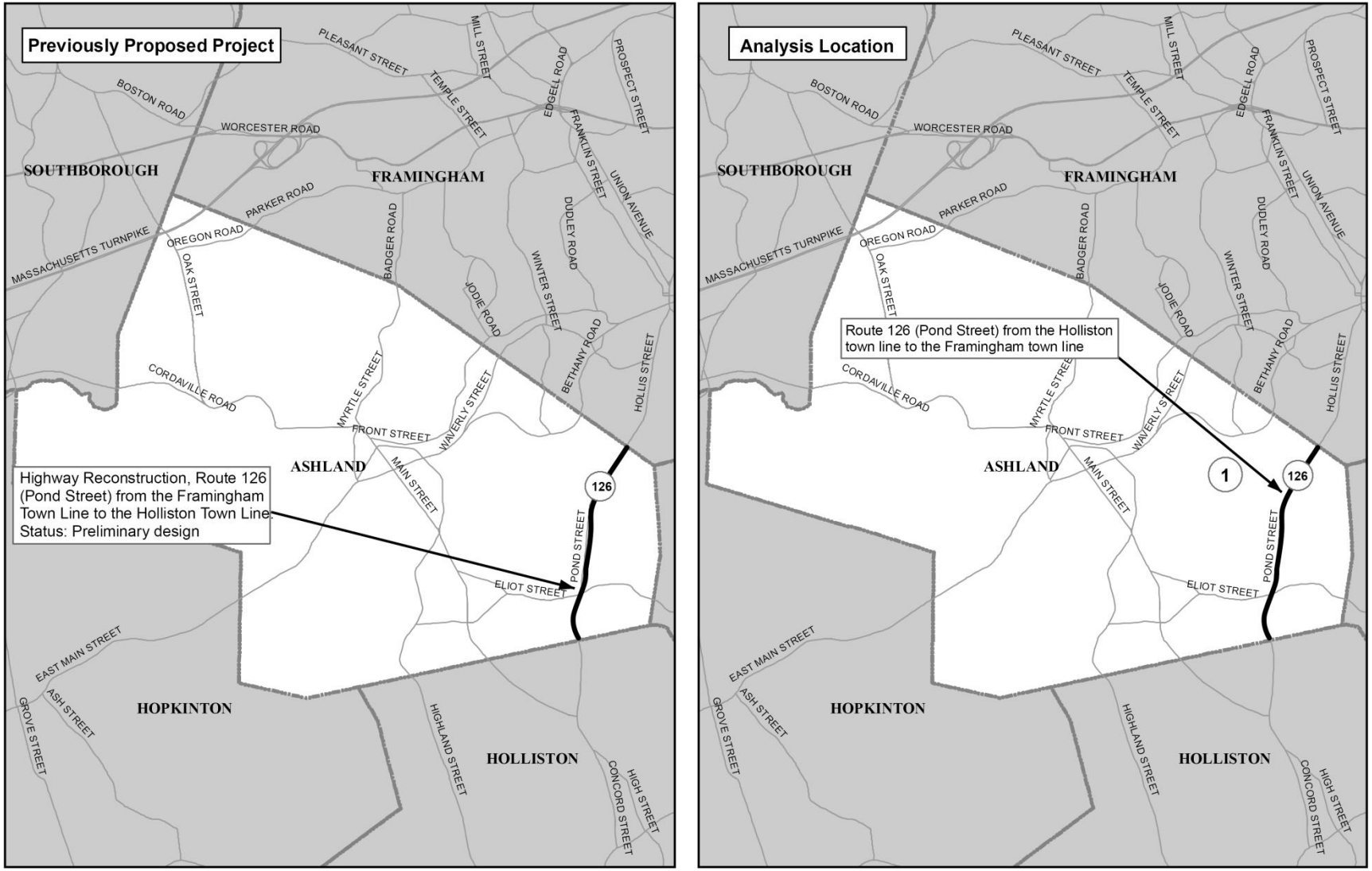


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FIGURE 6-1
Previously Proposed Project and Analysis Location in Ashland

Route 126 Corridor Study

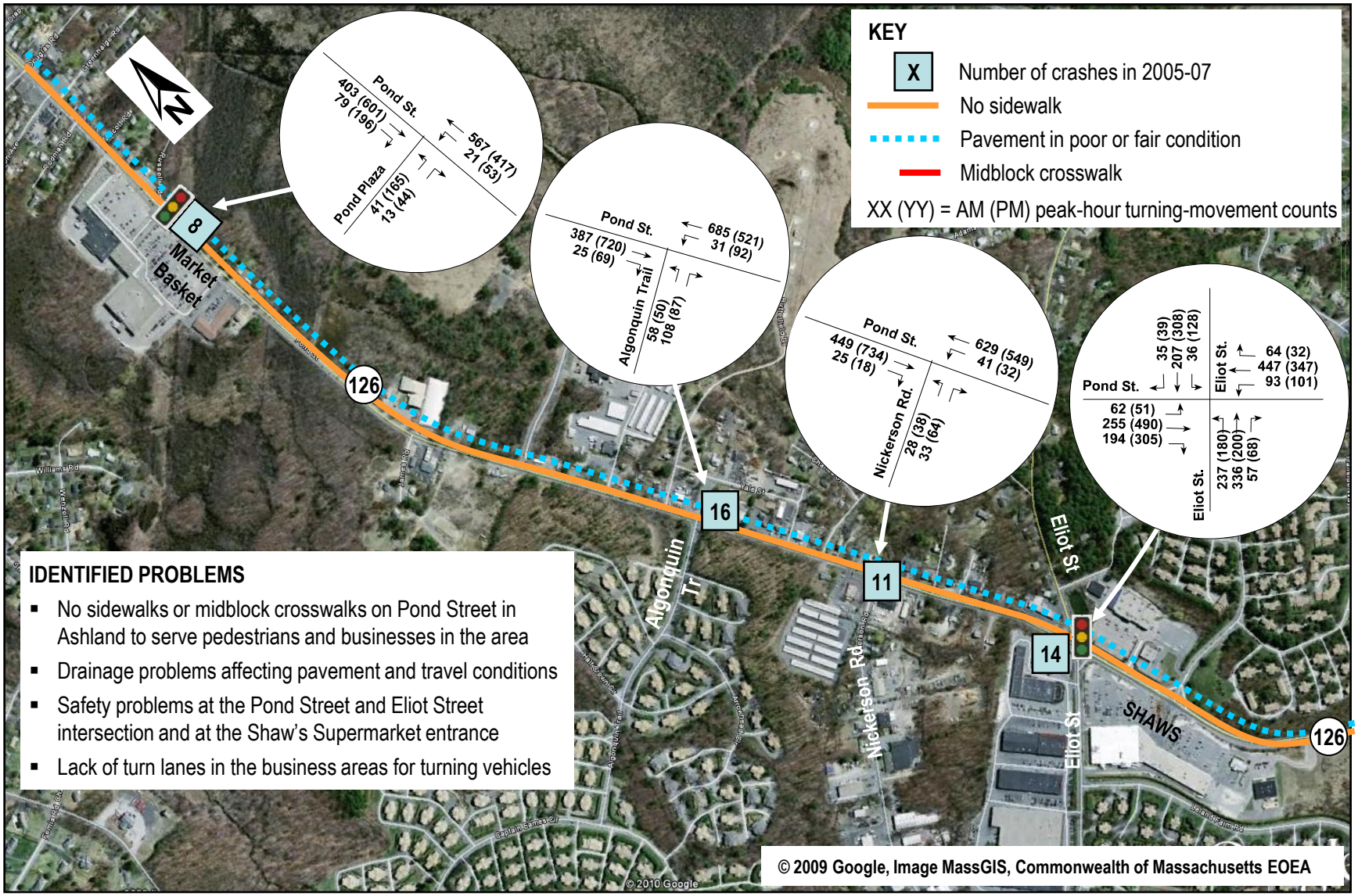

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FIGURE 6-2
Pond Street: From the Holliston Town Line to the Framingham Town Line: Identified Problems

Route 126 Corridor Study

Table 6-1 shows the results of the intersection capacity analyses for this intersection. Analysis indicates that traffic at the intersection experiences some congestion (LOS E) during the PM peak hour, especially on the Pond Street southbound and Eliot Street westbound approaches.

Pond Street and Nickerson Road Intersection

Nickerson Road, which has numerous businesses on both sides, intersects Pond Street from the west to form a T-intersection, where it is controlled by a stop sign. At this intersection, there are no turn lanes; each of the approaches at the intersection is a single lane. This intersection currently lacks sidewalks and crosswalks. Figure 6-2 shows the turning-movement counts at the intersection, which were conducted in 2007. Table 6-1 presents the results of the intersection capacity analysis, which indicates that during the PM peak hour, traffic on Nickerson Road operates at LOS E.

Pond Street and Algonquin Trail Intersection

Algonquin Trail intersects Pond Street from the west to form a T-intersection. It is controlled by a stop sign, and serves a large residential area. At this intersection, there are no turn lanes; each of the approaches at the intersection is a single lane. Figure 6-2 shows the turning-movement counts at the intersection. The counts were conducted in 2007. Table 6-1 presents the results of the intersection capacity analysis, which indicates that during the PM peak hour, the traffic on Algonquin Trail operates at LOS F. This intersection currently lacks sidewalks and crosswalks.

Pond Street at the Pond Plaza Intersection

A number of businesses are located in the vicinity, including Market Basket, CVS, other retail stores, and restaurants. Figure 6.2 shows turning-movement counts at the intersection. The results of the intersection capacity analyses are presented in Table 6-1. Although the analyses indicated that the intersection of Pond Street and the Pond Plaza driveway operates at LOS B or better, the intersection is pedestrian unfriendly—it has no pedestrian amenities.

Safety Analysis

Table 6-2 presents the crash characteristics and frequency for the major intersections on Pond Street. The Pond Street and Eliot Street intersection had 14 crashes during 2006–08. During the same period, there were 11 crashes at the Pond Street and Nickerson Road intersection, 16 crashes at the Pond Street and Algonquin Trail intersection, and 8 crashes at the intersection of Pond Street and the Pond Plaza driveway.

The crash history of the major intersections on Pond Street was also evaluated to identify safety deficiencies and to determine if any of the locations experience a high crash rate (Table 6-3). With the exception of the Pond Street and Algonquin Trail intersection, the major intersections on Pond Street had crash rates that were lower than the average crash rates for MassDOT Highway Division's District 3 signalized or unsignalized intersections.

TABLE 6-1
Intersection Capacity Analysis: Ashland

	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Intersection	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)
Route 126 (Pond Street) and Eliot Street												
Pond Street NB L	B	17	78	C	35	#118	B	20	73	C	30	#99
Pond Street NB T+R	C	23	#458	B	19	303	C	29	#461	C	30	#406
Pond Street SB L	C	36	#378	E	59	#660	C	34	#79	B	16	46
Pond Street SB T	C	36	#378	E	59	#660	C	24	205	D	44	#540
Pond Street SB R	A	2	24	A	5	56	A	3	34	A	5	51
Eliot Street EB L	D	38	#290	D	36	#195	C	28	#248	D	42	#193
Eliot Street EB T+R	D	36	#474	C	31	253	C	27	#413	C	32	#269
Eliot Street WB L	C	24	42	C	32	#120	C	32	46	C	24	104
Eliot Street WB T+R	D	44	#296	E	79	#475	C	33	#261	D	48	#409
Route 126 (Pond Street) and Nickerson Road												
Pond Street NB L	A	1	3	A	1	3	A	9	3	A	10	3
Pond Street NB T	A	1	3	A	1	3	A	0	0	A	0	0
Pond Street SB T+R	A	0	3	A	0	0	A	0	3	A	0	3
Nickerson Road L	C	24	25	E	39	68	C	14	7	C	17	17
Nickerson Road R	C	24	25	E	39	68	C	14	7	C	17	17
Route 126 (Pond Street) and Algonquin Trail												
Pond Street NB L	A	1	2	A	3	11	A	8	2	B	10	11
Pond Street NB T	A	1	2	A	3	11	A	0	0	A	0	0
Pond Street SB T+R	A	0	0	A	0	0	A	0	0	A	0	0
Algonquin Trail L	D	27	72	F	65	111	C	20	37	E	41	69
Algonquin Trail R	D	27	72	F	65	111	C	20	37	E	41	69

(Cont.)

* 95% queue length

Note: T = through, R = right turn, L = left turn.
# = 95th percentile volume exceeds capacity.
m = Volume for 95th percentile queue is metered by upstream signal.

TABLE 6-1 (cont.)

Intersection	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)
Route 126 (Pond Street) and Pond Plaza Driveway												
Pond Street NB L	A	3	7	A	7	25	A	7	18	B	14	53
Pond Street NB T	A	4	120	A	7	132	A	9	#387	B	13	285
Pond Street SB T	A	4	75	B	12	#272	B	12	#314	B	17	#525
Pond Street NB R	A	2	10	A	2	21	A	5	29	A	4	45
Pond Plaza EB L	A	9	23	B	13	70	C	21	49	C	27	141
Pond Plaza EB R	A	7	8	A	5	15	B	11	13	A	9	27

* 95% queue length

Note: T = through, R = right turn, L = left turn.

= 95th percentile volume exceeds capacity.

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

TABLE 6-2
Crash Characteristics and Frequency, 2006–08:
Pond Street Analysis Location

	Number of Crashes			
Crash Characteristic	**Pond Street and Eliot Street**	**Pond Street and Nickerson Road**	**Pond Street and Algonquin Trail**	**Pond Street and Pond Plaza**
Crash Severity				
Fatality	0	0	0	0
Injury	2	2	7	3
Property damage only	11	9	8	5
Not reported	1	0	0	0
Unknown	0	0	1	0
Total	*14*	*11*	*16*	*8*
Collision Type				
Rear-end	8	7	6	1
Angle/sideswipe	5	3	8	5
Head-on	0	0	1	0
Single-vehicle crash	0	0	1	1
Not reported	0	0	0	1
Unknown	1	1	0	0
Total	*14*	*11*	*16*	*8*
Roadway Condition				
Dry	8	9	10	4
Wet	6	1	6	4
Snow	0	1	0	0
Not reported	0	0	0	0
Other	0	0	0	0
Total	*14*	*11*	*16*	*8*
Light Condition				
Daylight	14	9	9	4
Dawn	0	0	1	0
Dusk	0	0	1	0
Dark road, lighted	0	2	5	3
Dark road, unlighted	0	0	0	0
Not Reported	0	0	0	0
Other	0	0	0	1
Total	*14*	*11*	*16*	*8*
Year				
2005	7	2	4	1
2006	4	2	7	4
2007	3	7	5	3
Total	*14*	*11*	*16*	*8*

TABLE 6-3
Intersection Crash Rates for the Analysis Locations in Ashland

Intersection	Number of Crashes: 3-Year Total	Number of Crashes: Annual Average	Total Daily Approach Traffic	Crash Rate*
Pond Street and Eliot Street	14	4.67	28,113	0.45
Pond Street and Nickerson Road	11	3.67	17,938	0.56
Pond Street and Algonquin Trail	16	5.33	18,988	0.77
Pond Street and Pond Plaza	8	2.67	18,450	0.40
MassDOT Highway Division District 3 average crash rate for signalized intersections				0.87
MassDOT Highway Division District 3 Average crash rate for unsignalized intersections				0.69

* Crashes per million entering vehicles
Note: The shading denotes an intersection with a crash rate higher than the MassDOT Highway Division's District 3 average crash rate for unsignalized intersections.

The intersection of Pond Street and Algonquin Trail had a crash rate of 0.77 crashes per million entering vehicles (MEV), which is higher than the average of 0.69 crashes per MEV for MassDOT Highway Division's District 3 unsignalized intersections.

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were performed for the intersection of Pond Street and Nickerson Road and the intersection of Pond Street and Algonquin Trail. The results of the analysis indicated that:

- The Pond Street and Nickerson Road intersection meets only MUTCD Warrant 1 criteria.
- The Pond Street and Algonquin Trail intersection does not meet any of the MUTCD warrants.

6.4.2 PROPOSED IMPROVEMENTS

MPO staff reviewed and analyzed the conceptual improvements proposed by GPI for Pond Street and determined that they address the identified problems and that they improve traffic safety and operations for pedestrians, bicyclists, and motorists. Staff recommend implementing the improvements, which consists of the reconstruction of Pond Street from the Holliston town line to the Framingham town line for approximately 1.7 miles. Figures 6-3 through 6-6 show the proposed improvements at the major intersections. In total, the project is estimated to cost about $4.5 million to construct. The following sections describe the project in detail.

Pavement and Sidewalk Improvements

- Pavement rehabilitation and excavation/milling and drainage-related improvements for the abutting properties and the roadway.
- Construction of two 11-foot-wide travel lanes, with 4-foot-wide paved usable shoulders on both sides of Pond Street to accommodate bicyclists.
- Construction of a 12-foot-wide left-turn lane in the business areas.
- Construction of a new 5.5-foot-wide, accessible sidewalk on the east side of Pond Street for the entire length of the project; construction of sidewalks on the west side for some segments of Pond Street.
- Installation of midblock pedestrian crossings at locations where the sidewalk changes to the other side of the roadway. Installation of granite curbing and resetting of the guardrail.

Signal Improvements

- Installation of pedestrian signals, with push buttons and upgrading of the signal equipment, at the Pond Street and Eliot Street intersection, as well as at the intersection of Pond Street and the Pond Plaza driveway
- Retiming of the traffic signals at the Pond Street and Eliot Street intersection and the intersection of Pond Street at the Pond Plaza driveway to accommodate pedestrian and traffic phases

Geometric Improvements

- Construction of a southbound left-turn bay on the Pond Street approach at the intersection of Pond Street and Eliot Street
- Construction of left- and right-turn bays on the Nickerson Road approach and Algonquin Trail approach
- Construction of a northbound left-turn bay on the Pond Street approach for turning onto Nickerson Road and McDonald's driveway
- Construction of a northbound and a southbound left-turn bay on Pond Street for turning onto Algonquin Trail and businesses on the east side of Pond Street

Additional Improvements

In addition, to the GPI recommendations, MPO staff recommend the following improvements to increase safety and operations on Pond Street.

- Installation of yield-to-pedestrians signs at signalized intersections with concurrent pedestrian crossings
- Installation of detectors at signalized intersections that can sense bicycles

- Installations of signs for pedestrians crossing at the midblock crosswalks and new signs (posted and pavement markings) informing motorists to share the road with bicycles

R1-6

W11-1 and W16-1

W11-2

MUTCD

BOSTON REGION MPO

FIGURE 6-3
Pond Street and Eliot Street Intersection: Proposed Improvements

Route 126 Corridor Study

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FIGURE 6-4
Pond Street and Nickerson Road Intersection: Proposed Improvements

Route 126 Corridor Study

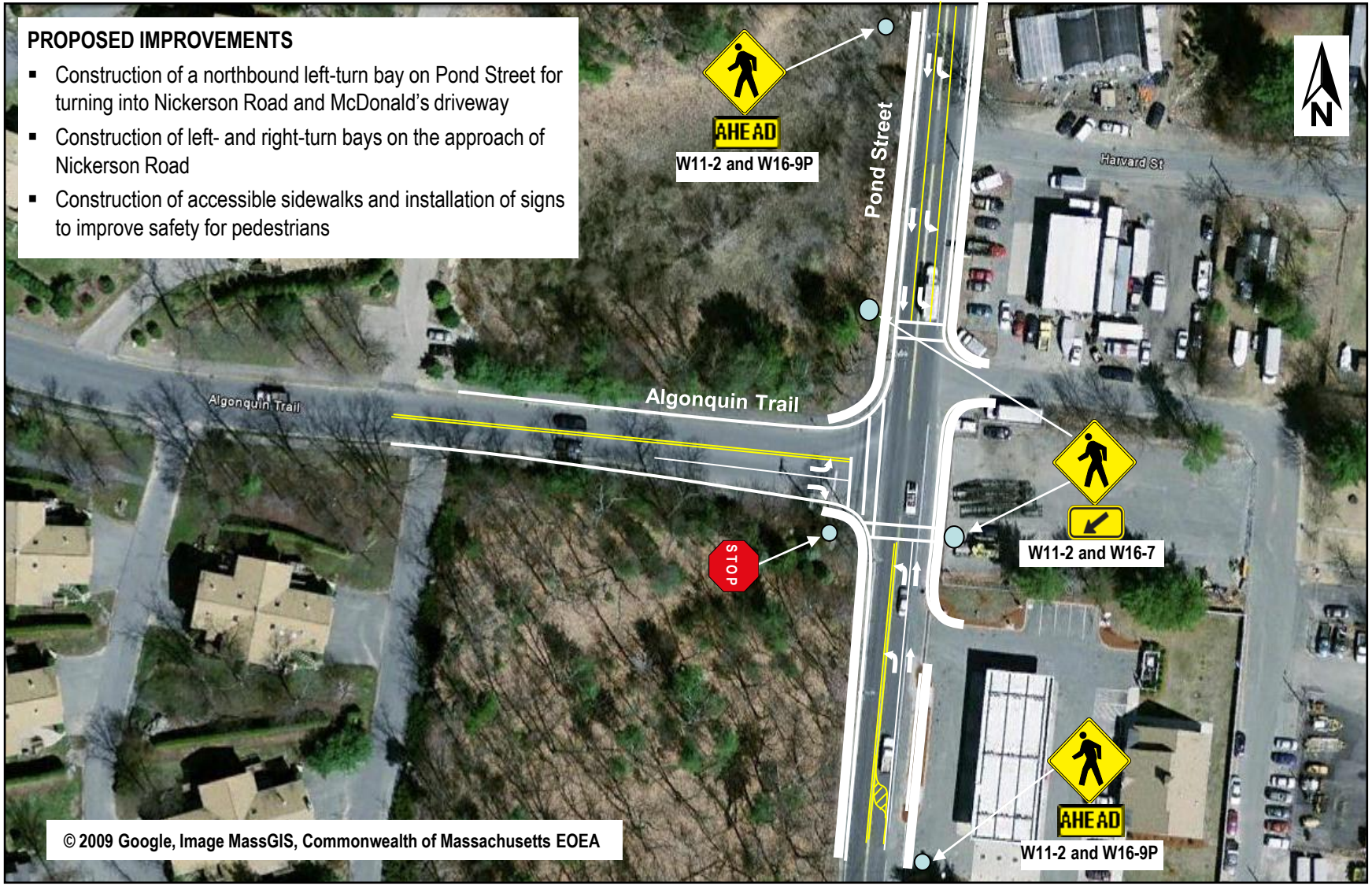

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FIGURE 6-5
Pond Street and Algonquin Trail Intersection: Proposed Improvements

Route 126 Corridor Study

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FIGURE 6-6
Pond Street and Pond Plaza Driveway Intersection: Proposed Improvements

Route 126 Corridor Study

FRAMINGHAM

7.1 INTRODUCTION

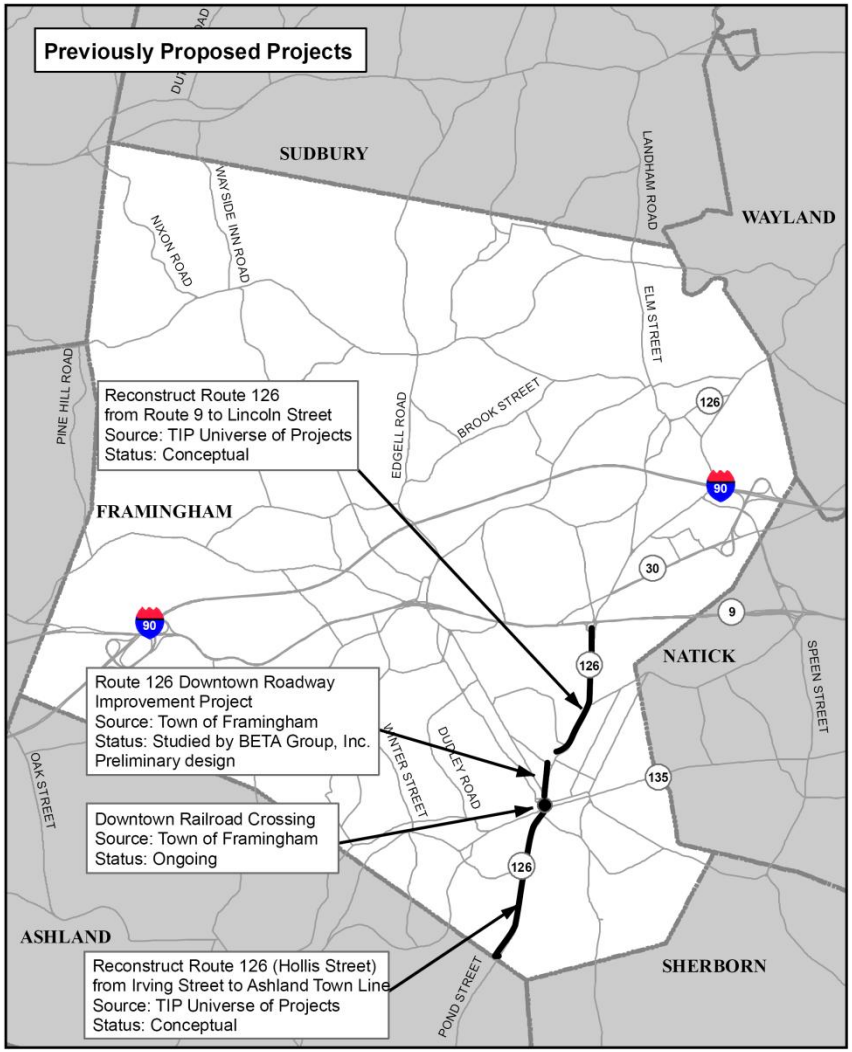
Route 126 in Framingham is a major north–south arterial road between the Ashland town line and the Wayland town line. In the study corridor, this north–south roadway is two lanes wide for the majority of its length, and wider (four lanes), including exclusive turning lanes, in the vicinity of downtown Framingham and south of Route 30 (Cochituate Road). The roadway is called Hollis Street in south Framingham, Concord Street in the downtown area and north of Route 9, and School Street near the Wayland town line. The roadway crosses major east–west key roadways and highways, including, from south to north, Route 135, Route 9, and Route 30.

The land uses in this section of the Route 126 corridor include residential, commercial, educational, and office parks. The majority of the road is under the jurisdiction of the town; however, the section of Hollis Street from the Ashland town line to Winthrop Street is under the jurisdiction of MassDOT's Highway Division (Figure 1-1, in Chapter 1). Route 126 carries an average of 16,000–19,600 vehicles per day along the section of roadway south of Route 135 (Waverley Street), and about 30,000 vehicles per day on the section of roadway north of Waverley Street that goes through the downtown area to Route 30.

Downtown Framingham is a multimodal transportation hub, with MBTA commuter rail, regional buses, CSX rail freight operations, trucking, motorists, pedestrians, bicyclists, and parking all located in the vicinity of the intersection of Route 126 and Route 135. All of these modes compete for right-of-way assignment through at-grade intersections along Route 126. MetroWest Regional Transit Authority (MWRTA) bus Routes 2, 3, and 6 use portions of Route 126 in Framingham.

7.2 PREVIOUSLY PROPOSED PROJECTS

Figure 7-1 shows the previously proposed projects in the Route 126 corridor in Framingham listed in the Boston Region MPO's Transportation Improvement Program (TIP) Universe of Projects (Appendix A of the FFYs 2006–10 TIP) or MassDOT Highway Division's project information database or the town's



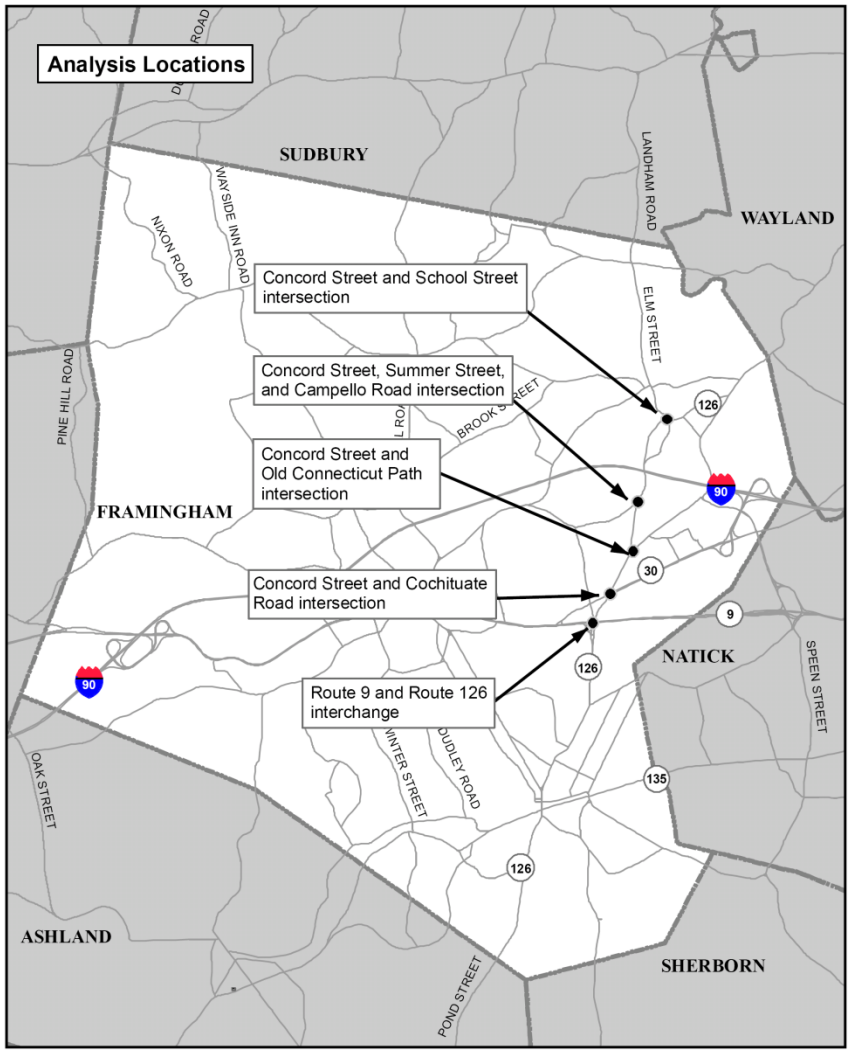


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FIGURE 7-1
Previously Proposed Projects and Analysis Locations in Framingham

Route 126 Corridor Study

website. Most of them are located south of Route 9. The projects are described in the section below.

Route 126 Downtown Roadway Improvement Project[6]

This proposed project would include transportation and streetscape improvements on Concord Street and Hollis Street. The project limits are from just north of Lincoln Street to just south of Irving Street; it also includes portions of Union Avenue, Irving Street, Park Street, Howard Street, and the Downtown Common. The proposed work would include but not be limited to:

- Installation of new ornamental traffic signals at the intersection of Concord Street and Union Avenue and the intersection of Hollis Street and Irving Street
- Upgrading of traffic signals at the intersection of Concord Street with Lincoln Street, Concord Street with Howard Street, and Concord Street with Waverley Street
- Rehabilitation or reconstruction of roadway pavement, construction or reconstruction of sidewalks, and installation of curbing
- Storm water collection system improvements
- Streetscape improvements, including ornamental street lighting, special sidewalk and crosswalk treatments, and street trees and street furniture, such as planters and benches

Downtown Railroad Crossing Project[7]

The goal of this project was to assess conditions in downtown Framingham and to evaluate the potential for alternatives to improve transportation, provide urban design and land use options, and develop opportunities for economic growth in downtown Framingham. The study, conducted by the BETA Group, analyzed four alternatives from the perspectives of transportation, urban design, land use, and economic potential with the intent of identifying a "build" alternative for further, more detailed engineering, as well as for environmental evaluation. The four alternatives were:

1. Grade Separation of Route 126 under Route 135 and the Rail Tracks
2. Grade Separation of Route 135 under Route 126
3. East Bypass – Loring Drive Alignment
4. Far East Bypass – New Alignment

MassDOT has hired the BETA Group to take the project through the next phase of design and analysis, including a full environmental review.

[6] The BETA Group, Route 126 Downtown Roadway Improvement Project, Presentation, Town of Framingham, March 2010.
[7] The BETA Group Inc., The Cecil Group Inc., and FXM Associates, Framingham Downtown Study, Final Report, Town of Framingham, August 2009.

Hollis Street Reconstruction Project

This project was listed in the FFYs 2006–10 TIP Universe of Projects, but no study or engineering has been conducted yet.

Concord Street Corridor Project, from Lincoln Street to Route 9

This project was in the FFYs 2006–10 TIP Universe of Projects, but no study or engineering has been conducted yet.

7.3 ANALYSIS LOCATIONS

Based on the previously proposed projects on Route 126 in the downtown area, Framingham town officials requested that MPO staff include the section of Route 126 north of Route 9 in this planning study (Figure 7-1). Using field reconnaissance and inspection crash data, MPO staff divided the section into two segments:

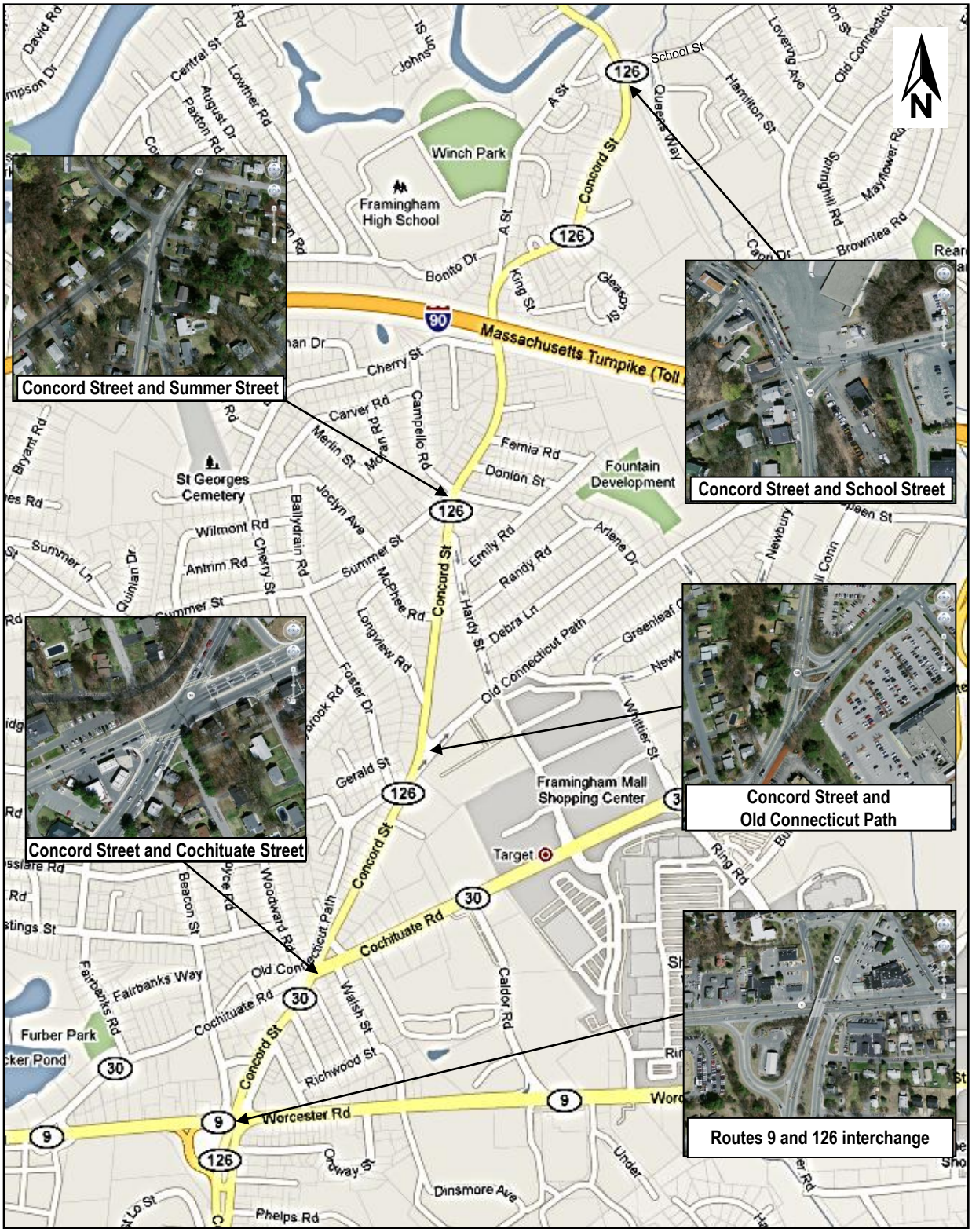
- Route 126, from the Route 9 and Route 126 interchange to Old Connecticut Path (OCP). The land use in this location is primarily commercial. The section had three problem locations (Figure 7-2):
    - Route 126 and Route 9 interchange
    - Concord Street and Cochituate Road (Route 30)
    - Concord Street and Old Connecticut Path
- Route 126, from Old Connecticut Path to the Wayland town line. The land use in the section is primarily residential. This section had two problem locations (Figure 7-2):
    - Concord Street, Summer Street, and Campello Road
    - Concord Street and School Street

7.4 ROUTE 9 AND ROUTE 126 (CONCORD STREET) INTERCHANGE

7.4.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement is in poor to fair condition, and some areas are beginning to show signs of distress, including cracking and disintegration. The pavement serviceability index of the analysis location indicates a need for rehabilitation (Figure 1-5), in Chapter 1.



BOSTON REGION MPO	**FIGURE 7-2** **Concord Street: Analysis Locations in Framingham**	*Route 126 Corridor Study*

Sidewalks

There is a four-foot-wide sidewalk on the west side of the Concord Street overpass that provides pedestrian access across Route 9. In addition, on the east side of the overpass, there is a two-to-three-foot-wide curbed spaced on the bridge that pedestrians use for crossing Route 9. The following pedestrian and bicycle problems were identified at the interchange.

- The sidewalks on the ramps north of Route 9 are broken and crumbled in many places.
- There are sidewalk connectivity problems in the interchange area, as shown in Figure 7-3. It is difficult to access the sidewalks on the Concord Street overpass, especially from the residential area on the east side of Concord Street.
- There were three pedestrian crashes in the crosswalks located in the southwest quadrant in front of the ramps to and from eastbound Route 9. There are no signs in the vicinity alerting motorists to the presence of pedestrians and bicyclists.

Traffic Operations

The ramps at the Route 9 and Route 126 interchange do not meet MassDOT Highway Division's standards; the acceleration and deceleration lanes are too short, some of the horizontal curves are too sharp, and the spacing between the entry and exit points is inadequate. Figure 7-3 shows the existing peak-hour traffic volumes at the interchange. The counts were conducted in September 2009 when schools were in session. Table 7-1 shows the results of the intersection capacity analysis of nearby intersections.

The analysis shows that traffic at the unsignalized ramp-arterial junctions operates at an unacceptable level of service, LOS E or F during peak periods. Field observations indicate that congestion at the interchange is worse during the PM peak period, when there are traffic queues on Route 9 and the Concord Street overpass. The westbound Route 9 on- and off-ramps at Beacon Street and the intersection of Concord Street and Fairbanks Street are also congested during the PM peak period.

Field observations indicated that the congestion at the interchange arises from three sources:

1. Poor traffic operations downstream on Route 9 and Route 126 that cause queues to spill into the interchange area
2. Substandard ramps requiring vehicles on the ramps to stop rather than merge—causing long waits and queues on ramps
3. High traffic volumes on both Route 9 and Route 126

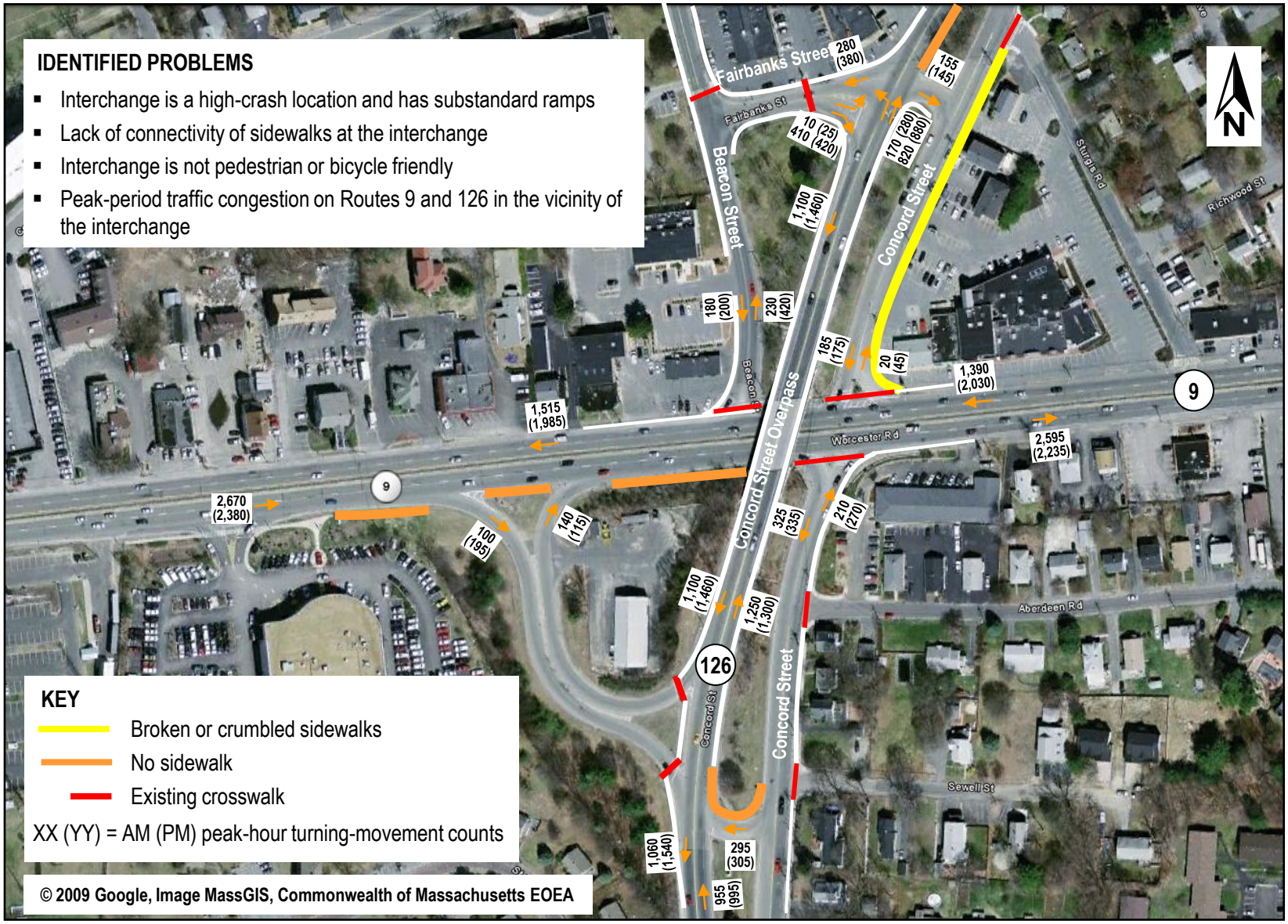


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FIGURE 7-3
Route 126 and Route 9 Interchange: Traffic Volumes and Problems

Route 126 Corridor Study

TABLE 7-1
Intersection Capacity Analysis: Framingham:
Route 9 and Route 126 Interchange

	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Intersection	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**
Route 9 and Route 126 ramp junctions												
Route 126 South, on-ramp to Route 9 East	F	195	226	F	101	105	Not performed, because proposed single-point urban interchange is configured differently from the existing interchange					
Route 126 North, on-ramp to Route 9 East	F	180	353	F	127	377						
Route 126 North/South, on-ramp to Route 9 West (Beacon Street)	E	37	118	F	182	307						
Route 126 North, on-ramp to Route 9 West (Concord Street)	D	25	76	D	26	20						
Route 9 East, off-ramp to Route 126 South	D	26	44	F	86	200						
Route 126 (Concord Street) and Fairbanks Way												
Concord Street NB L+T	A	9	43	F	139	333						
Concord Street NB T+R	A	6	43	F	70	333						
Concord Street SB T+R	A	0	0	F	19	100						
Fairbanks Way EB L+R	F	73	328	F	60	250						
Route 126 (Concord Street) Corregidor Road												
Concord Street NB L+T	A	1	0	A	2	0						
Concord Street NB R	A	3	4	A	0	0						
Concord Street SB L+T+R	A	0	3	C	19	#0						
Corregidor Road L+R	E	47	18	D	29	5						
Old Concord Street L+T+R	F	83	47	F	176	68						
Route 126 (Concord Street) and Sturgis Road												
Concord Street NB T+R	A	9	20	A	0	0						
Concord Street SB L	B	14	20	B	14	20						
Concord Street SB T	A	0	0	A	0	62						
Sturgis Road EB L+R	E	43	41	F	71	100						

* 95% queue length

Note: T = through, R = right turn, L = left turn.
# = 95th percentile volume exceeds capacity.
m = Volume for 95th percentile queue is metered by upstream signal.

Safety Analysis

Figure 7-4 is a collision diagram of the crashes at the Route 9 and Route 126 interchange for the years 2006 and 2007 (years for which police and operator records were available). The high number of crashes reflects the substandard design and poor traffic operations in the vicinity of the interchange.

- There were 120 crashes at the interchange between 2005 and 2007, 84 of which occurred between 2006 and 2007.
- Both rear-end and angle/sideswipe collisions accounted for 80 percent of crashes (40 percent for each collision type). Rear-end collisions are usually caused by the congestion on both Routes 9 and 126, which results in frequent stop-and-go maneuvers. The angle/sideswipe collisions are likely due to the merge points and lane changes at the interchange.

7.4.2 PROPOSED IMPROVEMENTS

Staff recommend the following short-term improvements at the Route 9 and Concord Street interchange to make it safer and more pedestrian friendly. These improvements, which are described in Figure 7-5, are estimated to cost $500,000.

- Installation of solar crosswalk flashing beacons at the two crosswalks on the ramps in the southwest quadrant and on Fairbanks Way. Installation of crosswalk and sidewalk enhancements, such as lighting, to facilitate nighttime crossing and security at the interchange.
- Construction of a new sidewalk and a crosswalk that will connect the sidewalk on the east side of Concord Street serving the residences in the southeast quadrant to the sidewalk on the Concord Street overpass.
- Construction of a new sidewalk on Route 9 eastbound west of the Concord Street overpass to provide continuity with the existing sidewalk east of the overpass.
- Replacement of the broken sidewalks on Concord Street.
- Installation of a channelizing raised island with an opening for a crosswalk to channelize traffic, and yield-to-pedestrians signs, at the ramp junctions on Route 9.

Long-Term Improvements

Staff recommend the following long-term measures at the Route 9 and Concord Street interchange to address safety and traffic operations problems.

- Evaluate the feasibility of replacing the interchange with a single-point urban interchange (SPUI), shown in Figure 7-6. An SPUI is controlled by traffic signals, and it improves the efficiency and safety of traffic operations, reduces right-of-way requirements, and allows trucks to make wide turns. The drawbacks of a new interchange are cost and the impact of construction on traffic and on access to businesses on Routes 9 and 126 in the area.

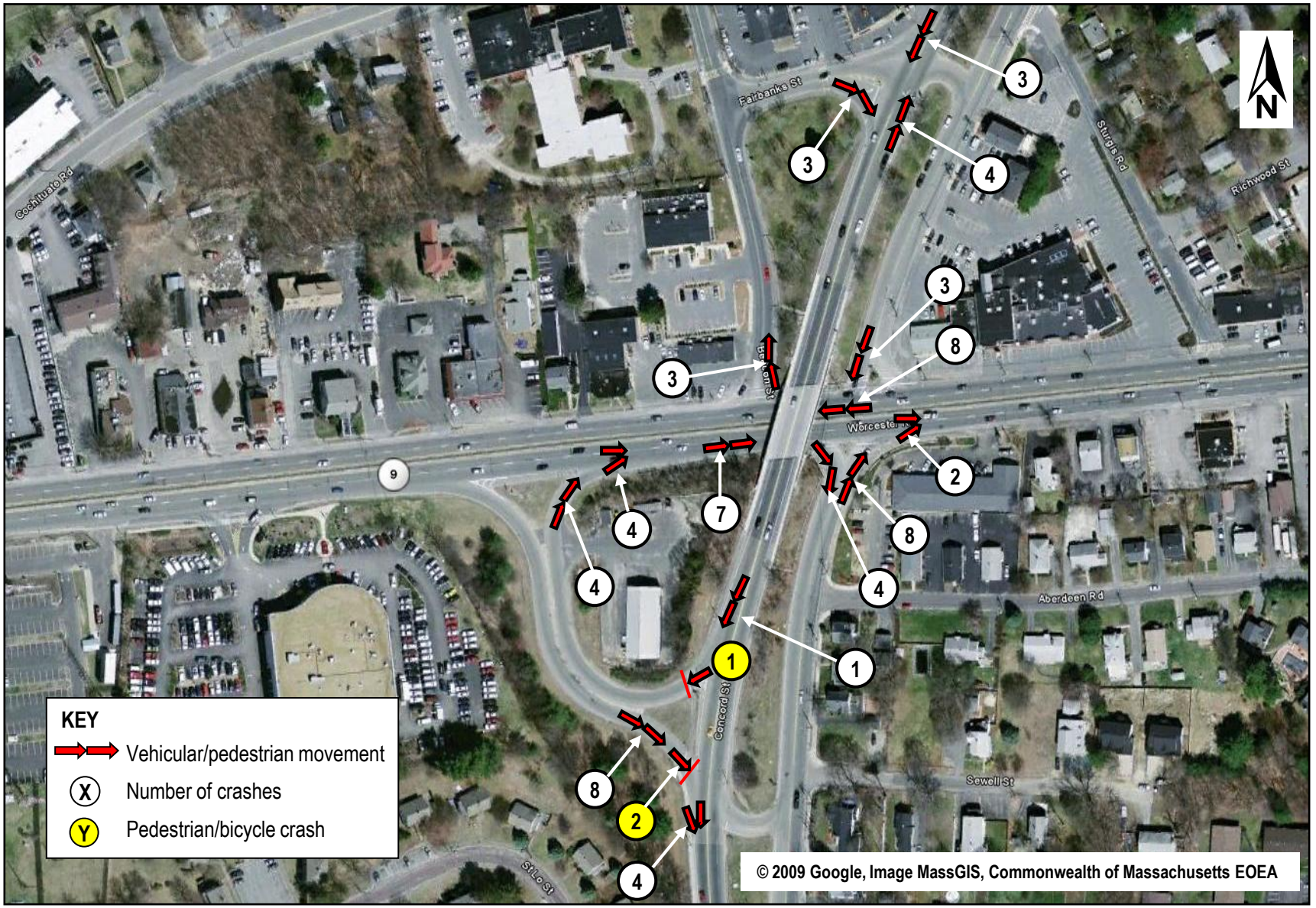

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FIGURE 7-4
Route 126 and Route 9 Interchange:
2006–07 Collision Diagram

Route 126 Corridor Study

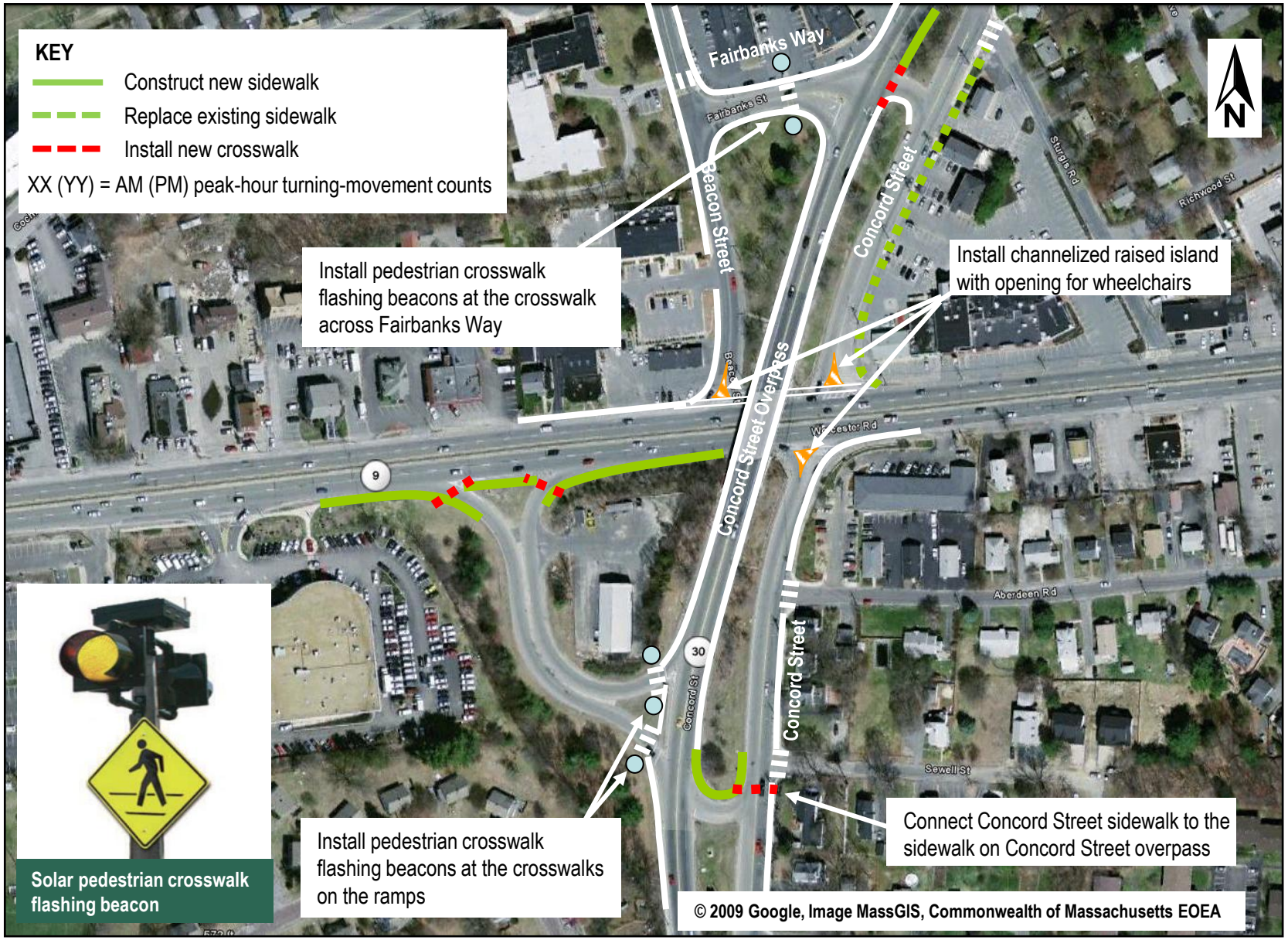

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FIGURE 7-5
Route 126 and Route 9 Interchange: Proposed Improvements

Route 126 Corridor Study

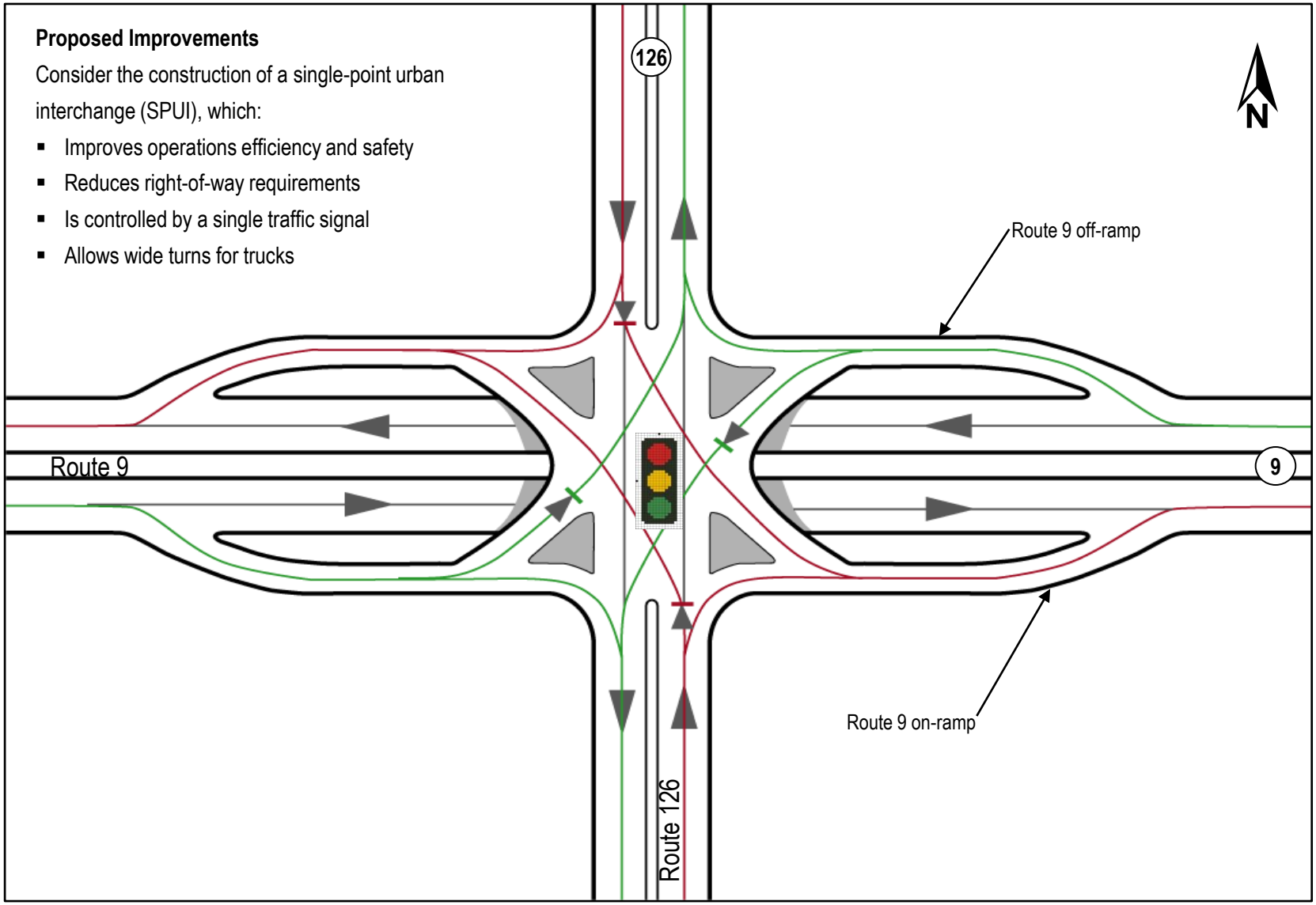

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FIGURE 7-6
Route 126 and Route 9 Interchange: Proposed Long-Term Improvements

Route 126 Corridor Study

- Initiate the Concord Street Corridor Project from Lincoln Street to Route 9 to find solutions to the congestion and safety problems in the Route 126 corridor south of the interchange. This previously proposed project was in the FFYs 2006–10 TIP Universe of Projects, but no study or engineering has been conducted yet.
- Address the congestion on Route 9 that spills into the Routes 9 and 126 interchange, impacting its operations.

7.5 CONCORD STREET AND COCHITUATE ROAD INTERSECTION

The intersection of Concord Street and Cochituate Road is a high-volume signalized intersection located just north of the Route 9 and Route 126 interchange. Figure 7-7 shows the layout of the intersection, which was reconstructed in 2005. The modifications consisted of traffic signal and roadway improvements; full-depth bituminous concrete pavement reconstruction, and overlay; drainage improvements; installation of new granite curbing, cement concrete sidewalks, and bituminous driveways and walkways; construction of retaining walls; and traffic signs and new pavement markings.

The land use in the vicinity of the intersection is primarily commercial, except in the northwest quadrant of the intersection, which is residential. An exclusive pedestrian signal phase with push buttons has been provided for activating the pedestrian walk phase; once activated, the pedestrian walk signal is turned on at all approaches and all vehicular movements are stopped. A symbol of a person walking and a flashing or steady red hand designate the pedestrian walk and don't-walk phases, respectively. The pedestrian crosswalks are marked across the approaches with parallel yellow stripes sufficiently visible to pedestrians and motorists, and are aligned at a right angle to each approach except for the Cochituate Road westbound approach. The stop lines are white and are set back about four feet from the crosswalks. The sidewalks on both Concord Street and Cochituate Road are four to six feet wide, are made of concrete, and are in good condition. The corners of the intersection feature sidewalk curb cuts and ramps for wheelchairs.

7.5.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement of Concord Street between Route 9 and Cochituate Road is in fair condition, and there are segments with visible signs of pavement distress, including cracking.

Sidewalks

There are sidewalks on Concord Street and Cochituate Road in the vicinity of the intersection (Figure 7-7), and they are in good condition. However, there is no crosswalk on the westbound approach on Cochituate Road to provide connectivity.

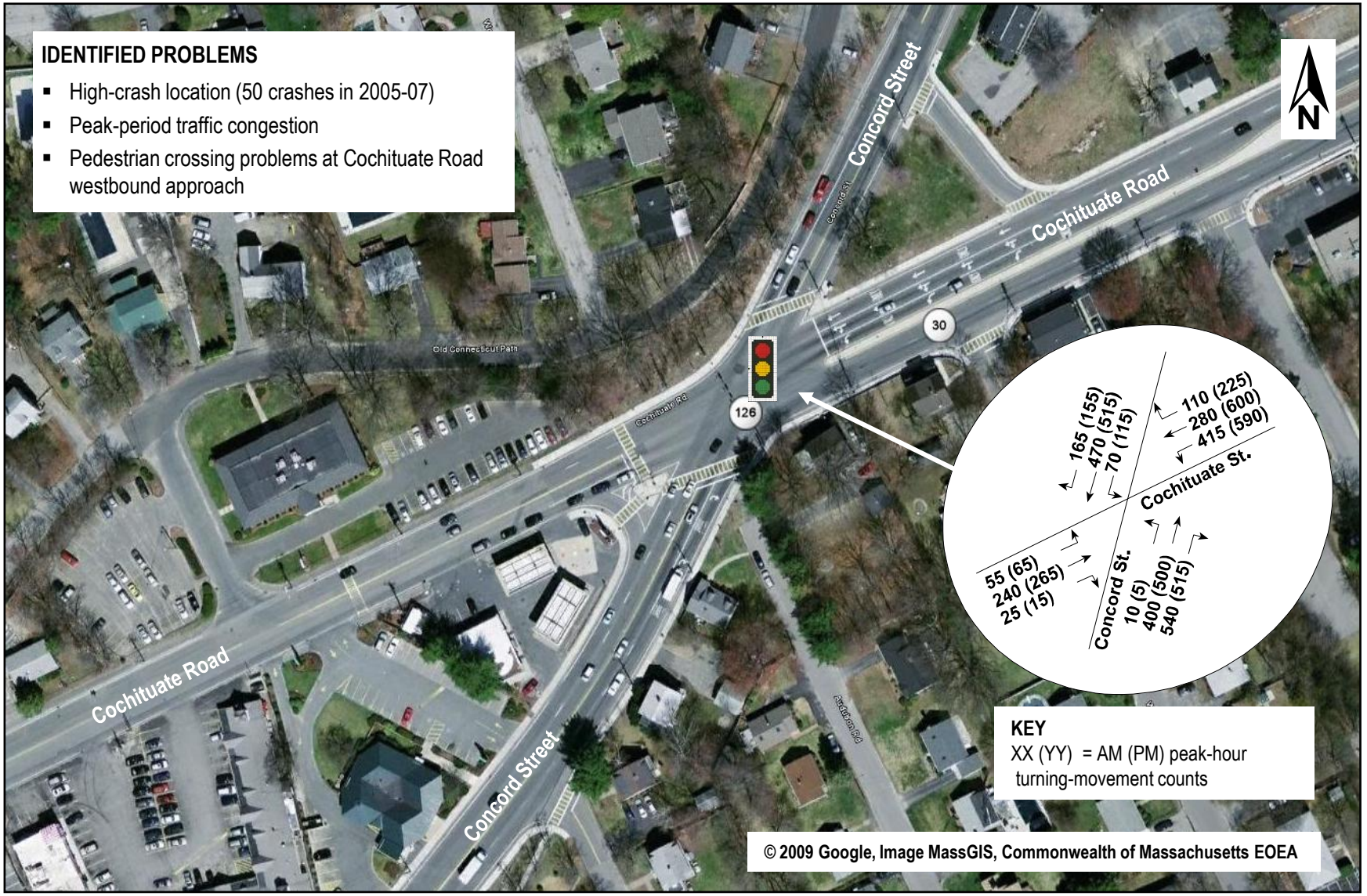

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FIGURE 7-7
Concord Street and Cochituate Road Intersection: Identified Problems

Route 126 Corridor Study

Traffic Operations

Figure 7-7 shows the existing AM and PM peak-hour turning-movement counts. The counts were conducted in September 2009, when schools were in session. Table 7-2 shows the results of the intersection capacity analysis. The analysis indicated that traffic operations are unacceptable (LOS E or F) at some approaches at the intersection during the AM and PM peak periods. There are long queues on the southbound and northbound approaches on Concord Street, as well as on the westbound approach of Cochituate Road, which block the free right turns.

Safety Analysis

The intersection of Cochituate Road and Concord Street had 50 crashes between 2005 and 2007, resulting in an average of 16.67 crashes per year; the characteristics of these crashes are shown in Table 7-3. Table 7-4 presents the crash rate of the Concord Street and Cochituate Road intersection. The crash rate of 1.15 crashes per million entering vehicles (MEV) is higher than the average of 0.87 crashes per MEV for MassDOT Highway Division's District 3 signalized intersections (Table 7-4). This intersection was reconstructed in 2005, but the recent crash history indicates that there is still a safety problem at the intersection. The most recent crash data show that there were 23 crashes at the intersection during 2008.

About 25 percent of the crashes at this intersection resulted in injury; 55 percent of the crashes involved angle and sideswipe collisions; and 43 percent involved rear-end collisions. A detailed examination of the causes of the crashes indicated that many of the collisions resulted from vehicles changing lanes at the intersection or making turns from the wrong lane. Lane assignment was a major contributor to collisions at the intersection, especially on the Concord Street approaches.

7.5.2 PROPOSED IMPROVEMENTS

Staff recommend implementing additional traffic operations and safety improvements at the intersection of Cochituate Road and Concord Street. The improvements, which are estimated to cost about $150,000, consist of the following:

- Retiming of the traffic signal to reduce traffic delay at the intersection. Increasing the cycle length from 110 seconds to 125 seconds for the AM peak hour and to 145 seconds for the PM peak hour would reduce traffic delays at the intersection. Doing so would also reduce the overall intersection delay from 49 to 45 seconds per vehicle for the AM peak hour, and from 113 to 78 seconds per vehicle for the PM peak hour.
- Installing overhead lane assignment signs informing motorists in advance of the lane assignment ahead at all approaches to the intersection so that vehicles can maneuver to the appropriate lane. Overhead signs are preferable to post-mounted signs, which are placed on the shoulder, because the overhead signs can be placed directly over the lanes to which they apply.

TABLE 7-2
Intersection Capacity Analysis: Framingham:
Concord Street, North of Route 9

	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Intersection	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**	**LOS**	**Delay (sec.)**	**Queue* (ft.)**
Route 126 (Concord St) and Route 30 (Cochituate St)												
Concord Street NB L + T	D	51	#790	F	97	#787	D	44	#714	D	41	#744
Concord Street NB R	B	16	49	B	17	67	B	16	45	B	16	56
Concord Street SB L+T + R	E	76	#430	F	190	#511	D	51	#353	E	73	#542
Cochituate Road EB L+T	D	35	#203	C	34	#200	D	45	#248	D	54	#260
Cochituate Road EB R	C	31	23	C	31	30	D	39	26	D	48	41
Cochituate Road WB L+T	D	52	#312	F	150	#600	E	57	#330	F	145	#750
Cochituate Road WB R	D	38	48	D	36	67	D	43	53	D	45	73
Route 126 (Concord Street) and Old Connecticut Path												
Concord Street NB T	B	14	136	C	33	254	C	33	136	C	32	254
Concord Street NB R	A	1	0	A	0	0	A	3	0	A	2	0
Concord Street SB L	A	5	67	B	20	100	B	17	67	C	26	100
Concord Street SB T	A	5	147	A	10	159	B	18	147	B	14	159
Old Connecticut Path WB L	B	13	94	E	57	#449	B	12	94	C	25	#449
Old Connecticut Path WB R	A	0	0	A	1	0	A	0	0	A	1	0
Route 126 (Concord Street) and Summer Street, Campello Road												
Concord Street NB L	A	9	20	D	25	135	A	9	20	D	25	135
Concord Street NB T	A	0	0	A	0	0	A	0	0	A	0	0
Concord Street SB T + R	A	0	0	A	0	62	A	0	0	A	0	62
Summer Street EB L	E	38	85	F	284	188	E	38	85	F	284	188
Summer Street EB R	C	21	88	C	20	22	C	21	88	C	20	22
Campello Road L + R	B	15	7	C	20	12	B	15	7	C	20	12

(Cont.)

* 95% queue length

Note: T = through, R = right turn, L = left turn.
# = 95th percentile volume exceeds capacity.
m = Volume for 95th percentile queue is metered by upstream signal.

TABLE 7-2 (cont.)

Intersection	Existing Conditions						With Improvements					
	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)	LOS	Delay (sec.)	Queue* (ft.)
Route 126 (Concord Street) and Route 126 (School Street)												
Concord Street NB T	B	12	20	B	13	24	D	44	#333	D	40	#574
Concord Street NB R	B	12	20	B	13	24	A	5	29	B	14	95
Concord Street SB L	B	12	20	B	12	64	C	26	#768	C	31	#518
Concord Street SB T	A	0	0	A	0	0	A	8	222	A	9	264
School Street WB R	F	145	450	F	225	948	A	2	48	B	11	#287
School Street WB L	F	145	450	E	40	948	D	45	130	D	44	157

* 95% queue length

Note: T = through, R = right turn, L = left turn.

= 95th percentile volume exceeds capacity.

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

TABLE 7-3
Crash Characteristics and Frequency, 2005–07:
Concord Street Analysis Locations

	Number of Crashes at Intersection			
Crash Characteristic	**Concord St. and Cochituate Rd.**	**Concord St. and Old Connecticut Path**	**Concord St. and Summer St./Campello Rd.**	**Concord St. and School St.**
Crash Severity				
Fatality	0	0	0	0
Injury	12	5	2	6
Property damage only	34	22	9	18
Not reported	4	2	3	1
Unknown	0	0	0	0
Total	*50*	*29*	*14*	*25*
Collision Type				
Rear-end	19	9	2	5
Angle/sideswipe	26	13	11	14
Head-on	1	4	1	3
Single-vehicle crash	2	0	0	2
Not reported	2	3	1	1
Unknown	0	0	0	0
Total	*50*	*29*	*14*	*25*
Roadway Condition				
Dry	39	17	9	17
Wet	8	5	2	7
Snow	2	3	2	0
Not reported	1	4	1	1
Other	0	0	0	0
Total	*50*	*29*	*14*	*25*
Light Condition				
Daylight	38	19	11	19
Dawn	0	0	0	1
Dusk	1	1	0	0
Dark road, lighted	9	7	2	4
Dark road, unlighted	1	1	1	0
Not Reported	1	1	0	1
Other	0	0	0	0
Total	*50*	*29*	*14*	*25*
Year				
2005	16	13	6	10
2006	20	8	4	8
2007	14	8	4	7
Total	*50*	*29*	*14*	*25*

TABLE 7-4
Crash Rates for Framingham Intersections

Intersection	Number of Crashes: 3-Year Total	Number of Crashes: Annual Average	Total Daily Approach Traffic	Crash Rate*
Concord Street and Cochituate Road	50	16.66	39,61	1.15
Concord Street and Old Connecticut Path	29	9.67	27,27	0.97
Concord Street and Summer Street	14	4.67	22,88	0.56
Concord Street and School Street	25	6.33	26,05	0.88
MassDOT Highway Division District 3 average crash rate for signalized intersections				0.87
MassDOT Highway Division District 3 Average crash rate for unsignalized intersections				0.69

* Crashes per million entering vehicles
Note: The shading denotes intersections with higher crash rates than the MassDOT Highway Division's District 3 average crash rates.

- Constructing a crosswalk on the westbound approach on Cochituate Road to connect with the sidewalk on the east side of Concord Street.
- Repainting all of the faded pavement markings that show lane assignments at each approach

7.6 CONCORD STREET AND OLD CONNECTICUT PATH INTERSECTION

The intersection of Concord Street and Old Connecticut Path is a signalized intersection. Figure 7-8 shows the intersection layout and land uses in the vicinity. On the west side of Concord Street the land use is primarily residential, and on the east side it is primarily commercial. All of the turning movements to and from Old Connecticut Path are channelized, creating a series of four crosswalks across the approach of Old Connecticut Path. Figure 7-8 shows the existing AM and PM peak-hour turning-movement counts. The counts were conducted in September 2009, when schools were in session.

A concurrent pedestrian signal phase with push buttons has been provided for activating the pedestrian walk phase. Once activated, the pedestrian walk signal is turned on concurrently with the two-way through traffic on Concord Street; during that phase, pedestrians cross Old Connecticut Path. The concurrent pedestrian walk phase creates vehicle-pedestrian conflicts because right-turn movements are allowed during pedestrian walk phases. A symbol of a person walking and a flashing or steady red hand designate the pedestrian walk and don't-walk phases, respectively. The pedestrian crosswalks are marked across the approaches with yellow stripes (ladder style) sufficiently visible to pedestrians and motorists, and are aligned to each approach. Five-foot-wide sidewalks are provided on both sides of Concord Street between Cochituate

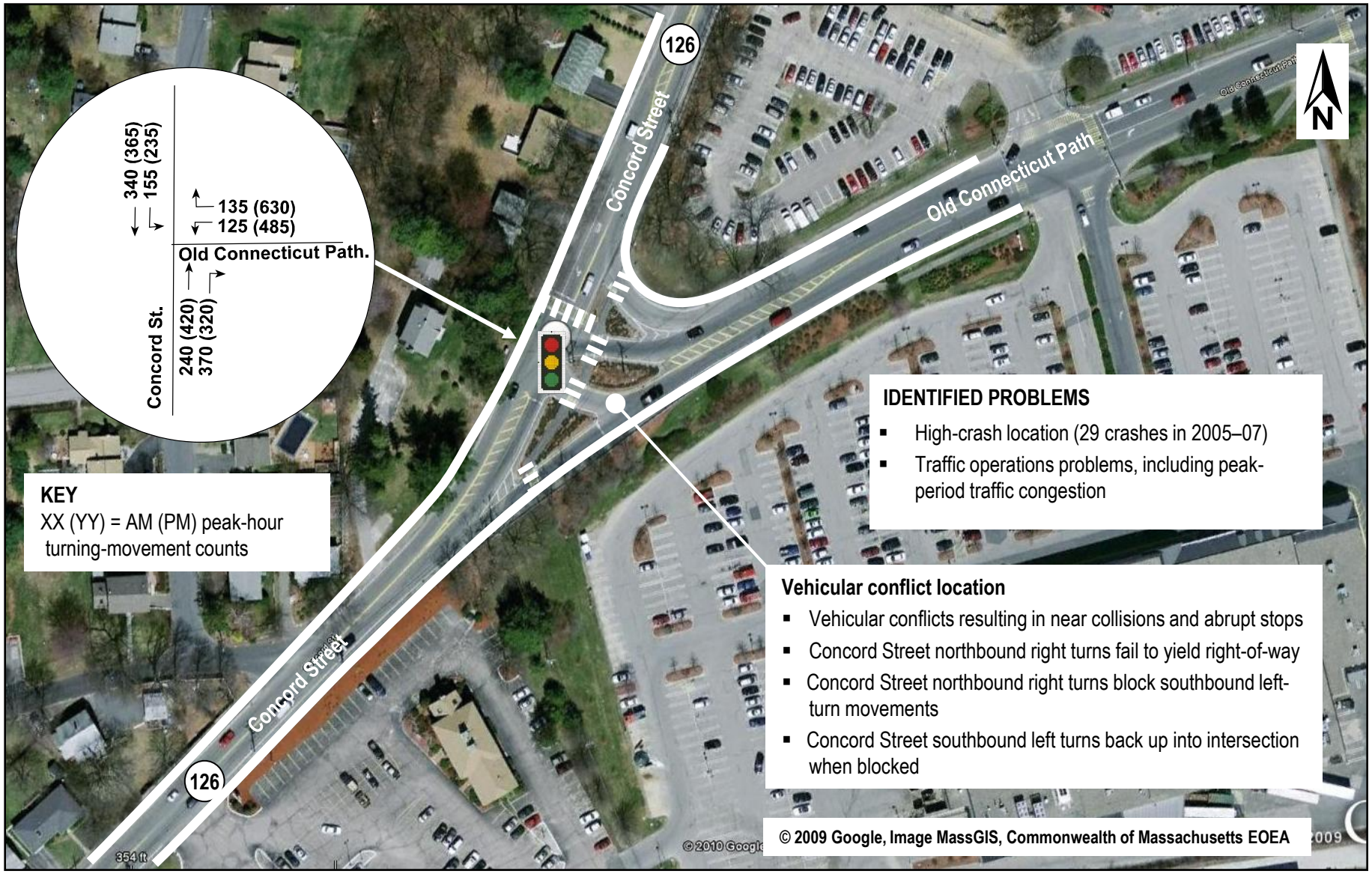

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FIGURE 7-8
Concord Street and Old Connecticut Path Intersection: Identified Problems

Route 126 Corridor Study

Road and Old Connecticut Path. They are generally in good condition. The street furniture does not reduce the width of the sidewalk. At the intersection, each end of a crosswalk features a sidewalk curb cut for wheelchairs.

7.6.1 IDENTIFIED PROBLEMS

Pavement Condition

The pavement between Cochituate Road and Old Connecticut Path is in fair condition, with some segments showing signs of pavement distress. The 2006–07 pavement serviceability index for this analysis location indicate the need for some type of rehabilitation.

Traffic Operations

Table 7-1 shows the results of the intersection capacity analysis, which shows that traffic operations at the intersection are acceptable, at LOS D or better, during the AM peak period. However, during the PM peak period, westbound Old Connecticut Path left-turn movements experience long delays, operating at LOS E.

In addition, the geometric layout of this intersection creates traffic operations and safety problems. A vehicle-vehicle conflict exists between southbound Concord Street left-turning traffic and northbound Concord Street right-turning traffic, which results in abrupt stops and near collisions. These near collisions and abrupt stops occur when northbound Concord Street right-turning vehicles fail to observe the yield sign when to southbound Concord Street left-turning vehicles that have a protected green. This occurrence causes southbound Concord Street left-turning traffic to back up into the intersection, which then blocks westbound Old Connecticut Path left-turn movements onto southbound Concord Street.

Safety Analysis

The intersection of Concord Street and Old Connecticut Path had 29 crashes between 2005 and 2007, resulting in an average of 9.67 crashes per year; the characteristics of these crashes are shown in Table 7-3. The crash rate of 0.97 crashes per million entering vehicles (MEV) is higher than the average of 0.87 crashes per MEV for District 3 signalized intersections (Table 7-4). About 25 percent of the crashes at this intersection resulted in injury and 75 percent in property damage only. Angle/sideswipe and rear-end crashes represented 75 percent of the collisions.

7.6.2 PROPOSED IMPROVEMENTS

Staff recommend implementing traffic operations and safety improvements at the intersection of Concord Street and Old Connecticut Path (Figure 7-9.) The improvements, which are estimated to cost about $50,000, include

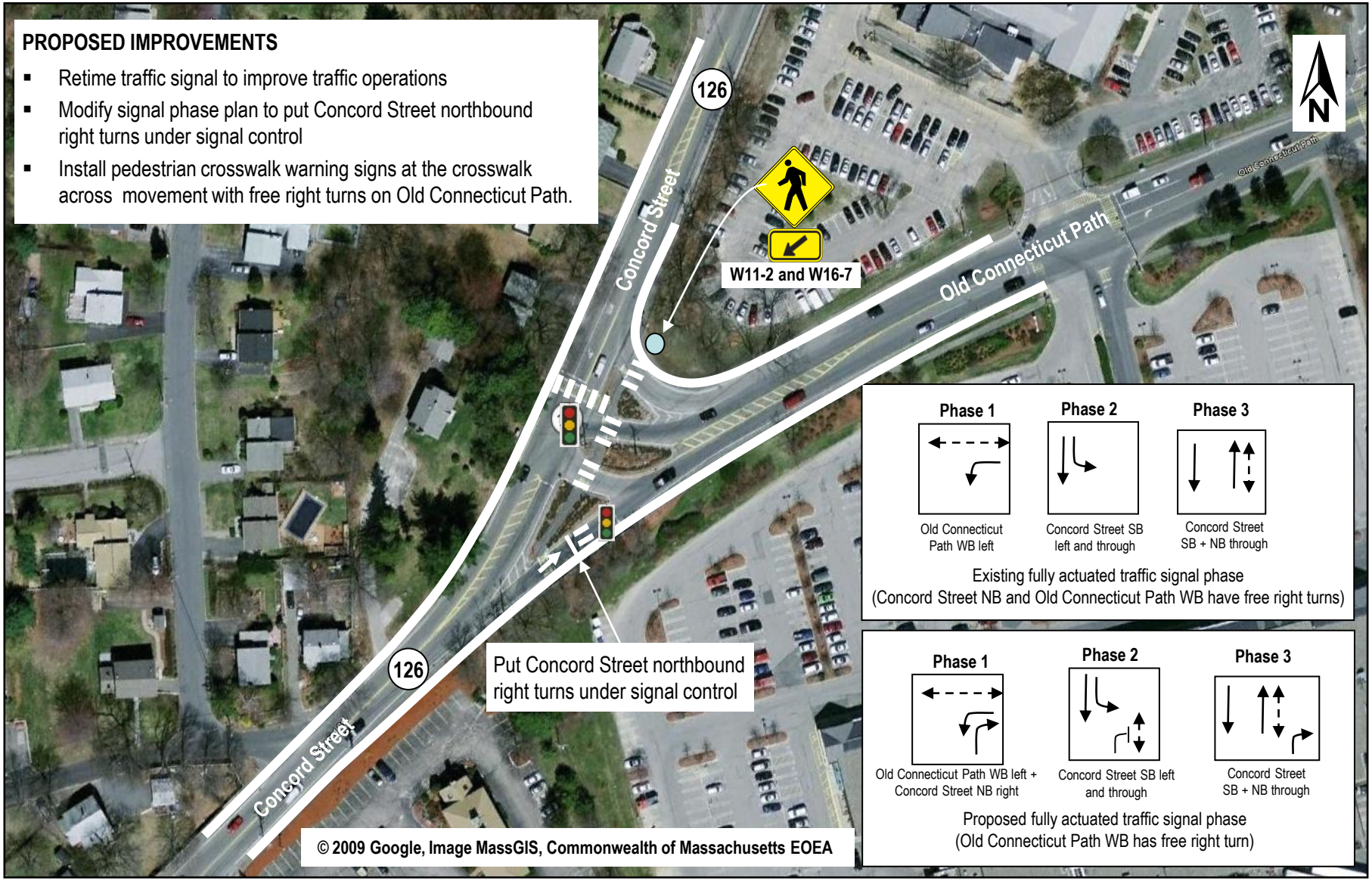

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FIGURE 7-9
Concord Street and Old Connecticut Path Intersection: Proposed Improvements

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- Retiming of the traffic signal to make it more effective. Analysis shows that allocating more green time to Old Connecticut Path while maintaining an 80-second cycle length would reduce traffic delay at that approach and improve the LOS to C from E during the PM peak hour. The retiming would also improve the overall intersection delay to 15.3 seconds (LOS B) from 20.4 seconds (LOS C) during the PM peak hour.
- Modifying the signal-timing plan to put Concord Street northbound right turns under traffic signal control to improve safety. Analysis indicates that putting the Concord Street northbound right turns under signal control would not significantly increase delay for that movement or impact traffic operations at the intersection.
- Installing pedestrian-crossing signs at the crosswalk across movement with free right turns on Old Connecticut Path to alert motorists turning right to the presence of pedestrians.

7.7 CONCORD STREET, SUMMER STREET, AND CAMPELLO ROAD INTERSECTION

The intersection of Concord Street, Summer Street, and Campello Road is unsignalized. Figure 7-10 shows the intersection layout and land uses, which are primarily residential, in the vicinity. Traffic on Summer Street and Campello Road is controlled by stop signs; Concord Street traffic is uncontrolled. All of the turning movements to and from Summer Street are channelized, creating two mini-intersections on its approach to Concord Street. South of the intersection, there is a five-foot-wide sidewalk on the west side of Concord Street. North of the intersection on Concord Street, there are five-foot-wide sidewalks on both sides of the street. The sidewalks are in fair condition.

7.7.1 IDENTIFIED PROBLEMS

Pavement

The pavement condition of the section of Concord Street between Old Connecticut Path and Campello Road is poor to fair. There are segments in this section with pavement distress. The 2006–07 pavement serviceability index indicated that this analysis location needs some form of pavement rehabilitation.

Sidewalks

The following problems were identified at the intersection of Concord Street, Summer Street, and Campello Road.

- There are sidewalks on both sides of Concord Street at the intersection, but there is no crosswalk on Concord Street connecting those sidewalks.
- There are no curb cuts or wheelchair ramps at this intersection; this intersection is not ADA-compliant.

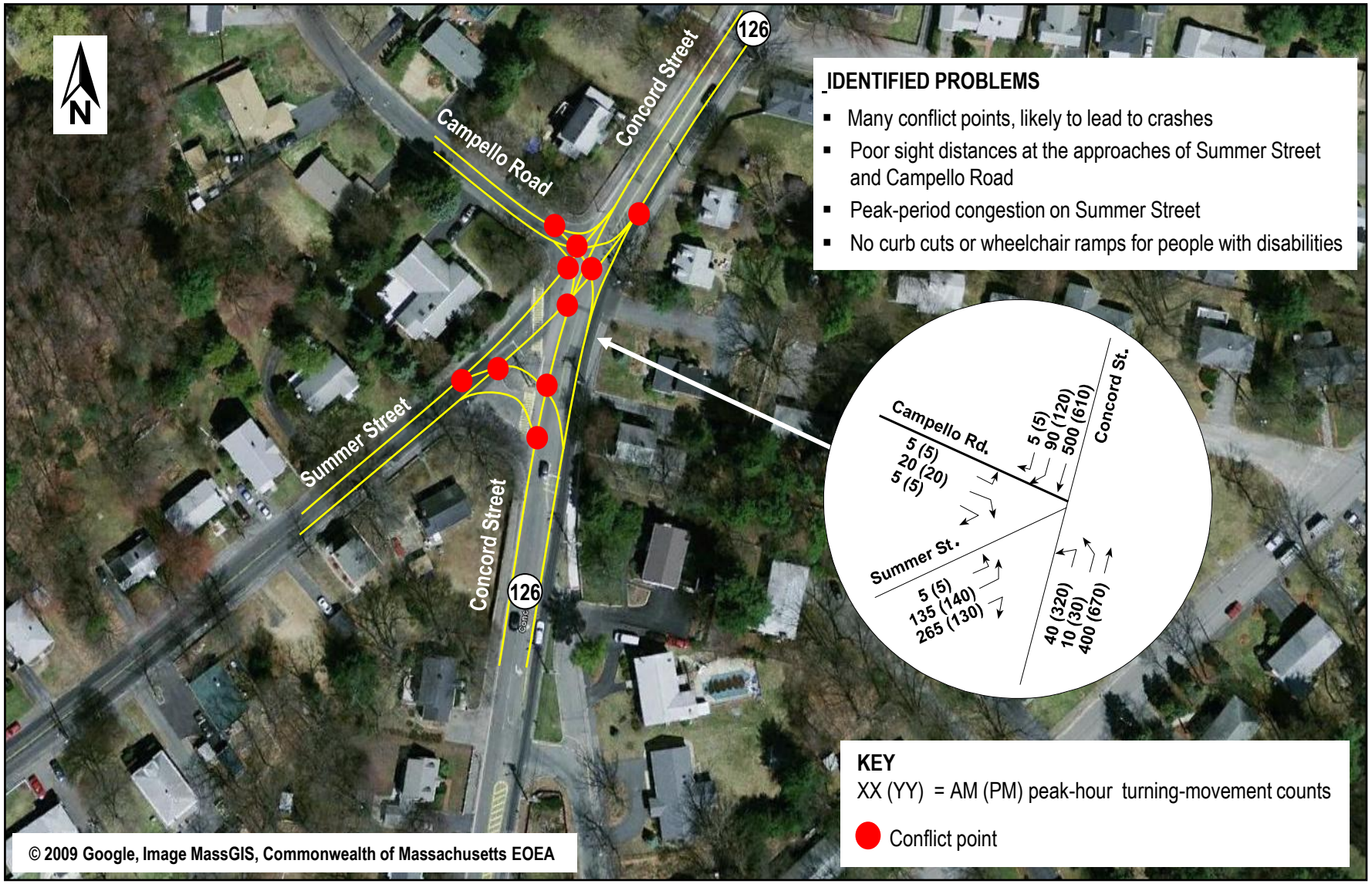

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FIGURE 7-10
Concord Street, Summer Street, and Campello Road Intersection: Identified Problems

Route 126 Corridor Study

- The traffic island in front of Summer Street has no opening (a cut through the island) to facilitate crossing for people with disabilities.

Traffic Operations

The intersection is situated on a horizontal curve on Concord Street, which impacts the sight distances at the intersection. The current intersection geometry creates many conflict points, as indicated in Figure 7-10. The existing AM and PM peak-hour traffic counts are shown in Figure 7-10. Table 7-1 shows the results of the intersection capacity analysis, which shows that traffic on Summer Street operates at LOS E or F during the AM and PM peak hours. Field observations show a traffic queue on the approach during these hours. In addition, during the PM peak hour on Concord Street, northbound left-turning motorists block the intersection while waiting for gaps to turn onto Summer Street. This occurrence is not reflected in the results of the capacity analysis because Concord Street traffic experiences some delay during the PM peak hour.

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were performed for the intersection of Concord Street, Summer Street, and Campello Road. The results of the analysis indicated that peak-period traffic operations meet MUTCD's Warrants 2 and 3 criteria.

Safety Analysis

Table 7-3 shows the frequency and characteristics of the crashes at the intersection of Concord Street, Summer Street, and Campello Road. There were 14 crashes at the intersection between 2005 and 2007, resulting in an average of 4.67 crashes per year. The intersection crash rate was 0.48 crashes per million entering vehicles (MEV), which is lower than the average of 0.69 crashes per MEV for MassDOT Highway Division's District 3 unsignalized intersections (Table 7-4). About 64 percent of the crashes at this intersection were angle/sideswipe collisions.

7.7.2 PROPOSED IMPROVEMENTS

Staff recommend making geometric improvements at the intersection of Concord Street, Summer Street, and Campello Road to improve safety. Figure 7-11 shows the modifications proposed for the intersection. The proposed improvements, which are estimated to cost $1.0 million, comprise the following:

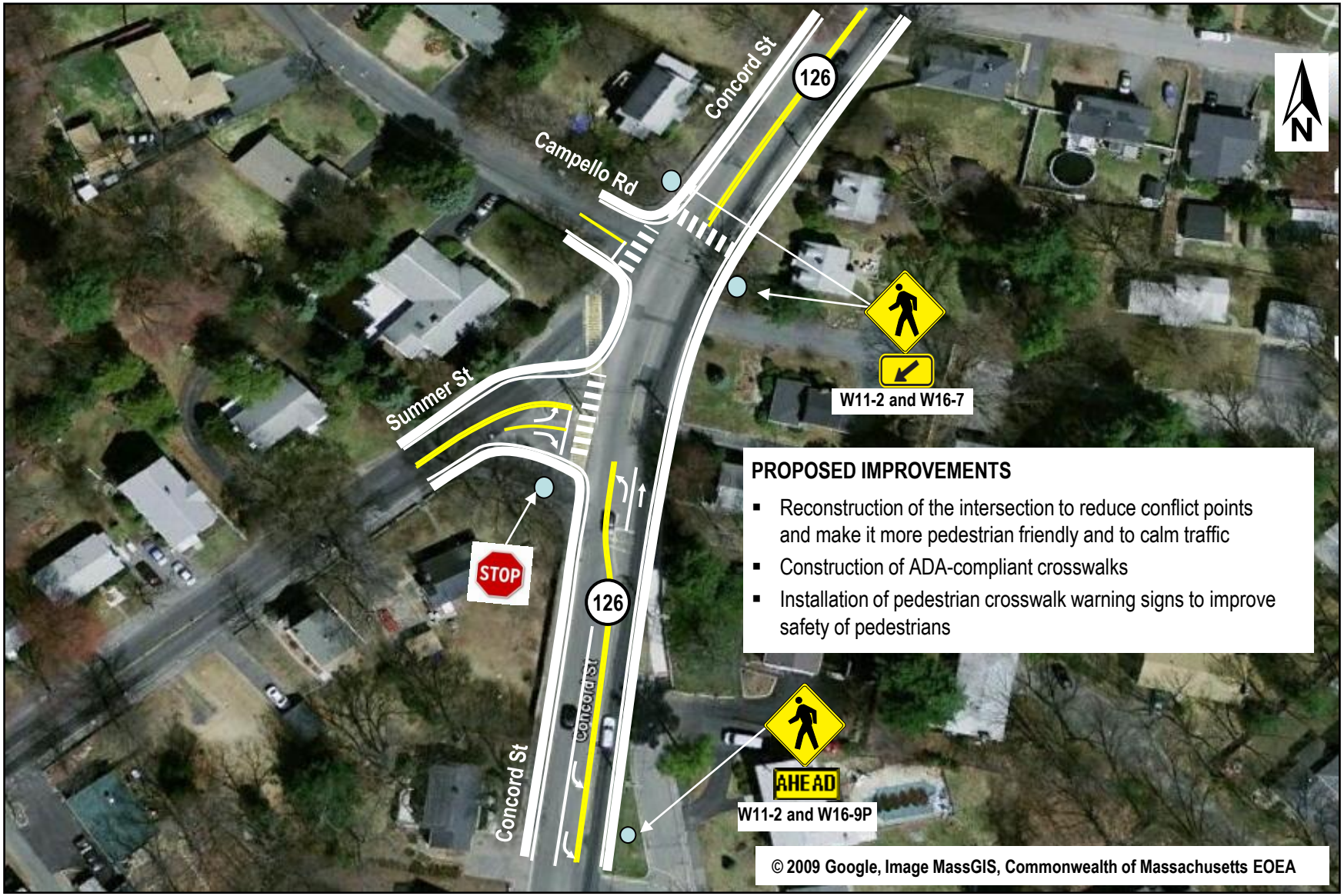

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FIGURE 7-11
Concord Street, Summer Street, and Campello Road Intersection: Proposed Improvements

Route 126 Corridor Study

- Reconstruction of the intersection to reduce conflict points and to make it more pedestrian friendly by realigning Summer Street so that it approaches Concord Street perpendicularly to improve sight distance and safety. A realignment of Summer Street would also reduce the crossing distance for pedestrians.
- Construction of accessible crosswalks at the intersection for crossing Concord Street, Campello Road, and Summer Street.
- Installation of yield-to-pedestrians warning signs to improve safety for pedestrians at the intersection, especially for the new crosswalk proposed on Concord Street.

7.8 CONCORD STREET AND SCHOOL STREET INTERSECTION

The intersection of Concord Street and School Street is an unsignalized T-intersection. Figure 7-12 shows the intersection layout and land uses in the vicinity. School Street intersects Concord Street from the east, and its traffic is controlled by a stop sign. Traffic on Concord Street, the major street, is uncontrolled. All of the turning movements to and from School Street are channelized. The intersection's geometric layout also creates additional conflict points at the approaches of Concord Street and School Street (Figure 7-12). There is a five-foot-wide sidewalk on the east side of Concord Street south of the intersection. North of the intersection, there are five-foot-wide sidewalks on both sides of Concord Street.

7.8.1 IDENTIFIED PROBLEMS

Sidewalks

This is a very busy intersection, with numerous school buses and students passing through.[8] Although there is a pedestrian crosswalk on the approach of School Street, marked with yellow stripes (ladder style) sufficiently visible to pedestrians and motorists, the sidewalks lack curb cuts and ramps for wheelchair use. Furthermore, there is no crosswalk for crossing Concord Street at this intersection. In summary, the intersection is not pedestrian friendly and ADA-compliant.

Traffic Operations

Figure 7-12 shows the existing AM and PM peak-hour turning-movement counts. The counts were conducted in September 2009, when schools were in session. Table 7-2 shows the results of the intersection capacity analysis, which indicates that traffic on School Street operates at LOS F during the AM and PM peak hours, with long traffic queues.

[8] Framingham High School is located not far to the west of the intersection.

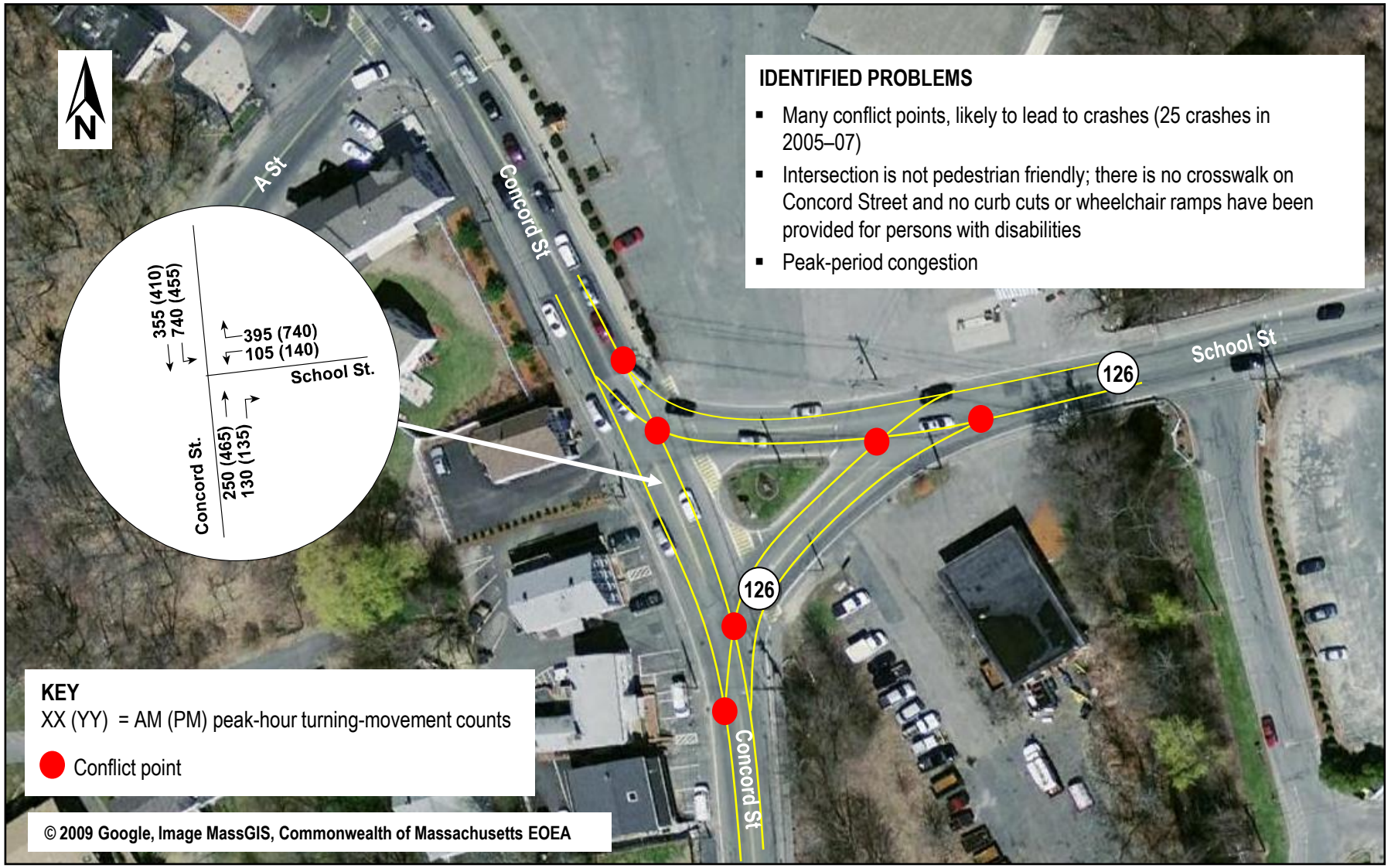

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FIGURE 7-12
Concord Street and School Street Intersection: Identified Problems

Route 126 Corridor Study

Although the southbound approach of Concord Street is marked as one lane, motorists used it as two lanes (a through and a left-turn lane) during peak hours. The capacity analysis accounted for this observation, and it is reflected in the analysis results. Field observations indicate that there is a long traffic queue for the southbound Concord Street left turns, as they yield to Concord Street northbound traffic. In addition, the southbound Concord Street left turns are frequently blocked by vehicles on School Street westbound waiting to turn left onto Concord Street—a situation that results from the complex intersection layout and conflict points.

The capacity analysis results do not reflect the traffic queue on the Concord Street southbound approach during peak hours due to the complexity of the intersection. Field observations indicate that traffic operations at the southbound Concord Street approach most likely function at LOS E or F rather than LOS B. Another traffic operations issue at the Concord Street and School Street intersection is the close proximity of the Concord Street and A Street intersection—traffic operations at each intersection impacts the other. While the Concord Street and A Street intersection is not located on Route 126, it is considered part of the Route 126 corridor.

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were performed for the intersection of Concord Street and School Street to ensure that a proposed traffic signal planned for the intersection by MS Transportation Systems Inc. is justified. Based on the analysis, traffic operations meet MUTCD's Warrants 2 and 3 criteria.

Safety Analysis

The intersection of Concord Street and School Street had 25 crashes between 2005 and 2007, resulting in an average of 8.33 crashes per year. The intersection crash rate was 0.88 crashes per million entering vehicles (MEV), which is higher than the average of 0.69 crashes per MEV for MassDOT Highway Division's District 3 unsignalized intersections (Table 7-4). About 60 percent of the crashes at this intersection were angle/sideswipe collisions, many of which were due to collisions involving turning movements.

7.8.2 PROPOSED IMPROVEMENTS

Staff recommend the reconstruction of the Concord Street and School Street intersection to improve traffic safety and operations and make it more pedestrian friendly. The proposed modifications, which are estimated to cost $2.0 million, include the following, also shown in Figure 7-13:

- Reconstruction of the intersection with geometric improvements to reduce conflict points and make it more pedestrian friendly.

- Installation of a fully actuated traffic signal with pedestrian push buttons at the intersections of Concord Street with School Street and A Street.[9] Analysis shows that installing a traffic signal at the intersection would improve the overall intersection delay to 19.6 seconds (LOS B) from 43.8 seconds (LOS E) during the AM peak hour, and to 22.6 seconds (LOS C) from 89.7 seconds (LOS F) during the PM peak hour.
- Construction of accessible sidewalks at the intersection for pedestrians and people with disabilities.
- Installation of bicycle signs (both painted on the pavement and post-mounted) and pavement detectors that sense bicycles at an intersection waiting for a green light. An example of a bicycle detector pavement marking is shown below. The proposed Cochituate Rail Trail in Framingham would end at this intersection; therefore, meeting the needs of pedestrians and bicyclists at this intersecting is essential. The sign showing a bicycle and a pedestrian (type W11-15) can be used where both bicyclists and pedestrians might be crossing the roadway, such as at this intersection. A trail-crossing plaque (type W11-15P) or "ahead" plaque (type W16-9P) may be mounted below the W11-15 sign and placed about 300 feet before the intersection to warn motorists of the pedestrians and bicyclists ahead.

Bicycle-detector pavement marking

W11-15

W11-15P

W16-9P

MUTCD

[9] In 2008, MDM Transportation Consultants Inc., as part of a traffic mitigation study for a developer, recommended signalizing and coordinating these two intersections. Analysis by MPO staff supports this recommendation.

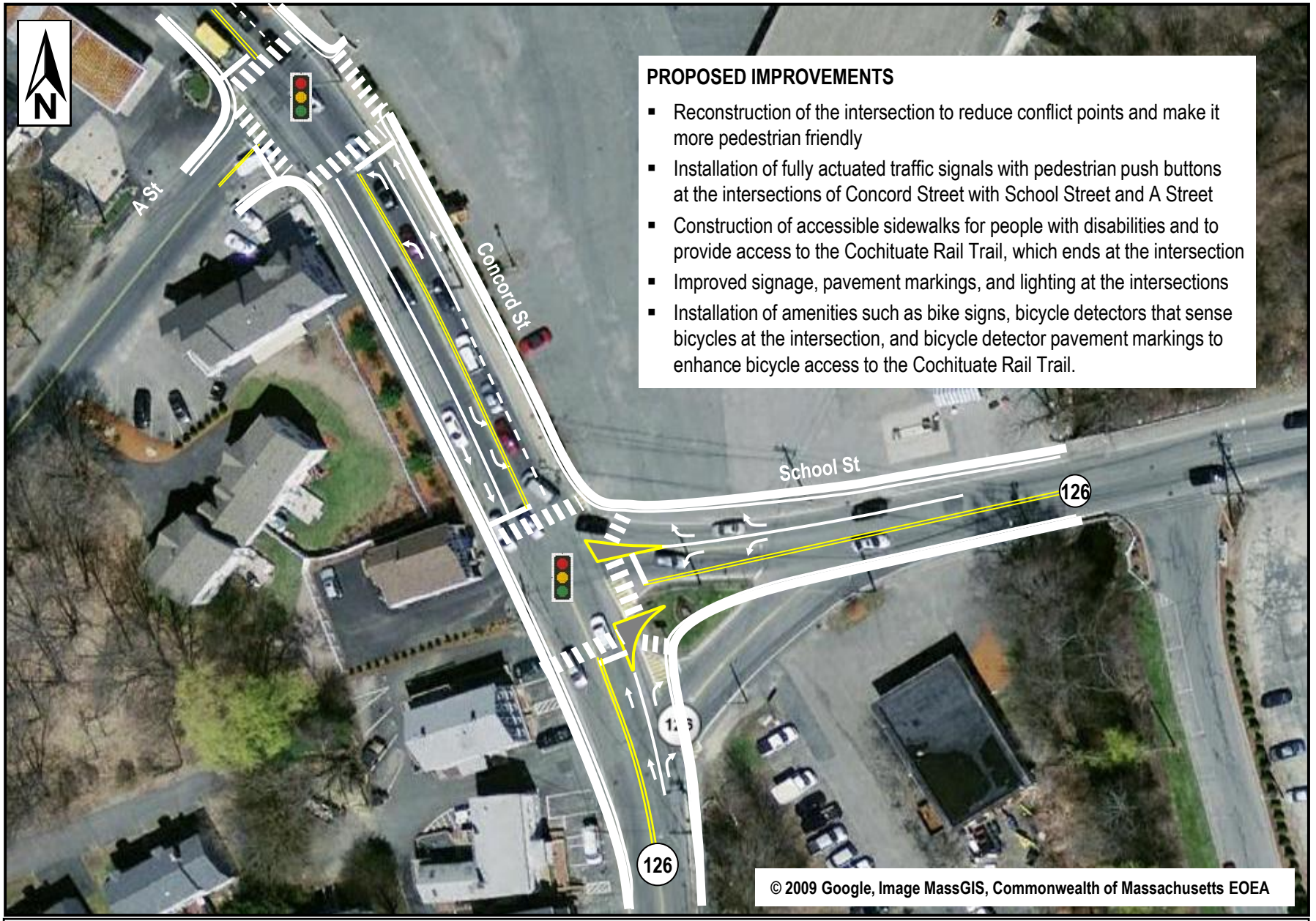

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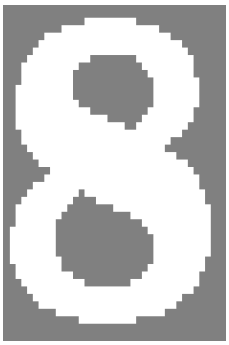
FIGURE 7-13
Concord Street and School Street
Intersection: Proposed Improvements

Route 126
Corridor
Study



TRANSIT

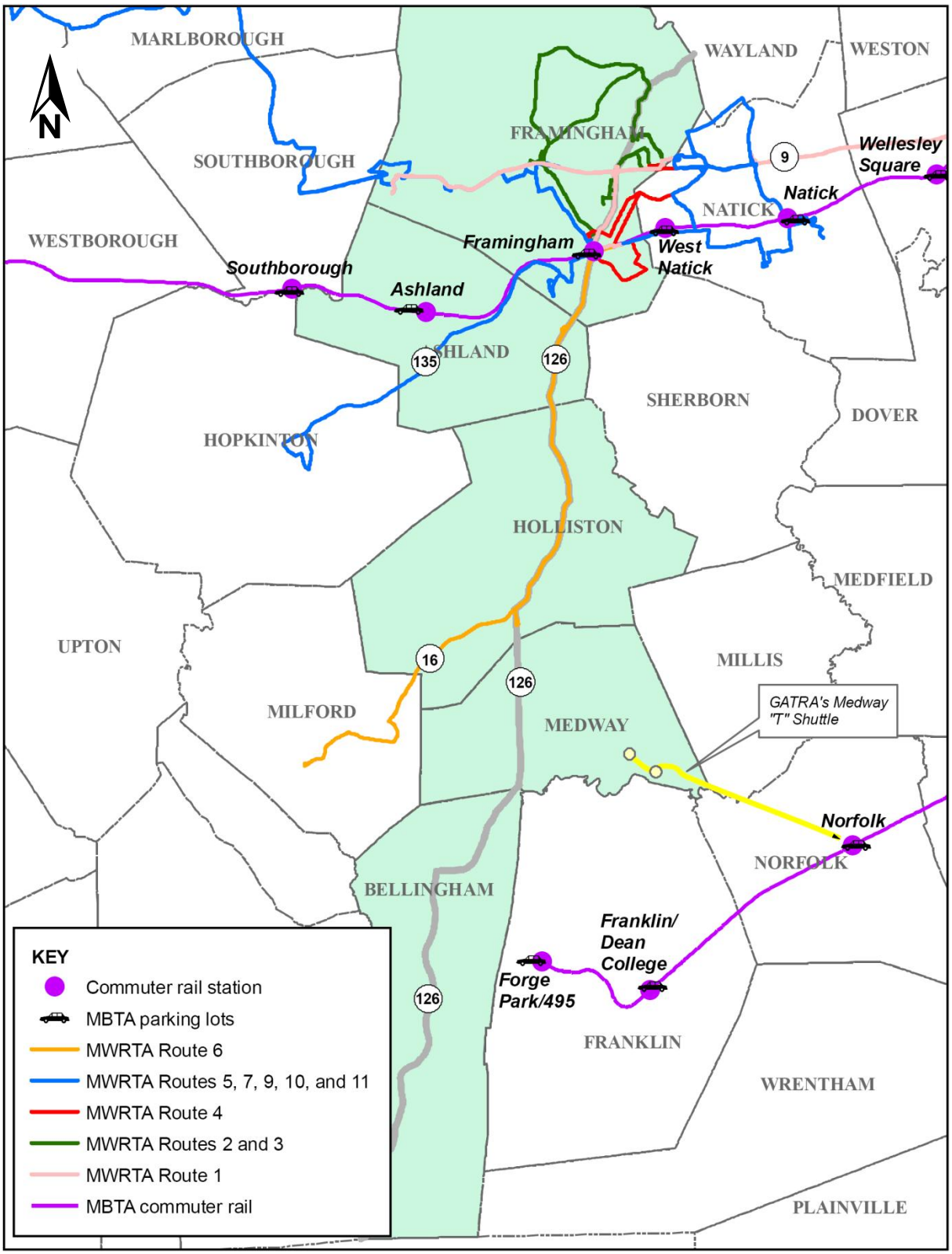
8.1 INTRODUCTION

A recent Boston Region MPO study, "Evaluation of the MWRTA Fixed-Route Network," evaluated MetroWest Regional Transit Authority (MWRTA) fixed-route transit services, recommended potential improvements to the present routes and schedules, and assessed the desirability of adding new routes.[10] Chapter 8 of this report builds on the previous MPO study by addressing the possibility of making roadway improvements to facilitate transit services in the Route 126 corridor, as well as evaluating a potential connection between MWRTA's Route 6 and GATRA's Medway "T" (Figure 8-1). There are five MWRTA fixed-route networks that use portions of Route 126: Routes 1, 2, 3, 4, and 6.

- Route 1 operates as a loop, primarily within Framingham but with some service into Natick, Wellesley, and Newton, to serve the Natick Collection, Newton-Wellesley Hospital, and Woodland T Stop on the Green Line D Branch.
- Routes 2 and 3 operate as a loop, primarily within Framingham but they also provide service into Natick to serve Shoppers World and the Natick Collection. Route 2 operates clockwise and Route 3 counterclockwise, using the same loop.
- Route 4 connects Central Hub, Beaver Park, Market Basket, downtown Framingham, the Natick Collection, Shoppers World, and Sherwood Plaza.
- Route 6 connects Framingham with Milford via Ashland and Holliston.

The previous Boston Region MPO study suggested that MWRTA's Routes 2 and 3 need more realistic schedules to deal with the existing traffic congestion. In addition, the study indicated that changing the travel times for these two routes should improve their on-time performance substantially and their overall reliability moderately. The study also suggested that MWRTA's Route 4, operating primarily within Framingham, could be slightly reconfigured to

[10] Jonathan Belcher, "Evaluation of MWRTA Fixed-Route Network," memorandum to the Boston Region MPO's Transportation Planning and Programming Committee, November 24, 2009.



BOSTON REGION MPO

FIGURE 8-1
Public Transit Serving the Route 126 Corridor

Route 126 Corridor Study

make it a more attractive option for travel between downtown Framingham and the Route 9 employment and shopping areas. The study also recommended exploring the potential of an expanded bus network in the MetroWest area.

8.2 EXISTING RIDERSHIP AND PASSENGER ACTIVITY

Table 8-1 shows the ridership information for MWRTA Routes 2, 3, 4, and 6; these are the routes that use portions of Route 126 in the study corridor. Routes 2 and 3, which are the most heavily used routes, have stops on Route 126 in downtown Framingham.

The MWRTA service follows defined-route systems, picking up and dropping off passengers at designated stops. However, it is a FLEX service that serves main stops and also makes stops between the main stops when a passenger is waiting or asks to be dropped off. Passengers can flag down the bus or be dropped off at any safe point along the route. Table 8-2 shows the aggregate passenger activity by stop location on Route 126 in the study corridor. Because of the FLEX service, passenger activity is aggregated for main stops and for sections of Route 126. The locations with a high level of passenger activity are highlighted Table 8-1. The data indicate the following:

- In Framingham, a high level of passenger activity occurs at the following locations:
    - Concord Street at Howard Street
    - Concord Street south of Rose Kennedy Lane
    - Hollis Street
- In Ashland, the Market Basket store on Pond Street is a location with a high level of passenger activity.
- In Holliston, there is no location with a high level of passenger activity, but Mission Springs on Summer Street is a terminal for MWRTA's Route 6 during the off-peak period. During peak periods, Route 6 still serves Mission Springs, but it continues past there to Milford. Main Street at School Street in Milford is a location with a high level of passenger activity, but it is not on Route 126.

8.3 IDENTIFIED PROBLEMS

The map in Figure 8-2 shows observed travel speeds, with annotations culled from the traffic operations analysis conducted for the analysis locations in Bellingham, Medway, Holliston, Ashland, and Framingham. It shows the areas where vehicles, including buses, using Route 126 experience delay. Congestion at these locations adversely impacts the travel time of MWRTA buses, which affects their on-time performance rating. The difficulties experienced by

TABLE 8-1
Total Ridership by Route, Typical Weekday (October 2008 Counts)

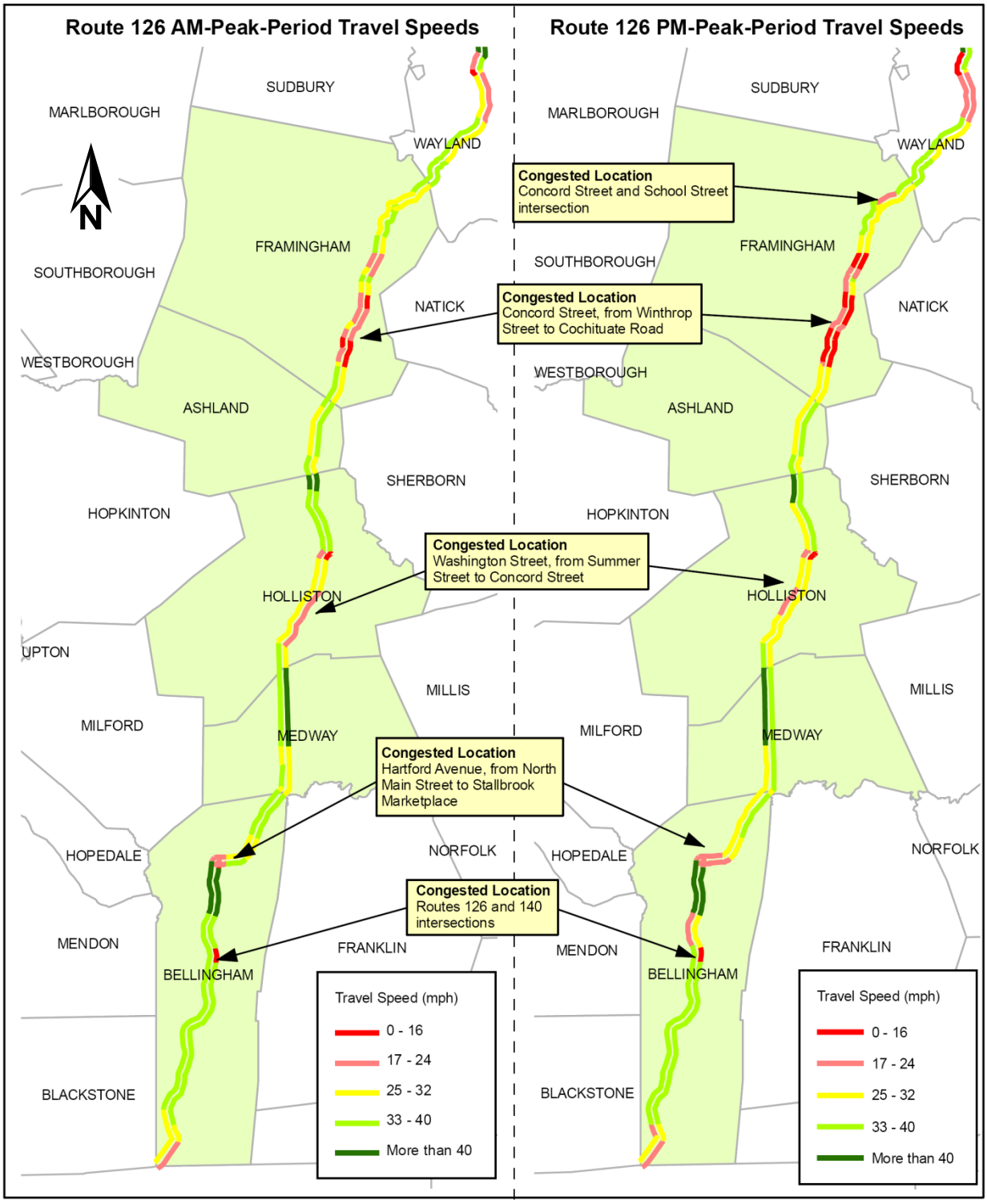
Route	Daily Passengers	Number of Round-Trips	Scheduled Hours of Service	Number of Passengers Per Round Trip	Number of Passengers Per Hour
Route 2 – Framingham Loop (clockwise)	160	13	13.00	12.3	12.3
Route 3 – Framingham Circuit (counterclockwise)	206	13	13.25	15.8	15.5
Route 4 – Market Basket, Beaver Park, and Natick Collection	72	10	9.00	7.2	8.0
Route 6 – Outbound to Milford	41				
Route 6 – Inbound from Milford	51	13	17.75	7.1	5.2

Source: Boston Region MPO study, "Evaluation of MWRTA Fixed-Route Network."
Note: Route 1 service, a new MWRTA route, was initiated after the data collection for the Boston Region MPO's study had been completed. It is not shown in this table.

TABLE 8-2
Aggregated Passenger Activity by Stop on Route 126 for Bus Routes 2, 3, 4, and 6

Stop Location	Passengers Boarding or Alighting	Bus Route(s) Using This Stop
Framingham		
Hollis Street	34	4, 6
Hollis Street at Waverly Street	17	4, 6
Concord Street	18	4, 6
Concord Street at Waverly Street	15	2
Concord Street at Howard Street	91	2, 3
Concord Street south of Rose Kennedy Lane	47	2, 3
Concord Street north of Rose Kennedy Lane and south of Route 9	16	2, 3
Concord Street at Anzio Road	4	2, 3
Concord Street north of Route 9	23	2, 3
Ashland		
Pond Street south of Market Basket	22	6
Market Basket at Pond Street	21	6, 4
Holliston		
Mission Springs at Summer Street	2	6
Washington Street	9	6
Concord Street at Taylor Road	1	6

Source: Boston Region MPO study by Jonathan Belcher, "Evaluation of MWRTA Fixed-Route Network," memorandum to the Boston Region MPO's Transportation Planning and Programming Committee, November 24, 2009.
Note: This table does not include the passenger activity of Route 1; it was established after the Boston Region MPO's data collection.
The shading denotes stop locations with a high level of passenger activity.



BOSTON REGION MPO

FIGURE 8-2
Average Travel Speeds

Route 126 Corridor Study

Routes 2, 3, 4, and 6 and riders on the buses are described below.

- Routes 2 and 3 have difficulty maintaining adequate running time, especially in the afternoon. Buses are not able to recover the time lost, leading to one or two fewer trips than scheduled in order to allow delayed buses to catch up. Congested areas on Concord Street south of Cochituate Road (Route 30), including downtown Framingham, are likely contributors to the difficulties experienced by Routes 2 and 3 in meeting their scheduled travel times.
- The Route 4 observed trips seem to have enough time to complete a round-trip within the scheduled travel time except for the last two trips, between 2:30 PM and 3:30 PM, which required an additional 5 to 10 minutes for each scheduled trip. Traffic congestion on Concord Street south of Hartford Street is a likely contributor to the difficulties experience by Route 4.
- The Route 6 observed trips have difficulty meeting the scheduled travel time for inbound trips, especially during the morning for the trips between 6:00 AM and 8:45 AM from Milford or Holliston. The outbound trips did operate within the scheduled time. Congested areas in Holliston and Framingham are likely contributors to the difficulties experienced by Route 6 in meeting the scheduled travel times for inbound trips.
- One of the concerns about transit service in the Route 126 corridor is that there are no bus bays at the high-activity areas. Another concern is the lack of signs identifying the bus route, particularly in Ashland, Framingham, and Holliston.

8.4 POTENTIAL TRANSIT IMPROVEMENTS

The traffic safety and operations improvements proposed in this study for the analysis locations in Holliston, Ashland, and Framingham, and other proposed projects by MassDOT and the town of Framingham if implemented, are expected to improve travel conditions in the Route 126 corridor for motorists—including bus transit riders, pedestrians, and bicyclists,. The following is a brief description of the proposed improvements:

- In Holliston, the proposed improvements at the intersection of Washington Street, Summer Street, and Oak Street, and the intersection of Washington Street and Highland Street are expected to reduce congestion. The provision of sidewalks on Summer Street, Washington Street, and Concord Street is expected to improve safety for MWRTA Route 6 riders. These improvements are described in detail in Chapter 5.
- In Ashland, the proposed improvements on Pond Street (section 6.4.2 in Chapter 6) are also expected to reduce traffic delay and to improve safety for pedestrians and bicyclists, as well as for motorists. The

improvements, which are described in detail in Chapter 6, would benefit MWRTA Routes 4 and 6 riders.

- In Framingham, the recent Route 126 Downtown Roadway Improvement Project has the objective of integrating and improving traffic flow and the environment for pedestrians and bicycles in the downtown area.[11] This project is expected to improve traffic flow in the downtown area on Concord Street and would benefit MWRTA Routes 2, 3, 4, and 6.

  In addition, this study addressed traffic congestion and safety on Route 126 north of Route 9. Improvements were proposed for the intersections of Concord Street at Cochituate Road, Old Connecticut Path, Summer Street, Campello Road, and School Street. The proposed improvements are expected to improve traffic flow in the Route 126 corridor north of Route 9 and would benefit MWRTA Routes 2 and 3.

  Another project in downtown Framingham is presently evaluating alternatives for addressing congestion in the downtown area, in particular, the impact of train crossings.[12] The project, which is currently going through the design and analysis phase, including a full environmental review, is a long-term project; therefore, its benefits will not be realized in a short time horizon.

  Based on passenger activity, staff recommend constructing bus bays and shelters at the following locations:

  - Concord Street at Howard Street in Framingham
  - Concord Street between Rose Kennedy Lane and Union Street in Framingham
  - Hollis Street between Draper Road and Waverley Street in Framingham

  The bus bays proposed for Concord Street could be included in and constructed as part of the recent Route 126 Downtown Roadway Improvement Project.[11] According to the Town of Framingham's website, this project's final design is expected to be completed in 2011, and construction, to be managed by MassDOT, is anticipated to commence in 2011 and be completed in 2012.[13]

[11] Route 126 Downtown Roadway Improvement Project, being conducted by the Beta Group Inc.
[12] Downtown Study Framingham, Final Report, prepared by the Beta Group Inc., Cecil Group, and FXM Associates, August 31, 2009.
[13] Town of Framingham's website, Web page link: http://www.framinghamma.gov/index.aspx?NID=1275, November 2010.

8.5 POTENTIAL COORDINATION AND CONNECTIVITY

The Greater Attleboro Regional Transit Authority (GATRA) and the town of Medway operate the Medway "T" bus shuttle, which begins at the Medway Middle School, at 45 Holliston Street, and stops at the Village Street Post Office before proceeding directly to the Norfolk commuter rail station.

The Boston Region MPO study that was performed for MWRTA addressed connectivity and coordination issues in the MetroWest area regarding services provided by MWRTA, the MBTA, and private carriers.[14] One connectivity and coordination issue, which was not addressed in the MPO study but was raised in this study, was the feasibility of connecting and coordinating MWRTA's Route 6 with GATRA's Medway "T" shuttle (Figure 8-1).

Evaluation of the existing routes of MWRTA's Route 6 and GATRA's Medway "T" shuttle shows that any connectivity between the two transit routes would require closing a substantial gap between them (Figure 8-1). Closing this gap would imply extending one or both of the transit routes and consequently modifying arrival and departure schedules.

Recently, GATRA's Medway "T" shuttle had shortened its route; it moved its western terminal location at the West Medway Fire Station, at the intersection of Routes 109 and 126, to the Medway Middle School. In addition, the stop and pick-up location at the Dry Bridge Crossing was cancelled. This action reduced the number of stops or pick-up locations in Medway from four to two. Shortening the route for GATRA's Medway "T" shuttle made a connection between the two transit systems even more difficult, as the gap has become wider. Considering all of these factors, MPO staff believe that connecting MWRTA's Route 6 and GATRA's Medway "T" shuttle would require a detailed study to evaluate its feasibility in terms of ridership and operating resources.

[14] Jonathan Belcher, "Evaluation of MWRTA Fixed-Route Network," memorandum to the Boston Region MPO's Transportation Planning and Programming Committee, November 24, 2009.

CONCLUSION

This study has identified several improvements that would address the issues of mobility and safety in the Route 126 corridor for motorists, bicyclists, pedestrians, and transit users. They comprise both short-term and long-term improvements. Table 9-1 presents the proposed improvements, their locations, and construction cost estimates. The construction cost estimates do not include land takings.

There are several agencies that operate transportation facilities in the corridor, including the MassDOT Highway Division and the MetroWest Regional Transit Authority, and also the towns of Ashland, Bellingham, Framingham, Holliston, and Medway. Successful implementation of the projects recommended in this study is dependent on coordination among the stakeholders, sufficient public participation, and securing funding for the projects.

For reference, a description of the implementation process of the MassDOT Highway Division is provided in the appendix.

TABLE 9-1
Summary of Proposed Improvements and Cost Estimates

Town	Project Description	Proposed Improvements	Cost Estimates ($ Million)
Bellingham	Reconstruct Pulaski Boulevard from the Blackstone town line to Moody Street for approximately 0.75 miles to improve mobility and safety.	Pavement rehabilitation, accessible sidewalks, four-foot-wide shoulders, granite curbing, and signs and pavement markings to improve safety for pedestrians and bicyclists.	2.5
Bellingham	Reconstruct South Main Street from Pulaski Boulevard to Elm Street for approximately 0.7 miles to improve mobility and safety.	Pavement rehabilitation and drainage-related improvements, accessible sidewalks, four-foot-wide shoulders, and curbing. Other improvements are signs and pavement markings to improve safety for pedestrians and bicyclists.	2.2
Bellingham	Improve mobility and safety for pedestrians and bicyclists on South Main Street, from Elm Street to Scott Hill Boulevard, approximately 2.0 miles.	Construct accessible sidewalks on at least on one side of South Main Street, granite curbing, four-foot-wide shoulders, and signs and pavement markings to improve safety for pedestrians and bicyclists.	1.5
Bellingham	Reconstruct South Main Street from Easy Street to Mechanic Street for approximately 0.9 miles to improve mobility and safety.	Pavement rehabilitation, improved drainage, accessible sidewalks, granite curbing, midblock crosswalks, and signs and pavement markings to improve safety for pedestrians and bicyclists.	3.0
Bellingham	Make geometric and signal improvements at Route 126 and Route 140 intersections to improve traffic operations and safety.	**North Main Street and Mendon Street Intersection** Construct a right-turn lane on eastbound approach of Mendon Street and a through lane on northbound approach of Mechanic Street. Revise signal layout to accommodate geometric changes, optimize signal phases, and coordinate signals. **South Main Street and Mechanic Street Intersection** Convert use of through/right shared lane to left/through/right shared lane on South Main Street approach and construct a through lane on northbound approach of Mechanic Street. Revise signal layout to accommodate geometric changes, optimize signal phases, and coordinate signals.	1.5

(Cont.)

TABLE 9-1 (cont.)

Town	Project Description	Proposed Improvements	Cost Estimates ($ Million)
Bellingham	Retime and coordinate Hartford Avenue signalized intersections from North Main Street to Stallbrook Marketplace to improve traffic operations and safety.	**Short-term improvements** Signal retiming and coordination of five signals. Improved pavement markings for motorists. **Long-term improvements** Redesign the Route 126/I-495 ramp junctions to improve safety. Evaluate the possibility of a roundabout at Route 126/I-495/Deerfield Road ramp-arterial junction to prevent the left-turning vehicles from trapping the straight-through vehicles in the westbound shared lane and preventing motorists from changing lanes.	0.2 Not applicable
Bellingham	Reconstruct Hartford Avenue from Plymouth Road to Summer Street for approximately 1.0 miles to improve safety, mobility, and traffic operations.	Pavement rehabilitation of full-depth road reconstruction; improved drainage; construction of accessible sidewalks, granite curbing, and crosswalks; and sign and pavement markings to improve safety for pedestrians and bicyclists. Installation of a new traffic signal at Hartford Avenue and Pearl Street intersection and construction of a westbound left-turn bay on Hartford Avenue.	3.5
Medway	Reconstruct Main Street from the Bellingham town line to Summer Street for approximately 750 feet to improve safety and mobility.	Construction of accessible sidewalks on Main Street; realignment of West Street to intersect Main Street perpendicularly. Pavement rehabilitation and markings and installation of signs to improve visibility and safety at the intersection of Main Street and Summer Street.	0.30
Holliston	Reconstruct Summer Street from the Medway town line to the Washington Street, Summer Street, and Oak Street intersection for approximately 0.6 miles to improve safety and traffic operations.	Pavement rehabilitation; construction of accessible sidewalks, paved shoulders, and granite curbing; midblock crosswalks; and improved signage. Reconstruction of the intersection Washington Street, Summer Street, and Oak Street, including installation of a new traffic signal and signal-ahead signs, construction of a westbound left-turn bay, and provision of pedestrian amenities such as crosswalks and push buttons. Installation of signal-ahead signs at the intersection of Washington Street, Summer Street, and Oak Street.	2.5

(Cont.)

TABLE 9-1 (cont.)

Town	Project Description	Proposed Improvements	Cost Estimates ($ Million)
Holliston	Reconstruct Washington Street from Summer Street to Green Street/ Exchange Street for approximately 1.5 miles to improve mobility and safety.	Pavement rehabilitation and drainage-related improvements, construction of accessible sidewalks, shoulders, and granite curbing, Retiming of the traffic signal and upgrade of signal equipment at Washington Street and Highland Street. Installation of signal-ahead signs to alert motorists of the approaching traffic signal.	3.0
Holliston	Reconstruct Concord Street from Baker Street to the Ashland town line for approximately 2.0 miles to improve mobility and safety.	Pavement rehabilitation and drainage-related improvements, construction of accessible sidewalks, and signs and pavement markings to improve safety for pedestrians and bicyclists. Realignment of High Street approach so that it intersects Concord Street perpendicularly.	5.0
Ashland	Reconstruct Pond Street from the Holliston town line to the Framingham town line for approximately 1.7 miles to improve mobility, safety, and traffic operations.	Construction of accessible sidewalks and midblock pedestrian crossings, paved shoulders, granite curbing, pavement rehabilitation, and drainage-related improvements. Other improvements include construction of left-turn lanes in the business areas, geometric improvements at the signalized and unsignalized intersections, signal retiming, and signs and pavement markings to improve safety for pedestrians and bicyclists.	4.5
Framingham	Make the Route 9 and Route 126 interchange pedestrian- and bicyclist-friendly to improve safety.	Make the interchange pedestrian friendly by installing crosswalk enhancements such as lighting, pedestrian crosswalk flashing beacons, and crossing signs. Interconnect existing sidewalks by constructing new sidewalks. Replacing broken and crumbled sidewalks. Other improvements include the installation of raised traffic islands at the ramp junctions to channel traffic flow to and from Route 9. Evaluate the feasibility of a single-point urban interchange to replace the existing interchange as a long-term measure.	0.5 Not applicable
Framingham	Make traffic signal and signage improvements at Cochituate Road and Concord Street intersection to enhance safety and traffic operations.	Retime traffic signal and install overhead lane assignment signs at each approach in advance of the intersection to improve traffic operations and safety. Install a crosswalk on the westbound approach of Concord Street to improve connectivity of the sidewalks.	0.15

(Cont.)

TABLE 9-1 (cont.)

Framingham	Modify traffic signal phase and retime traffic signal to improve safety and operations at Concord Street and Old Connecticut Path intersection	Retime traffic signal to make it more effective. Modify signal-timing plan to put Concord Street northbound right turns under traffic signal control to improve safety. Install yield-to-pedestrians signs at the crosswalks across lanes that have with free right turns.	0.05
Framingham	Reconstruct Concord Street, Summer Street, and Campello Road intersection to make it pedestrian friendly.	Reconstruct intersection to improve safety and to make it more pedestrian friendly. Realign Summer Street so that it approaches Concord Street perpendicularly to improve sight distance and safety. Construct accessible crosswalks and signs and pavement markings to improve safety for pedestrians.	1.0
Framingham	Reconstruct Concord Street and School Street intersection to improve mobility, safety, and operations.	Reconstruct the intersection with geometric improvements to reduce conflict points and increase safety. Install fully actuated coordinated traffic signals with pedestrian push buttons and detectors for sensing bicycles at the Concord Street intersection with School Street and with A Street. Construct accessible sidewalks and install signs and pavement markings to improve safety for pedestrians and bicyclists.	2.0

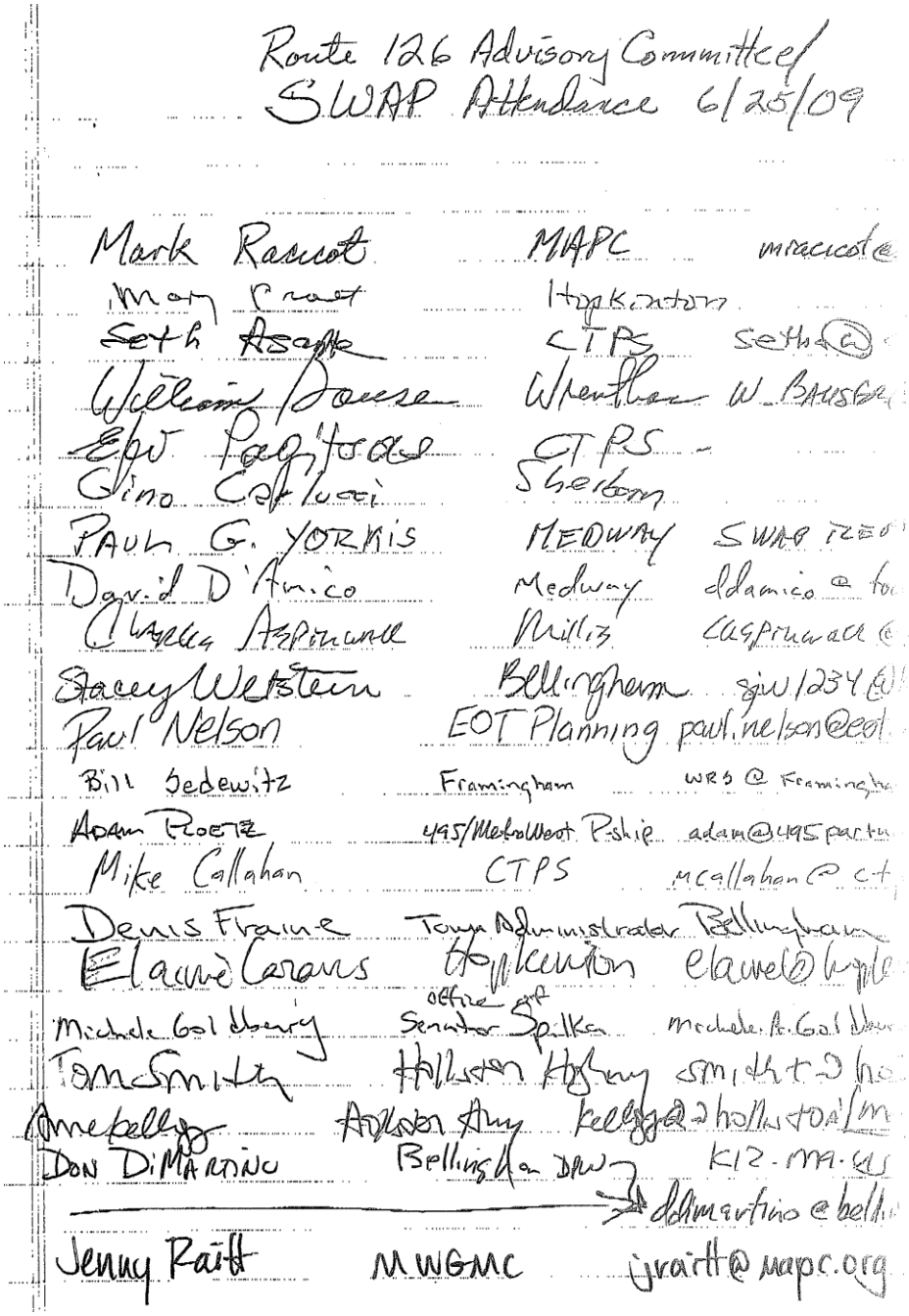
APPENDIX A
Public Participation

A.1 ATTENDANCE AT THE TASK FORCE MEETING HELD ON JUNE 25, 2009, AT THE BELLINGHAM TOWN HALL

A.2 ATTENDANCE AT THE TASK FORCE MEETING HELD ON FEBRUARY 10, 2010, AT THE ASHLAND TOWN HALL

APPENDIX A
Public Participation

A.1 ATTENDANCE AT THE TASK FORCE MEETING HELD ON JUNE 25, 2009, AT THE BELLINGHAM TOWN HALL



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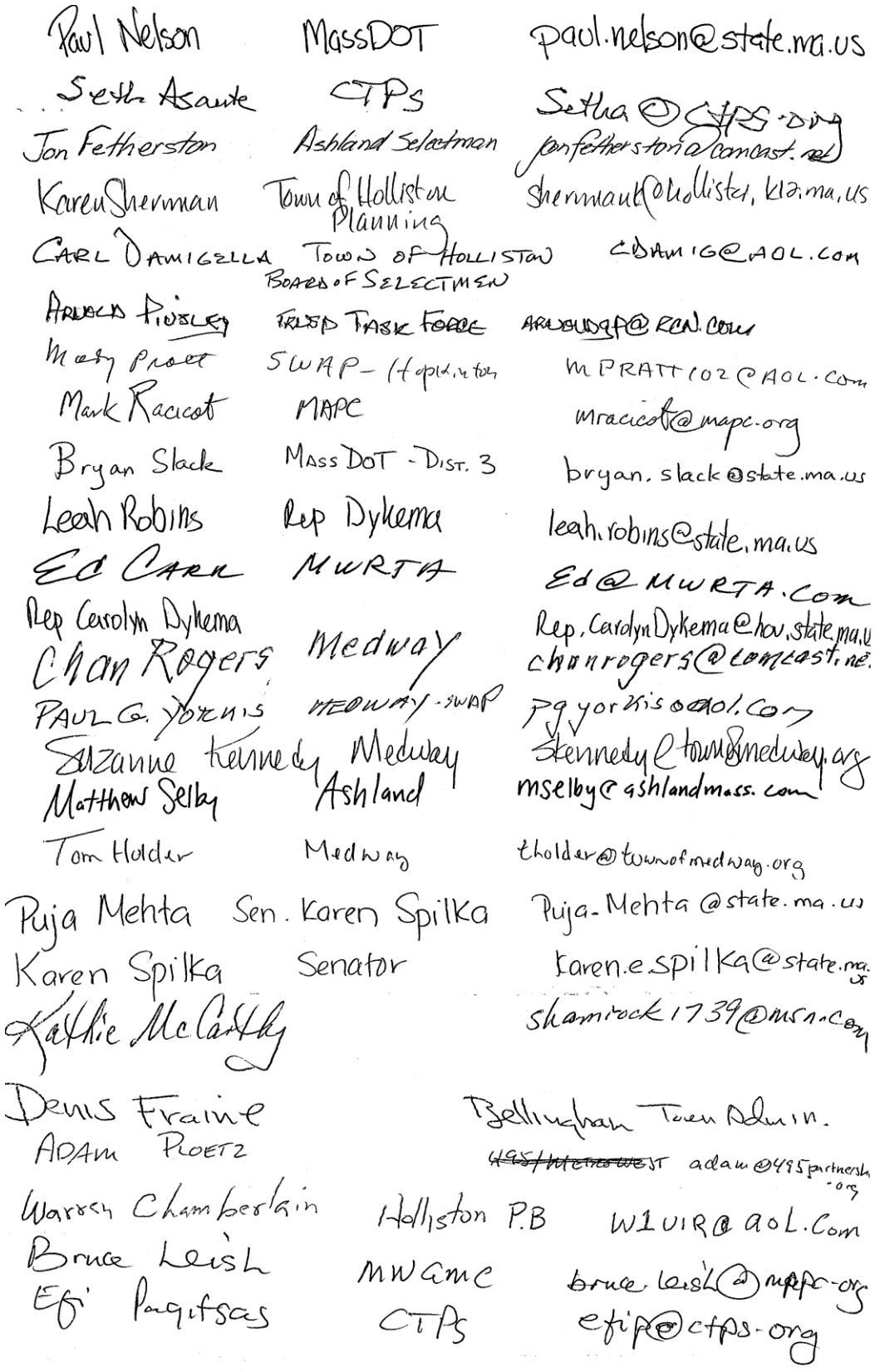
A.2 ATTENDANCE AT THE TASK FORCE MEETING HELD ON FEBRUARY 10, 2010, AT THE ASHLAND TOWN HALL



APPENDIX B
Implementation Process

APPENDIX B
Implementation Process

The following description of the implementation process is based on Chapter 2 of the MassDOT Highway Division's *Project Development and Design Guide (2006)*. The text below borrows heavily from that document.

B.1 NEEDS IDENTIFICATION

For each of the locations at which an improvement is to be implemented, the MassDOT Highway Division leads an effort to define the problem, establishes project goals and objectives, and defines the scope of the planning needed for implementation. To that end, it has to complete a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facility or location. The PNF documents the problems and explains why corrective action is needed. For this study, the information defining the need for the project will be drawn primarily, perhaps exclusively, from the present report. Also, at this point in the process, the MassDOT Highway Division meets with potential participants, such as the Boston Region Metropolitan Planning Organization (MPO) and community members, to allow for an informal review of the project.

The PNF is reviewed by the MassDOT Highway Division district office whose jurisdiction includes the location of the proposed project. The MassDOT Highway Division also sends the PNF to the MPO, for informational purposes. The outcome of this step determines whether the project requires further planning, whether it is already well supported by prior planning studies, and, therefore, whether it is ready to move forward into the design phase, or whether it should be dismissed from further consideration.

B.2 PLANNING

This phase will likely not be required for implementation of the improvements proposed in this planning study, as this planning report should constitute the outcome of this step. However, in general, the purpose of this implementation step is for the project proponent to identify issues, impacts, and approvals that may need to be obtained, so that the subsequent design and permitting processes are understood.

The level of planning needed varies widely, depending on the complexity of the project. Typical tasks include: defining the existing context, confirming project need, establishing goals and objectives, initiating public outreach, defining the project, collecting data, developing and analyzing alternatives, making recommendations, and providing documentation. Likely outcomes include consensus on the project definition to enable it to move forward into environmental documentation (if needed) and

design, or a recommendation to delay the project or dismiss it from further consideration.

B.3 PROJECT INITIATION

At this point in the process, the proponent, the MassDOT Highway Division, fills out, for each improvement, a Project Initiation Form (PIF), which is reviewed by its Project Review Committee (PRC) and the MPO. The PRC is composed of the Chief Engineer, each District Highway Director, and representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge sections, and the Capital Expenditure Program Office (CEPO). The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First the PRC reviews and evaluates the proposed project based on the Massachusetts Department of Transportation's statewide priorities and criteria. If the result is positive, the MassDOT Highway Division moves the project forward to the design phase and to programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes a project evaluation based on the MPO's regional priorities and criteria. The MPO may assign a score based on project evaluation criteria, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

B.4 ENVIRONMENTAL, DESIGN, AND RIGHT-OF-WAY PROCESS

This step has four distinct but closely integrated elements: public outreach, environmental documentation and permitting (if required), design, and right-of-way acquisition (if required). The outcome of this step is a fully designed and permitted project ready for construction. However, a project does not have to be fully designed in order for the MPO to program it in the TIP.

B.5 PROGRAMMING

Programming, which typically begins during the design phase, can actually occur at any time during the process, from the planning to the design phase. In this step, which is distinct from project initiation, where the MPO receives preliminary information on the proposed project, the proponent requests that the MPO place the project in the region's TIP. The MPO considers the project in terms of regional needs, evaluation criteria, and compliance with the regional long-range transportation plan and decides whether to place it in the draft TIP for public review and then in the final TIP.

B.6 PROCUREMENT

Following project design and programming, the MassDOT Highway Division publishes a request for proposals. It then reviews the bids and awards the contract to the qualified bidder with the lowest bid.

B.7 CONSTRUCTION

After a construction contract has been awarded, the MassDOT Highway Division and the contractor develop a public participation plan and a management plan for the construction process.

B.8 PROJECT ASSESSMENT

The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. The MassDOT Highway Division can apply what is learned in this process to future projects.