Route 18 Corridor Study

Including the Towns
of
Abington, Whitman,
East Bridgewater, & Bridgewater, Massachusetts

Prepared by
Old Colony Planning Council
70 School Street
Brockton, MA 02301
Under MassDOT Contract # 0052455

November, 2009

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The views and opinions of the Old Colony Planning Council expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

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1.0 EXECUTIVE SUMMARY

STUDY PURPOSE AND SCOPE

The Old Colony Planning Council has undertaken a comprehensive study of the Route 18 corridor in the Towns of Abington, Whitman, East Bridgewater, and Bridgewater to identify specific problems in traffic efficiency, circulation, and safety. The geographic scope of this study includes the Route 18 corridor from the Abington/Weymouth Town Line south to the Bridgewater/Middleborough Town Line. This study focuses on key intersections as well as the road corridor itself. Route 18 provides connections between Route 3, in Weymouth connecting to Route 139 and Route 123 in Abington, Route 27 and Route 14 in Whitman, East Bridgewater center and Route 106 in East Bridgewater, and Bridgewater Central Square and Route 28 in Bridgewater. South of Bridgewater, Route 18 connects to Route 44 at the Middleborough Rotary.

As traffic within the corridor grows, due to retail and commercial development, congestion and delay also grow at these key intersections. In addition, increased traffic volumes heighten crash exposure, especially at driveways and side streets with multiple turning movement conflicts.

As part of a public outreach program for this study, a stakeholder meeting was held in each of the study area towns with representation from the Board of Selectmen, Planning Board, DPW, Planning Department, and Police Department, as well as the Chamber of Commerce, MassDOT, and MassDOT District Five. Recommended improvements were developed based on the review of the data and analyses, as well as through discussions at each of the stakeholder meetings. Recommended improvements in the corridor were made in concert with existing TIP improvement projects and planned mitigation for developments. A variety of funding sources were considered for the recommendations and strategies for implementation of improvements.

RECOMMENDED IMPROVEMENTS

Abington - Route 18 Bedford Street at Route 139 North Avenue/Randolph Street

An improvements project for this intersection has been completed recently in a TIP funded project; however, vehicles turning left on the eastbound approach share a lane with the eastbound through movement. These left turns do not have a protected phase and must yield to oncoming traffic and get hung up in the intersection at the end of the phase due to heavy westbound volumes. This problem was brought up at the Route 18 stakeholders meeting in Abington. Further study of this intersection was recommended for adding a protected left turn phase on this eastbound Route 139 approach.

Whitman - Route 18 at Route 27

Although congestion at this intersection is not problematic, this intersection does have a higher than average crash rate at 1.80 crashes per million entering vehicles. A survey of the types of crashes at this intersection indicates that the curb cuts in close proximity, within 200 feet of the intersection, at the Cumberland Farms and Marcello's entrance and exits, makes up approximately 20 to 25 percent of the crashes attributed to the

intersection. Other patterns include 44 percent angle or cross-movement crashes at the intersection involve left turning vehicles, and a continuing situation where tractor trailers taking a right turn from Route 18 northbound to Route 27 eastbound encroach onto the shoulder and hit poles on the side of the road due to insufficient turning radii. Recommendations for this intersection include adding a protected phase for the eastbound and westbound approaches.

Whitman - Route 18 Bedford Street at Route 14 Auburn Street
The Route 18 Bedford Street/Route 14 Auburn Street intersection operates under acceptable levels-of-service under morning and afternoon peak hour conditions; however, under future 2014 conditions, the peak hour LOS is expected to be at LOS "D" in the AM and "E" in the PM. In addition, this intersection, much like the Route 18/Route 27 intersection, experiences a higher than average crash rate, which is at 1.76 crashes per million entering vehicles (MEV).

A high crash rate and a high number of cross-movement crashes were important issues discussed at the stakeholder meeting held in Whitman. The suggested recommendation from that meeting included adding protected phasing for the eastbound and westbound approaches. It was also suggested that the all red timing for the intersection be increased by one second in order that vehicles clear the intersection before conflicting vehicles begin a green phase.

East Bridgewater - Route 18 Bedford Street at Central Street/Maple Street (East Bridgewater Center)
The intersection at East Bridgewater Center is a major bottleneck along the Route 18 corridor. Along with congestion and delay, this intersection has a higher than average crash rate. These problems are due to heavy peak hour volumes entering the intersection, and to the unusual alignment of the intersection, which has six approaches. A number of improvements for this intersection were discussed at the stakeholder meeting held in East Bridgewater. These included widening the northbound Route 18 approach to two lanes, as well as enhancing signage and crosswalks for pedestrian safety within the center. Although there is a pedestrian actuated signal currently at the signalized Route 18/Central Street/Spring Street/Maple Street intersection, there is a mid-block crosswalk across Route 18 in the center located just north of Maple Street and Central Street that is in need of enhanced signage to warn motorists of a pedestrian crosswalk.

Route 18 Bedford Street at Route 106 West Street and East Street
This intersection operates at acceptable levels-of-service under existing peak hour conditions; however, the crash rate for this intersection is at 1.51 crashes per million entering vehicles, which is well above the 0.80 rate for the Massachusetts average and the 0.75 for MassDOT District 5 average. The discussion of issues for this intersection at the stakeholders meeting focused on the cause of the high number of cross movement crashes at this location. The recommendations included adding left turn storage lanes on the northbound and southbound approaches and adding protected phases for these left turn movements.

Bridgewater - Central Square

Bridgewater's Central Square represents a major bottleneck for traffic flow in the Route 18 corridor. Central Square forms an oval with Route 18 Broad Street, Route 28 Main Street, and Route 104 Summer Street intersecting at a signalized intersection at the northern end. At the southern end of Central Square, there are two yield control access points with Route 104 South Street entering the oval with a yield control, and Route 18/28 Bedford Street at another yield controlled access. During the morning and afternoon peak hours, delays at the signalized intersection of Route 18 Broad Street/Route 28 Main Street/Route 104 Summer Street cause back-ups for vehicles in the center (northbound), which in turn causes back-ups at the two yield controlled south end intersections; Route 104 South Street at Central Square and Route 18/28 Bedford Street at Central Square. Traffic also queues southbound on Route 18 Broad Street at this intersection during the AM and PM peak hour so that the queues back up past the commuter rail grade crossing, with vehicles stopped on the tracks for the signal.

An extension of lane markings through the signalized intersection in the northern end (Route 28 Main Street/Route 18 Broad Street/Route 104 Summer Street could help to reduce congestion and confusion over lane use. Another potential modification to this intersection includes the prohibition of left turning vehicles from Route 28 Main Street approach (headed southeast) to Route 18 northbound. This would eliminate a phase in the cycle allowing more green time on other approaches such as the northbound approach with traffic entering the intersection from the town oval.

Other improvements for Central Square include upgrading signage and adding more signs in the square to alert motorists of pedestrian crossings. There is a lack of pedestrian warning signs in Central Square, despite a significant amount of pedestrian traffic.

Route 18 Bedford Street at Grove Street

Traffic operations at this intersection under current peak hour conditions are at LOS "D" during the morning peak hour and LOS "F" during the afternoon peak hour. This intersection meets the signal warrants described in the *Manual on Uniform Traffic Control Devices*. Town officials have expressed concern regarding operations and safety at this intersection because of the high speed of northbound traffic on Bedford Street and the high number of crashes at this intersection. Previous traffic studies by consultants for the Town recommended the creation of a gateway south of the intersection on Bedford Street for traffic approaching Central Square that would emphasize that drivers are entering a more congested area and should slow down. This gateway would include items such as aesthetic signing (such as "Entering Historic District"), period lighting, landscaping, and textured/colored pavement. A flashing warning beacon was also recommended for accompanying the speed limit sign where the speed changes to again alert drivers to the expected change in vehicle speed.

Route 18 Bedford Street at Flagg Street

Poor peak hour levels-of-service at this location are due mainly to the constant flow of traffic on the major street, Route 18, which results in insufficient gaps in traffic for Flagg Street left turns to enter onto Route 18. Previous traffic studies recommended that traffic

volumes at this intersection be monitored to determine when a traffic signal at this location would be warranted. The installation of a signal would require state approval.

2.0 INTRODUCTION

2.1 Study Purpose and Scope

This study was undertaken as part of the Old Colony Metropolitan Planning Organization (MPO) *Unified Planning Work Program* (UPWP). The UPWP describes and lists the planning tasks and activities provided under the provisions of the Safe, Accountable, and Efficiency Transportation Act: A Legacy for Users (SAFETEA-LU).

The purpose of this study is to assist the member communities of Abington, Whitman, East Bridgewater, and Bridgewater in developing short and long term solutions for identified transportation deficiencies along the Route 18 corridor that are in keeping with the visions for the future development, character, and land use patterns of these communities. The findings and recommendations in this report are intended to serve as a basis for including improvement projects in the Old Colony Metropolitan Planning Organization (MPO) Transportation Improvement Program (TIP), and Regional Transportation Plan (RTP).

The main tasks included in this study process include:

- Developing and maintaining a comprehensive public participation component, including forming of a study steering committee to oversee the study process, and holding a series of stakeholder meetings in the communities, and other various meetings, to garner input from local officials, businesses, institutions, and intersected parties and individuals.
- Documenting existing traffic and transportation conditions and identifying problems.
- Forecasting future conditions and identifying potential improvement projects, short term and long term, for the study area.

2.2 Methodology and Process

This study includes a review of existing traffic conditions (traffic volumes, intersection peak hour levels-of-service, speeds, and heavy vehicles), physical conditions (such as traffic control, lane use, signage, pavement conditions, intersection alignment), crash analyses, planned improvements, land use conditions, community goals and plans, zoning, and previous studies pertinent to the Route 18 corridor. In addition, traffic forecasts and level-of-service analyses for future (five-year horizon) peak hour conditions were performed for this study. Traffic analyses were completed utilizing standard practices published in the ITE *Highway Capacity Manual*. The traffic analyses were completed for the intersection peak hour operations using SYNCHRO software (with SimTraffic.) There are a number of key intersections within the corridor that are nearby to one other. SYNCHRO conforms to the *Highway Capacity Manual* practices, and along with SimTraffic, takes into account traffic back-ups, delays, and queues from an intersection that interfere with operations at other nearby intersections.

Signal Warrant analyses were performed in accordance with national standards as established in the *Manual On Uniform Traffic Control Devices 2003 (MUTCD)* by the Federal Highway Administration (FHWA). Traffic data collection and crash analyses were completed in accordance with the procedures and techniques in the *Manual of Traffic Engineering Studies by the Institute of Traffic Engineers* (ITE). Information on intersection crashes, right-of-way, highway width, functional classification, and jurisdiction were obtained from the Massachusetts Registry of Motor Vehicles, the Massachusetts Department of Transportation (MassDOT), the Federal Highway Administration (FHWA), and the Massachusetts Geographic Information System (MassGIS).

Stakeholders were contacted through a direct mailing campaign and the general public was notified of the study through articles in the local newspapers in the study area communities.

Public outreach was initiated through the establishment of an overall study steering committee and the identification of stakeholders. The public outreach effort enables a bottom-up approach to the planning process. Minutes of the steering committee meetings are included in the report appendix. Periodic updates of the study's progress were provided to the Old Colony Joint Transportation Committee (JTC) and the Old Colony Metropolitan Planning Organization (MPO) over the course of the study.

3.0 EXISTING CONDITIONS

3.1 Jurisdiction, Road Classification, and Land Use

Route 18 is an important north-south highway corridor in southeastern Massachusetts that extends from Route 3 in Weymouth south to Interstate 195 in New Bedford. In the OCPC region, Route 18 is two-lane state highway, except for some four-lane segments in Abington (Lincoln Boulevard to Thayer Street) and East Bridgewater (New Water Street to North Water Street and from Whitman Street to Elmwood). This study includes approximately 14.75 miles of the Route 18 corridor in the communities of Abington, Whitman, East Bridgewater, and Bridgewater. Route 18, within the OCPC region, is classified as a principal urban arterial and is under the jurisdiction of MassDOT, except for the portion from Spring Street through Bridgewater Central Square, where Route 18 is under the jurisdiction of the Town of Bridgewater. Figure 1 shows the geographic scope of the study area.

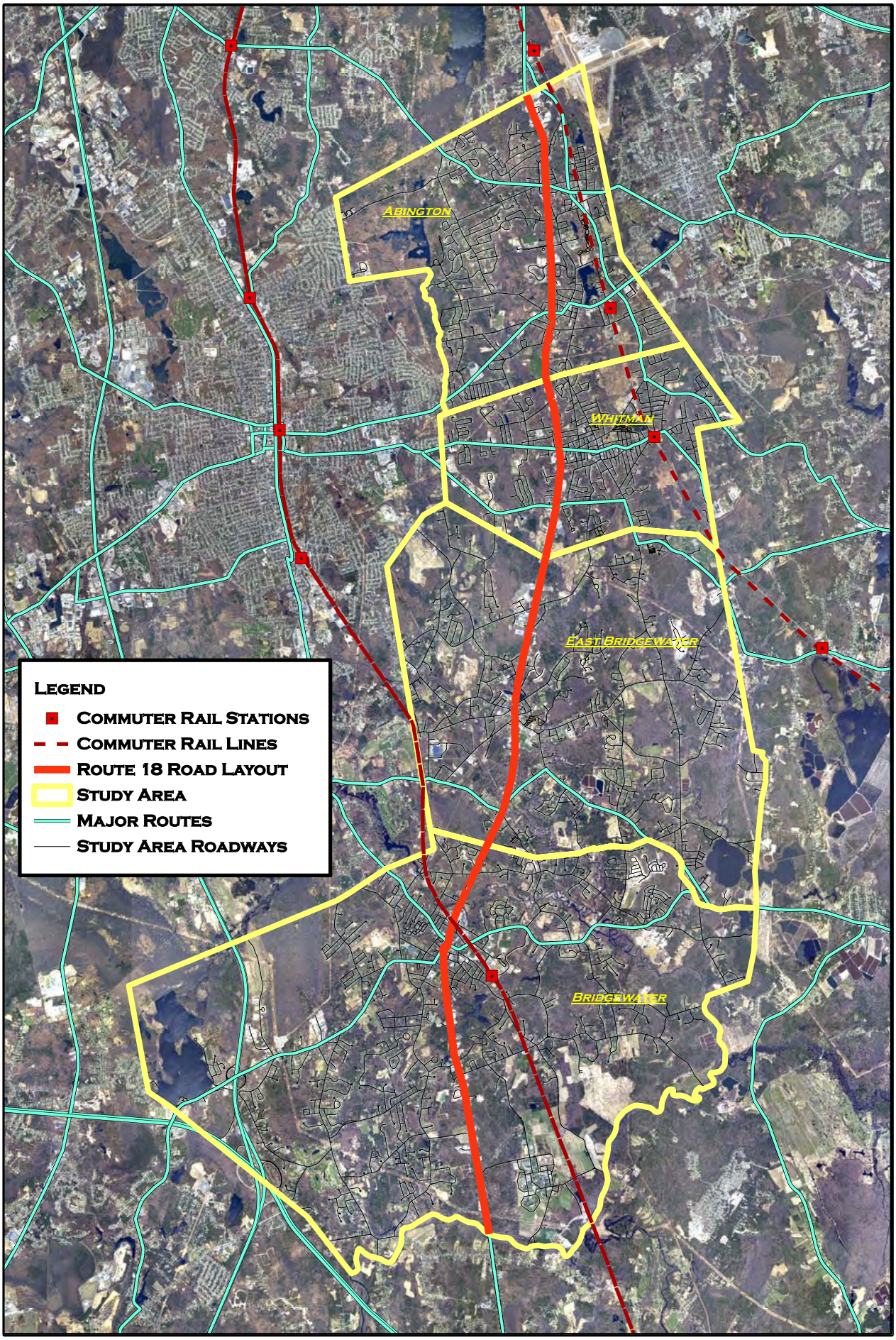
The responsibility for road maintenance is determined through jurisdiction. Road classification indicates funding eligibility. Route 18 is classified as a principal urban arterial, which indicates that it is eligible for both state and federal funding.

Route 18 provides connections for regional access to Route 128/Interstate 95 and Interstate 93 to Boston in the north and Interstate 495 to the south. Other important highway junctions include Route 139 in Abington, Route 123 in Abington, Route 27 in Whitman, Route 14 in Whitman, Route 106 in East Bridgewater, Route 104 and Route 28 in Bridgewater Central Square, and Route 44 in Middleborough. Important trip generators within the Route 18 corridor include the Southfield Development (South Weymouth Naval Air Station) in Abington and Weymouth, and MCI Bridgewater and Bridgewater State College in Bridgewater.

The land use along the Route 18 corridor varies and includes commercial entities interspersed with residential uses in Abington and Whitman. In East Bridgewater, Route 18 traverses the downtown creating an important intersection with Spring Street and Central Street. Route 18 also traverses Central Square in Bridgewater where parking is allowed on both sides of the road. Route 18 crosses the MBTA Commuter Rail tracks at an at-grade crossing just south of Spring Street in Bridgewater. Central Square in Bridgewater contains mainly retail uses within the corridor. South of Central Square in Bridgewater, there are a number of commercial plazas along the corridor. Zoning along Route 18 is discussed in *Section 2.8 Community Goals and Visions* in this report.

Route 18 Corridor Study ~ Ortho & Study Area

Figure 1



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT,

November, 2009

3.2 Existing Traffic Volumes

3.2.1 Average Daily Traffic (ADT)

Automatic traffic recorders were utilized to determine the average daily traffic (ADT) at specific locations on Route 18. The traffic recorders were installed for a minimum 48-hour period and recorded traffic in both directions in one-hour intervals. The traffic recorders were programmed to record vehicle speeds and the number of heavy vehicles in the traffic stream, as well as the traffic volumes. They were installed at locations within the study area. Figures 2 through 5 show the average daily traffic (24-hour traffic total for both directions of travel) for the Route 18 study area. The automatic traffic recorder counts are included in the appendix to this study.

The ADT varies on Route 18, depending upon the community and the land use. Figure 2 shows the ADT in Abington. The ADT on Route 18 (Bedford Street) in Abington at the Weymouth Town Line is 21,100 vehicles per day (VPD). The volumes on Route 18 north of Gliniewicz Way are 22,090 vehicles per day and 23,688 vehicles per day south of Gliniewicz Way. The volumes are highest in Abington on Route 18 just north of Washington Street at 25,100 vehicles per day, and are lower at the Abington/Whitman Town Line at 18,080 vehicles per day (see Figure 3).

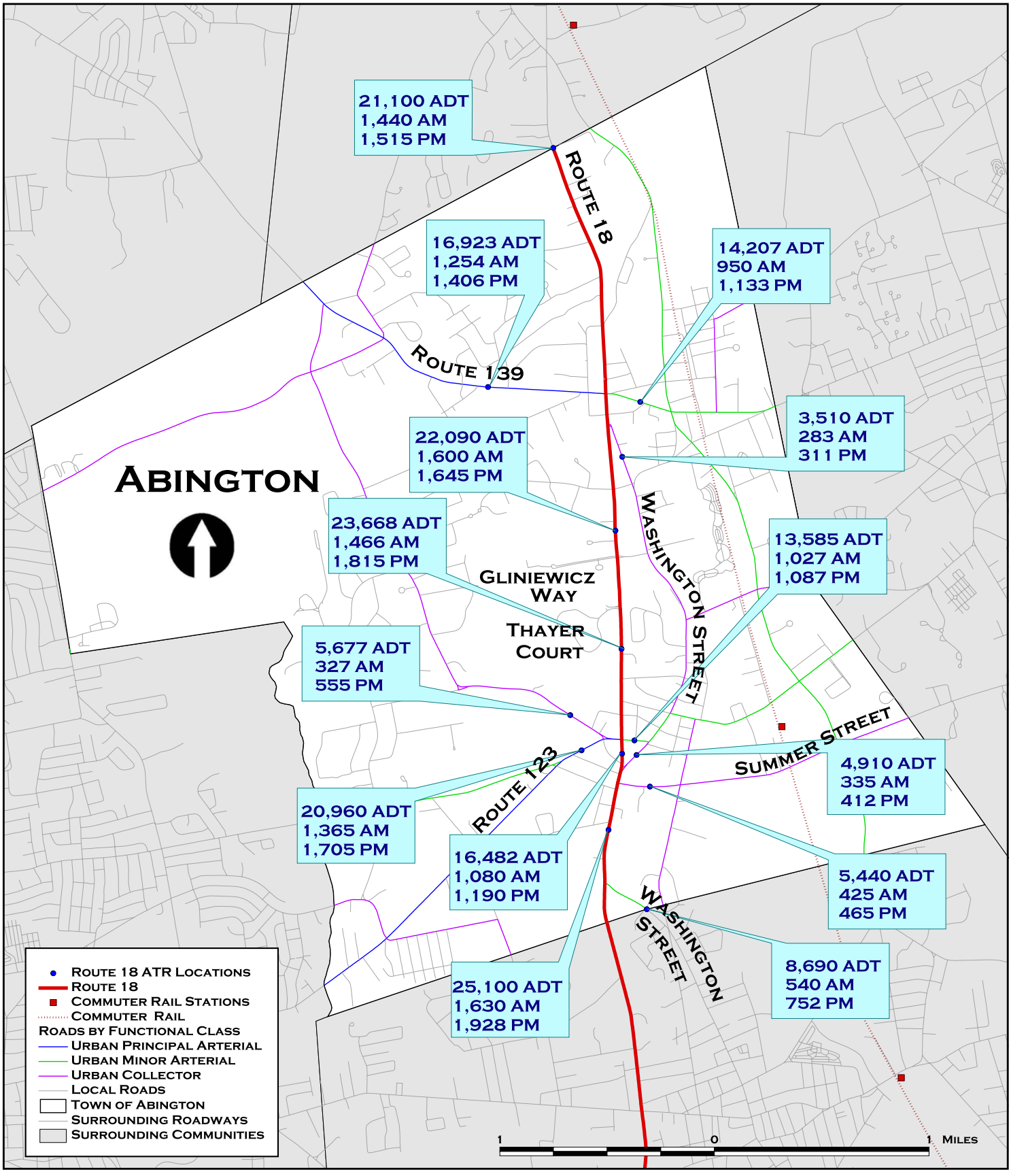
Figure 3 shows the ADT in Whitman. The traffic volumes on Route 18 in Whitman remain steady through the corridor in this town. The ADT on Route 18 at the Abington/Whitman Town Line is 18,080 vehicles per day. The volume of traffic on Route 18 between the Route 18/Route 27 intersection and the Route 18/Route 14 intersection is 19,516 vehicles per day, and the traffic volume is 18,725 vehicles per day (see Figure 4) on Route 18 at the Whitman/East Bridgewater Town Line.

Figure 4 shows the ADT in East Bridgewater. The traffic volumes on Route 18 vary in East Bridgewater as traffic enters and exits the highway corridor via important east-west connections in the downtown, including Spring Street and Central Street, and at Route 106 in the southern portion of the town. The volume on Route 18 at the East Bridgewater/Whitman Town Line is 18,725 vehicles per day. The traffic volume is 19,158 vehicles per day on Route 18 north of Grove Street. The traffic volume on Route 18 in East Bridgewater center is lower at 16,695 vehicles per day between Union Street and Spring Street, and at 15,550 south of East Bridgewater Center. The highest volumes on Route 18 were recorded on a section of the corridor between Whitman Street and West Street. Route 106, which is also West Street, joins Route 18 at the Route 18/West Street/East Street intersection, and then Route 106 continues jointly with Route 18 to Whitman Street. At the intersection of Whitman Street, Route 106 continues eastward following along Whitman Street. Within this section of the corridor that is jointly Route 18 and Route 106, the corridor reaches its highest volumes in East Bridgewater at 20,945 vehicles per day. Route 18 at the East Bridgewater/Bridgewater Town Line carries 17,700 vehicles per day.

Route 18 Corridor Study

Abington Average Daily Traffic & AM & PM Peak Hour Volumes

Figure 2



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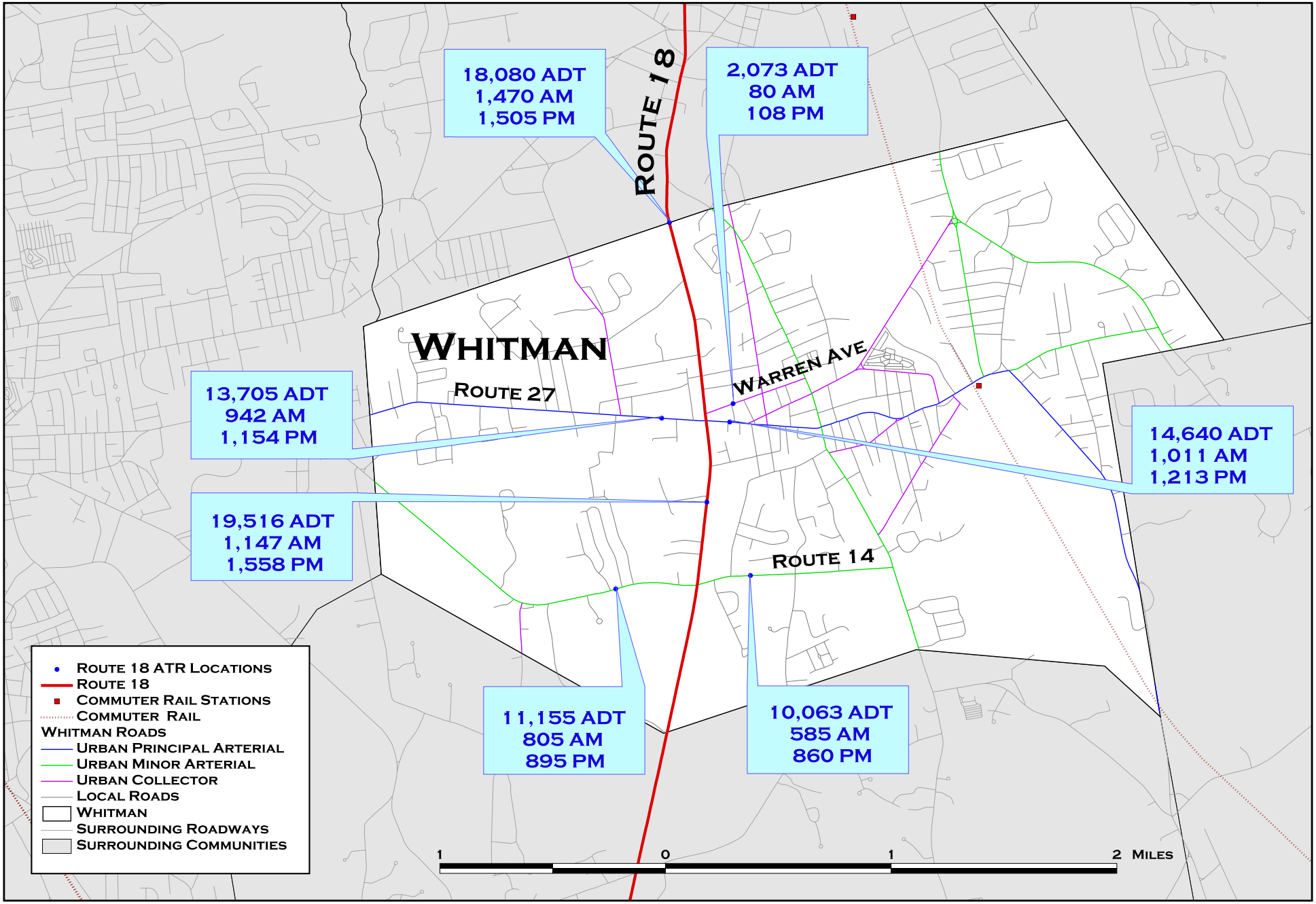
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Abington

November, 2009

Route 18 Corridor Study

Average Daily Traffic & AM & PM Peak Hour Volumes

Figure 3



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GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Whitman

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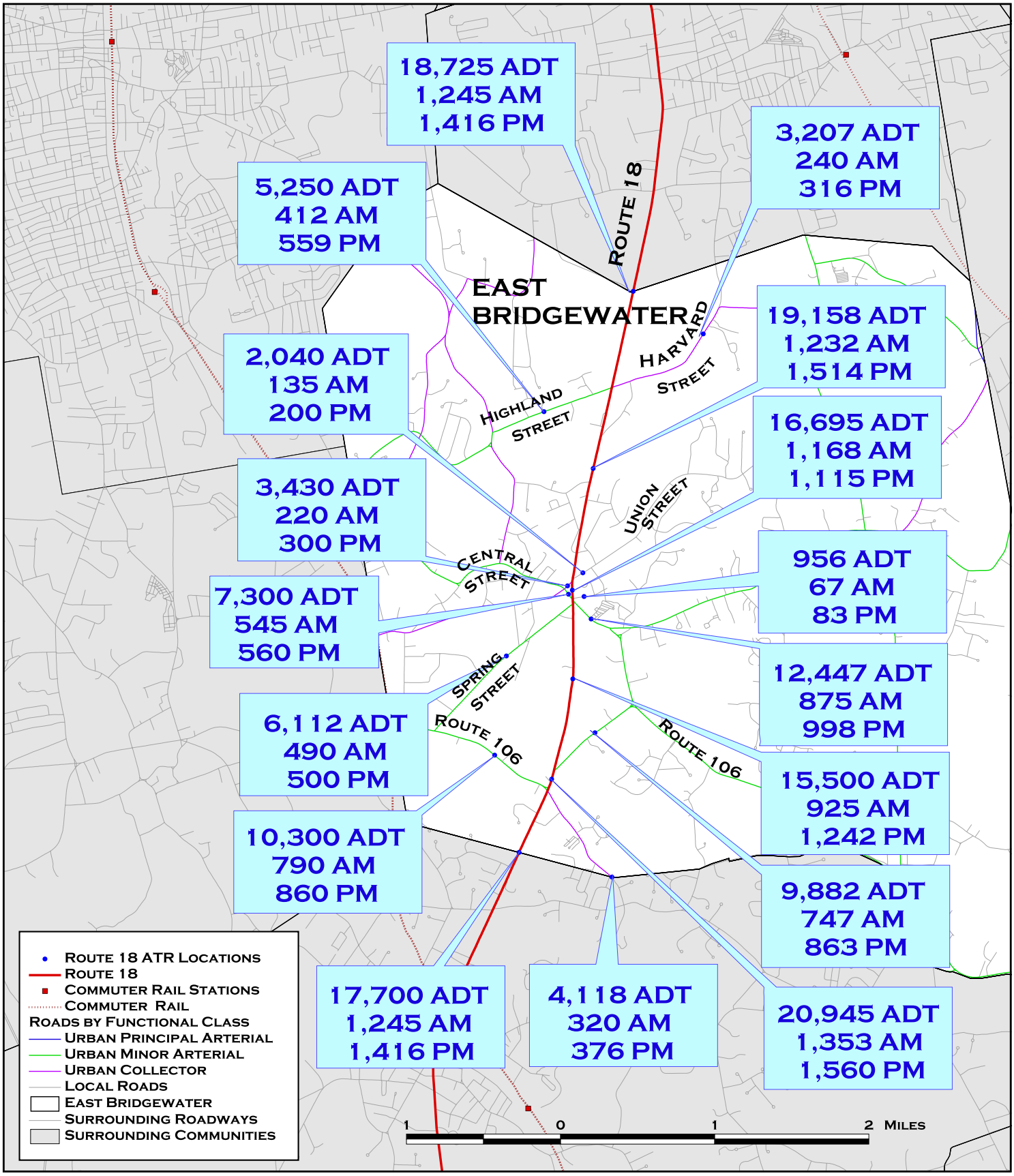
Route 18 Corridor Study

Average Daily Traffic & AM & PM Peak Hour Volumes

Figure 4



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GIS Data Sources: MassGIS, MassDOT, OCPC, Town of East Bridgewater

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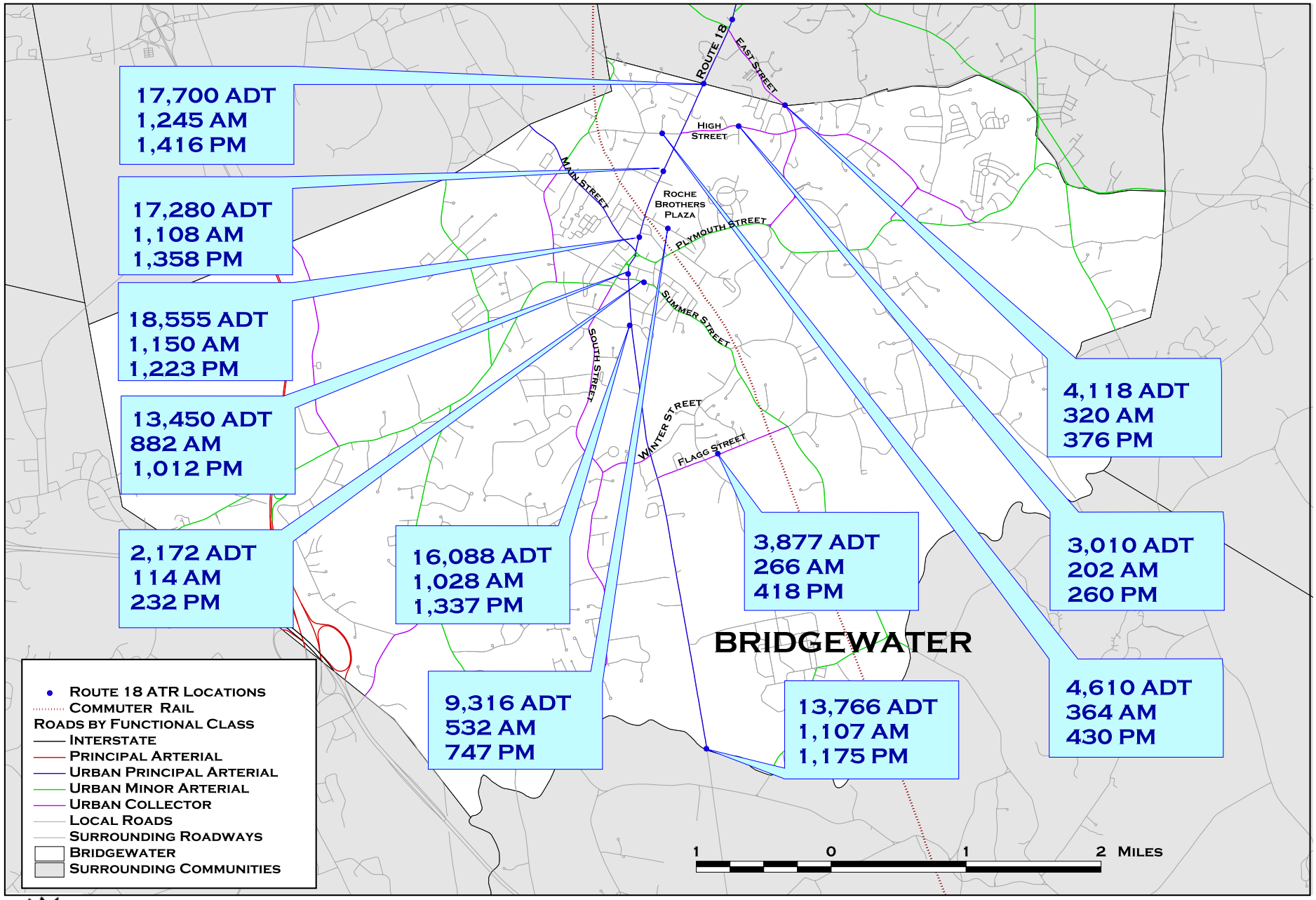
Route 18 Corridor Study

Average Daily Traffic & AM & PM Peak Volumes

Figure 5



Old Colony Planning Council, 70 School Street, Brockton, MA 02301

GIS Data Sources: MassGIS, MassDOT, OCPC

November, 2009

Traffic volumes within the Route 18 corridor in Bridgewater are shown in Figure 5. The ADT volumes are highest north of Bridgewater Central Square. The ADT is 17,280 vehicles per day on Route 18 north of the Campus Plaza and 18,555 vehicles per day south of Stetson Street. South of Central Square, the ADT is 16,088 vehicles per day and the ADT is 13,766 vehicles per day at the Bridgewater/Middleborough Town Line.

3.2.2 Peak Hour Intersection Turning Movement Counts (TMCs)

Manual turning movement counts were conducted at key intersections (signalized and un-signalized) within the corridor during the morning and afternoon (7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM) to determine the peak hours of operation. The turning movement counts include a count of pedestrians and heavy vehicles entering intersections as well as passenger cars. The turning movement counts are included in the appendix to this study.

3.3 Existing Traffic Operations

Level-of-service analyses (LOS) were completed for the study area intersections to determine the operating conditions during the morning and afternoon peak hours. Level-of-service analysis is a qualitative and quantitative measure based on the analysis techniques published in the *Highway Capacity Manual* by the Transportation Research Board. Level-of-service is a general measure that summarizes the overall operation of an intersection or transportation facility. It is based upon the operational conditions of a facility including lane use, traffic control, and lane width, and takes into account such factors as operating speeds, traffic interruptions, and freedom to maneuver. Level-of-service represents a range of operating conditions and is summarized with letter grades from “A” to “F”, with “A” being the most desirable. Level-of-service “E” represents the maximum flow rate or the capacity on a facility. The following describes the characteristics of each level-of-service:

- LOS "A" represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream.
- LOS "B" is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is still relatively unaffected.
- LOS "C" is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. Occasional backups occur behind turning vehicles.
- LOS "D" represents high-density, but stable, flow. Speed and freedom to maneuver are restricted, and the driver experiences a below average level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.
- LOS "E" represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform level. Freedom to maneuver within the traffic stream is extremely limited, and generally requires forcing other vehicles to give way. Congestion levels and delay are very high.

- LOS "F" is representative of forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount that can traverse the point, resulting in lengthy queues and delay.

The LOS definitions describe conditions based on a number of operational parameters. There are certain parameters utilized as measures of effectiveness for specific facilities. In the case for intersections, two-lane highways, and arterials, which represent the physical conditions that typify the study area corridor, time delay, average stop delay, and average travel speed are used as measures of operational effectiveness to which levels-of-service are assigned. Table 1 shows the delay criteria for each level-of-service for both un-signalized and signalized intersections.

Table 1 Level-of-Service Criteria Average Delay in Seconds

Level-of-Service	Stop Sign	Traffic Signal
A	0 to 10	0 to 10
B	>10 to 15	>10 to 20
C	>15 to 25	>20 to 35
D	>25 to 35	>35 to 55
E	>35 to 50	>55 to 80
F	>50	>80

Table 2 shows the signalized and un-signalized levels-of-service for the Route 18 study area intersections under existing peak hour conditions. Congestion at intersections in Table 2 (LOS “E” and “F”) is shown in shaded blocks.

Table 2 shows that 19 of the 32 study area intersections are stop sign or yield controlled and that 16 of these intersections experience LOS “E” or “F” conditions during the morning peak hour, afternoon peak hour, or during both peak hours. As shown in table 2, 13 of the study area intersections are signal controlled. Table 2 shows that there are 13 signalized intersections and that four of these intersections experience LOS “E” or “F” conditions during the morning peak hour, afternoon peak hour, or during both peak hours. The poor LOS at the un-signalized intersections is due to the heavy traffic flow on Route 18 during the peak hours, which is so heavy in both directions that there are very few gaps sufficient for the side street left turns to enter the main stream traffic safely or without very long delays. Subsequently, side street traffic often forces its way into the main flow on Route 18, forcing Route 18 traffic to slow down, or worse, causing crashes. The critical movement from Route 18, vehicles turning left into the side streets, also lacks sufficient gaps in the Route 18 through traffic. These left turns block traffic behind them on Route 18 if there is no room for vehicles behind them to perform a bypass maneuver.

Table 2 Existing 2009 Intersection Levels-of-Service

ID	Community	Intersection	Traffic Control	AM LOS	PM LOS
1	Abington	Route 18 Bedford St at Route 139 Randolph St/North Ave	Signal	C	E
2	Abington	Route 18 Bedford St at Washington Street (north)	Stop Sign	F	F
3	Abington	Route 18 Bedford St at Shaw Ave	Stop Sign	F	F
4	Abington	Route 18 Bedford St at Lincoln Blvd/Glineiwicz Way	Signal	B	B
5	Abington	Route 18 Bedford St at Thayer Street/Lowes	Signal	B	B
6	Abington	Route 18 Bedford St at Route 123 Brockton Ave	Signal	C	C
7	Abington	Route 18 Bedford St at Washington St (south)	Stop Sign	F	F
8	Abington	Route 18 Washington St at Summer St	Stop Sign	F	F
9	Abington	Route 18 Washington St at Bedford St (Whitman line)	Stop Sign	F	E
10	Whitman	Route 18 Bedford St at Warren Ave	Stop Sign	D	E
11	Whitman	Route 18 Bedford St at Route 27 Temple St	Signal	B	B
12	Whitman	Route 18 Bedford St at Route 14 Auburn St	Signal	C	D
13	East Bridgewater	Route 18 Bedford St at Highland St/Harvard St	Signal	B	E
14	East Bridgewater	Route 18 Bedford St at Water St	Stop Sign	C	F
15	East Bridgewater	Route 18 Bedford St at Union St	Stop Sign	F	F
16	East Bridgewater	Route 18 Bedford St at Central St/Spring St Town Center	Signal	F	F
17	East Bridgewater	Route 18 Bedford St at Whitman St Route 106	Signal	B	B
18	East Bridgewater	Route 18 Bedford St at West St Route 106	Signal	B	D
19	Bridgewater	Route 18 Bedford St at High St	Stop Sign	F	F
20	Bridgewater	Route 18 at McDonalds Driveway	Stop Sign	C	D
21	Bridgewater	Route 18 Bedford St at Campus Plaza (main entrance)	Stop Sign	E	F
22	Bridgewater	Route 18 Bedford St at Campus Plaza (south entrance)	Stop Sign	F	E
23	Bridgewater	Route 18 Bedford St Spring St	Signal	B	B
24	Bridgewater	Route 18 Bedford St at Stetson St	Stop Sign	F	F
25	Bridgewater	Main Street Route 18 Broad at Main St/Summer St (Central Square)	Signal	D	E
26	Bridgewater	Central Square at Church Street/South St Route 104	Yield	D	E
27	Bridgewater	Central Square at School St/Bedford St Route 18/28	Yield	E	F
28	Bridgewater	Bedford St Route 18/28 at Grove St	Stop Sign	D	F
29	Bridgewater	Bedford St Route 18/28 at Maple Ave	Stop Sign	D	D
30	Bridgewater	Bedford St Route 18/28 at Cottage St	Stop Sign	C	D
31	Bridgewater	Bedford St Route 18/28 at Winter St	Signal	B	C
32	Bridgewater	Bedford St Route 18/28 at Flagg St	Stop Sign	D	F

Table 2 shows a number of intersections with poor peak hour levels-of-service, both at signalized and un-signalized intersections. These intersections represent congestion bottle-necks along the Route 18 corridor. In the Town of Abington, the signalized intersection of Route 18 Bedford Street at Route 139 Randolph Street/North Avenue experiences LOS "E" during the afternoon peak hour. The un-signalized Route 18/Washington Street/Trucchi's Supermarket intersection is approximately 225 feet south of the Route 18 Bedford Street at Route 139 Randolph Street/North Avenue intersection, and experiences LOS "F" (forced flow) during the morning and afternoon peak hours. Traffic operations at both of these intersections often impact each other as traffic northbound on Route 18 often queues from the Route 139 intersection back through the Trucchi's Supermarket/Washington Street intersection. The failed (LOS "F") LOS at the Trucchi's Supermarket/Washington Street intersection is due to the lack of sufficient gaps in the Route 18 peak hour flow, which causes long delays for side street (Trucchi's exit and Washington Street) waiting to turn left onto Route 18.

Other key un-signalized intersections in Abington along Route 18 that experience long delays and/or forced flow (LOS "E" and "F") conditions during the morning and afternoon peak hours due to the lack of sufficient gaps in the Route 18 peak hour flow, include Route 18 Bedford Street at Shaw Avenue, Route 18 Bedford Street at Washington Street, Route 18 Washington Street at Summer Street, and Route 18 Washington Street at Bedford Street.

The lack of sufficient gaps in the Route 18 peak hour flow at the Route 18 Bedford Street/Warren Avenue un-signalized intersection in Whitman, along with its close proximity to the Route 18/Route 27 intersection, result in very long delays (LOS "E") for traffic entering and exiting Warren Street to and from Route 18.

There are a number of important un-signalized intersections along the Route 18 corridor that experience very long delays (forced flow) to and from the side streets due to heavy peak hour volumes and a lack of sufficient gaps in the Route 18 traffic flow. In East Bridgewater, these include Route 18 Bedford Street at Water Street and Route 18 Bedford Street at Union Street. In Bridgewater, as shown in Table 2, un-signalized intersections along the Route 18 corridor that experience very long delays and forced flow to and from the side streets due to heavy peak volumes and a lack of sufficient mainstream gaps, include Route 18 Broad Street at High Street, Route 18 Broad Street at Campus Plaza Main Entrance, Route 18 Broad Street at Campus Plaza South Entrance, Central Square at Church Street/South Street Route 104, Central Square at School Street/Bedford Street Route 18/28, Bedford Street Route 18/28 at Grove Street, Bedford Street Route 18/28 at Flagg Street.

In Abington, the Route 18 signalized intersections operate under acceptable levels-of-service during the morning and afternoon peak hours, except for the Route 18 Bedford St at Route 139 Randolph St/North Avenue intersection, which operates under LOS "E" conditions during the afternoon peak hours. Also, as shown in Table 2, the signalized intersections in Whitman along Route 18, Route 18 at Route 27, and Route 18 at Route 14, operate under acceptable levels-of-service during the peak hours.

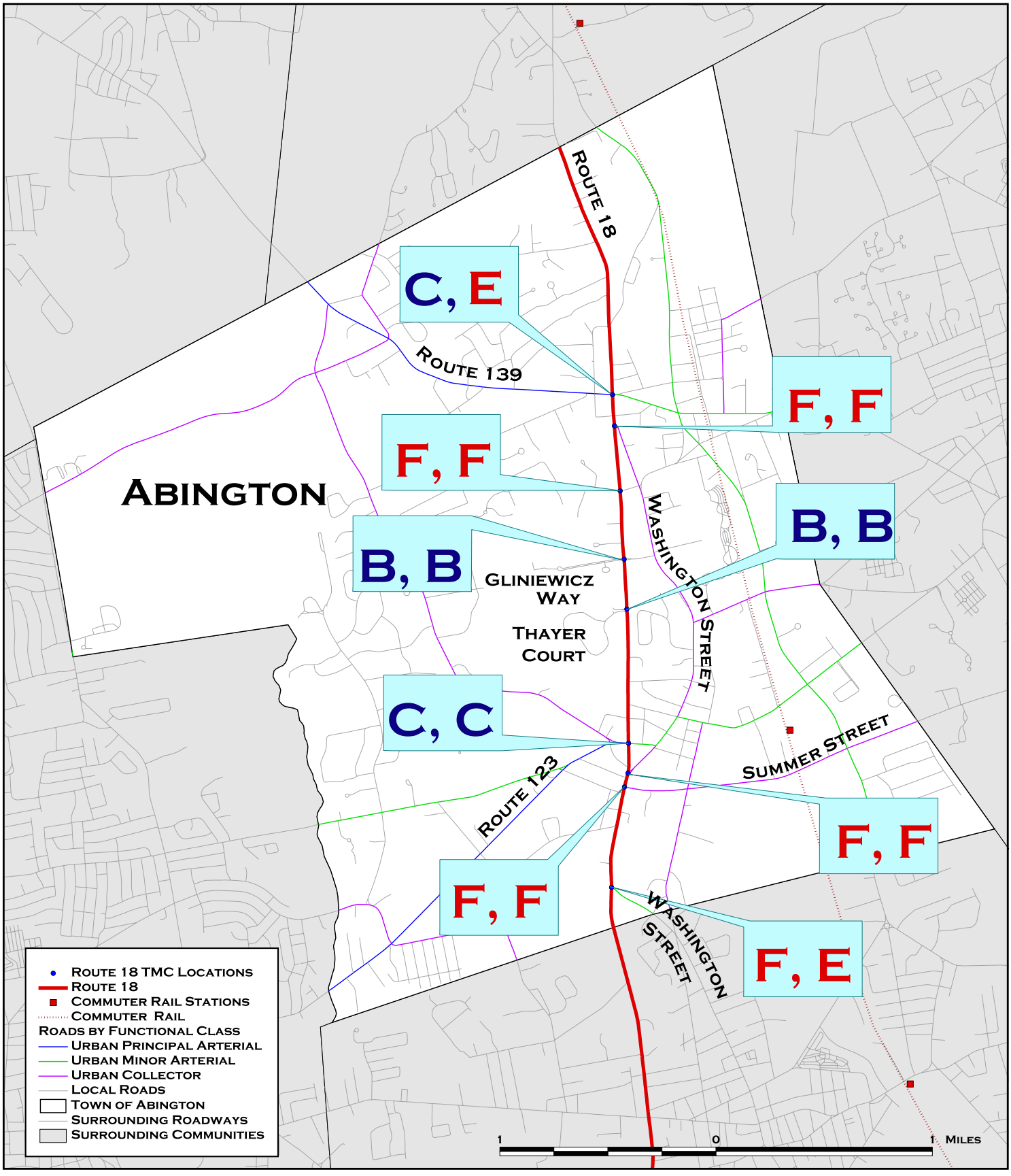
The signalized intersections in East Bridgewater, as shown in Table 2, operate under acceptable levels-of-service except for the afternoon peak at the Route 18/Highland Street/Harvard Street intersection, which is at LOS "E", and the Route 18 Bedford Street at Spring Street/Center Street in the East Bridgewater center. East Bridgewater center is a major traffic bottleneck during the morning and afternoon peak hours, which experiences forced flow (LOS "F") conditions.

In Bridgewater, the signalized Route 28 Main Street/Route 18 Broad/Route 104 Summer Street (Central Square) intersection is also a major bottleneck in the Route 18 corridor. This intersection operates at forced flow (LOS "F") conditions during the morning and afternoon peak hours. Figures 6, 7, 8. and 9 show the AM and PM peak hour levels-of-service at the Route 18 corridor study area intersections.

Route 18 Corridor Study

Peak Hour
Level of Service (AM, PM)

Figure 6



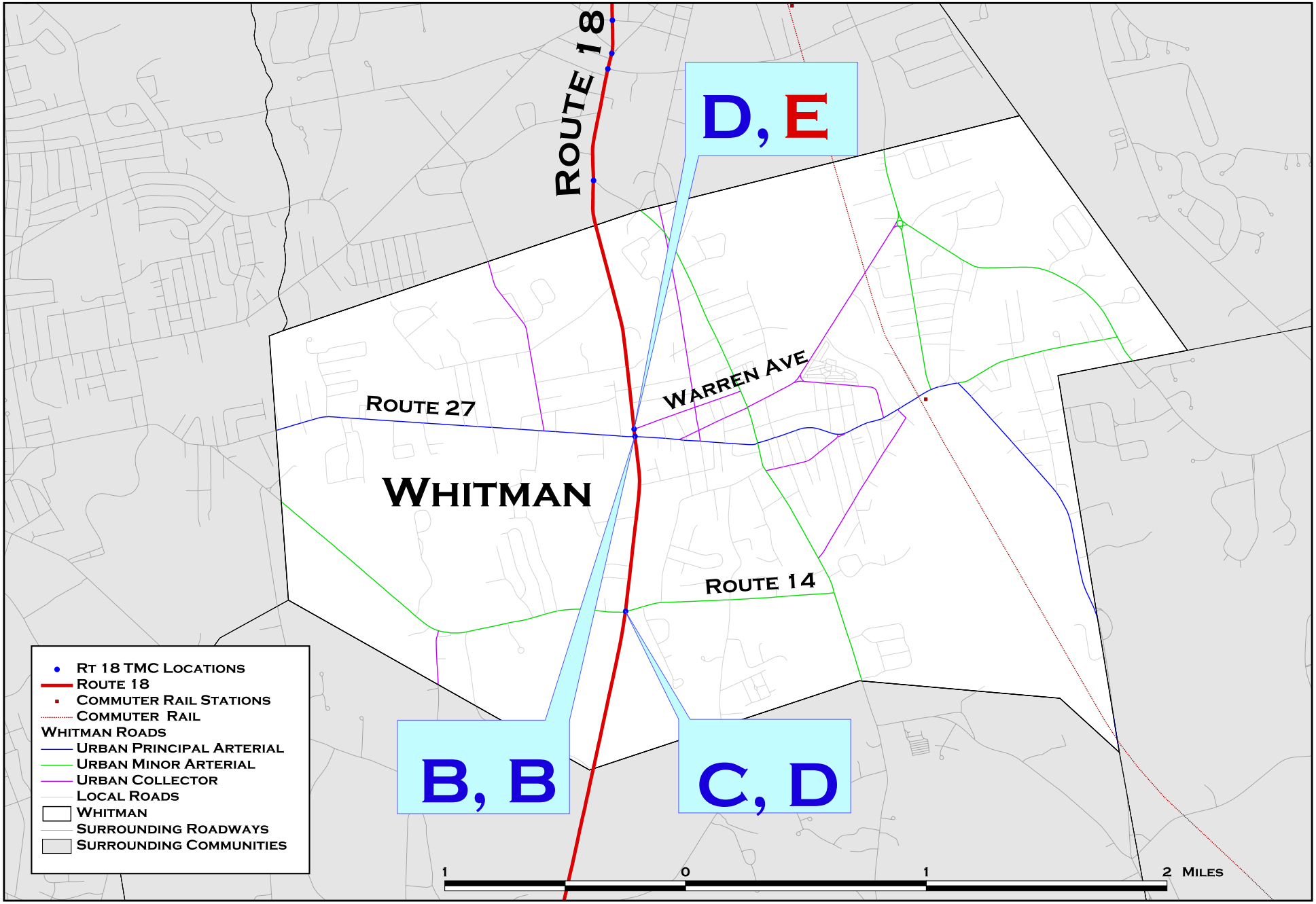
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Abington

November, 2009

Route 18 Corridor Study

Peak Hour Level of Service (AM, PM)

Figure 7



Old Colony Planning Council, 70 School Street, Brockton, MA 02301

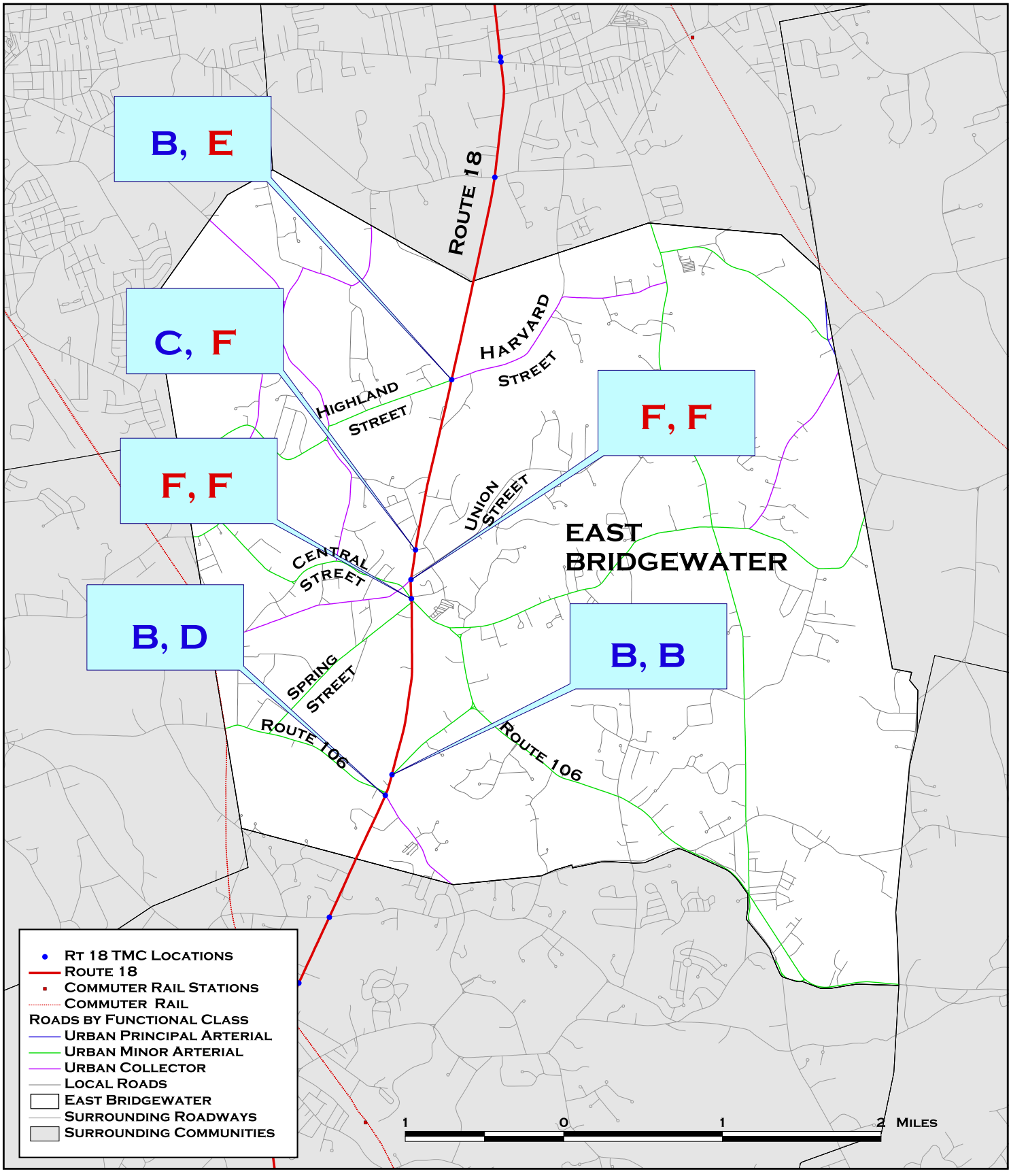
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Whitman

November, 2009

Route 18 Corridor Study

Peak Hour Level of Service

Figure 8



Old Colony Planning Council, 70 School Street, Brockton, MA 02301

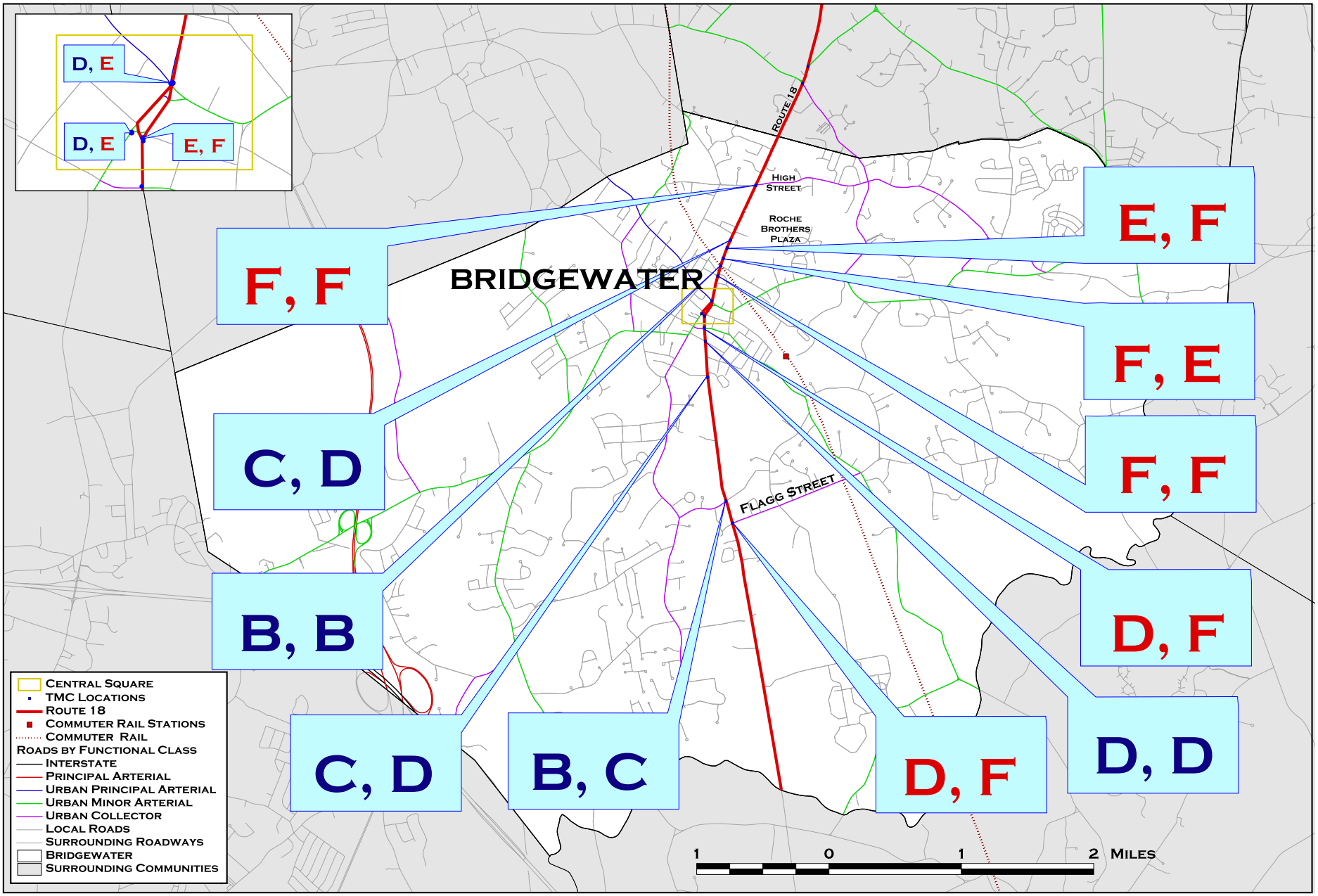
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of East Bridgewater

November, 2009

Route 18 Corridor Study

Peak Hour
Level of Service (AM, PM)

Figure 9



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

November, 2009

3.4 Crash Analysis

Information on crashes that occurred at the study area intersections was obtained from the Massachusetts Department of Transportation (MassDOT) for the latest available three-year period (2005, 2006, and 2007). This data, which is made available to MassDOT from the Massachusetts Registry of Motor Vehicles (RMV), was compiled and analyzed in accordance with the standard practices published by the Institute of Transportation Engineers (ITE) in the *Manual of Traffic Engineering Studies.* A crash rate was calculated based on the procedures in the *Manual of Traffic Engineering Studies* and compared with the average crash rate for the State and for MassDOT District 5. Collision diagrams were developed for the intersections that had crash rates above the state and district average (where the records were made available by the local police) in order to better determine crash patterns and discern specific safety issues.

The purpose for analyzing crash data includes:

- To define and identify high crash locations;
- To justify actions for the installation of traffic control devices;
- To evaluate the geometric design (including lane use) and proposed changes in traffic regulations;
- To justify expenditures for improvements that offer crash reduction or prevention;
- To identify a need for traffic enforcement; and,
- To identify needs in pedestrian and bicycle safety and certain actions causing crashes that can be prevented through driver and/or public education.

The crash rate is a good indicator of the frequency of crashes at intersections. The crash rate helps measure the crash exposure. It is based on the number of crashes per million entering vehicles (MEV). The number of crashes often increases as traffic volumes increase. Traffic growth creates more opportunities for crashes to occur and therefore increases vehicle exposure to crashes. A particular condition that causes crashes at an intersection can become exacerbated with increased traffic, and frequency will therefore rise. The crash rate equation is shown in the appendix to this report. The crash rate per million entering vehicles is the average number of accidents per year (over three years) times one million, divided by the number of vehicles entering the intersection in a year. Table 3 shows the number of crashes and crash rates for the study area intersections.

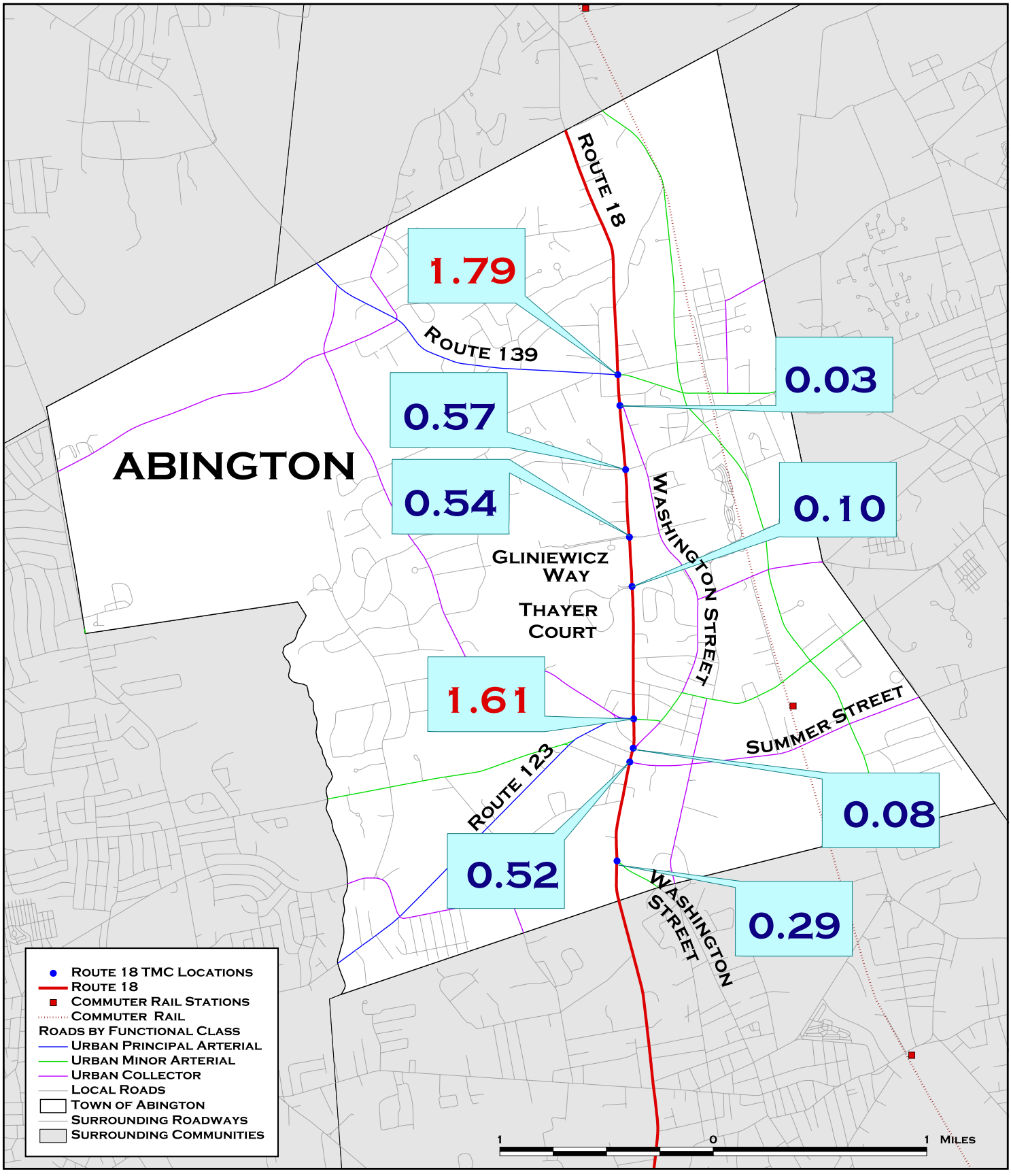
Table 3 also shows the number of injury related crashes, the number of fatal crashes, and a ranking for the intersections in MassDOT's Top 200 Hazardous Intersection List and the OCPC Region's Top 100 Hazardous Intersection List. The State's Top 200 list and the OCPC Region's Top 100 list are based upon a weighted average where, for every intersection, 10 points is given for every fatal crash, 5 points for every crash resulting in personal injury, and one point given for every property damage only crash.

Crash rates for the study area intersections are shown in Figures 10, 11, 12, and 13.

Route 18 Corridor Study

Intersection
Crash Rate (Per MEV)

Figure 10



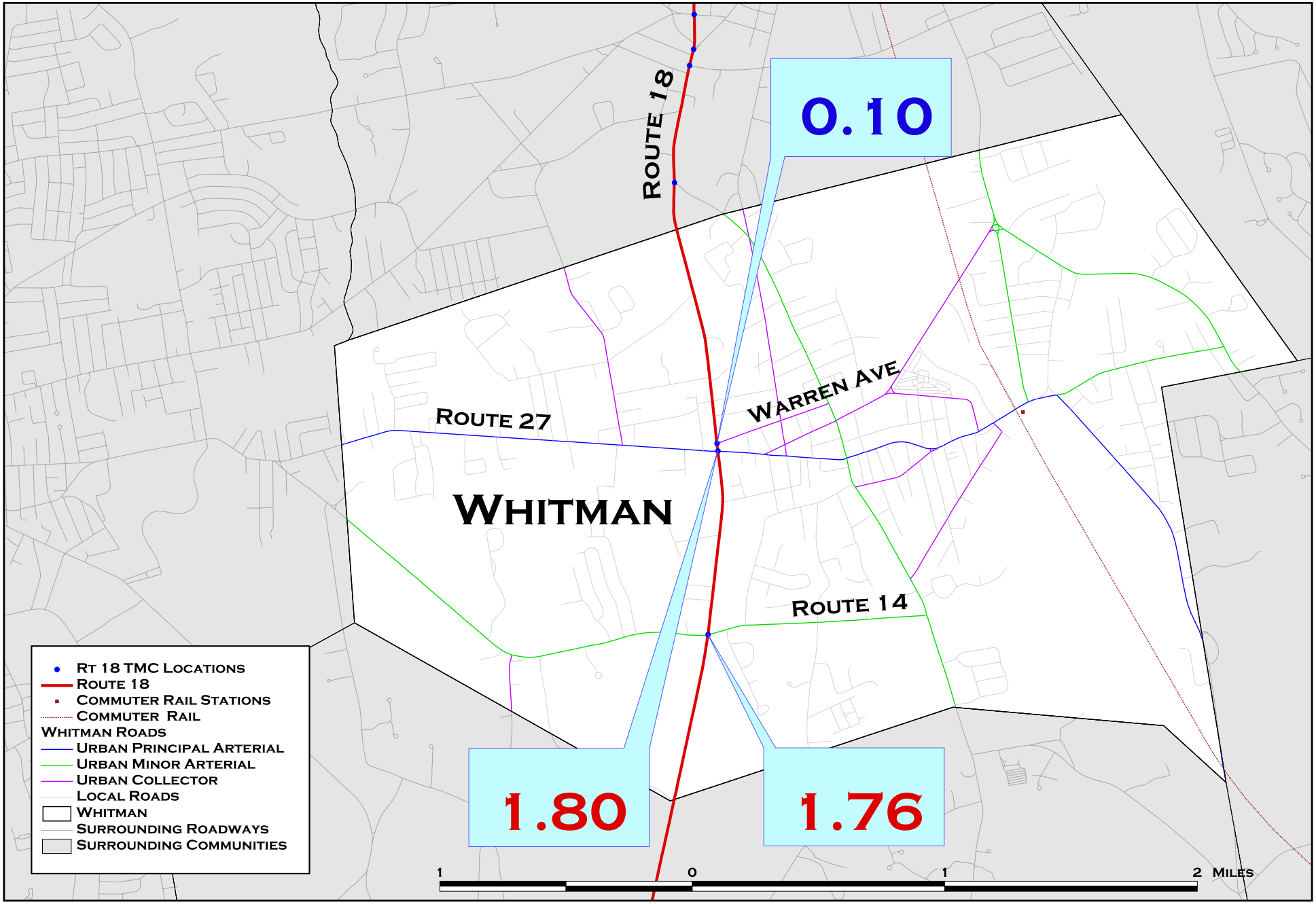
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Abington

November, 2009

Route 18 Corridor Study

Intersection Crash Rate (per MEV)

Figure 11



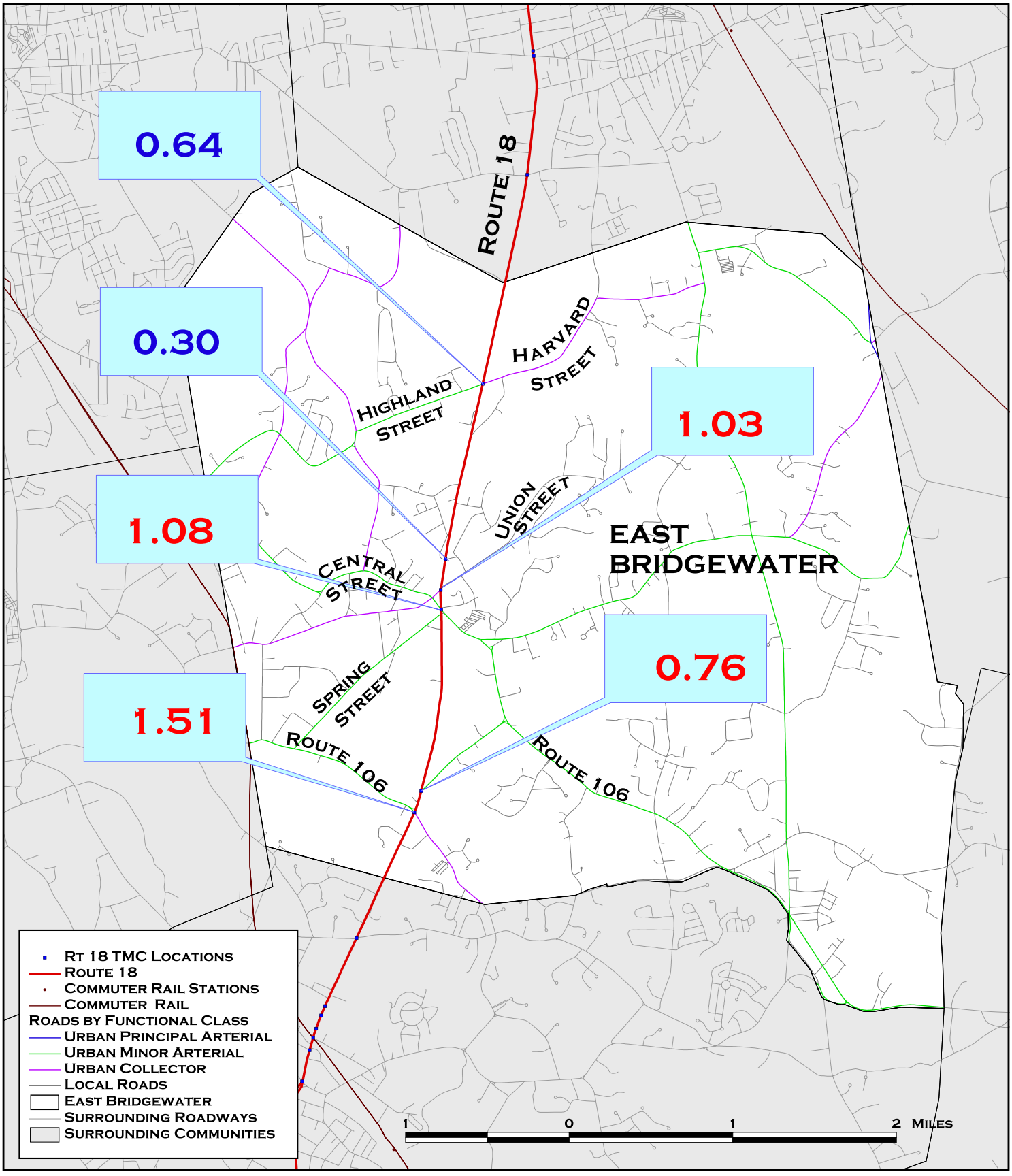
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Whitman

November, 2009

Route 18 Corridor Study

Intersection Crash Rate
(Per MEV)

Figure 12



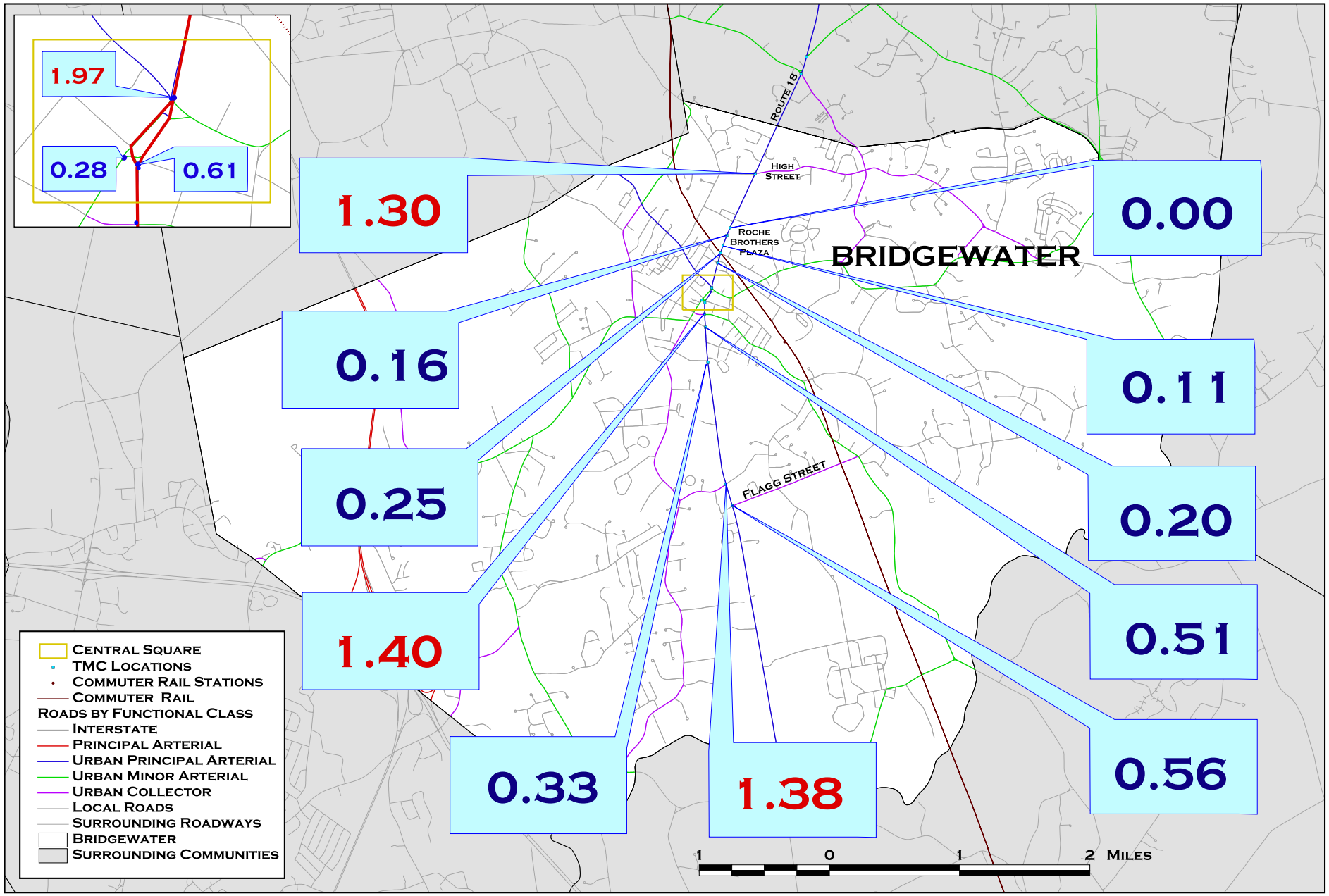
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of East Bridgewater

November, 2009

Route 18 Corridor Study

Intersection Crash Rate (Per MEV)

Figure 13



Old Colony Planning Council, 70 School Street, Brockton, MA 02301

GIS Data Sources: MassGIS, MassDOT, OCPC

November, 2009

Table 3 – Crashes and Crash Rates (per Million Entering Vehicles, MEV)

	Community	Intersection	Traffic Control	Number of Crashes	Rate	Injury Crashes	Fatal	State Top 200?	OCPC Top 100?
1	Abington	Route 18 Bedford St at Route 139 Randolph St/North Ave	Signal	77	1.79	18	0	32	6
2	Abington	Route 18 Bedford St at Washington St (north)	Stop Sign	1	0.03	0	0		
3	Abington	Route 18 Bedford St at Shaw Ave	Stop Sign	13	0.57	7	0		
4	Abington	Route 18 Bedford St at Lincoln Blvd/Glineiwicz Way	Signal	13	0.54	5	0		
5	Abington	Route 18 Bedford St at Thayer St/Lowes	Signal	3	0.10	0	0		
6	Abington	Route 18 Bedford St at Route 123 Brockton Ave	Signal	58	1.61	18	0	81	21
7	Abington	Route 18 Bedford St at Washington St (south)	Stop Sign	2	0.08	1	0		
8	Abington	Route 18 Washington St at Summer St	Stop Sign	14	0.52	7	0		
9	Abington	Route 18 Washington St at Bedford St (Whitman line)	Stop Sign	8	0.29	2	0		
10	Whitman	Route 18 Bedford St at Warren Ave	Stop Sign	2	0.10	1	0		
11	Whitman	Route 18 Bedford St at Route 27 Temple St	Signal	59	1.80	10	0		42
12	Whitman	Route 18 Bedford St at Route 14 Auburn St	Signal	55	1.76	13	1	128	18
13	East Bridgewater	Route 18 Bedford St at Highland St/Harvard St	Signal	23	0.64	6	0		
14	East Bridgewater	Route 18 Bedford St at Water St	Stop Sign	7	0.30	1	0		
15	East Bridgewater	Route 18 Bedford St at Union St	Stop Sign	34	1.03	4	0		
16	East Bridgewater	Route 18 Bedford St at Central St/Spring St Town Center	Signal	40	1.08	8	0		
17	East Bridgewater	Route 18 Bedford St at Whitman St Route 106	Signal	21	0.76	5	0		
18	East Bridgewater	Route 18 Bedford St at West St Route 106	Signal	53	1.51	14	0		24
19	Bridgewater	Route 18 Broad St at High St	Stop Sign	27	1.30	2	0		
20	Bridgewater	Route 18 at McDonalds Driveway	Stop Sign	3	0.00	1	0		
21	Bridgewater	Route 18 Broad Street at Campus Plaza (main entrance)	Stop Sign	5	0.16	1	0		
22	Bridgewater	Route 18 Broad St at Campus Plaza south entrance	Stop Sign	2	0.11	0	0		
23	Bridgewater	Route 18 Broad St Spring St	Signal	7	0.25	2	1		

MassDOT District 5 Average Crash Rate for signalized intersections is 0.75. MassDOT District 5 Average Crash Rate for un-signalized intersections is 0.58. Massachusetts Statewide Average Crash Rate for signalized intersections is 0.80, and Massachusetts Statewide Average for un-signalized intersections is 0.60.

Table 3 Crashes and Crash Rates (continued)

	Community	Intersection	Control	Number of Crashes	Crash Rate	Injury Crashes	Fatal	State Top 200?	OCPC Top 100?
24	Bridgewater	Route 18 Broad St at Stetson St	Stop Sign	5	0.20		0		
25	Bridgewater	Main St Route 28/Broad St Route 18/ Route 104 Summer St (Central Square)	Signal	63	1.97	8	0	124	44
26	Bridgewater	Central Square at Church St/South St Route 104	Yield	7	0.28	1	0		
27	Bridgewater	Central Square at School St/Bedford St Route 18/28	Yield	15	0.61	5	0		
28	Bridgewater	Bedford St Route 18/28 at Grove St	Stop Sign	24	1.40	6	0		
29	Bridgewater	Bedford St Route 18/28 at Maple Ave	Stop Sign	9	0.51	5	0		
30	Bridgewater	Bedford St Route 18/28 at Cottage St	Stop Sign	6	0.33	1	0		
31	Bridgewater	Bedford St Route 18/28 at Winter St	Signal	28	1.38	3	0		
32	Bridgewater	Bedford St Route 18/28 at Flagg St	Stop Sign	10	0.56	2	0		

MassDOT District 5 Average crash rate for signalized intersections is 0.75. MassDOT District 5 Average Crash Rate for un-signalized intersections is 0.58. Massachusetts Statewide Average Crash Rate for signalized intersections is 0.80, and Massachusetts statewide average for un-signalized intersections is 0.60.

The average crash rate for MassDOT District 5 is 0.58 per MEV for un-signalized intersections and 0.75 per MEV for signalized intersections. The Massachusetts Statewide Average is 0.60 per MEV for un-signalized intersections and 0.80 per MEV for signalized intersections. A rate higher than the District Average is used as an indicator that safety improvements should be considered to reduce crashes at an intersection location. Other criteria used as indications that improvements are necessary include inclusion on MassDOT's Top 200 Hazardous Intersection List and the OCPC Region's Top 100 Hazardous Intersection List, as well as the percentage of injury crashes and the overall number of crashes. There are four study area intersections that are included on the state's Top 200 Hazardous Intersection List, and six intersections that are included on the OCPC Region's Top 100 Hazardous Intersection List.

In Abington, there were two intersections that experienced higher than average crash rates, including Route 18 Bedford Street at Route 139 Randolph Street/North Avenue and Route 18 Bedford Street at Route 123 Brockton Avenue. Two intersections in Whitman, Route 18 Bedford Street at Route 27 Temple Street and Route 18 Bedford Street at Route 14 Auburn Street, experienced higher than average crash rates. Within the Route 18 corridor in East Bridgewater, there were three intersections with higher than average crash rates; Route 18 Bedford Street at Union Street, Route 18 Bedford St at Central St/Spring St (East Bridgewater Center), and Route 18 Bedford Street at West Street Route 106/East Street. The Town of Bridgewater has the most intersections above the state and MassDOT District 5 average with four above average intersections; Route 18 Broad Street at High Street, Route 18 Broad Street at Route 28 Main Street/Summer

Street (Central Square), Bedford Street Route 18/28 at Grove Street, and Bedford Street Route 18/28 at Winter Street.

3.5 Spot Speed Studies

OCPC staff measured vehicle speeds under prevailing conditions at specific locations with the Route 18 corridor. These speed studies were conducted using automatic traffic recorders, which also recorded vehicle classification to identify the percentage of heavy vehicles in the traffic flow. Spot speed data collection occurs over the course of a 24 to 48 hour period during a weekday. The use of automatic recorders allows for non-peak as well as peak hour data collection. Figures 14, 15, 16, and 17 summarize the speed data collected for the Route 18 corridor, as well as the percentage of heavy vehicles in the traffic flow. The 85th percentile speed is the speed at or below in which 85 percent of all vehicles were traveling at the time of the study. It is used in the MassDOT's guidelines as one of the criteria to determine the posted speed limit on a road.

As shown in Figure 14, the 85th percentile speed on Route 18 in Abington at the Weymouth Town Line is 50 miles per hour. Also, the 85th percentile speed just north of Gliniewicz Way was recorded at 50 miles per hour. The prevailing speeds on Route 18 in Abington are lower south of Route 123, where the 85th percentile is 38 miles per hour, and just north of Washington Street, where the 85th percentile is 41 miles per hour. The 85th percentile, prevailing speed on Route 18 in Whitman, between the Route 27 and Route 14 intersections, is 41 miles per hour. Figure 14 shows that the prevailing speeds vary in East Bridgewater. The 85th percentile speed is 44 miles per hour north of East Bridgewater center, 33 miles per hour within the town center, and 47 miles per hour south of the town center. The speeds are high at the East Bridgewater/Bridgewater Town Line where the 85th percentile is 52 miles per hour. In Bridgewater, the prevailing speed north of the town center (Central Square) is 46 miles per hour. South of Central Square the 85th percentile is 49 miles per hour and at the Bridgewater/Middleborough Town Line, the 85th percentile speed is 54 miles per hour.

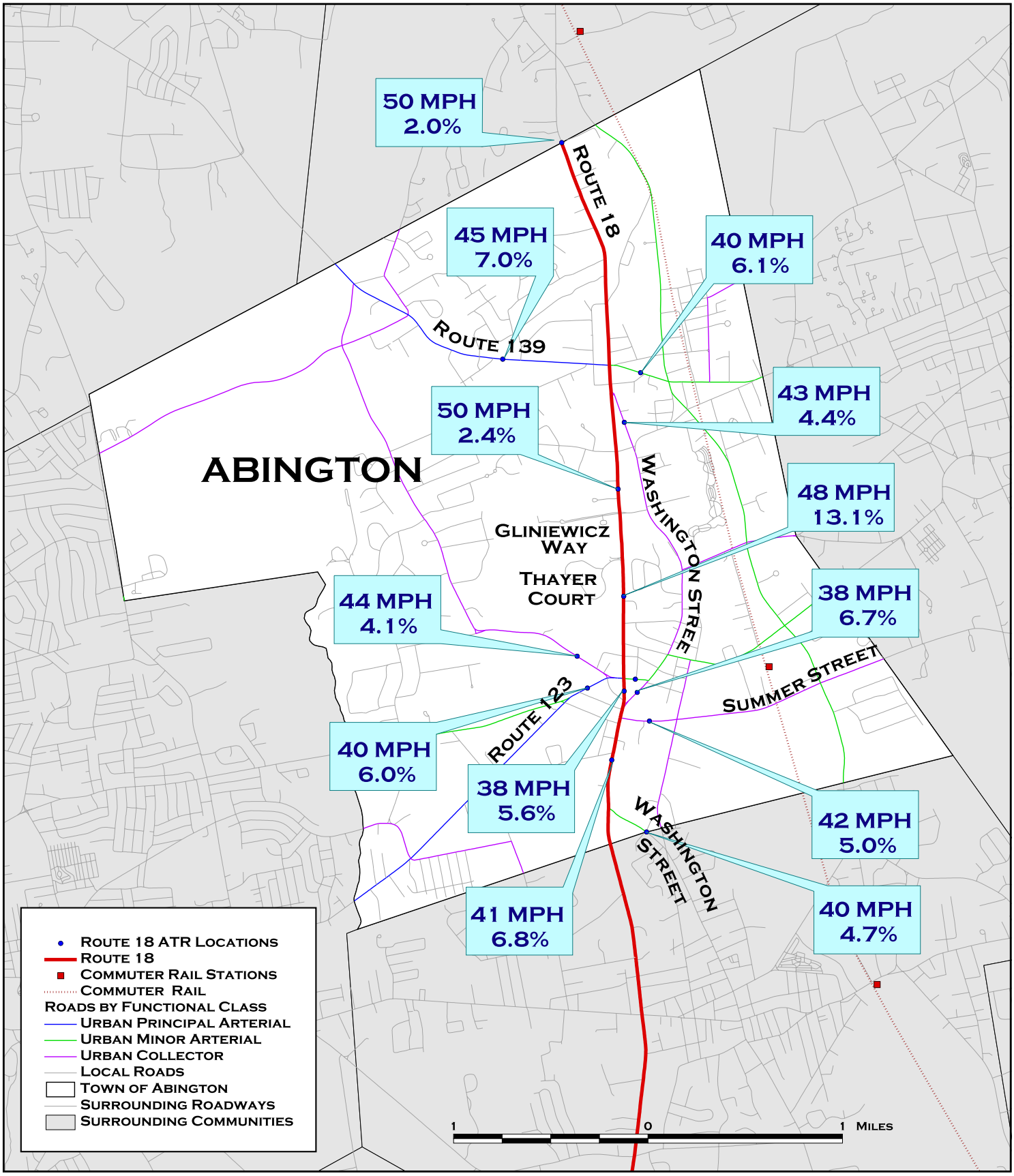
3.6 Heavy Vehicle Traffic

The percentage of heavy vehicles within the traffic stream, which was determined utilizing the automatic traffic recorders, is shown in Figures 14, 15, 16, and 17, in addition to the 85th percentile speeds. In Abington, the percentage of heavy vehicles is 2 percent and 2.6 percent on Route 18 north of the Route 123 intersection; however, south of Route 123 the percentage is higher at 5.6 percent and 6.8 percent south of Summer Street. In Whitman, the percentage of heavy vehicles within the traffic stream is the highest within the study area with 8.1 percent heavy vehicles on Route 18. The percentage of heavy vehicles on Route 18 in East Bridgewater varies with 6.2 percent north of East Bridgewater center, 6.3 percent within the town center, 6.6 percent south of the town center, and 4.9 percent at the East Bridgewater/Bridgewater Town Line. In Bridgewater, the percentage of heavy vehicles is 4.9 percent north of Central Square, 5.7 percent south of Central Square, and 5.1 percent at the Bridgewater/Middleborough Town Line.

Route 18 Corridor Study

85th Percentile &
Heavy Vehicle Percentage

Figure 14



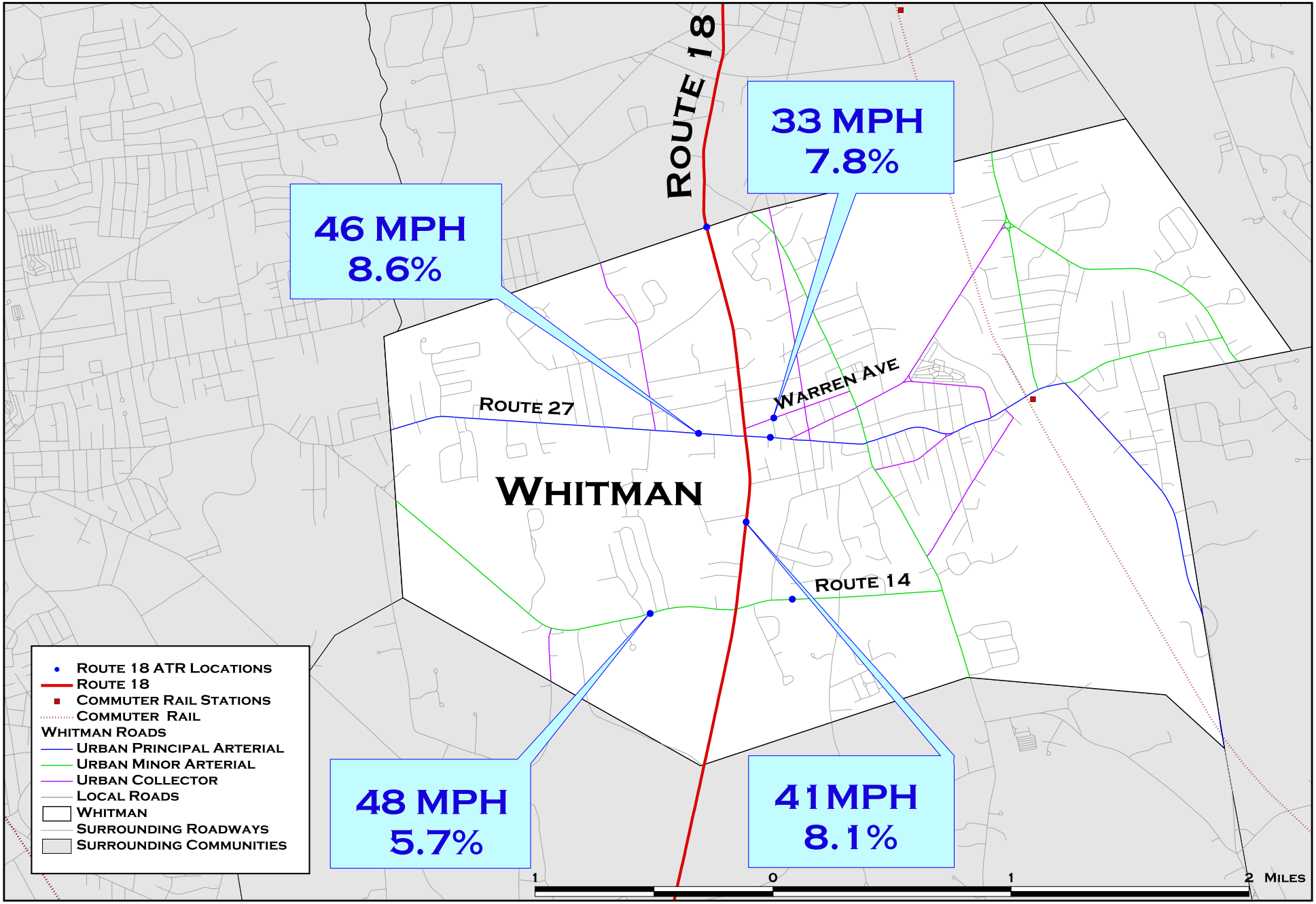
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Abington

November, 2009

Route 18 Corridor Study

85th Percentile Speed &
Heavy Vehicle Percentage

Figure 15



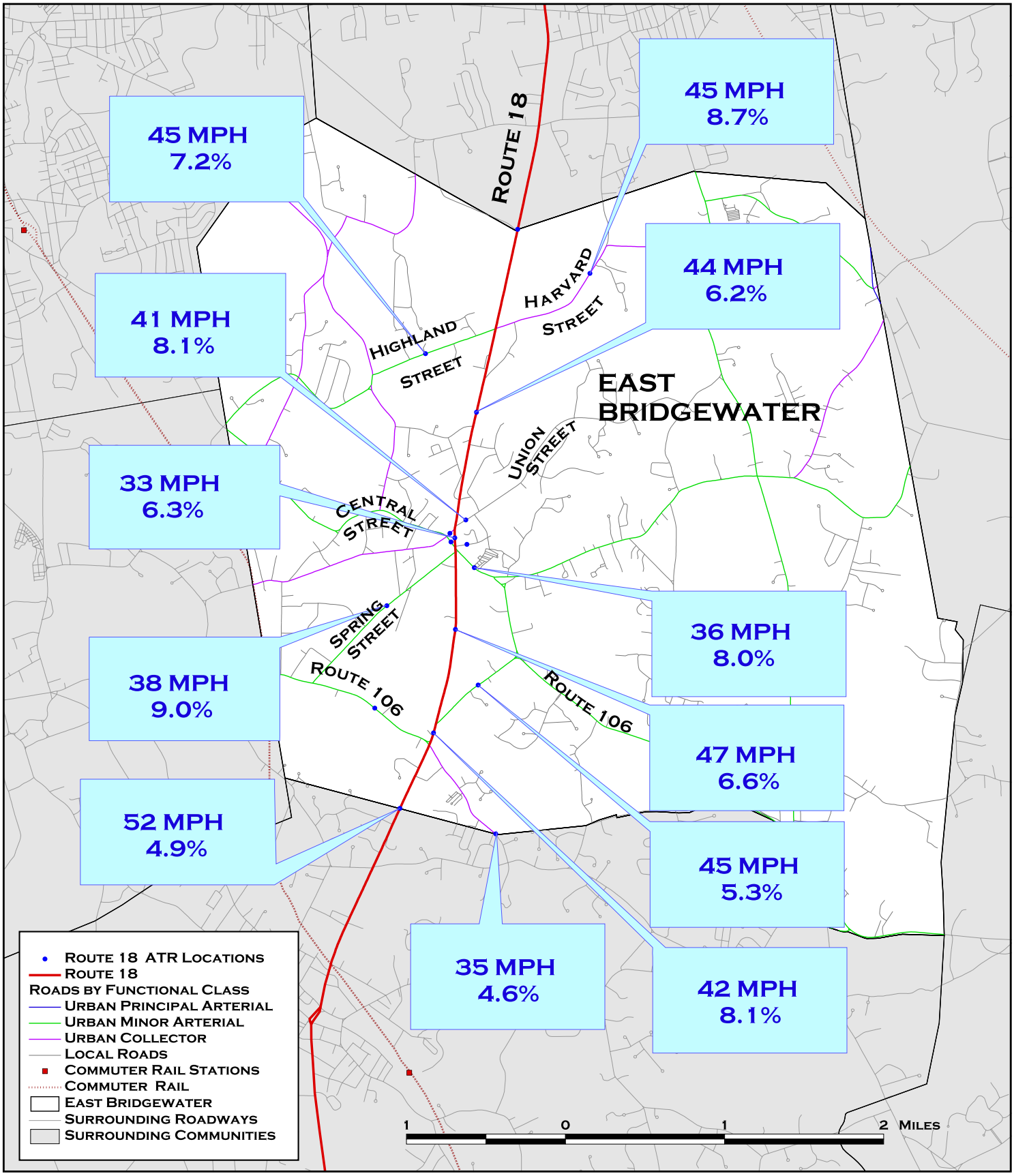
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of Whitman

November, 2009

Route 18 Corridor Study

85th Percentile Speed & Heavy Vehicle Percentage

Figure 16



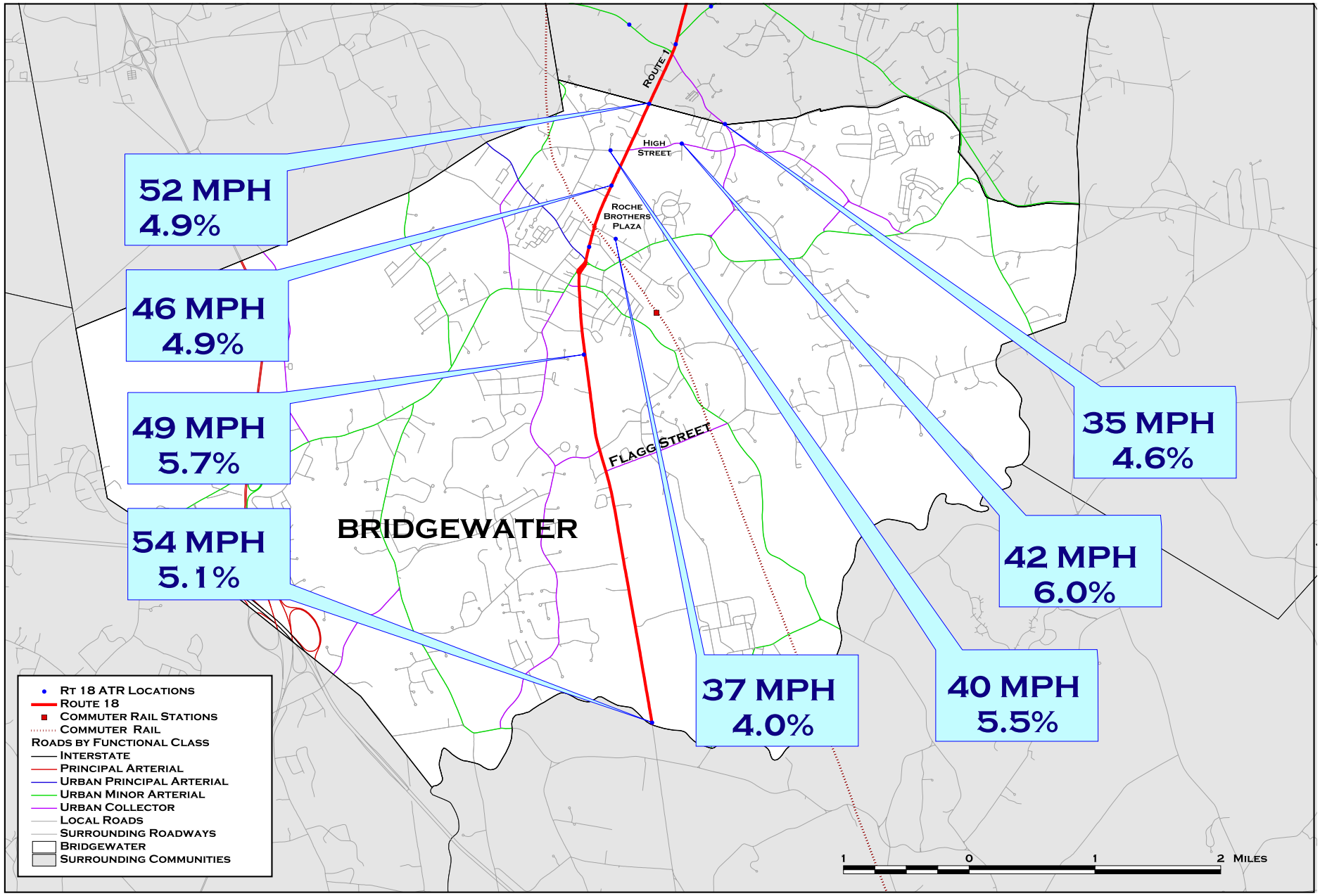
Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Town of East Bridgewater

November, 2009

Route 18 Corridor Study

85th Percentile & Heavy Vehicle Percentage

Figure 17



Old Colony Planning Council, 70 School Street, Brockton, MA 02301

GIS Data Sources: MassGIS, MassDOT, OCPC

November, 2009

3.7 Pavement Conditions

OCPC uses *Road Manager* software to maintain a region-wide Pavement Management System (PMS). *Road Manager* includes a pavement deterioration curve that demonstrates the rate of deterioration of pavement and the implications for cost of maintenance. *Road Manager* calculates Pavement Condition Index (PCI) scores for the surveyed road segments, which is an index derived from an evaluation of pavement distress factors, average daily traffic, and roadway classification. The PCI is based on a scale of 1 to 100, with 100 indicating a flawless road surface. PCI scores of 95 or higher indicate that the road surface is in excellent condition.

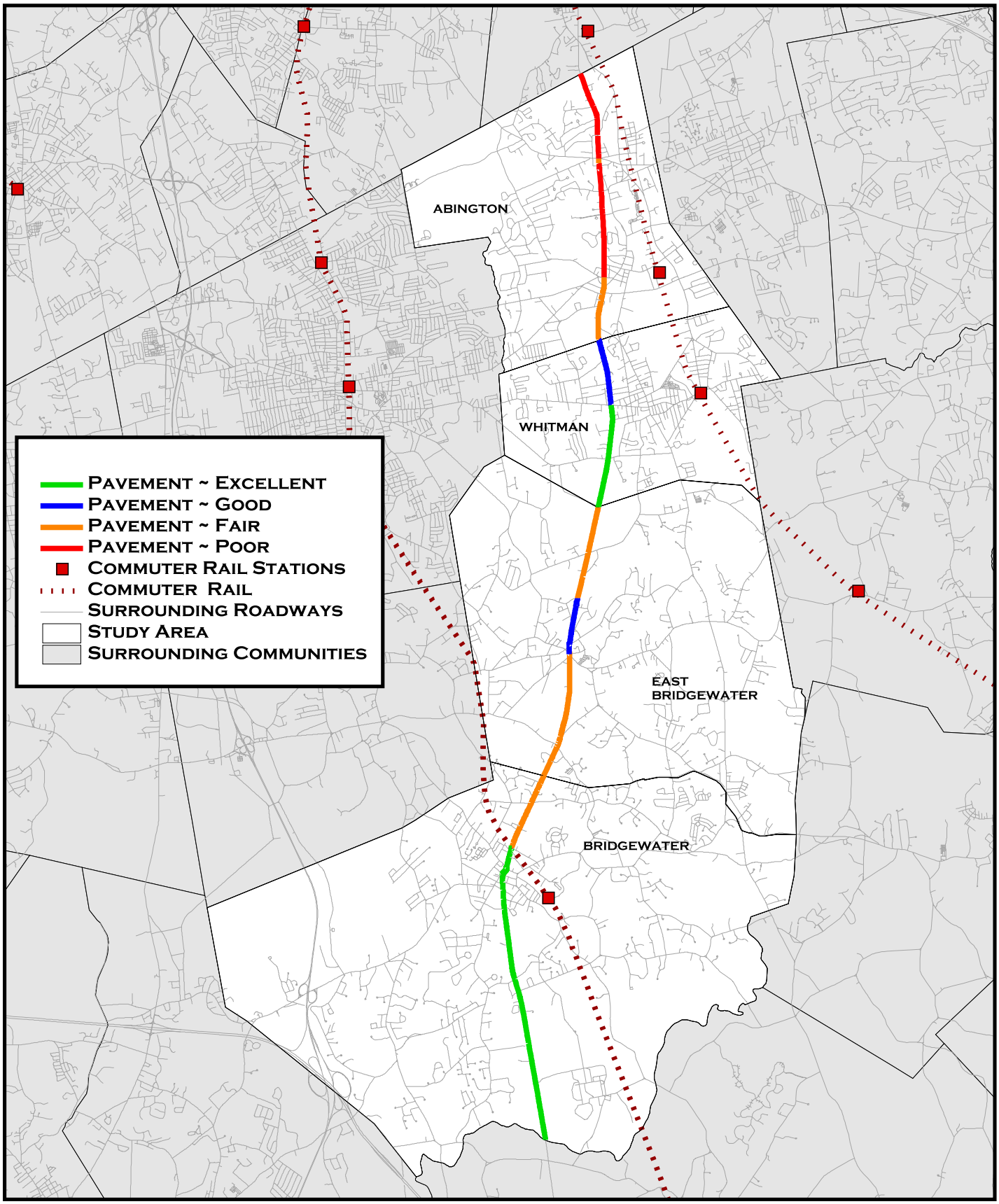
PCI scores between 85 and 94 normally indicate that the road has some distresses but is in good condition. Roads with scores between 65 and 84 are in fair condition and are in need of maintenance or mill and overlay repairs. Roads with scores below 65 need base rehabilitation or reconstruction and overlay.

OCPC conducted a windshield survey of the Route 18 corridor to determine the condition of the surface pavement. The road was segmented for analysis purposes. Figure 18 shows the results of the survey and the road conditions for each segment as determined by *Road Manager*. As shown in Figure 18, the Route 18 corridor in Abington is in "Poor" condition from the Abington/Weymouth Town Line south to Route 123, and in "Fair" condition from Route 123 to the Abington/Whitman Town Line. Route 18 in Whitman is in "Good" and "Excellent" condition, as a re-surfacing project for Route 18 has been recently completed. In East Bridgewater, the surface of Route 18 is in "Fair" condition, except for the portion of the road between Grove Street and Maple Street, which is in the "Good" category. Route 18 in Bridgewater is in the "Fair" category from the Bridgewater/East Bridgewater Town Line south to Spring Street; from Spring Street south the road surface is in the "Excellent" category. The resurfacing of Route 18 in Bridgewater, beginning at Cottage Street and ending in Middleborough at the Route 44 Rotary began on August 24, 2009, and is nearing completion. This section will be in the "Excellent" category upon completion of this project in 2010.

Route 18 Corridor Study

Pavement Conditions

Figure 18



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC, Towns of Abington, Whitman, East Bridgewater, & Bridgewater

November, 2009

3.8 Community Goals and Visions

Land use and zoning play an integral role in shaping the development patterns along a highway corridor, especially along non-limited access facilities such as Route 18. Route 18 is classified as an urban principal arterial. The publication, *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials (AASHTO), describes the function of an urban principal arterial system as serving the major centers of activity of urbanized areas. The nature of the land use along Route 18 has evolved over time and the zoning along the corridor has played a role in these changes. Although classified as an urban principal arterial, with the main function of providing access between urbanized areas, Route 18 also provides land access to the many businesses and residents along the corridor.

Zoning maps, zoning ordinances, and land use and master plans of the Route 18 communities were compiled in order to discern the vision that each of the communities has had for the corridor and has for future development patterns. A review of these documents helps also to discern consistency in zoning and land use as Route 18 transitions from one town to the next.

3.8.1 Abington Zoning and Land Use

Parcels adjacent to Route 18 in Abington are mainly zoned for Highway Commercial uses, although the zoning varies and includes Medium Density Residential, High Density Residential, Central Business District Commercial (at the Route 123 intersection), and a Technology Business District along the north portion of the corridor from Vineyard Road to the Abington/Weymouth Town Line. Development occurring along the corridor over the past five years includes retail, such as the Lowes Home Improvement Center off of Thayer Street, as well as residential such as the Abington Woods Apartments on Forsythe Drive off of Route 18. The Route 18 corridor in Abington is mainly retail and commercial in character with supermarkets, businesses, and restaurants with direct access to Route 18.

The redevelopment of the former South Weymouth Naval Air Station, which is known as Southfield, is expected to have a significant impact on the Route 18 corridor. The project is described by the proponent as a mix of retail, residential, and office uses oriented around a series of public squares. The project's Village Center is proposed to be within walking distance of the MBTA's Old Colony commuter rail station in South Weymouth. In addition, several residential/mixed-use development clusters, many of the recreational fields and amenities, and significant portions of the Shea Science Park are proposed to be within walking distance of the Village Center.

The Master Plan for the development includes a public school facility that will accommodate Kindergarten through Eighth Grade elementary and middle school as well as a civic or community center. The Master Plan calls for buildings along the main street in the Village Center to accommodate residential and commercial, with shops on the ground floor and residential units above. The residential mix will consist of the following: a neighborhood of townhouses and garden homes oriented to a series of small

parks and squares in the Northern Village Center; a neighborhood of townhouses and single-family homes next to the planned public golf course in the Golf Village; and a neighborhood primarily of townhouses and single-family homes next to public squares, small parks and recreation fields in the East Village.

The project is expected to be built in three major phases, and will include total 2,855 housing units (single-family, townhouse condominiums, apartments), 900,000 to 2,000,000 commercial square feet, a golf course, public playgrounds and recreation fields, and an east-west parkway that will connect Route 18 in Weymouth to Route 228 Hingham Street in Rockland.

Route 18 south of Ashland Street is zoned residential to the Abington Whitman Town Line. Route 18 in Whitman, at the Abington/Whitman Town line is zoned Highway Business on the east side of the corridor (with a small section on the west side) and is zoned residential from Pine Street to Rock Street.

3.8.2 Whitman Zoning and Land Use

Most of Route 18 in Whitman is zoned Highway Business, with the exception of a portion between Pine Street and Rock Street, which is zoned Residential, and a portion at the Whitman/East Bridgewater Town Line, which is zoned Limited Industrial (a portion about 1,000 feet north from the town line).

Whitman has experienced substantial retail growth along the Route 18 corridor, especially surrounding the Route 27 Temple Street/Route 18 Bedford Street intersection and the Route 14 Auburn Street/Route 18 Bedford Street intersection and on Route 18 between the two intersections. Developments include fast food restaurants, chain pharmacies, and supermarkets, which increases the number of driveways directly to and from Route 18. Whitman's zoning by-laws require a town permit for new curb cuts. Route 18 is under the jurisdiction of MassDOT, and the state's highway permit regulations are in force.

3.8.3 East Bridgewater Zoning and Land Use

The land along Route 18 in Whitman, just north of the East Bridgewater/Whitman Town Line is zoned Industrial, and it is also zoned Industrial in East Bridgewater from the town line south to Harvard Street, on the east side of Route 18, and south to Grove Street on the west side of Route 18. The zoning along Route 18, from Harvard Street on the east side and from Grove Street on the west side, is zoned business south to Route 106 Whitman Street (with the exception of the portion of Route 18 south from Central Street for approximately 2,000 feet). Route 18 is zoned residential in East Bridgewater from Route 106 Whitman Street south to the East Bridgewater/Bridgewater Town Line.

East Bridgewater has scattered commercial uses within the Business district along Route 18, and most recently, a medical office center has been constructed just north of Grove Street.

3.8.4 Bridgewater Zoning and Land Use

The existing zoning for the Route 18 corridor in Bridgewater includes three types of uses; residential, Central Business District (CBD) uses, and Business (a general "Business, B" and "South Business District, SBD").

The zoning along Route 18 in Bridgewater, at the East Bridgewater Town Line, is residential, as it is in the south portion of East Bridgewater. The residential district in the north begins at the Bridgewater/East Bridgewater Town Line and ends approximately 1,000 feet north of Ball Avenue, where the Central Business District (CBD) begins. The CBD district extends south through Central Square, ending at the south end of the square. Route 18 is zoned residential from Central Square south to Cottage Street, where the Business District begins. The Business district extends south to Flagg Street, where the South Business District begins. The South Business Districts extends along Route 18 to the Bridgewater/Middleboro Town Line.

Bridgewater has a mix of commercial uses along Route 18 north and south of Central Square, including the Campus Plaza just north of the Route 18/Spring Street intersection, which contains a supermarket and fast food restaurants. South of Central Square, Route 18 transitions into a commercial corridor with plazas in the vicinity of the Route 18 Bedford Street/Winter Street intersection.

4.0 FUTURE ROUTE 18 CONDITIONS

4.1 Planned Improvements

Information on planned infrastructure improvements was compiled from MassDOT, the Old Colony Transportation Improvement Program (TIP), and from the four study area towns. These include improvements planned or proposed prior to the initiation of this Route 18 Corridor Study. Some of these projects have recently been completed as mitigation for land use development. Table 4 summarizes these improvements.

As shown in Table 4, there are four Route 18 improvement projects in Abington. The purpose of three of these projects is to accommodate increased traffic expected from Southfield development. These include improvements at the Route 18/Route 139 intersection (construction complete), widening of the Route 18 corridor from Weymouth to the Route 18/Route 139 intersection, and the potential widening of the Route 18 corridor from the Route 18/Route 139 intersection south to the Route 14 intersection in Whitman (needs community and State Project Review Committee approval). The current volume to capacity ratio ranges from 0.45 to 0.65. Currently, no funding sources for this widening have been identified. The remaining Route 18 project in Abington that was recently completed was the reconstruction of the Route 18/Thayer Street intersection, which was completed for mitigation of traffic due to the new Lowes Home store on Thayer Street.

The widening of the Route 18 corridor from Weymouth to the Route 18/Route 139 intersection includes widening the cross-section of Route 18 to include four travel lanes and sidewalks on both sides of the road. This project includes the reconstruction of the Route 18 bridge over the MBTA commuter rail tracks in Weymouth, along with improvements to the horizontal alignment of the road. This project was recently approved through the National Environmental Policy Act (NEPA) process, and is currently under Massachusetts Environmental Policy Act (MEPA) review.

Table 4 Route 18 Corridor Planned Projects

Location and Project Number	Community	Description	Status	Comments
Route 18 at Route 139. (603163)	Abington	Improve the Route 18/Route 139 intersection.	Construction complete. (Old Colony TIP.)	Although this project has been completed, vehicles turning left on the eastbound approach get hung up. The state will look into a protected left turn phase on this approach.
Route 18 from the Weymouth Town Line to the Route 18/Route 139 intersection. (601630)	Abington	Widen Route 18 to four lanes from Columbia Road in Weymouth to Route 139 in Abington.	A Finding of No Significant Impact (FONSI) has been signed by FHWA under NEPA. MassDOT will begin the MEPA process, and will proceed with the 25% design.	
Improvements at the Thayer Street intersection (mitigation for Lowes.)	Abington	Signal timing improvements at Thayer Street and Route 18 and at the Route 18/Route 123 intersections.	Improvements complete. (Developer mitigation.)	
Route 18 capacity enhancements.	Abington	Enhancement of Route 18 capacity from Route 139 south to Route 14.	Requires Project Review Committee and community approval.	
Resurfacing of Route 18. (604160)	Whitman	Resurfacing of Route 18 from Joyce Ave to East Bridgewater Town Line.	Complete.	
Resurfacing Route 18. (604750)	East Bridgewater	Sidewalk repair and installation on Route 18 from Bridgewater to Whitman.	In FFY 2013 of 2010- 2013 TIP, design at 0 percent, funding category to be determined.	Under Design
Improvements at three locations.	East Bridgewater	Route 106 at Route 18, Union Street at Central Street, and Union Street at Route 18. Reconstruct intersections, add sidewalks, repaving.	Project complete. (Old Colony TIP.)	
Route 18 at Medical Center.	East Bridgewater	Install right turn lane and left turn lanes on Route 18 at entrance.	Construction complete. (Developer mitigation.)	Signals to be installed when warranted.
Route 18 from Cottage Street to the Route 44 Rotary in Middleboro.	Bridgewater and Middleboro	Resurfacing and drainage improvements on Route 18/28 in the Towns of Bridgewater and Middleborough. The project extends from Cottage Street to the Middleboro Rotary (intersection of Route 44).	Currently under construction. (Old Colony TIP.)	Bridgewater portion complete.
Route 18 at High Street. (603660)	Bridgewater	Install traffic signals and geometric improvements.	Programmed in FFY 2013 of 2010- 2013 TIP.	Under design.
Route 18/28 at Winter Street. (603568)	Bridgewater	Install traffic signals and geometric improvements.	Construction complete. (Old Colony TIP)	

Route 18 at Route 139 (northbound) Abington

Route 18 at Lowes Home Store (southbound) Abington

Resurfacing Route 18 in Whitman at the Route 27 intersection

Table 4 shows one Route 18 improvement project in Whitman; the resurfacing of Route 18 from Joyce Avenue to the East Bridgewater Town Line, which is currently under construction.

Table 4 shows three improvement projects in East Bridgewater. Two of these projects were recently completed including, improvements at three intersections (Route 18 at Route 106 Whitman Street, Route 18/Union Street, Central Street Union Street), and improvements at the Route 18/Medical Center (completed as mitigation for the new Medical Office Building). The remaining proposed project, sidewalk improvements within the Route 18 corridor in East Bridgewater, has been approved by the Project Review Committee, but is still under design.

There are two proposed improvement projects for Bridgewater listed in Table 4, including resurfacing of Route 18/28 Bedford Street and the installation of traffic signals at Route 18 Broad Street at High Street. The Bridgewater portion of the resurfacing project is complete, and the signal project is currently under design by MassDOT.

Route 18 Broad Street at High Street in Bridgewater

Route 18/28 Bedford Street in Bridgewater

4.2 Traffic Forecasts

A five-year time horizon has been chosen for analysis of future conditions, which is consistent with state guidelines for traffic studies. A review of traffic growth rates within the Old Colony Region shows that there has been rapid traffic growth in some corridors and little or no growth on other highways. Those areas showing traffic growth reflect the impact of retail development within specific highway corridors. A review of traffic counts for the Route 18 corridor between 2000 and 2008, compiled by OCPC in the *Old Colony Traffic Volumes Report 2009*, shows that there has been traffic growth in the corridor in East Bridgewater and Whitman; however, growth in Abington and Bridgewater at specific points, has been static and has actually declined slightly. In order to account for potential retail and commercial development, and a potential upswing in commuter trips in the corridor, an annual growth rate of two percent projected over a five-year horizon has been applied to the existing turning movement volumes in order to discern the future peak hour turning movements at study area intersections.

4.3 Future Traffic Operations

Level-of-service analyses (LOS) were completed for the study area intersections to determine the operating conditions that are expected to occur during the morning and afternoon peak hours under future operating conditions. Table 5 shows the signalized and un-signalized LOS for the Route 18 study area intersections for future peak hour conditions. Congestion at intersections in Table 4 (LOS "E" and "F") is shown in shaded blocks.

As shown in Figure 5, traffic growth in the Route 18 corridor in Abington will impact peak hour levels-of-service at three of the study area intersections. The Route 18/Route 139 intersection is expected to experience a drop in LOS from LOS "C" in the AM to "D" in the PM, and from "E" in the PM to "F" in the PM under future conditions. Also, the Route 18/Route 123 intersection will see a drop in LOS from LOS "C" in the AM to LOS "D" in the AM under future conditions. The Route 18/Washington Street intersection (just north of the Whitman Town Line) will see a drop in LOS from LOS "E" in the AM to LOS "F" in the PM under future conditions.

The three Route 18 study area intersections in Whitman are expected to be impacted under future peak hour LOS conditions. The Route 18/Warren Avenue intersection will experience reduced LOS from LOS "D" in the AM and "E" in the PM under existing conditions, to LOS "E" in the AM and "F" in the PM under future conditions. The Route 18/Route 27 intersection is expected to experience a drop in LOS from LOS "B" during the PM peak under existing to LOS "C" under future conditions. At the Route 18/Route 14 intersection in Whitman, the LOS is expected to drop from LOS "C" in the AM and "D" in the PM to LOS "D" in the AM and "E" in the PM under the future conditions.

The peak hour intersection levels-of-service at Route 18 intersections in East Bridgewater are expected to be impacted by future increases in traffic in the corridor. Table 5 shows that the LOS will drop from LOS "B" in the AM and "E" in the PM to LOS "C" and "F" respectively at the Route 18/Highland Street/Harvard Avenue intersection, and from LOS "C" to "D" in the AM at the Route 18/Water Street intersection. The AM and PM peak

hour levels-of-service at the Route 18/Union Street intersection and East Bridgewater Central Square (Route 18 at Central Street/Spring Street/Maple Avenue) will remain at LOS "F" under future conditions as they are under existing conditions. The Route 18/Route 106 Whitman Street intersection is expected to remain at LOS "B" in the PM future scenario, as it is under existing conditions; however, the AM peak hour will drop from LOS "B" to "C" under future conditions.

Table 5 Future 2014 Intersection Levels-of-Service

ID	Community	Intersection	Traffic Control	AM LOS	PM LOS
1	Abington	Route 18 Bedford St at Route 139 Randolph St/North Ave.	Signal	D	F
2	Abington	Route 18 Bedford St at Washington St (north)	Stop Sign	F	F
3	Abington	Route 18 Bedford Street at Shaw Ave	Stop Sign	F	F
4	Abington	Route 18 Bedford St at Lincoln Blvd/Glineiwicz Way	Signal	B	B
5	Abington	Route 18 Bedford St at Thayer Street/Lowes	Signal	B	B
6	Abington	Route 18 Bedford St at Route 123 Brockton Ave	Signal	D	C
7	Abington	Route 18 Bedford St at Washington Street South	Stop Sign	F	F
8	Abington	Route 18 Washington St at Summer St	Stop Sign	F	F
9	Abington	Route 18 Washington St at Bedford St (Whitman line)	Stop Sign	F	F
10	Whitman	Route 18 Bedford St at Warren Ave	Stop Sign	E	F
11	Whitman	Route 18 Bedford St at Route 27 Temple St	Signal	B	C
12	Whitman	Route 18 Bedford St at Route 14 Auburn St	Signal	D	E
13	East Bridgewater	Route 18 Bedford St at Highland St/Harvard St	Signal	C	F
14	East Bridgewater	Route 18 Bedford St at Water St	Stop Sign	D	F
15	East Bridgewater	Route 18 Bedford St at Union St	Stop Sign	F	F
16	East Bridgewater	Route 18 Bedford St at Central St/Spring St Town Center	Signal	F	F
17	East Bridgewater	Route 18 Bedford St at Whitman St Route 106	Signal	C	B
18	East Bridgewater	Route 18 Bedford St at West St Route 106	Signal	B	E
19	Bridgewater	Route 18 Broad St at High St	Signal	B	B
20	Bridgewater	Route 18 Broad St at McDonalds Driveway	Stop Sign	C	D
21	Bridgewater	Route 18 Broad St at Campus Plaza (main entrance)	Stop Sign	F	F
22	Bridgewater	Route 18 Broad St at Campus Plaza (south entrance)	Stop Sign	F	F
23	Bridgewater	Route 18 Broad St Spring St	Signal	C	C
24	Bridgewater	Route 18 Broad St at Stetson St	Stop Sign	F	F
25	Bridgewater	Main Street Route 18 Broad at Main St/Summer St (Central Square)	Signal	E	F
26	Bridgewater	Central Square at Church St/South St Route 104	Yield	E	E
27	Bridgewater	Central Square at School St/Bedford St Route 18/28	Yield	F	F
28	Bridgewater	Route 18/28 Bedford St at Grove St	Stop Sign	D	F
29	Bridgewater	Route 18/28 Bedford St at Maple Ave	Stop Sign	D	D
30	Bridgewater	Route 18/28 Bedford St at Cottage St	Stop Sign	C	E
31	Bridgewater	Route 18/28 Bedford St at Winter St	Signal	B	C
32	Bridgewater	Route 18/28 Bedford St at Flagg St	Stop Sign	E	F

The Route 18/Route 106 West Street/East Street intersection is expected to experience a drop in the PM LOS from "D" under existing to "E" under future PM peak hour conditions.

In Bridgewater, the Route 18 Broad Street/High Street intersection will become signalized under 2014 conditions with improvements, which will improve the AM and PM peak hour levels-of service from failing, LOS "F", to acceptable levels, LOS "B". The future intersection peak hour levels-of-service in the Route 18 corridor in

Bridgewater north of Central Square will drop; however, those intersections currently experiencing acceptable levels-of-service will continue to experience acceptable levels, despite the decline. The levels-of-service at the Route 18 Broad Street/McDonalds drive intersection will remain the same in 2014 as under current conditions (AM "C" and PM "D"), and the Route 18 Broad Street/Spring Street intersection will drop from LOS "B" under existing AM and PM to LOS "C" under future AM and PM. The other study area intersections north of Central Square are at failing levels-of-service (LOS "E" and "F") under existing conditions and will continue to be at failing LOS under future conditions, including Route 18 Broad Street/Campus Plaza Main Entrance, Route 18 Broad Street/Campus Plaza South Entrance, and Route 18 Broad Street at Stetson Street.

The levels-of-service at the Central Square signalized intersection (Route 28 Main Street/Route 18 Broad Street/Route 104 Summer Street) are expected to decline from LOS "D" in the AM and LOS "E" in the PM under existing conditions to LOS "E" in the AM and LOS "F" in the PM under future conditions. At the yield controlled Route 104 South Street/Church Street intersection, at the south end of Central Square, the LOS in the AM is expected to decline from LOS "D" to LOS "E" under future conditions. The other major yield controlled intersection at the south end of Central Square, Route 18/28 Bedford Street/Central Square School Street is expected to remain at failed levels-of-service, LOS "F" in the AM and "F" in the PM, under future conditions as under existing conditions, LOS "E" in the AM and "F" in the PM.

South of Central Square in Bridgewater, there are two study area intersections that are impacted due to future growth. These include Route 18/28 Bedford Street at Cottage Street, which experiences a drop in the PM peak hour LOS from "D" to "E", and Route 18/28 Bedford Street at Flagg Street, which experiences a drop in the AM peak hour LOS from "D" to "E". The AM and PM peak hour levels-of-service for the three other Route 18 study area intersections south of Central Square remain the same under future conditions as they are under existing conditions.

5.0 RECOMMENDATIONS

The recommendations in this study have been developed based upon a series of stakeholder meetings with the study area towns and MassDOT. Notices for each of the stakeholder meetings were distributed not only to municipal officials and departments, but also to businesses in the Route 18 corridor, as well as local media (newspapers and radio). The agenda and sign-in attendance sheets for the meetings are included in the appendix to this report. In addition, recommended improvement projects were developed based on improvement strategies outlined in the National Cooperative Research Program (NCHRP) Report 500 series, which is a series of implementation guides addressing the emphasis areas of the American Association of Safety Highway and Transportation Officials' (AASHTO) Strategic Highway Safety Plan. These reports describe the resources and expertise of professionals compiled from around the country through research, workshops, and actual demonstrations. The resulting reports documented best practices in different areas of emphasis (safety at signalized intersections, pedestrian safety, etc.)

5.1 Overall Corridor Improvements

As previously described in Section 3.1, road improvements are planned at a number of specific locations within the Route 18 corridor. However, there is no plan to improve the overall safety, physical conditions, and traffic operations for the entire corridor for motor vehicle traffic and other users. The study area communities should work together with state agencies and private developers to implement-short term and long-term improvements that address the cumulative impacts of growth along the Route 18 corridor.

The following overall improvements were identified in regards to traffic, pedestrian, and bicyclist safety and operation in the Route 18 corridor:

Short term improvements:

- Re-striping and signage improvements at crosswalks throughout the corridor,
- Provide pavement marking revision and re-striping along the Route 18 corridor (centerlines, fog lines, side street stop lines).
- Install new and revised signing upgraded to meet MUTCD reflectivity standards.
- Replace missing speed limit signs.
- Conduct regular roadway sweeping.
- Improve lighting along the road and at intersections.
- Clear vegetation to improve sight distances at intersections and driveways, and to provide recovery areas for lane departures.
- Relocate and or remove fixed objects (utility poles, trees, etc.) that are too close to travel lanes and present lane departure hazards.
- Install post mounted curve delineators and chevrons.
- Enhance speed management by providing immediate and strict speed enforcement.
- Implement traffic signal updates and modifications (improvements to equipment, coordination, and timing and phasing).

- Consider lane use revisions.
- Conduct strict enforcement of posted speed limits.

Long term improvements:

- Participate in the Safe Routes to School Program (currently, the Abington Center School and East Bridgewater Central School participate in this program).
- Implement construction and/or operational improvements, such as adding or expanding shoulders, straightening dangerous curves, and realigning and improving hazardous intersections.
- Realign intersections and remove obstacles to improve sight distances at intersections.
- Request that OCPC routinely monitor traffic conditions on Route 18 as part of its regional growth monitoring efforts.
- Study area communities should continue to participate in the Joint Transportation Committee and Metropolitan Planning Organization.
- Continue to utilize pavement management system.
- Construct, reconstruct, and replace sidewalks in conformance with the Americans with Disabilities Act, and provide overall sidewalk continuity and connectivety.
- Communities should review zoning ordinances and site plan review procedures to incorporate Access Management techniques that encourage driveway sharing, reducing curb cuts, linking existing parking lots, and avoiding curb cuts too close to intersections.

5.2 Recommended Improvements - Abington

Route 18 Bedford Street at Route 139 North Avenue/Randolph Street

As previously shown in Section 3.0, Table 4, improvements to this intersection have been completed, including adding left turn lanes on Route 18 and updating the signal timing and phasing. Although improvements at this intersection have been completed, vehicles turning left on the eastbound approach share a lane with the eastbound through movement, and this intersection remains in the State's Top 200 High Crash location list. These left turns do not have a protected phase and must yield to oncoming traffic and get hung up in the intersection at the end of the phase due to heavy westbound volumes. This problem was discussed at the Route 18 stakeholders meeting in Abington. This problem was communicated to MassDOT officials by OCPC staff at a public meeting for Route 18 widening project (from the Weymouth Town Line to the Route 18/Route 139 intersection, 601630). The project manager for the Route 18 widening project stated that they will look into the feasibility of adding a protected left turn phase on this eastbound Route 139 approach.

5.3 Recommended Improvements - Whitman

Route 18 at Route 27

This signalized intersection currently operates under acceptable levels-of-service during the morning and afternoon peak hours, and is expected to remain that way under 2014 conditions. Although congestion at this intersection is not problematic, this intersection does have a higher than average crash rate at 1.80 crashes per million entering vehicles,

which is more than double the average statewide crash rate (0.80) and the District 5 rate (0.75) for signalized intersections. A survey of the types of crashes at this intersection indicates that the curb cuts in close proximity, within 200 feet of the intersection, at the Cumberland Farms and Marcello's entrance and exits, makes up approximately 20 to 25 percent of the crashes attributed to the intersection. Other patterns include 44 percent angle or cross-movement crashes at the intersection involving left turning vehicles, and a continuing situation where tractor trailers taking a right turn from Route 18 northbound to Route 27 eastbound encroach onto the shoulder and hit poles on the side of the road due to insufficient turning radii.

A number of issues, including the high number of cross movement crashes and the prohibition of right turn on red at all four intersection approaches were discussed at the Whitman stakeholders meeting on Thursday, August 6, 2009. The input from that meeting included adding a protected phase for the eastbound and westbound approaches.

The turning movement counts conducted by OCPC showed that there are very few pedestrians crossing the intersection during the morning and afternoon peak hours.

Strategies, both low cost short term and high cost long term, for improving safety at signalized intersections are outlined in the National Cooperative Highway Research Program's publication; (NCHRP) *Report 500 Volume 12: A Guide for Reducing Collisions at Signalized Intersections*, published by the Transportation Research Board (TRB.) According to this report, timing, phasing, and control strategies can produce safety benefits with only marginal adverse effects on delay. Revising the signal phasing is a strategy that is low-cost and can be implemented in a short time period.

Peak hour morning and afternoon level-of-service analyses for the intersection under future conditions with the recommended protected eastbound and westbound phases in place show that this recommendation can be implemented with little negative impact to overall traffic operations. Protected phases for the eastbound and westbound approaches will cut down on cross movement crashes. These protections can be achieved by adding a lead phase for eastbound for through movements and left turns, while the westbound vehicles remain stopped with a red light, then a phase where both eastbound and westbound are allowed with a green signal, followed by a lag protected phase for through and left movements westbound with the eastbound stopped.

Table 6 compares the levels-of-service for the Route 18 Bedford Street/Route 27 Temple Street intersection under peak hour existing conditions, future conditions, and future conditions with recommended improvements.

Table 6 - Route 18 Bedford Street at Route 27 Temple Street Intersection LOS

Peak Hour Conditions	AM LOS	PM LOS
Existing Conditions	B	B
2014 Conditions, no improvements	B	C
2014 Conditions, with improvements, protected phasing	B	C

Route 18 Bedford Street at Route 14 Auburn Street

The Route 18 Bedford Street/Route 14 Auburn Street intersection operates under acceptable levels-of-service under morning and afternoon peak hour conditions (LOS "C" in the AM and "D" in the PM). Under future 2014 conditions, the peak hour LOS is expected to be at LOS "D" in the AM and "E" in the PM. In addition, this intersection, much like the Route 18/Route 27 intersection, experiences a higher than average crash rate, which is at 1.76 crashes per million entering vehicles (MEV). This is more than double the Massachusetts average for signalized intersections (0.80) and the MassDOT District 5 average (0.75).

The high crash rate and the high number of cross-movement crashes were important issues discussed at the stakeholder meeting for Whitman. Cross movement crashes at the intersection make up approximately 30 percent of all crashes within a three year study period. As in the case for the Route 18/Route 27 intersection, the suggestion from that meeting included removing the prohibition on right turns on red, and adding a protected phase for the eastbound and westbound approaches. Nevertheless, this prohibition provides for reductions of conflicting turning movements and pedestrian safety, and as such should be retained. In addition, it was suggested that the all red timing for the intersection be increased by one second in order that vehicles clear the intersection before conflicting vehicles begin a green phase. Table 7 shows the LOS results compared to existing conditions, 2014 conditions, and 2014 conditions with improvements in place.

Table 7 - Route 18 Bedford Street at Route 14 Auburn Street Intersection LOS

Peak Hour Conditions	AM LOS	PM LOS
Existing Conditions	C	D
2014 Conditions, no improvements	D	E
2014 Conditions, with improvements, protected phasing	B	C

As shown in Table 7, the peak hour levels-of-service are expected to improve with recommendations (protected eastbound and westbound phases), over both the future 2014 conditions with no improvements, and over existing conditions.

5.4 Recommended Improvements – East Bridgewater

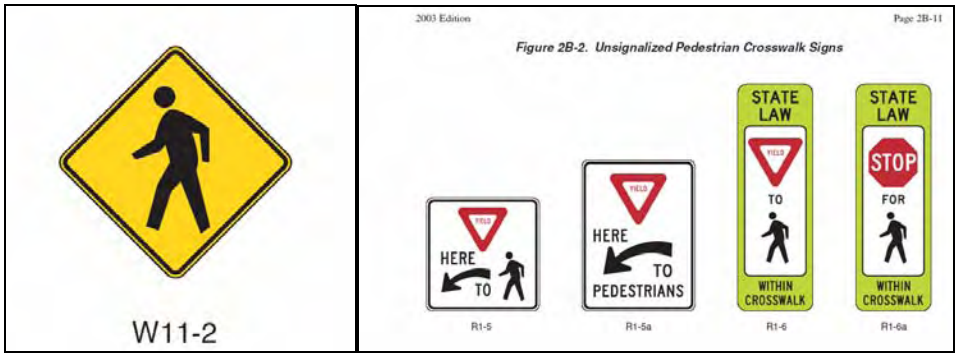
Route 18 Bedford Street at Central Street/Maple Street (East Bridgewater Center)

The intersection at the East Bridgewater Center is a major bottleneck along the Route 18 corridor, and along with congestion and delay, the intersection has a higher than average crash rate. These problems are due to heavy peak hour volumes entering the intersection, and also due to the unusual alignment of the intersection, which has six approaches. This intersection had been the subject of a traffic study conducted by OCPC in November of 1988, in which reconstruction and traffic flow reorganization was recommended. These recommendations included making Spring Street a one-way westbound away from the intersection and Maple Street one-way eastbound away from the intersection. The other important recommendation from that study included the construction of a new road between Spring Street and the southern leg of Route 18 to re-route eastbound Spring Street traffic. It was also recommended in this study that Route 18 northbound would be widened to two lanes, and the stop lines for the Route 18 northbound approach and the northwest-bound Central Street Central Street approach be moved further into the intersection.

During the stakeholder meeting for East Bridgewater, a number of improvements for this intersection were discussed, including improvements from the OCPC 1988 study. These included adding a second lane to the Route 18 northbound approach and moving the stop lines into the intersection on the Route 18 northbound approach and the Central Street northwest approach. One of the problems with East Bridgewater Center is that because the intersection is a six-approach intersection, there is a lot of area within the intersection where vehicles waiting to turn left get hung up at the end of a green phase. Moving the stop lines up gives vehicles a shorter route to exit the intersection. The problem with moving the stop lines into the intersection on the northbound and northwest approaches is that vehicles stopped for a red light on these approaches would be in the path of other vehicles entering the intersection from Spring Street. This did not present a problem in the recommendations from the 1988 OCPC study, since Spring Street was proposed to be one-way westbound with no vehicles entering the intersection from Spring Street.

Other improvements discussed for East Bridgewater Center include the enhancement of signage and crosswalks for pedestrian safety within the center. Although there is a pedestrian actuated signal currently at the signalized Route 18/Central Street/Spring Street/Maple Street intersection, there is a mid-block crosswalk across Route 18 in the center located just north of Maple Street and Central Street.

East Bridgewater Center looking north toward mid-block crossing on Route 18



Pedestrian signs for crosswalks from the FHWA's *Manual on Uniform Traffic Control Devices.*

Route 18 Bedford Street at Route 106 West Street and East Street

This intersection operates at acceptable levels-of-service under existing peak hour conditions, LOS "B" in the AM and "D" in the PM. Although the LOS is still at LOS "B" under the 2014 AM peak, the PM peak under 2014 conditions drops to LOS "E". In addition, the crash rate for this intersection is at 1.51 crashes per million entering vehicles, which is well above the 0.80 rate for the Massachusetts average and the 0.75 for MassDOT District 5 average. The discussion of issues for this intersection at the stakeholders meeting focused on the cause of the high number of cross movement crashes at this location. The Route 18 southbound approach has three lanes including a shared left-through lane, a through lane, and an exclusive right turn lane to Route 106 westbound. The Route 18 northbound approach has a shared left-through lane and a shared right-through lane. Based on the stakeholders discussion, it appears that there are

many crashes due to Route 18 southbound vehicles in the lane closest to the centerline yielding to northbound left turning vehicles, which in turn hit through vehicles using the other Route 18 southbound lane that do not yield. The vehicles turning left are often unable to see the southbound vehicles in the far lane because the sight line is blocked by vehicles in the lane closest to the centerline. Further analysis of the crash data provided by the East Bridgewater Police Department confirmed that the percent of crashes at this intersection were due to vehicle cross-movement crashes involving left turning vehicles from the northbound approach. Forty percent of the crashes at this intersection involved vehicles turning left onto Route 106 West Street from Route 18 Bedford Street northbound, according to the police department data.

Table 8 shows the 2014 peak hour LOS for the intersection with improvements that include adding left turn storage lanes on the northbound and southbound approaches and adding protected phases for the northbound and southbound left turn movements.

Table 8 Route 18 Bedford Street at West Street Route 106 and East Street

Peak Hour Conditions	AM LOS	PM LOS
Existing Conditions	B	D
2014 Conditions, no improvements	B	E
2014 Conditions with improvements, protected phasing, and widening Route 18 approaches to include exclusive left turn storage	B	C

5.5 Recommended Improvements – Bridgewater

Bridgewater Central Square

Bridgewater's Central Square represents a major bottleneck for traffic flow in the Route 18 corridor. Central Square forms an oval with Route 18 Broad Street, Route 28 Main Street, and Route 104 Summer Street intersecting at a signalized intersection in the northern end. At the southern end of Central Square there are two yield control access points with Route 104 South Street entering the oval with a yield control, and Route 18/28 Bedford Street at another yield controlled access. Bedford Street continues south of Central Square and is designated as both Route 18 and Route 28, while Route 104 continues along South Street connecting with Route 24. In addition, there is head-in parking inside Central Square, with parking maneuvers interfering with overall traffic operations.

During the morning and afternoon peak hours, delays at the signalized intersection of Route 18 Broad Street/Route 28 Main Street/Route 104 Summer Street cause back-ups for vehicles in the oval (northbound), which in turn causes back-ups at the two yield controlled south end intersections; Route 104 South Street at Central Square and Route 18/28 Bedford Street at Central Square. Traffic also queues southbound on Route 18 Broad Street at this intersection during the AM and PM peak hour so that the queues back

up past the commuter rail grade crossing, with vehicles stopped on the tracks for the signal. Given that, the town should coordinate with the MBTA to explore signal coordination opportunities between the railroad crossing and the traffic signals at the northern end of Central Square.

At present, the signalized Route 18 Broad Street/Route 28 Main Street/Route 104 Summer Street intersection operates at LOS "D" in the AM and "E" in the PM. The crash rate is 1.97 crashes per million entering vehicles. The 2014 peak hour levels-of-service are expected to be at "E" in the AM and "F" in the PM.

There are long delays at the Route 18/28 Bedford Street northbound yield approach into Central Square. This intersection operates at LOS "E" during the AM peak hour and "F" during the PM peak hour. Vehicle queues from northbound traffic at the Route 18 Broad Street/Route 28 Main Street/Route 104 Summer Street intersection tend to back up into the town center creating delays for traffic trying to enter the oval on the Bedford Street northbound yield approach and the South Street yield approach. The South Street yield intersection at Central Square operates at LOS "D" during the AM and "E" during the PM peak hour. There are also deficiencies in the alignment of the Route 18 Broad Street/Route 28 Main Street/Route 104 Summer Street intersection that lead to motorist confusion. An extension of lane markings through the intersection could help to reduce congestion and confusion over lane use at this intersection. Another potential modification to this intersection includes the prohibition of left turning vehicles from Route 28 Main Street approach (headed southeast) to Route 18 northbound, and removal of some on-street parking on Route 18 directly north of Central Square. This would eliminate a phase in the cycle allowing more green time on other approaches such as the northbound approach with traffic entering the intersection from the town oval. This would help reduce back-ups into the oval from this approach that in turn blocks the South Street and Bedford Street yield approaches. Traffic can access Route 18 from the Route 28 Main Street approach (southeast approach) by going around the square and returning to the intersection northbound to Route 18.

Other improvements for Central Square include upgrading signage and adding more signs in the square to alert motorists of pedestrian crossings. In addition, pedestrian visibility features such as lighted crosswalks should be considered. An example of such features is present in Plymouth along Route 4A across from Memorial Hall.

Faded pedestrian sign on Route 104 at Central Square intersection

Lack of pedestrian warning signs looking southbound in Central Square

Lack of pedestrian warning signs in Central Square looking northbound

Route 18/28 Bedford Street at Grove Street
Traffic operations at this intersection under current peak hour conditions are currently at LOS "D" during the morning peak hour and LOS "F" during the afternoon peak hour. This intersection meets the peak hour traffic signal warrant under Warrant 1 of the MUTCD "Interruption of Continuous Flow" and Warrant 3 for Peak Hour Volumes under existing conditions. In a previous townwide traffic study completed by a traffic engineering consultant for the Town of Bridgewater, traffic signal installation was not recommended because at that time the intersection volumes did not meet the required threshold of the *Manual on Uniform Traffic Control Devices*. It was recommended in that study that future volumes at this intersection be monitored to determine when a signal would be warranted.

According to the townwide study, town officials have expressed concern because of the high speed of northbound and southbound traffic on Bedford Street and the high number of crashes at this intersection. The study recommended the creation of a gateway south of the intersection on Bedford Street for traffic approaching Central Square. This gateway would emphasize that drivers are entering a more congested area and should slow down. This gateway could include items such as aesthetic signing (such as "Entering Historic District"), period lighting, landscaping, and textured/colored pavement. A combination of these types of treatments could be used to help alert drivers that they are no longer on the 55 mph section of Bedford Street. In addition, a flashing warning beacon is recommended for accompanying the speed limit sign where the speed changes to again alert drivers to the expected change in vehicle speed. Furthermore, strict enforcement of the posted speed is paramount.

Route 18 Bedford Street at Flagg Street
This intersection currently operates under LOS "D" during the morning peak hour and "F" during the afternoon peak hour. The poor peak hour levels-of-service are due mainly to the constant flow of traffic on the major street, Route 18, which results in insufficient gaps in traffic for Flagg Street left turns to enter onto Route 18. The townwide study recommended that traffic volumes at this intersection be monitored to determine when a traffic signal at this location would be warranted. The installation of a signal would require state approval.

Planned and recommended improvements for the Route 18 corridor are shown in Figure 19.

Route 18 Corridor Study

Planned and Recommended Improvements

Figure 19

Improvements at Route 18 / Route 139(completed) , MassHighway to review timing/ phasing to improve EB left turns

Widen Route 18 to 4 lanes from Columbia Road, Weymouth , to Route 139, Abington (in design stage)

Enhancement of Route 18 Capacity from Route 139, Abington to Route 14, Whitman (requires PRC and Community approval)

Thayer Street Intersection improvements (completed)

ABINGTON

Route 18 at Route 27, Whitman, Add protected left turn phasing on eastbound and westbound approaches

WHITMAN

Route 18 at Route 14, Whitman, add a protected left turn phasing on eastbound and westbound approaches

Route 18 Sidewalk repair and installation (under design) from Whitman Town Line to Bridgewater Town Line

East Bridgewater Improvements at three intersections (completed)

EAST BRIDGEWATER

Route 18 at East Bridgewater Center, add signage to improve pedestrian safety, widen northbound Route 18 approach to two lanes

Route 18 at East Street, West Street, East Bridgewater, add left turn storage lanes on Route 18 northbound and southbound approaches, with protected phasing

Central Square Bridgewater, improve signage and pedestrian amenities to improve safety. Improve signal operations by prohibiting left turns on Route 28, Main Street approach. Extend left turn lane markings northbound through the intersection

BRIDGEWATER

Route 18 at High Street, Bridgewater, install traffic signals and geometric improvements under design

Bridgewater, Resurface Route 18, Cottage Street , to Middleboro Rotary Bridgewater portion complete.

Route 18 Improvements

- TIP Project
- Corridor Study Recomendations
- Proposed Mitigation
- Pre-Approved PRC Project
- Route 18 Road Layout
- Surrounding Roadways
- Study Area
- Surrounding Communities

1 0 1 2 3 4 5 Miles

Old Colony Planning Council, 70 School Street, Brockton, MA 02301

GIS Data Sources: MassGIS, MassDOT, OCPC, Towns of Abington, Whitman, East Bridgewater & Bridgewater

November, 2009

5.6 Recommended Improvements – Access Management

A commonality throughout the Route 18 corridor, within each of the study area communities, is the lack of control, placement, spacing, and width of curb cuts that provide access to adjacent properties. These conditions, which are prevalent throughout the corridor, have led to situations in which safety and traffic flow have been compromised, especially at the intersection of key highways, as in Abington at the Route 18/Route 139 intersection, and in Whitman at the Route 18/Route 27 intersection and the Route 18/Route 14 intersection. The crash analysis has shown that crashes at driveway entrances within 150 feet of the Route 18/Route 27 intersection and the Route 18/Route 14 intersection in Whitman make up approximately 30 percent of the total crashes attributed to each intersection.

Access Management is defined as the planning of the design, location, and operation of driveways, median openings, interchanges, and street connections. Access management provides two important advantages when applied to a roadway corridor:

1. Improved Safety
2. Improved Capacity

These advantages are achieved through Access Management techniques that seek to obtain the following results:

- Limit the number of conflict points in turning movements
- Separate conflict areas
- Remove turning vehicles from through traffic lanes
- Reduce conflicting volumes
- Improve roadway operations
- Improve driveway operations

Commercial and retail activities are important within certain segments of the Route 18 corridor, as described in this report in Section 3.8. Although some access management techniques include limiting the number of curb cuts, adding medians, and reducing turning movements, studies show that well planned access management design and modifications do not negatively impact businesses. Access Management applications result in reduced blocking of driveways by queues, better access between neighborhoods and businesses, and safer overall driving conditions. All of these attributes are important to both retailers and the customers they serve.

The prevailing conditions along the Route 18 corridor are such that much of the land adjacent to the road has already been developed, especially in the more urbanized areas. Development along the corridor sometimes results in the redevelopment of parcels that were abandoned or are in transition in regards to use. The techniques applied to these segments will involve retrofitting access management to existing curb cut access, which sometimes requires the consolidation of access points.

The areas within the Route 18 corridor in which access management techniques should be a prime focus are shown in Figure 20. These include:

- Route 18 (Bedford Street) in Abington from north of the Route 18/Route 139 intersection south to the Whitman Town Line.
- Route 18 in Whitman from north of the Route 18/Route 27 intersection south to south of the Route 18/Route 14 intersection.
- Route 18 in Bridgewater from the Route 18/High Street intersection south to the Central Square, and from Central Square south to the Middleborough Town Line.

6.0 Project Development and Funding

The implementation of projects includes taking transportation improvements from the concept stage through to design and construction. Funding is an essential element in ensuring the implementation of recommended improvements. The *MassDOT Project Development and Design Guide* explains the project development process in Massachusetts and design standards for transportation projects. The MassDOT project development process consists of eight steps:

I. Problem/Need/Opportunity Identification (A Project Need form is submitted to MassDOT)
II. Planning (A project planning report is completed)
III. Project Initiation (A Project Initiation Form is submitted to MassDOT)
- Identification of Appropriate Funding
- Definition of Appropriate Next Steps
- Project Review Committee Action

VI. Environmental Design and ROW Process (Includes Plans, Specifications, and Estimates, P, S, & E)
- Environmental Studies and Permits
- Right-of-Way Plans
- Permits

V. Programming (Old Colony TIP and State Transportation Improvement Program, STIP)
- Programming of Funds

VI. Procurement (Construction bids and contractor selection)
VII. Construction
VIII. Project Assessment

On sections of roadway owned and maintained by the municipality, they typically initiate a project by completing and submitting the Project Need Form (available in the Appendix), as well as providing for project planning and design. Similarly, for state owned facilities, the MassDOT initiates projects and provides planning and design on their section of roads.

Many funding options are available for project construction, and are outlined below. Note that some funding programs, such as the Congestion Mitigation and Air Quality (CMAQ) Program, are for specific types of projects that meet specific criteria, while other programs such as Chapter 90 can be utilized on a much broader range of projects. Federal aid eligible regional transportation needs have outpaced available funding in the Transportation Improvement Program (TIP) for the past several years. All projects on the TIP go through a comprehensive evaluation process to determine priority for funding; therefore, the programming of the TIP is a competitive process. In general, the process to fund a project through the TIP may take up to five years. Therefore, due to this limitation of TIP funding, communities are encouraged to seek alternate funding avenues for their high priority projects. Examples of such options include using Chapter 90 funds, developer mitigation, or public/private partnerships with local stakeholders.

Funding Programs

- **Capital Improvement Program (CIP) and Local Funding** has historically been utilized to help provide the design and engineering of highway projects.
- **Exactions (Developer Mitigation Agreements)** Communities have increasingly turned to exactions as a means to meet new infrastructure and public service needs. Cities and towns use developer exactions as a strategy to offset the burdens of new development on the community. Exactions contribute to regional equity by ensuring that a new development pays a fair share of the public costs that they generate. Exactions consist of a developer's payment of funds to offset the cost of necessary construction, design, or maintenance of public infrastructure directly connected to the new development. Developers commit to an agreement for funding or constructing off-site improvements in exchange for the approvals to proceed with a development project.
- **Bridge Replacement and Rehabilitation Program** provides funds for rehabilitation and replacement of any bridge on a public road. Bridges on the federal aid system or off the federal aid system are eligible for these funds.
- **Chapter 90** provides funding for highway construction, preservation, and improvement projects that create or extend the life of capital facilities. The level of funding is determined by a formula that is based upon public way mileage, population and level of employment in each community. The Chapter 90 Program is a reimbursement program, as the community must initially pay the cost of a particular project.
- **Community Development Block Grant (CDBG) Program** provides for the development or expansion of economic opportunities and the provision of decent housing and public facilities. Eligible use of funds includes community development (construction or reconstruction of streets, water and sewer facilities, neighborhood centers, recreation facilities, and other public works).
- **Congestion Mitigation and Air Quality Improvement Program (CMAQ)** directs funds toward transportation projects in Clean Air Act non-attainment areas for ozone and carbon monoxide. OCPC is located in the Boston non-attainment area for ozone.
- **National Highway System (NHS)** consists primarily of existing Interstate Highway routes and portions of the Primary System. This program was established to focus federal resources on roads that are the most important to interstate travel, national defense, inter-modal connections, and international commerce.
- **Non-Federal Aid (NFA)** provides state funds for projects that due to federal fiscal constraints would not be able to receive federal funding. Projects under this category are listed for informational purposes only.
- **Public Works Economic Development (PWED)** grants are designed to assist municipalities seeking infrastructure improvements that support economic development goals.
- **Surface Transportation Program (STP)** is a block grant type program that may be used for any roads (including NHS) that are not functionally classified as local or rural minor collectors. These roads are collectively referred to as federal-aid eligible roads.

- **Transportation Bond Bill (TBB)** authorizes and directs the MassDot to expend monies for transportation projects such as reconstruction, resurfacing, rehabilitation or improvements of highways, bridges, and parking facilities. From this, the State will issue either general obligation or special obligation bonds.
- **Federal appropriations** allocate Federal funding for Federal Aid eligible projects.

7.0 Appendices (see enclosed CD)

7.1 Appendix A - Route 18 Meeting Minutes

7.2 Appendix B - Intersection Crash Rate Equation

7.3 Appendix C - MassDOT Project Notification Form

7.4 Appendix D - Automatic Traffic Recorder Counts

7.5 Appendix E - Intersection Turning Movement Counts

7.6 Appendix F - Safe Routes to School Information