

ROUTE 106 CORRIDOR STUDY (WEST BRIDGEWATER, EAST BRIDGEWATER, HALIFAX, PLYMPTON AND KINGSTON)



Old Colony Planning Council
70 School Street
Brockton, MA 02301

Prepared under MassDOT Contract # 88826

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Route 106 Corridor Study

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1 Introduction

1.1 Study Purpose and Scope

The Route 106 Corridor Study focuses on a section of Route 106, approximately 16 miles, beginning at the Route 106/Route 28 intersection in West Bridgewater (West Bridgewater Center) extending east to Route 3A in Kingston. This section of the corridor includes Route 106 in the Towns of West Bridgewater (from Route 28 east to East Bridgewater), East Bridgewater, Halifax, Plympton, and Kingston.

The purpose of this study is to identify, address, and alleviate deficiencies in the corridor thereby enhancing the movement of people and goods, improving circulation and traffic flow efficiency, improving safety and bicycle and pedestrian accommodation, and reducing gaps to essential services. This study was completed in cooperation with the Towns of West Bridgewater, East Bridgewater, Halifax, Plympton, and Kingston, and includes a public outreach component with meetings with local and state public officials. The study area is shown in Figure 1 and Figure 2.

This study includes traffic data collection (average daily traffic and peak hour turning movements), analyses of existing and future traffic conditions (intersection peak hour levels-of-service, speeds, and heavy vehicles), an inventory of physical conditions (pavement width, lane use, signage, traffic control, and pavement conditions), a review of land use and community goals, a general assessment and review of public health (as well as the health impacts of transportation), and a review and analysis of crash data within the study area. Traffic forecasts and intersection peak hour level-of-service (LOS) analyses for future (five-year horizon) peak hour conditions were performed for the study.

Traffic analyses were completed utilizing standard practices in the *Highway Capacity Manual*, published by the Institute of Transportation Engineers (ITE). The traffic analysis software used to complete this study includes SYNCHRO. Signal Warrant analyses were performed in accordance with national standards established in the *Manual on Uniform Traffic Control Devices* (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 ITE. In addition to data collection, crash information was 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).

A review of pedestrian, transit, and bicycle accommodations is included in this study. The “Complete Streets” concept (designing roads to accommodate all road users), traffic calming, access management, and reviews of local and state plans were discussed in the public outreach meetings to develop specific improvement projects and to define a long term vision for the study area corridor and intersection locations. Improvements for pedestrians have been proposed to support transit use (where applicable), and to ensure mobility, safety, and access for all users.

Figure 1 – Study Area

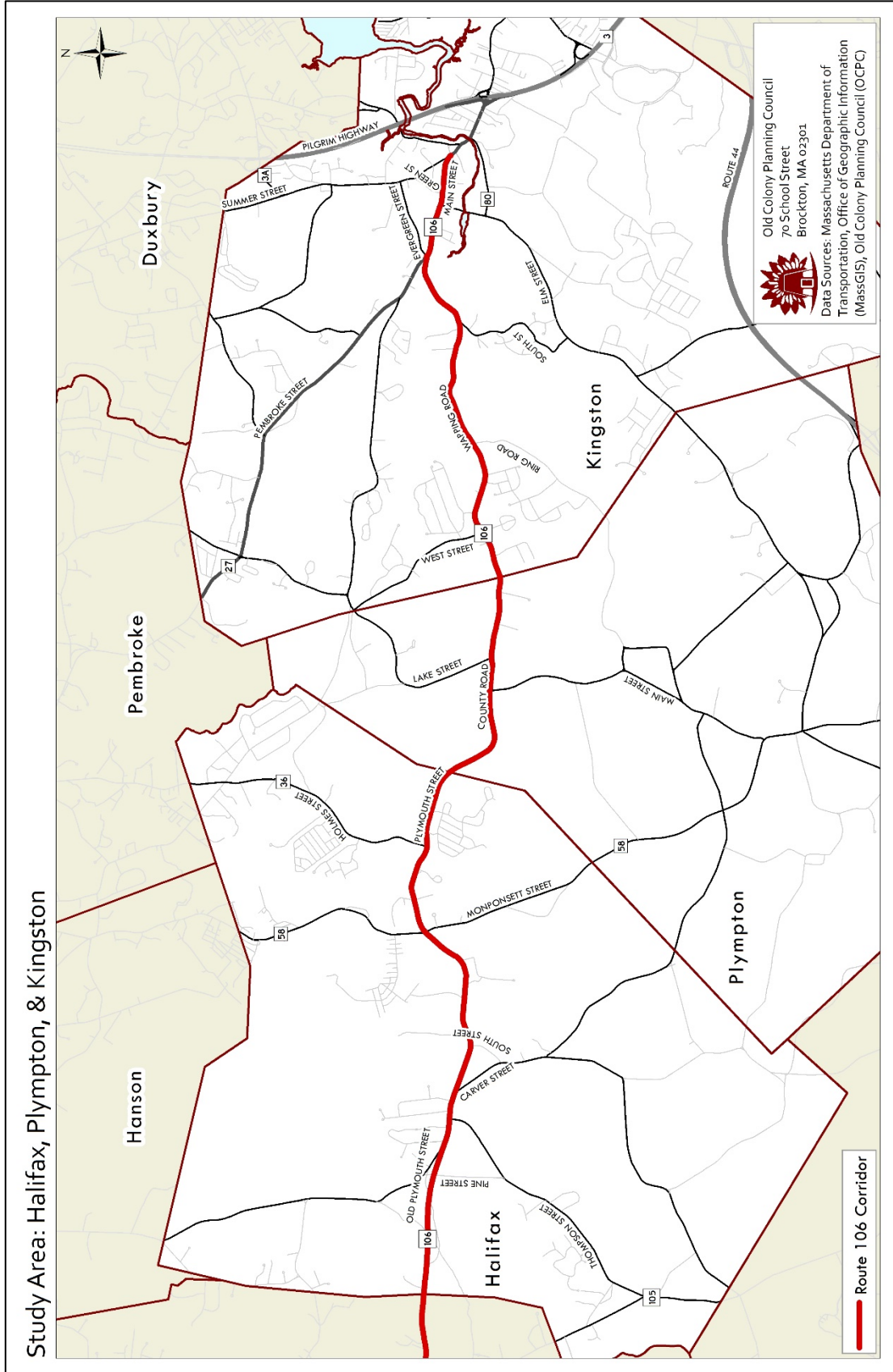
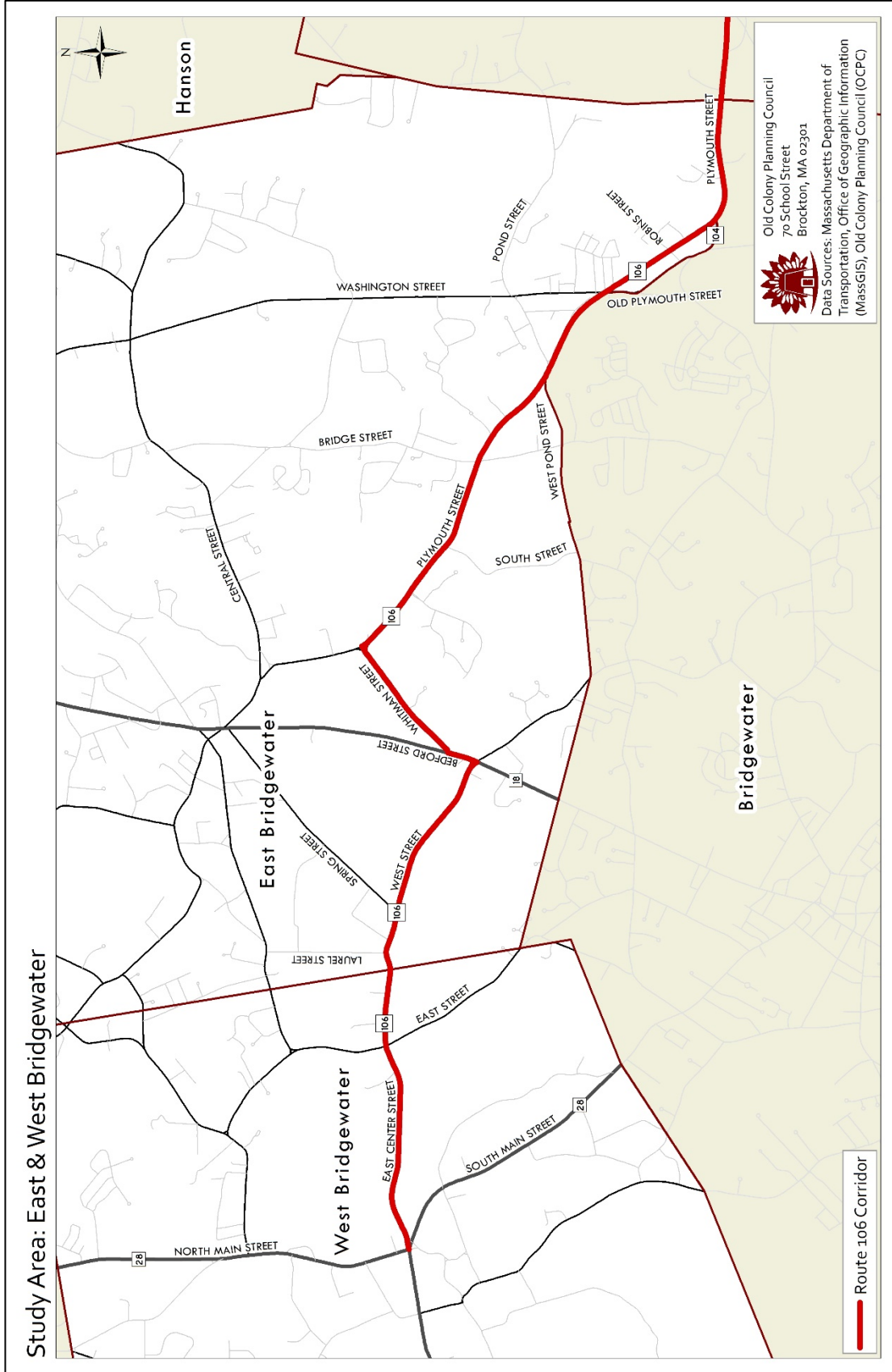


Figure 2 – Study Area



1.2 Public Outreach

The study process requires a public outreach program for the identification of transportation issues important to stakeholders. The public outreach program helps to ensure that the planning process is comprehensive and equitable, and collaboration and consensus among stakeholders results in the development of improvements that reflect the vision of the study area communities. An important part of the public outreach process includes the identification of stakeholders, especially those who have the potential to be impacted by the study, those who are important in the implementation of improvements, and those who have an interest in the study and process. Old Colony Planning Council’s (OCPC) stakeholder identification included reaching out to the public at large, and groups that have been traditionally underserved including the elderly, groups with Limited English Proficiency (LEP), immigrants, minorities, and people below the poverty line.

Public outreach is also important for maintaining consistency in state, regional, and local plans and for initiating specific projects in the communities for inclusion in the region’s Transportation Improvement Program (TIP). The study outreach process includes posting information about the study on OCPC’s website. The website page provides an overview of the project, notices of public meetings, and the conclusions and improvements resulting from the study. The study included presentations of existing conditions and potential improvements. All of OCPC’s meetings are held at local venues that are screened for ADA accessibility by OCPC. The *Old Colony MPO ADA/Section 504 Transition Plan* was completed in 2017. This plan outlines OCPC’s procedures for evaluating access to programs and premises for all individuals, including those with disabilities. Public meetings and stakeholder meetings for this corridor study were conducted according to the plans and procedures outlined in the *Old Colony MPO ADA/Section 504 Transition Plan*.

1.2.1 On-Line Survey

OCPC developed an on-line questionnaire survey to help identify and prioritize problems and improvement strategies within the Route 106 corridor study area. The survey was designed to raise awareness of the issues in the study area and to give the general public the opportunity to participate anonymously, although individuals were encouraged to leave contact information to provide additional input and keep them updated on study meetings. The survey, which received 23 responses, was available electronically via a link on OCPC’s website through Survey Monkey. The survey questions are included in the appendix to this report. The results of the survey are as follows:

Question 1: At what intersection or location do you experience congestion or delays with the Route 106 corridor, what town(s)?

Table 1 - Question 1 Responses

Response	Percent Responses
Route 106 at Route 104, East Bridgewater	8 %
Route 106 at Washington Street, East Bridgewater	38 %
Route 106 at Bridge Street, East Bridgewater	8%
Route 106 at Route 28, West Bridgewater	15 %
Route 106 at Wal-Mart, Halifax	15 %
Main Street, Kingston	8 %
Route 106 at Route 18, East Bridgewater	8 %

Question 2: What time period do you typically experience traffic congestion?

Table 2 - Question 2 Responses

Response	Percent Responses
5 am to 7 am	0 %
7 am to 9 am	0 %
9 am to 2 pm	4 %
2 pm to 4 pm	14 %
4 pm to 6 pm	23 %
After 6 pm	0 %
All Day	59 %

Question 3: How much delay do you usually experience at this location and at what time of the year?

Table 3 - Question 3 Responses*:

Response	Percent Responses
Five minutes	37 %
Ten minutes	42 %
Fifteen minutes	0 %
Twenty minutes or more	14 %
School time	7 %

(*Seventy percent of all respondents experience delay all year or most of the year.)

Question 4: What do you believe is the root cause for congestion and delay?

Table 4 - Question 4 Responses:

Response	Percent Responses
No response	7 %
High peak volumes and not enough capacity	36 %
Inadequate intersection design or traffic (signal) control	43 %
Distracted drivers, lack of enforcement	14 %

Question 5: What improvements for safety and convenience do you think should be made in the study area for better walking and bicycling conditions?

Table 5 - Question 5 Responses:

Responses	Number of Responses
Don't know	8 %
Construct more and safer sidewalks	15 %
Add bicycle lanes	23 %
Improve intersection design and traffic control	31 %
Limit or prohibit bicycles and walking on Route 106	23 %

Question 6: What is the most important safety issue(s) on Route 106 (for vehicles, pedestrians, bicycles, or other), and what do you think are the best solutions to address the issue?

Table 6 - Question 6 Responses:

Responses	Number of Responses
Improve Route 106 and Washington Street, East Bridgewater (signals or roundabout)	33 %
Speed enforcement and traffic calming	33 %
Widen Route 106 and improve intersection alignment	11 %
Improve or add sidewalks	22 %

The survey results show that the respondents cited the intersection of Route 106 at Washington Street as being the most problematic in regards to traffic delays and safety. The survey indicated that respondents favored significant improvements at that intersection, which could include traffic signals or a roundabout as well as improved traffic enforcement along Route 106.

1.2.2 Public Outreach and Meetings

OCPC held a number of meetings with key stakeholders to garner input regarding existing deficiencies, potential for future infrastructure and land use changes, and potential improvements that can be developed into specific TIP projects. OCPC met with the Kingston Transportation Committee, the East Bridgewater DPW, and the Halifax Traffic Committee.

West Bridgewater

OCPC staff met with the West Bridgewater DPW director, with follow up phone conversations, to discern the Town's Route 106 priorities. The Town's Route 106 priorities within the study area are focused on the East Center Street (Route 106)/East Street intersection. This intersection is a high crash location, (HSIP eligible 5% cluster), with geometric improvement needs as well as signalization installation. West Bridgewater recently passed a town warrant to provide \$511,000 in funds for signal installation and intersection reconstruction and signal installation is currently underway.

In addition, presentations of the Route 106 corridor study at the Old Colony MPO meetings included discussions on the need to improve signal coordination for progression of Route 106 east and west through

traffic through the intersection of Route 106 and Route 28. The Route 106/Route 28 intersection was reconstructed, with funding from the Old Colony Transportation Improvement Program (TIP), and construction ending in 2016. The improvements included signal equipment upgrades, improvements to phasing and timing, intersection reconstruction, widening, as well as improvements to lane use and traffic channeling. Traffic congestion on Route 106 west of the Route 106/Route 28 intersection in West Bridgewater remains problematic (especially during the peak hour) with average daily traffic volumes above 20,000¹ vehicles per day. Route 106 at the location east of Route 28 in West Bridgewater experiences average daily traffic volumes between 16,000 and 17,000 vehicles per day.

East Bridgewater

OCPC staff met with the director of the Town's Public Works (DPW) and the superintendent of highways. The DPW has several priorities within the Route 106 corridor in East Bridgewater. The DPW submitted a Project Notification Form (PNF) to the Massachusetts Department of Transportation (MassDOT) in 2007. At that time, the PNF was not approved by the MassDOT Project Review Committee (PRC). The PNF included the following potential improvements to the Route 106 corridor:

- Whitman Street (Route 106)/Plymouth Street intersection, include intersection reconstruction, adding sidewalks (ADA compatible), and signalizing the intersection.
- Plymouth Street (Route 106) at Bridge Street intersection, include adding overhead flashing beacons and realigning the roadway to improve sight distance.
- Plymouth Street (Route 106) at Pond Street intersection, include re-aligning the intersection to improve sight distance problems.
- Plymouth Street (Route 106) at Washington Street/Old Plymouth Street intersection – The misalignment of the intersection causes driver confusion and a high number of crashes due to added vehicle conflicts. A Road Safety Audit, completed in September of 2011, recommended signalization and realigning the intersection. The Town has implemented short term measures, which include mobile speed trailers on Plymouth Street and increased police enforcement of speeds, while it pursues additional funds for long term improvements, which include reconstruction and realignment of the intersection and signalization.

Halifax

Old Colony Planning Council staff met with the Halifax Town Traffic Committee (October 4, 2018) to discuss traffic and safety issues within the Route 106 corridor in Halifax. The committee discussed a number of issues regarding delay and safety. The improvements include the following:

- The Plymouth Street (Route 106)/Thompson Street (Route 105) intersection, add a dedicated left turn storage lane to the westbound Route 106 approach lane allow for queuing of vehicles, which block the Route 106 westbound approach during the peak hours due to vehicles turning left.
- The Plymouth Street (Route 106)/Pine Street intersection is stop sign controlled. The speed limit for Route 106 through the intersection is 45 miles per hour. During the peak hours, there are few suitable gaps for vehicles turning in and out of Pine Street. If there was a traffic signal at this intersection or at an intersection nearby, it could help create more sufficient gaps in the traffic for side street traffic to enter the Route 106 flow. Warning signs along Route 106 as it approached the Pine Street intersection might improve overall safety at the intersection.
- Sidewalks along the north side of Route 106, from Cranberry Drive to Circuit Street (through the Route 106/Pine Street intersection) will improve pedestrian safety within the corridor.

¹ Based on historic traffic counts completed by OCPC – *Old Colony Traffic Volumes Report 2017*, Page 43.

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- The Town is considering internal improvements to traffic circulation (pick-up and drop-off areas) at the Halifax Elementary School. Currently, traffic queues up on site and backs onto Route 106 as parents pick-up and drop-off students. The Town is considering knocking down trees to the east of the school and using the additional cleared area for internal storage so that all traffic waiting to pick-up and drop-off at the school queues on site and does not back onto Route 106, which creates a Route 106 hazard.
- The section of Route 106, between The Route 106/Route 58 intersection to the Stop and Shop access, approximately one-quarter of a mile, experiences delays due to vehicles entering and exiting access drives along the corridor. The town would like to consider a three lane cross-section, which includes an eastbound lane, a westbound lane, and a two-way turning lane in the center. They would also like to consider the feasibility of adding bicycle lanes to both sides of the road. The Town would also like to upgrade the three traffic signals within this section of Route 106, (Route 106 at Stop and Shop, Route 106 at Wal-Mart, and Route 106 at Route 58). These signals are within close proximity and could be coordinated to improve through traffic flow on Route 106.
- Currently, Plymouth Street (Route 106) has two lanes on the eastbound and westbound approaches to the Route 106/Route 58 intersection, with an island for channeling traffic for the right turns on the eastbound approach. Both of these approaches provide a left turn storage lane. Route 58 provides three lanes on the southbound approach to the intersection (left turn, through, and right turn), and the Route 58 northbound approach provides two lanes, including a left turn storage lane. The northbound approach also provides an island for channeling right turns. The Town would like to consider eliminating the right turn islands on the eastbound and northbound approaches to create space for providing all approaches to the intersection with three lanes, an exclusive left turn lane, a through lane, and an exclusive right turn lane.
- The Town would like to consider the feasibility of realigning the Route 106 at Holmes Street (Route 36) intersection.

Plympton

OCPC contacted the Plympton Highway Department to discern the town's priorities regarding traffic and safety within the Route 106 corridor. The key intersections within the Route 106 corridor in Plympton include Route 106 at Main Street and Route 106 at Lake Street. At this time there are not a high number of crashes at either intersection and peak hour levels-of-service at both intersections are at acceptable levels. The Plympton Highway superintendent stated he would like to monitor both intersections for any future safety or congestion problems.

Kingston

OCPC staff met with the Kingston Transportation Committee. The discussion focused on the section of Route 106 between Evergreen Street and Route 3A. The Town has expressed interest in implementing Complete Streets treatments in this section of Route 106, (accommodations for all modes including bicyclists and pedestrians, as well as motor vehicles). This section of Route 106 is within Kingston's historic district. The Old Colony Planning Council completed a technical memo in 2018 that reported on traffic volumes and crashes in and around Kingston's historic district, including this section of Route 106 between Evergreen Street and Route 3A. The technical memo stated that since 2016, this section of Route 106 saw an increase in about 1,000 vehicles per day (an increase of about 7%), although in the three years prior to 2016, the traffic remained about the same.

1.2.3 Environmental Justice

Environmental Justice Populations in the OCPC region were identified based on federal aid guidelines and utilizing census blocks and block groups that have high minority populations, high populations of low income, and high populations with limited English proficiency and foreign born populations.

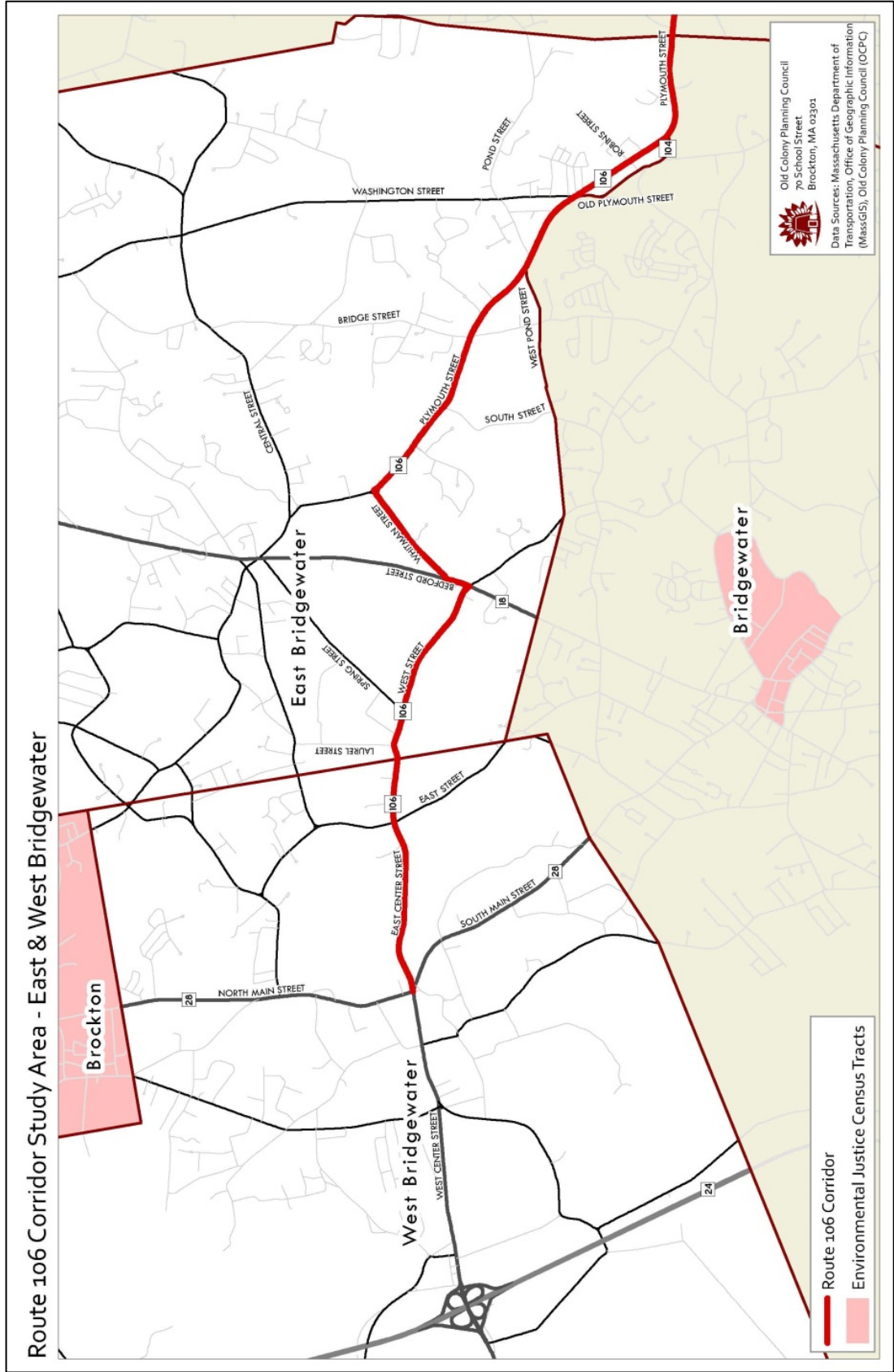
There are three fundamental Environmental Justice principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of project benefits by minority populations and low-income populations.

The Route 106 study area in West Bridgewater, East Bridgewater, Halifax, Plympton, and Kingston has no Environmental Justice Areas. Figure 3 shows Environmental Justice areas in Bridgewater to the south and Brockton to the north, but none directly adjacent to the Route 106 corridor.

Public involvement is an integral part of transportation planning and project development decision-making. MassDOT directs greater access to information and opportunities for public participation in matters that may affect human health and the environment for minority populations and low-income populations. The objective of Environmental Justice is to ensure that there is equity in the distribution of transportation resources and services for low income and minority communities and neighborhoods. As part of this objective, Metropolitan Planning Organizations (MPOs) are required to provide full and fair participation for all socio-economic groups throughout their planning and decision-making processes. OCPC, through its public outreach process for this study, has provided input to all stakeholders, including those residing in Environmental Justice Areas.

Figure 3 – Environmental Justice Areas



2 Previous Studies and Improvements

2.1 West Bridgewater Intersection Improvements at East and West Center Street (Route 106) and Route 28

This project, which was completed in 2016, consisted of major improvements (reconstruction) of state owned Route 28 and town owned Route 106 to address congestion issues in West Bridgewater's downtown area. The project included improvements to pedestrian safety and access and streetscape to the downtown. The improvement project added a second set of traffic signals due to the skewed nature of the intersection, which essentially cordons the downtown into two intersections. As vehicles approach on Route 28 from the south (travelling northbound on Route 28), the intersection is a signalized "T" type intersection. As they proceed, they turn left onto Route 106 for a short distance, and then turn right at another signalized intersection to continue to head northbound on Route 28. Vehicles travelling southbound on Route 28 through the downtown take a reverse route. They turn left at the signal, traveling on Route 106 for a short distance, and then right at the next signal to continue southbound on Route 28. Vehicles on East and West Center Street (Route 106) as they travel eastbound and westbound through West Bridgewater Central Square travel through two signalized intersections. Figure 4 illustrates the two signals at West Bridgewater downtown, which operate under signal coordination.

Figure 4 West Bridgewater Central Square (Route 106 at Route 28)



2.2 East Center Street (Route 106) at East Street in West Bridgewater

The Town of West Bridgewater has made improvements to the intersection of East Center Street (Route 106) at East Street in the past as it has experienced a high number of crashes. These include adding retro-reflective and flashing stop signs on the East Street minor street approach. The Town has recently passed a Town Meeting ordinance to borrow \$513,000 for the purpose of installing a traffic signal at the East Center

Street (Route 106) at East Street intersection. This construction project has been completed and the signals have been installed.

2.3 Bedford Street (Route 18) at Whitman Street (Route 106) in East Bridgewater

A Road Safety Audit for Route 18 (Bedford Street) from Whitman Street to Central Square in the Town of East Bridgewater was held on April 1, 2014 at East Bridgewater High School in East Bridgewater. The RSA was conducted by an engineering consultant for MassDOT. The RSA was held due to a number of safety concerns, which included; the intersection of Route 18 and Whitman Street was identified as a high crash location within the OCPC Region, the intersection of Bedford Street and Central Street (Central Square) was previously identified as a high crash location within the OCPC region, and the Route 18 corridor was identified as a potential location for roadway and pedestrian safety improvements between Whitman Street and Central Square. The RSA is intended to identify potential short and long term safety improvements that can be made along the corridor, and implemented through for short term low cost improvements or incorporated into the future project. An improvements project has been included in the Old Colony TIP to implement improvements within the geographic scope of the RSA. The improvements include resurfacing and sidewalk construction on Bedford Street (Route 18) from Whitman Street (Route 106) to Central Square. In addition, work on this project includes the resurfacing of Route 18 and the addition of bicycle lanes along the corridor. Drainage upgrades will also be included, and intersection improvements at Bedford Street (Route 18)/Whitman Street (Route 106) will be incorporated into the project.

The RSA included the following recommended improvements to the Bedford Street (Route 18)/Whitman Street (Route 106) intersection:

- Reconfigure the existing roadway pavement and/or widen the roadway to provide wider shoulders accommodating bicycles. This is a long-term, potentially high cost improvement if widening is required. It is assumed that this improvement can be completed in conjunction with corridor improvements.
- Remove pedestrian warning signs on Route 18 approaching Whitman Street to reduce sign clutter. Pedestrian warning signage is not required and is typically not provided at signalized intersections, because the traffic signal controls vehicle actions during pedestrian actuation. This is a short-term low cost improvement.
- Remove the W4-2 Lane Ends (merge) sign on the northbound approach. This sign is not appropriate because drivers do not need to merge in advance of the intersection. This is a short-term, low cost improvement.
- Review traffic distribution and operation to determine if an exclusive northbound right turn lane (Route 18) is warranted. If warranted, replaced “Right Lane for Right Turn” sign with “Right Lane Must Turn Right” sign, and revise markings.
- Install street name signs at the intersection. Street name signs should be provided for both Whitman Street and Bedford Street. This is a short-term, low cost improvement.
- Review drainage to determine if upgrades are necessary. Review of existing drainage is a short-term improvement. If existing drainage is inadequate based on MassDOT stormwater management guidelines, drainage upgrades could be incorporated into the future project as a long-term improvement.
- To reduce rear-end crashes, update clearance times and signal timing. This is a short-term, low cost improvement.
- Consider signal coordination between Whitman Street and West Street along Route 18. This is a short term low cost improvement.

- Provide overhead signals for the Whitman Street approach. Overhead signals would increase visibility, which could reduce red-light running. This is a long-term, high cost improvement.
- Consider arrow and left only markings for the left lane from Whitman Street to Route 18 southbound. Arrow and only markings in both lanes would confirm intended lane assignments. This is a short term, low cost improvement.
- Review truck turning paths, and consider the need for widening and/or realignment. It was suggested that trucks encroach on adjacent lanes when turning from both Route 18 northbound and Whitman Street. Review of turning paths is a short-term improvement, while widening and/or realignment is a long-term, potentially high cost improvement.

2.4 Project Notification Form for Improvements to Route 106 East Bridgewater

The Town of East Bridgewater submitted a Project Need Form (PNF) to District 5 in January of 2007. This PNF included a number of potential improvements on Route 106 and at key intersections within the section of Route 106 described in the PNF as starting from the Route 106/Central Street intersection east to a point 200 feet west of the Route 106/Pond Street (Route 104) intersection (approximately 3.3 miles). The improvements included resurfacing, reconstruction and realignment of the roadway and intersections, widening of Route 106, reconstructing and adding sidewalks, and improved traffic control (signage and signalization). The following improvements were recommended:

- The PNF recommended adding traffic signalization and sidewalks (ADA compliant) at the Whitman Street (Route 106)/Plymouth Street intersection. The intersection is currently stop sign and yield sign controlled. The proposed PNF improvements included adding sidewalks to the intersection splitter islands for pedestrian refuge. The PNF stated that the intersection satisfied Warrant 3 of the Manual on Uniform Traffic Control Devices (MUTCD).
- The Route 106/Bridge Street intersection is a four-way intersection with stop control on the minor street (Bridge Street) approaches. According to the PNF, the sight distance on the Bridge Street approaches is limited due to vertical curves in Route 106. The PNF proposed that the Bridge Street northbound approach be shifted westerly to improve the alignment with the southbound approach, thereby improving the sight distance on both approaches. The PNF also stated that the vertical curve on Route 106 could be lowered to improve sight distance, and an overhead flashing beacon could be utilized to increase visibility of the intersection location.
- The PNF stated that Pond Street intersects Route 106 on a skewed angle and includes a large splitter island with two-way traffic on both sides of the island between Pond Street and Route 106. The PNF recommended that the Pond Street be relocated in the center of the large island at a ninety degree angle and Route 106 be widened to allow left turn storage on Route 106 for vehicles turning left from Route 106 to Pond Street.
- The Plymouth Street (Route 106)/Washington Street/Old Plymouth Street intersection is a four-way stop controlled intersection (on the Washington Street southbound and Old Plymouth Street northbound approaches). The minor street (Washington Street and Old Plymouth Street) southbound and northbound approaches to the intersection are acutely skewed at the intersection, creating sight distance problems and additional non-conventional cross-movements. The approaches are so skewed that two offset “T” intersections have been proposed at times for each of the approaches. The PNF stated that the Town is considering signalization for a long term improvement for the intersection, and any improvements at this intersection would include improvements to sidewalks and bicycle access.

2.5 Road Safety Audit Plymouth Street (Route 106) at Washington Street and Old Plymouth Street East Bridgewater

The Old Colony Planning Council completed a Road Safety Audit (RSA) for the Plymouth Street (Route 106) at Washington Street and Old Plymouth Street intersection in East Bridgewater. The Road Safety Audit was coordinated by Old Colony Planning Council with technical assistance from the Massachusetts Department of Transportation (MassDOT). The RSA was held in the Town of East Bridgewater on October 27, 2010. The inventory report included documentation of a discussion of deficiencies and issues identified from the RSA process along with both short-term/lower-cost and long-term/higher cost potential improvements.

The Road Safety Audit concluded that this is a highly complex intersection, with acutely skewed approaches on the northbound and southbound approaches, which leads to driver confusion and high frequency of injuries from crashes. There are high travel speeds through the intersection on Washington Street. The sight lines between Washington Street and Plymouth Street are obscured by signage and roadside vegetation. Drivers are frequently running the stop signs on the minor street Washington Street approach. It is difficult for through traffic on Route 106 to see the paved traffic islands, which blend into the roadway environment. There is also a lack of infrastructure for pedestrians and bicyclists.

The RSA potential improvement recommendations included:

- Enhance the intersection layout with pavement striping that includes highly reflective striping for fog lines, center lines, and stop lines. In the interim, test reconfigurations that include channeling all approaching vehicles from Washington Street to the right with temporary traffic control devices (portable barriers).
- Enhanced speed enforcement.
- Reassess and consolidate signage on traffic islands, and trim back vegetation at the side of the road for better sight lines.
- Install a flashing control beacon and add doubled up oversized stop signs on right and left side of the approaches.
- Reconstruct and realign the intersection to eliminate the skewing, and add a roundabout or traffic signals.

Following the Road Safety Audit, the Town hired an engineering consultant to design improvements to the intersections to be used in the interim before long term improvements are implemented, such as reconstruction and installation of traffic signals or a roundabout. These improvements are shown in Figure 5. Construction to reconfigure the intersection for interim improvements will begin in May of 2019. The medians will be reconfigured on the northbound and southbound approach. Drivers headed south on Washington Street, through movements, will no longer cross Plymouth Street (Route 106). They will instead turn left on Route 106, drive across the intersection a few yards, and turn right onto Old Plymouth Street. Drivers heading north from Old Plymouth Street to Washington Street will turn left onto Route 106 and then right onto Washington Street.

Figure 5



2.6 Road Safety Audit (RSA) Halifax Middle School

Old Colony Planning Council (OCPC) completed the *Pedestrian Road Safety Audit for Plymouth Street (Route 106) Between Post Office and Indian Path Road* in April of 2011 for the Town of Halifax. Staff from OCPC met with the Halifax Traffic Committee prior to the (RSA) to discuss pedestrian safety on Route 106 and at key intersections. In addition, the Town requested that OCPC evaluate moving a mid-block crosswalk on Route 106 between Hemlock Lane and Halifax Town Hall 100 feet west next to the Halifax Town Hall Driveway. The evaluation of the sight distance for this crosswalk (which was separate from the RSA), showed that moving this crosswalk closer to Town Hall would result in inadequate sight distance for vehicles on Route 106 approaching the crosswalk.

The Pedestrian Road Safety Audit (RSA) was coordinated by OCPC with technical assistance from the Massachusetts Department of Transportation (MassDOT). The Study Area comprised of a section of Plymouth Street (Route 106) about six-tenths of a mile long through the Town's main village center district, extending from the US Post Office on the western edge to Indian Path Road. Development in the study area is consistent with tradition New England town centers, with primarily commercial and municipal uses along the roadway, and residential neighborhoods surrounding the center. The trip generators in the RSA study area include the US Post Office, the Halifax Elementary School, and a plaza that contains a fitness center, medical space, and small retail businesses.

The RSA included a review of the latest three-year compilation of crashes within the study area as well as automatic traffic counts, which compiled data on traffic volumes, speeds, and heavy vehicle traffic. In addition, OCPC staff counted pedestrian and bicycle crossings within the study area to discern non-motorized activity and operational safety.

An inventory of deficiencies and issues identified from the Road Safety Audit process was documented along with short-term/lower-cost and long-term/higher cost potential improvements recommended as a result of

the RSA. The Old Colony Planning Council completed a final report and met again with the Halifax Traffic Committee to discuss the findings and recommendations.

Corridor-wide issues included:

- Sidewalk discontinuity and low visibility of crosswalks to approaching motorists due to inconsistent roadway signing and striping, utility pole placement, sidewalk placement, signs not conforming to MUTCD standards, and heavy vegetation and tree canopy along the roadway.
- Sign location and spacing was inconsistent and passing zones and signs denoting passing zones were inconsistent.
- Vehicles on Plymouth Street (Route 106) travel at high rates of speed.
- Lack of access management to adjacent properties (multiple driveways create additional exposure to pedestrians and increased turning movement conflicts for vehicles.)

The RSA included a number of recommended countermeasures, including:

- Relocate signage so the school zone has consistent boundaries in eastbound and westbound directions.
- Remove the “Ped X-ING” Plaques and replace with MUTCD supported signage.
- Remove “No Passing Zone” signage.
- Relocate existing, or place additional dynamic flashing “Your Speed” signs in advance of the school zone.
- Enact left turn restrictions at western-most school driveway at Halifax Elementary School.
- Trim back roadside vegetation and overhanging foliage canopies.
- Install tactile surfaces (truncated domes) on all crosswalk ramps.
- Implement enhanced speed enforcement.

3 Study Area Built Environment and Land Use

Route 106 is a major state numbered east west corridor highway in southeastern Massachusetts. It extends northeast from Route I-95 and I-495 in Plainville and Mansfield to Easton, West Bridgewater, East Bridgewater, Halifax, and Plympton, to Route 3A in Kingston. It connects with Route 123, Route 138, Route 24, Route 28, Route 104, Route 105, Route 58, Route 36, Route 27, and Route 3A.

Route 106 is a two lane facility within the study area scope, except for a short section in East Bridgewater, where it is a four lane cross section between east Center Street and Whitman Street. Route 106 is classified as an Urban Minor Arterial except for two sections. The section of Bedford Street (Route 106), a four-lane section in East Bridgewater (about 0.15 miles) between East and West Street and Whitman Street, is classified as an Urban Principal Arterial, and the section of Main Street (Route 106) in Kingston (a two lane cross section 0.80 miles) is also classified as an Urban Principal Arterial. Route 106, is classified as an Urban Minor Arterial and an Urban Principal Arterial, and is eligible for federal TIP funding under federal statute. The posted speed limits on Route 106 vary between 35, 40, and 45 miles per hour. There is a substantial volume of heavy peak hour vehicle traffic within the corridor due to commuting and due to modest retail/commercial areas and school related traffic. These volumes vary between the communities. Sidewalks are sparse and where provided are intermittent, usually on one side of the road. Figure 6 shows the existing land use within the Route 106 corridor in West Bridgewater and East Bridgewater. Figure 7 shows the existing land use in Halifax, Plympton, and Kingston.

Figure 6

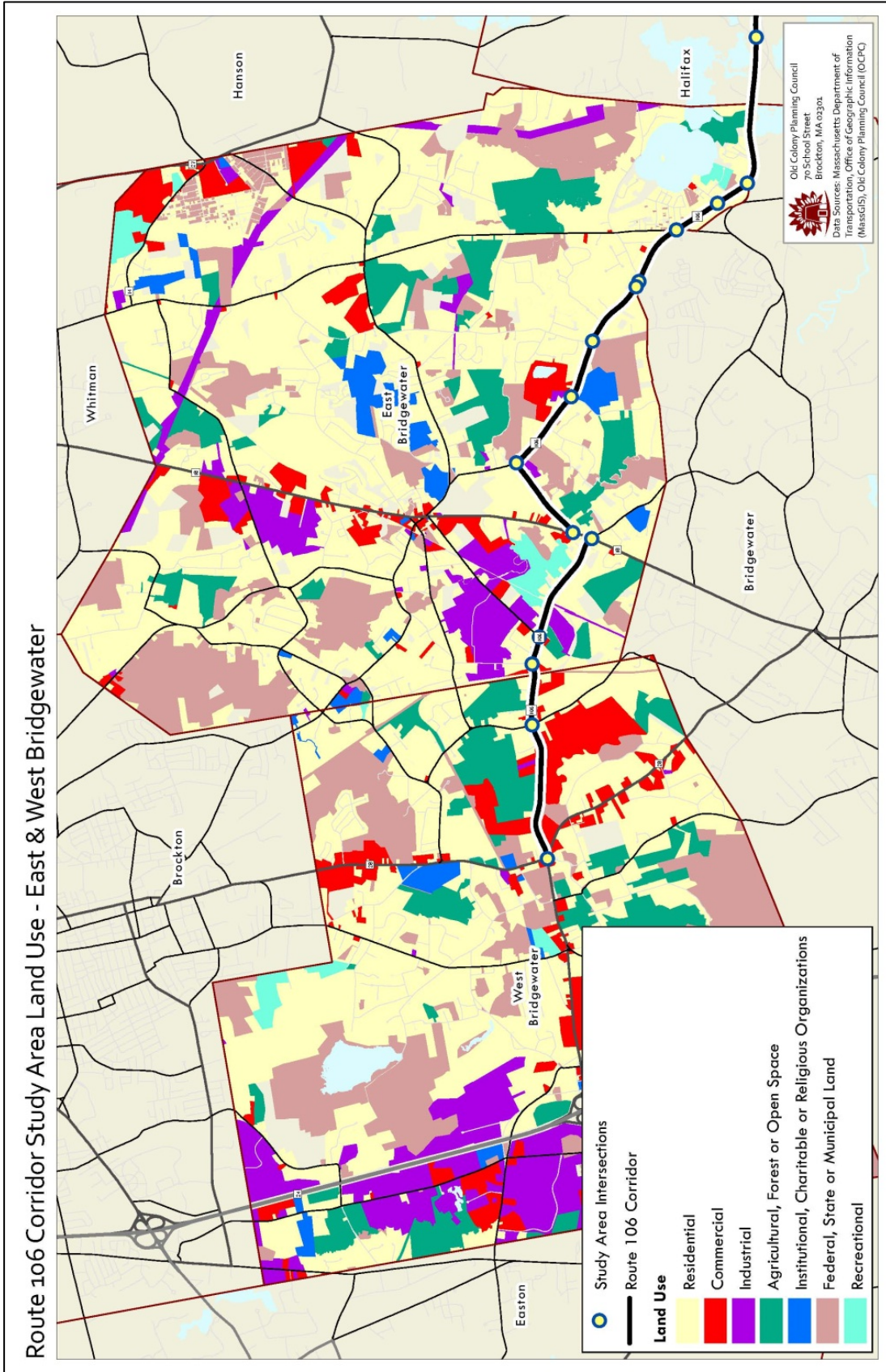


Figure 7

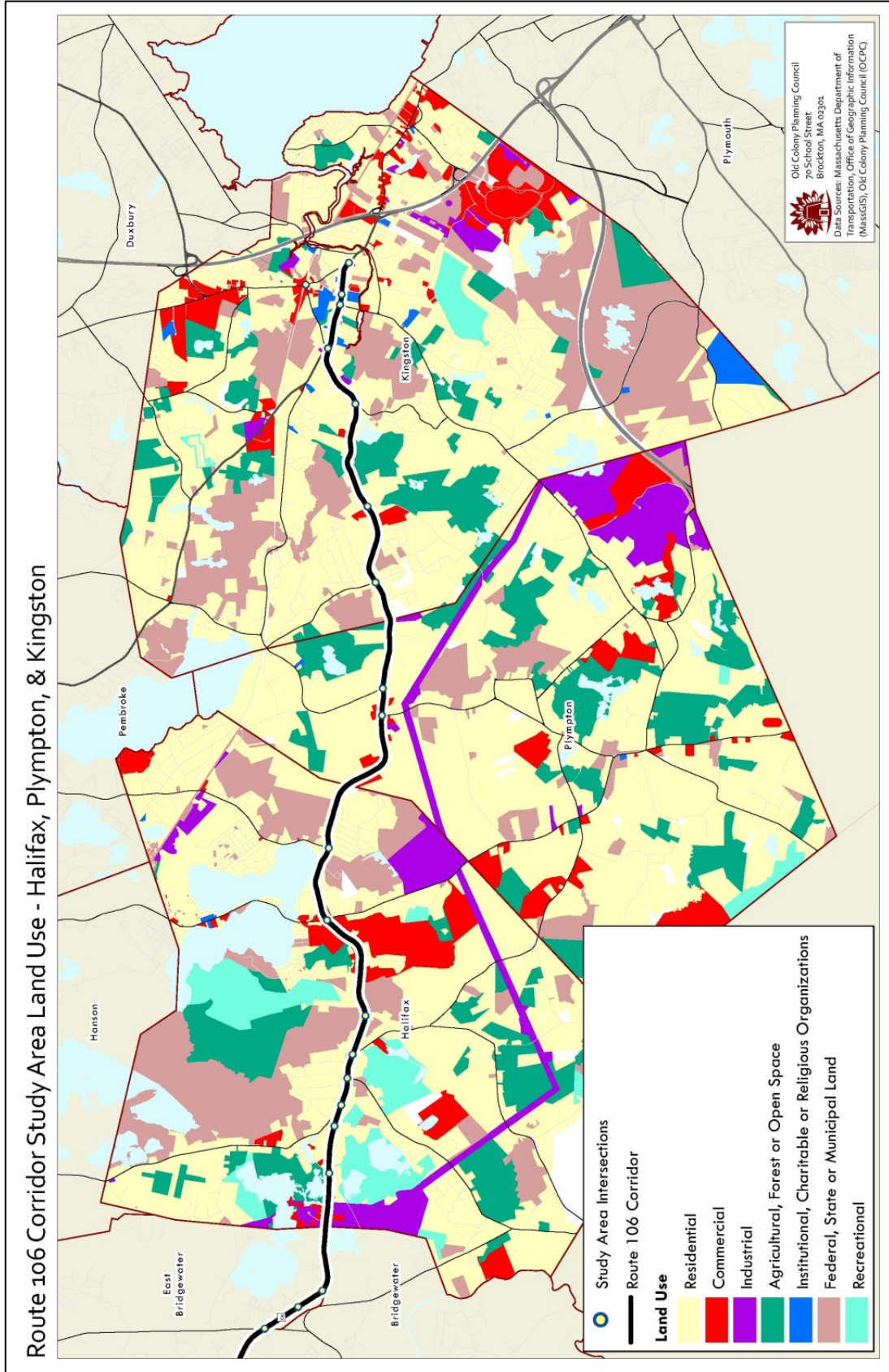


Figure 6 shows that there are substantial commercial land uses along Route 106 in West Bridgewater. Residential parcels are interspersed along Route 106 in West Bridgewater also with open space and agricultural land to the north of Route 106. In East Bridgewater, there are some commercial parcels, as well as industrial parcels located to the north of Route 106, interspersed with residential areas. East Bridgewater also has agricultural land uses and open space within close proximity to the Route 106 corridor. Figure 7 shows that there are substantial residential areas along Route 106 in Halifax, Plympton, and Kingston, interspersed with limited commercial areas, and an industrial area in Halifax

3.1 Livability and Sustainability

The Old Colony Regional Transportation Plan includes goals to incorporate livability principles and sustainable practices into transportation plans and programs for maximizing the efficiency of existing transportation investments, providing better access within and between activity centers, reinvesting in aging suburban corridors, restoring complete streets and networks, and maintaining a transportation system that provides reliable, safe access to jobs, education, health care, and goods and services.

Sustainability encourages alternative, non-motorized modes to conserve energy and reduce reliance on fossil fuels. Principles for creating more sustainable neighborhoods include designing streets and the rights-of-way to encourage shared pedestrian, bicycle, and vehicular use. A new design strategy, often referred to as “Complete Streets,” enables safe road access and operation for all users including pedestrians, bicyclists, motorists, and public transportation users of all ages and abilities. Complete Streets make it easy to cross the street, walk, and bicycle to and from destinations (shops, work, school, etc.) by integrating safety for non-motorized travel in the design and construction of roads.

The Federal Highway Administration (FHWA) defines Livability in the following way: “Livability is about tying the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, high quality schools, and safe streets. This includes addressing safety and capacity issues on all roads through better planning and design.”

MassDOT’s Healthy Transportation Directive commits to maintaining a transportation network that serves all mode choices. In addition, Massachusetts has allocated \$12.5 million for two years beginning in 2016 for Complete Streets Policy development and implementation. The Massachusetts Complete Streets Program presents an opportunity for funding and implementing livability principles and sustainable practices. OCPC provides support for member communities who participate in the state’s Complete Streets funding program. Based on information from MassDOT, West Bridgewater is the only community that has formally participated in the Massachusetts Complete Streets Funding Program, although the Transportation Committees in Halifax and Kingston have both discussed adopting a Complete Streets policy, and therefore achieve eligibility for the program. West Bridgewater has submitted a letter of intent to MassDOT to begin participation in the program.

4 Existing Traffic and Operational Conditions

4.1 Average Daily Traffic, Prevailing Speeds, and Heavy Vehicles

OCPC utilized automatic traffic recorders placed at various points along the Route 106 corridor and on important intersecting streets to determine the average daily traffic (ADT) within the study area. The traffic recorders were installed for a minimum 48-hour period and recorded traffic for both directions of travel in fifteen minute intervals. In addition, 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. Table 7 shows the average daily traffic (Vehicles Per Day, VPD), 24-hour total for both directions of travel on Route 106, as well as the

prevailing 85th percentile speeds (Miles Per Hour, MPH), and the percentage of heavy vehicles in the traffic flow for Route 106 in the study area communities. Table 7 also shows the average daily traffic, the prevailing 85th percentile speeds, and the percentage of heavy vehicles for intersecting streets and on Route 106. The automatic traffic recorder count reports are included in the appendix to this study.

Table 7 – Automatic Traffic Recorder Counts on Route 106

	Location	Year of count	ADT	85th %	Trucks
1	East Center Street (Route 106) east of East Street - West Bridgewater	2017	14,529	40 MPH	8.9%
2	East Center Street (Route 106) west of East Street - West Bridgewater	2017	16,731	43 MPH	11.4%
3	West Street (Route 106), west of Bedford St (Route 18) - East Bridgewater	2012	10,494	43 MPH	7.5%
4	Bedford Street (Route 18/106) north of West Street (Route 106) - East Bridgewater	2016	22,686	NA	NA
5	Whitman Street (Route 106) east of Bedford Street (Route 18/106) - East Bridgewater	2017	10,545	43 MPH	7.5%
6	Plymouth Street (Route 106) east of Whitman Street - East Bridgewater	2017	12,326	42 MPH	7.4%
7	Plymouth Street (Route 106) west of Old Plymouth Street (Route 104) - East Bridgewater	2017	7,834	47 MPH	11%
8	Plymouth Street (Route 106) east of Old Plymouth Street (Route 104) - East Bridgewater	2017	12,108	47 MPH	8.6%
9	Plymouth (Route 106) west of Thompson Street (Route 105) - Halifax	2017	13,311	47 MPH	10.1%
10	Plymouth (Route 106) east of Thompson Street (Route 105) - Halifax	2017	15,930	40 MPH	6.1%
11	Plymouth (Route 106), east of Holmes (Route 36)- Halifax	2017	6,721	46 MPH	12%
12	County Road (Route 106) west of Lake Street - Plympton	2018	7,662	44 MPH	11%
13	County Road (Route 106) at the Kingston/Plympton Town Line	2018	5,564	44 MPH	10.3%
14	Main St (Route 106) west of Elm Street - Kingston	2016	13,450	39 MPH	10.2%
15	Main St (Route 106) west of Summer Street (Route 3A) - Kingston	2016	12,006	38 MPH	6.7%

The heaviest daily traffic volumes with the Route 106 corridor study occurs on the four-way cross section in East Bridgewater on Bedford Street, which is designated as Route 106 and Route 18. This section of Route 106 carries 22,686 Vehicles per Day (VPD). Other locations that experienced high daily traffic volumes include East Center Street (Route 106) east of East Street in West Bridgewater with 14,529 VPD, East Center Street (Route 106) west of East Street in West Bridgewater, with 16,731 VPD, Plymouth Street (Route 106) east of Whitman Street in East Bridgewater with 12,326 VPD, Plymouth Street (Route 106) east of Old Plymouth Street (Route 104) in East Bridgewater with 12,108 VPD, Plymouth (Route 106) east of Thompson Street (Route 105) in Halifax with 15,930 VPD, Plymouth (Route 106) west of Thompson Street (Route 105) in Halifax with 13,311 VPD, and Main St (Route 106) west of Summer Street (Route 3A) in Kingston with 13,450 VPD. Figure 8 and Figure 9 show the automatic traffic recorder count locations.

Figure 8

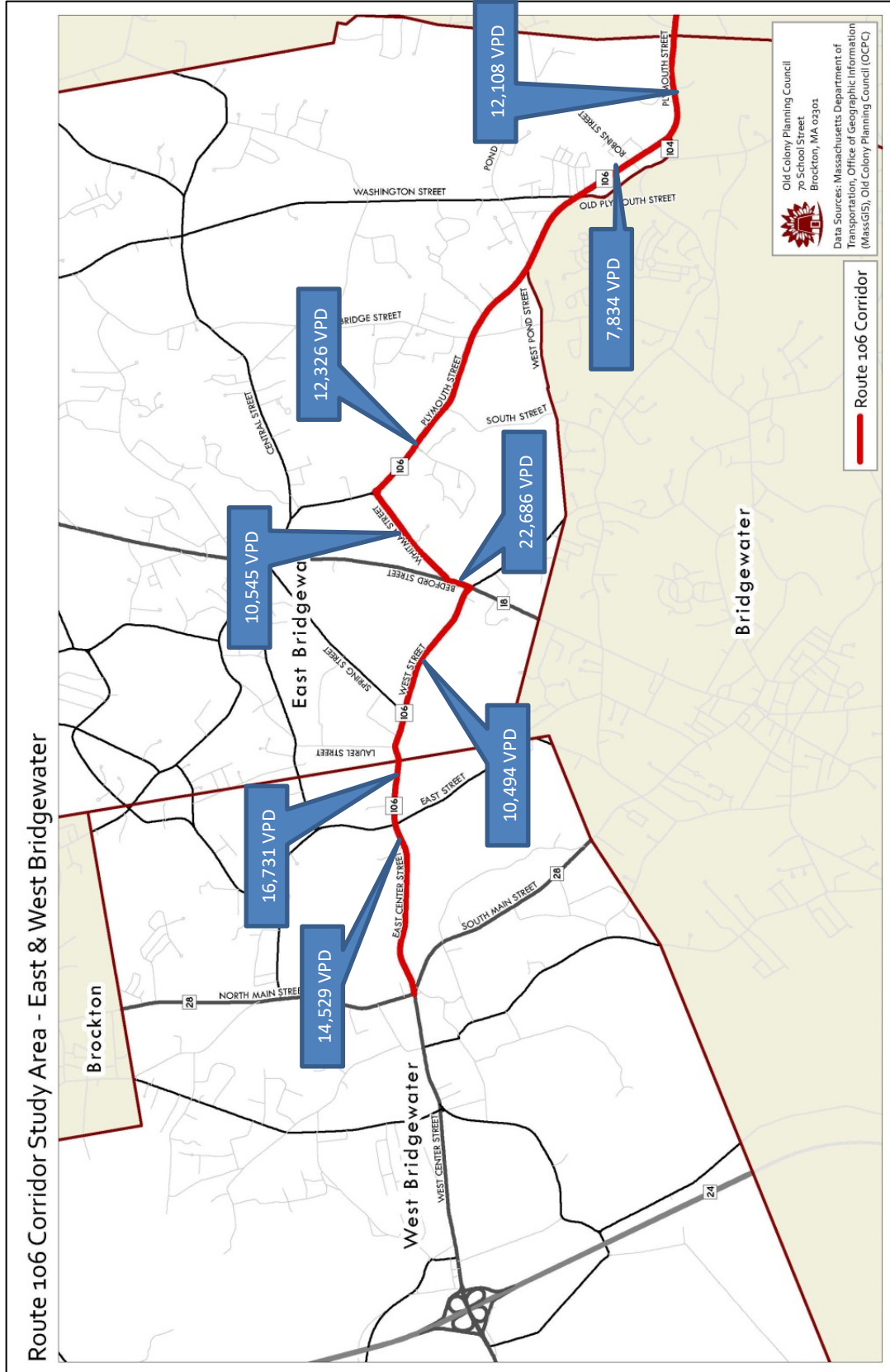
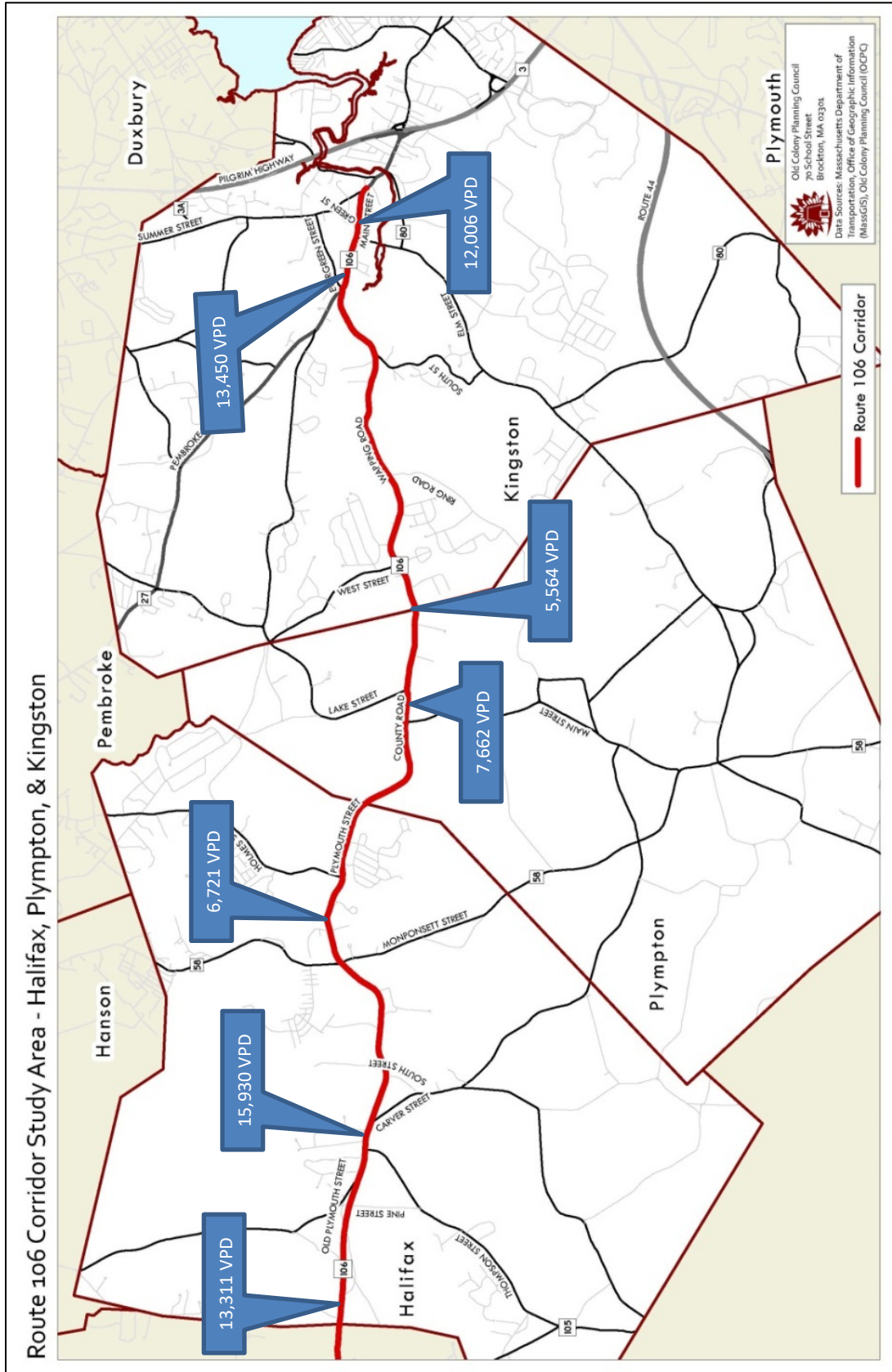


Figure 9



4.2 Intersection Peak Hour Levels-of-Service (LOS)

This study includes analysis at thirty-one intersections (eight signalized and twenty-three un-signalized) in the Route 106 corridor study area. 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. It 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. Level-of-service “F” represents forced flow or bottleneck conditions. The following, from the *Highway Capacity Manual*, 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 as operations approach the capacity of the facility. 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 corridors, time delay, average stop delay, and average travel speed are used as measures of operational effectiveness to which levels-of-service are assigned. Table 8 shows the delay criteria for each level-of-service for both un-signalized and signalized intersections.

Table 8 - 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

Source: *Highway Capacity Manual*

Table 9 summarizes the signalized and unsignalized levels-of-service for the study area intersections under existing peak hour conditions in the study area. The analysis includes the morning a.m. peak hour and the p.m. peak hour. Failed traffic operations at intersections in Tables 9 (LOS “E” and “F”) are shown in shaded blocks. Level-of-Service “D” represents long delays and back-ups with volumes approaching congestion.

Table 9 – Route 106 Intersection Existing Peak Hour Level-of-Service

	Intersection	Community	Traffic Control	Existing AM LOS	Existing PM LOS
1	East and West Center Street (Route 106) at Route 28	W Bridgewater	Signal	F	F
2	East Center Street (Route 106) at East Street	W Bridgewater	Signal	B	B
3	West Street (Route 106) at Spring Street	E Bridgewater	Stop Sign		
	Spring Street Southbound left/through/right			C	F
	West Street (Route 106) eastbound left			A	A
4	West Street (Route 106) at Bedford Street (Route 18) and East Street	E Bridgewater	Signal	B	B
5	Bedford Street (Route 18/106) at Whitman Street (Route 106)	E Bridgewater	Signal	B	B
6	Whitman Street (Route 106) at Plymouth Street (Route 106)	E Bridgewater	Stop Sign		
	Whitman Street (Route 106)Northbound left/right			F	F
	Plymouth Street (Route 106) westbound left			A	A
7	Plymouth Street (Route 106) at South Street	E Bridgewater	Stop Sign		
	South Street Northbound left/right			B	C
	Plymouth Street (Route 106) Westbound left			A	A
8	Plymouth Street (Route 106) at Bridge Street	E Bridgewater	Stop Sign		
	Bridge Street Northbound left/through/right			D	F
	Bridge Street Southbound left/through/right			C	E
	Plymouth Street (Route 106) Eastbound/Westbound left			A	A
9	Plymouth Street (Route 106) at West Pond Street	E Bridgewater	Stop Sign		
	West Pond Street Northbound left/right			A	B
	Route 106 Westbound left turn			A	A
10	Plymouth Street (Route 106) at Pond Street	E Bridgewater	Stop Sign		
	Pond Street Southbound left/right			B	D
	Plymouth Street (Route 106) Eastbound left			A	A
11	Plymouth Street (Route 106) at Washington Street and Old Plymouth Street	E Bridgewater	Stop Sign		
	Old Plymouth Street Northbound left/through/right			E	D
	Washington Street Southbound left/through/right			C	F
	Plymouth Street (Route 106) Eastbound/Westbound left			A	A
12	Plymouth Street (Route 106) at Old Plymouth Street (Route 104)	E Bridgewater	Stop Sign		
	Old Plymouth Street (Route 104) Northbound left/right			B	C
	Plymouth Street Westbound left			A	A
13	Plymouth Street (Route 106) at Old Plymouth Street (western intersection)	Halifax	Stop Sign		
	Old Plymouth Street (west section) southbound left/right			B	B
	Route 106 Eastbound left turn			A	A
14	Plymouth Street (Route 106) at Pine Street	Halifax	Stop Sign		
	Pine Street Northbound left/through/right			D	E
	Pine Street Southbound left/through/right			C	E
	Plymouth Street (Route 106) Eastbound/Westbound left			A	A

Table 9 – Route 106 Intersection Existing Peak Hour Level-of-Service (continued)

	Intersection	Community	Traffic Control	Existing AM LOS	Existing PM LOS
15	Plymouth Street (Route 106) at Old Plymouth Street (eastern intersection)	Halifax	Stop Sign		
	Old Plymouth Street (eastern) southbound left and right			C	E
	Plymouth Street (Route 106) Eastbound left turns			A	A
16	Plymouth Street (Route 106) at Thompson Drive (Route 105)	Halifax	Stop Sign		
	Thompson Drive Northbound left/right			B	C
	Plymouth Street (Route 106) Westbound through			B	C
	Plymouth Street (Route 106) Westbound left			A	A
17	Plymouth Street (Route 106) at Carver Street	Halifax	Stop Sign		
	Carver Street Northbound left/right			F	F
	Plymouth Street (Route 106) Westbound through/left			A	A
18	Plymouth Street (Route 106) at South Street	Halifax	Stop Sign		
	South Street Northbound left/right			B	C
	Plymouth Street (Route 106) Westbound through/left			A	A
19	Plymouth Street (Route 106) at Stop and Shop Plaza	Halifax	Signal	A	B
20	Plymouth Street (Route 106) at Wal-Mart	Halifax	Signal	C	C
21	Plymouth Street (Route 106) at Monponsett Street (Route 58)	Halifax	Signal	C	C
22	Plymouth Street (Route 106) at Holmes Street (Route 36)	Halifax	Stop Sign		
	Holmes Street (Route 36) Southbound left/right turns			C	C
	Plymouth Street (Route 106) Eastbound left turns			A	A
23	County Road (Route 106) at Main Street	Plympton	Stop Sign		
	Main Street Northbound left/right turns			B	B
	County Road (Route 106) Westbound through/left turns			A	A
24	County Road (Route 106) at Lake Street	Plympton	Stop Sign		
	Lake Street Southbound left/right turns			B	B
	County Road (Route 106) Eastbound through/left turns			A	A
25	Wapping Road (Route 106) at Ring Road	Kingston	Stop Sign		
	Ring Road Northbound left/right turns			B	B
	Wapping Road (Route 106) Westbound through/left turns			A	A
26	Wapping Road (Route 106) at South Street	Kingston	Stop Sign		
	South Street Northbound left/right			B	B
	Wapping Road (Route 106) Westbound through/left turns			A	A
27	Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street	Kingston	Signal	D	D
28	Main Street (Route 106) at Elm Street	Kingston	Stop Sign		
	Elm Street Northbound left/right turns			C	F
	Main Street westbound left turns			A	B
29	Main Street (Route 106) at Green Street	Kingston	Stop Sign		
	Green Street Southbound left and right turn			B	C
	Main Street (Route 106) Eastbound left turns			A	A
30	Main Street (Route 106) at Summer Street (Route 3A)	Kingston	Stop Sign		
	Main Street (Route 106) Eastbound Right Turns			C	D
	Main Street (Route 3A) northbound left turns			A	A
31	Main Street (Route 3A) at Evergreen Street	Kingston	Signal	B	B

Table 9 shows that the intersection of East and West Center Street (Route 106) at Route 28 in West Bridgewater operates at LOS “F” during the morning and afternoon peak hours. Reconstruction of this intersection was completed in 2016. The project consisted of intersection improvements at the intersection of Route 28 (which is state owned) and Route 106 (which is under Town jurisdiction) to address congestion issues in West Bridgewater's downtown area (Central Square). The unsignalized intersection of East Center Street (Route 106) at East Street in West Bridgewater also experiences LOS “F” conditions during the morning and afternoon peak hours. The East Center Street (Route 106) at East Street intersection in West Bridgewater is currently under reconstruction. The reconstruction includes signalizing the intersection.

In East Bridgewater there are four unsignalized intersections that experience failed levels-of-service (LOS) under existing morning or afternoon peak hour conditions. The intersection of West Street (Route 106) at Spring Street experiences LOS “F” during the afternoon peak hour, the Whitman Street (Route 106) at Plymouth Street (Route 106) intersection experiences LOS “F” during the morning and afternoon peak hours, the Plymouth Street (Route 106) at Bridge Street intersection experiences LOS “F” during the afternoon peak hour, and the Plymouth Street (Route 106) at Washington Street and Old Plymouth Street intersection experiences LOS “E” during the morning peak hour and LOS “F” during the afternoon peak hour.

Halifax has three intersections, which are all unsignalized, that experience failed levels-of-service. These include the Plymouth Street (Route 106) at Pine Street intersection, which experiences LOS “E” during the afternoon peak hour, the Plymouth Street (Route 106) at Old Plymouth Street (eastern intersection), which experiences LOS “E” during the afternoon peak hour, and the Plymouth Street (Route 106) at Carver Street intersection, which experiences LOS “F” during the morning and afternoon peak hours.

Kingston has only one intersection, which is unsignalized, that operates under failed conditions. The Main Street (Route 106) at Elm Street operates under LOS “F” conditions during the afternoon peak hour. The signalized Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street intersection in Kingston, although not at failed LOS “E” or “F” conditions, operates under LOS “D” conditions, with long delays and queues during the morning and afternoon peak hours.

4.3 Intersection Crash Experience

Crash data for the study area intersections within the Route 106 corridor study area was obtained for the latest available three-year period (2014-2015-2016) from the Massachusetts Department of Transportation (MassDOT). The data is made available by the Massachusetts Registry of Motor Vehicles and then compiled by MassDOT. The data was analyzed by OCPC in accordance with the standard practices published by the Institute of Transportation Engineers (ITE) in the *Manual of Traffic Engineering Studies*. Crash rates were calculated and compared with the average crash rates for Massachusetts and for MassDOT District 5.

Crash rates are used, according to the *Manual of Traffic Engineering Studies*, to characterize the crash exposure of a facility. Crash rates for intersections are calculated based on the average number of crashes per million entering vehicles (MEV). The statewide average crash rates are 0.78 MEV for signalized intersections and 0.57 MEV for un-signalized intersections. The MassDOT District 5 average crash rates are 0.75 MEV for signalized intersections and 0.57 MEV for un-signalized intersections.

The purposes for analyzing crash data include:

- To define and identify high crash locations.
- To justify 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.

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- To identify a need for traffic enforcement.
- To identify needs in pedestrian and bicycle safety and certain actions causing crashes that can be prevented through driver and/or public education.

The number of crashes often increases as traffic volumes increase. Traffic growth creates more opportunities for crashes and therefore increases vehicle exposure to crashes. A particular condition that causes crashes at an intersection can become exacerbated with increased traffic, and crash frequency will therefore rise. The crash rate utilized for intersection analysis is the crash rate per million entering vehicles, which 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 10 summarizes the number of crashes and corresponding crash rates for the study area corridor intersections for the three year history 2014, 2015, and 2016. Crash rates that exceed the statewide and District 5 crash rate averages are shaded in Table 10.

Table 10 - Intersection Crashes and Crash Rates (2014, 2015, 2016)

	Intersection	Community	Injury	Fatal	Total	Crash Rate
1	East and West Center Street (Route 106) at Route 28 (signal)	West Bridgewater	12	1	80	2.58
2	East Center Street (Route 106) at East Street (signal)	West Bridgewater	7	0	21	1.05
3	West Street (Route 106) at Spring Street (stop sign)	East Bridgewater	4	0	12	0.19
4	West Street (Route 106) at Bedford Street (Route 18) and East Street (signal)	East Bridgewater	23	0	78	2.47
5	Bedford Street (Route 18/106) at Whitman Street (Route 106) (signal)	East Bridgewater	2	0	11	0.42
6	Whitman Street (Route 106) at Plymouth Street (Route 106) (stop sign)	East Bridgewater	1	1	5	0.20
7	Plymouth Street (Route 106) at South Street (stop sign)	East Bridgewater	2	0	8	0.56
8	Plymouth Street (Route 106) at Bridge Street (stop sign)	East Bridgewater	3	0	13	0.86
9	Plymouth Street (Route 106) at West Pond Street (stop sign)	East Bridgewater	0	0	0	0.00
10	Plymouth Street (Route 106) at Pond Street (stop sign)	East Bridgewater	4	0	6	0.60
11	Plymouth Street (Route 106) at Washington Street and Old Plymouth Street (stop sign)	East Bridgewater	7	0	18	1.30
12	Plymouth Street (Route 106) at Old Plymouth Street (Route 104) (stop sign)	East Bridgewater	1	0	5	0.34
13	Plymouth Street (Route 106) at Old Plymouth Street (western intersection) (stop sign)	Halifax	2	0	5	0.40
14	Plymouth Street (Route 106) at Pine Street (stop sign)	Halifax	4	0	10	0.67
15	Plymouth Street (Route 106) at Old Plymouth Street (eastern intersection) (stop sign)	Halifax	1	0	1	0.07
16	Plymouth Street (Route 106) at Thompson Drive (Route 105) (stop sign)	Halifax	0	0	6	0.35
17	Plymouth Street (Route 106) at Carver Street (stop sign)	Halifax	1	0	7	0.35
18	Plymouth Street (Route 106) at South Street (stop sign)	Halifax	0	0	8	0.48
19	Plymouth Street (Route 106) at Stop and Shop Plaza (signal)	Halifax	3	0	7	0.21
20	Plymouth Street (Route 106) at Wal-Mart (signal)	Halifax	0	0	1	0.05
21	Plymouth Street (Route 106) at Monponsett Street (Route 58) (signal)	Halifax	8	0	28	1.15
22	Plymouth Street (Route 106) at Holmes Street (Route 36) (stop sign)	Halifax	3	0	8	0.62
23	County Road (Route 106) at Main Street (stop sign)	Plympton	0	0	2	0.22
24	County Road (Route 106) at Lake Street (stop sign)	Plympton	0	0	0	0.00
25	Wapping Road (Route 106) at Ring Road (stop sign)	Kingston	2	0	4	0.47
26	Wapping Road (Route 106) at South Street (stop sign)	Kingston	1	0	5	0.54
27	Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street (signal)	Kingston	3	0	25	1.25
28	Main Street (Route 106) at Elm Street (stop sign)	Kingston	2	0	7	0.33
29	Main Street (Route 3A) at Green Street (stop sign)	Kingston	1	0	1	0.07
30	Main Street (Route 106) at Summer Street (Route 3A) (stop sign)	Kingston	6	1	16	0.78
31	Main Street (Route 3A) at Evergreen Street (signal)	Kingston	0	0	4	0.25

Table 10 shows that three fatalities occurred during the three year study period. These occurred at three different intersections including East and West Center Street (Route 106) at Main Street (Route 28) in West Bridgewater, Whitman Street (Route 106) at Plymouth Street (Route 106) in East Bridgewater, and at Main Street (Route 106) at Summer Street (Route 3A) in Kingston.

Table 10 shows that the highest number of crashes within the Route 106 corridor study area occurred at the East and West Center Street (Route 106) at Route 28 signalized intersection in West Bridgewater with 80 crashes in the three year period. The West Street (Route 106) at Bedford Street (Route 18) and East Street intersection in East Bridgewater had the second highest number of crashes with 78 crashes within the three year period. Other intersections with a high number of crashes included the signalized Plymouth Street (Route 106) at Monponsett Street (Route 58) intersection in Halifax with 28 crashes within the three year period and the Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street signalized intersection with 25 crashes. The East Center Street (Route 106) at East Street intersection in West Bridgewater, which is stop sign controlled, had 21 crashes within the three year period. The top five intersections with the most crashes are signalized, except for the East Center Street (Route 106) at East Street in East Bridgewater; however, construction is currently underway to install traffic signals at this intersection.

The East and West Center Street (Route 106) at Route 28 intersection in West Bridgewater also had the highest crash rate at 2.58 crashes per million entering vehicles (MEV) with the West Street (Route 106) at Bedford Street (Route 18) and East Street intersection in East Bridgewater second with a 2.47 MEV rate. Other intersections with elevated crash rates over 1.00 MEV include the East Center Street (Route 106) at East Street intersection in West Bridgewater (1.05 MEV), the Plymouth Street (Route 106) at Washington Street and Old Plymouth Street intersection in East Bridgewater (1.30 MEV), the Plymouth Street (Route 106) at Monponsett Street (Route 58) in Halifax (1.15 MEV), and the Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street intersection (1.25 MEV).

MassDOT issues the *Top High Crash Locations Report* each year. The current report includes the top 200 high crash intersection locations using crash data obtained from the Massachusetts Registry of Motor Vehicles. This report includes the weighted (by crash severity) highest frequency motor vehicle crash locations and also the highest frequency bicycle-motor vehicle and pedestrian-motor vehicle crash locations. In addition, the MassDOT maintains an interactive map showing the top crash locations within each regional planning agency region for motor vehicle crashes, pedestrian crashes, and bicycle crashes (the top five percent crash locations within a region are eligible for the Highway Safety Improvement Program, HSIP). There were no intersections within the Route 106 corridor that are included in the top 200 high crash intersection list; however there are a number of intersections that are included in the top five percent crash locations within the OCPC Region. These include the East and West Center Street (Route 106) at Route 28 in West Bridgewater, the East Center Street (Route 106) at East Street intersection in West Bridgewater, the West Street (Route 106) at Bedford Street (Route 18) and East Street intersection in East Bridgewater, and the Plymouth Street (Route 106) at Monponsett Street (Route 58) intersection in Halifax.

4.4 Pavement Conditions

OCPC uses pavement management software (PMS) to maintain a region-wide data base of pavement surface conditions for federal aid roads. The PMS includes a data base that documents the severity and extent of pavement deterioration and the implications for cost of maintenance and repair. The severity and extent of pavement surface deterioration is obtained via a windshield survey of roads and then entered into the PMS. The software calculates Pavement Condition Index (PCI) scores for the surveyed road segments. The field survey evaluations are based on the severity and extent of specific surface condition criteria

including: potholes and patching, alligator cracking, distortion, rutting, weathering and block cracking, transverse and longitudinal cracking, bleeding and polished aggregate, surface wear and raveling, corrugations, shoving, and slippage. The PMS software calculates Pavement Condition Index (PCI) scores for the surveyed road segments, as a deduction is assigned for each distress as well as the extent of the distress. Each road or road segment is placed in a condition category based on the calculated PCI. These categories include “POOR” (PCI = 0 to 60), “DEFICIENT” (PCI = 61 to 72), “FAIR” (PCI = 73 to 85), “GOOD” (PCI 86 to 92), and “EXCELLENT (PCI = 93 to 100). The software recommends a repair and associated cost for each road and/or road segment. The PMS repair and maintenance strategies fall under five general default strategies. These include:

1. Base Reconstruction – This is recommended for road segments with a PCI between 0 and 60. This is recommended for roads in need of base improvement. Typical repairs include full depth reconstruction and reclamation.
2. Structural Improvement (Rehabilitation) – This is recommended for road segments with a PCI between 61 and 72. This is recommended when the pavement surface structure is in need of added strength for existing traffic. Typical repairs may include overlay with or without milling.
3. Preventive Maintenance – This is recommended for road segments with a PCI between 73 and 85. The pavement surface may be in need of surface sealing, full depth patch and/or crack sealing. This could include minor leveling, as well as surface treatments such as chip seals, micro-surfacing, and thin overlays.
4. Routine Maintenance – This is recommended for road segments with a PCI between 86 and 92. This is recommended when the surface may be in need of crack sealing or minor localized repair. This work may include crack sealing and pothole and full depth patching.
5. No Immediate Maintenance or Repair – This category is for road segments with a PCI between 93 and 100, and the surface is considered in excellent condition.

OCPC conducted a windshield survey of the Route 106 corridor in the study area communities. The windshield survey results were documented and added to the PMS software database. Potential improvement recommendations, along with associated estimated costs, were matched with the segments of the Route 106 corridor.

OCPC’s region-wide Pavement Management System includes all roads eligible for federal aid, including Route 106 in West Bridgewater, East Bridgewater, Halifax, Plympton, and Kingston. Table 11 summarizes the results of the Route 106 pavement management analysis in the study area. Table 11 shows that the Pavement Condition Index (PCI), (which characterizes the surface condition). Figure 10 and Figure 11 show the Route 106 pavement conditions and the potential recommendations.

Table 11 – Pavement Condition Index (PCI)

ROUTE 106 STREET NAME	COMMUNITY	FROM	TO	LENGTH (FEET)	ROAD CLASS	RECOMMENDED REPAIR	ESTIMATED COST	CURRENT PCI
East Center Street	West Bridgewater	Route 28	Private Drive 513 feet east of Route 28	513	Minor Arterial	None	\$0.0	99
East Center Street	West Bridgewater	Private Drive 513 feet east of Route 28	East Bridgewater	6,881	Minor Arterial	Base Rehabilitation	\$825,748	58
West Street	East Bridgewater	West Bridgewater	Bedford Street (Route 18/ Route 106)	6,245	Minor Arterial	Routine Maintenance	\$16,653	86
Bedford Street	East Bridgewater	West Street	Whitman Street	219	Principal Arterial	None	\$0.0	99
Whitman Street	East Bridgewater	Bedford Street	Plymouth Street	3,881	Minor Arterial	Routine Maintenance	\$9,262	88
Plymouth Street	East Bridgewater	Whitman Street	South Street	3,279	Minor Arterial	Routine Maintenance	\$11,635	88
Plymouth Street	East Bridgewater	South Street	500 feet east of Washington Street	7,165	Minor Arterial	None	\$0.0	99
Plymouth Street	East Bridgewater	500 feet east of Washington Street	Route 104	4,109	Minor Arterial	Base Rehabilitation	\$451,989	48
Plymouth Street	East Bridgewater	Route 104	Halifax Line	3,115	Minor Arterial	None	\$0.0	99
Plymouth Street	Halifax	East Bridgewater Line	Stony Weir Road	7,696	Minor Arterial	Routine Maintenance	\$18,811	89
Plymouth Street	Halifax	Stony Weir Road	Plympton Line	15,227	Minor Arterial	Structural Improvement	\$745,501	68
County Road	Plympton	Halifax Line	Kingston Line	9,122	Major Collector	Preventative Maintenance	\$111,497	73
Wapping Road	Kingston	Plympton Line	Hawthorne Road	939	Minor Arterial	Preventative Maintenance	\$2,296	87
Wapping Road	Kingston	Hawthorne Road	Evergreen Street	13,434	Minor Arterial	Routine Maintenance	\$159,686	85
Main Street	Kingston	Evergreen Street	Route 3A	4,276	Minor Arterial	None	\$0.0	99
Total				72,462			\$1,510,677	

Table 11 shows that Route 106 in West Bridgewater east of Route 28 to the East Bridgewater line is in Poor condition and requires Base Rehabilitation, (except for a short 513 foot section east of Route 28 that is in Excellent condition). Route 106 in East Bridgewater is in Excellent and Good condition requiring No Maintenance or Routine Maintenance. In East Bridgewater, Route 106 east of the West Bridgewater line, the road is in Good condition and requires Routine Maintenance to Route 18. Bedford Street, which is signed as Route 106 and Route 18 for a short four-lane section (approximately 219 feet), requires No Maintenance. As Route 106 continues along Whitman Street, the road is in Good condition and requires Routine Maintenance. As Route 106 continues along Plymouth Street in East Bridgewater, the road requires Routine Maintenance to South Street. East of South Street in East Bridgewater, Route 106 is in Excellent condition to a point about 500 feet west of Washington Street. Route 106 is in Poor condition requiring Base Rehabilitation from this point (500 feet west of Washington Street) up to the Route 104 intersection.

Route 106 in Halifax is in Good condition from the East Bridgewater line to Stony Weir Road, requiring Routine Maintenance. From Stony Weir Road east to the Plympton line in Halifax, Route 106 is in Fair condition requiring Structural Improvement. Route 106 in Plympton is in Fair condition requiring Preventative Maintenance. In Kingston, Route 106 is in Good Condition and Excellent condition. It is in Good condition from the Plympton Line to Evergreen Street requiring Preventative and Routine Maintenance. From Evergreen Street to Route 3A, Route 106 in Kingston is in Excellent Condition requiring No Maintenance. Figure 10 and Figure 11 show the pavement recommendations on Route 106 within the study area.

Figure 10

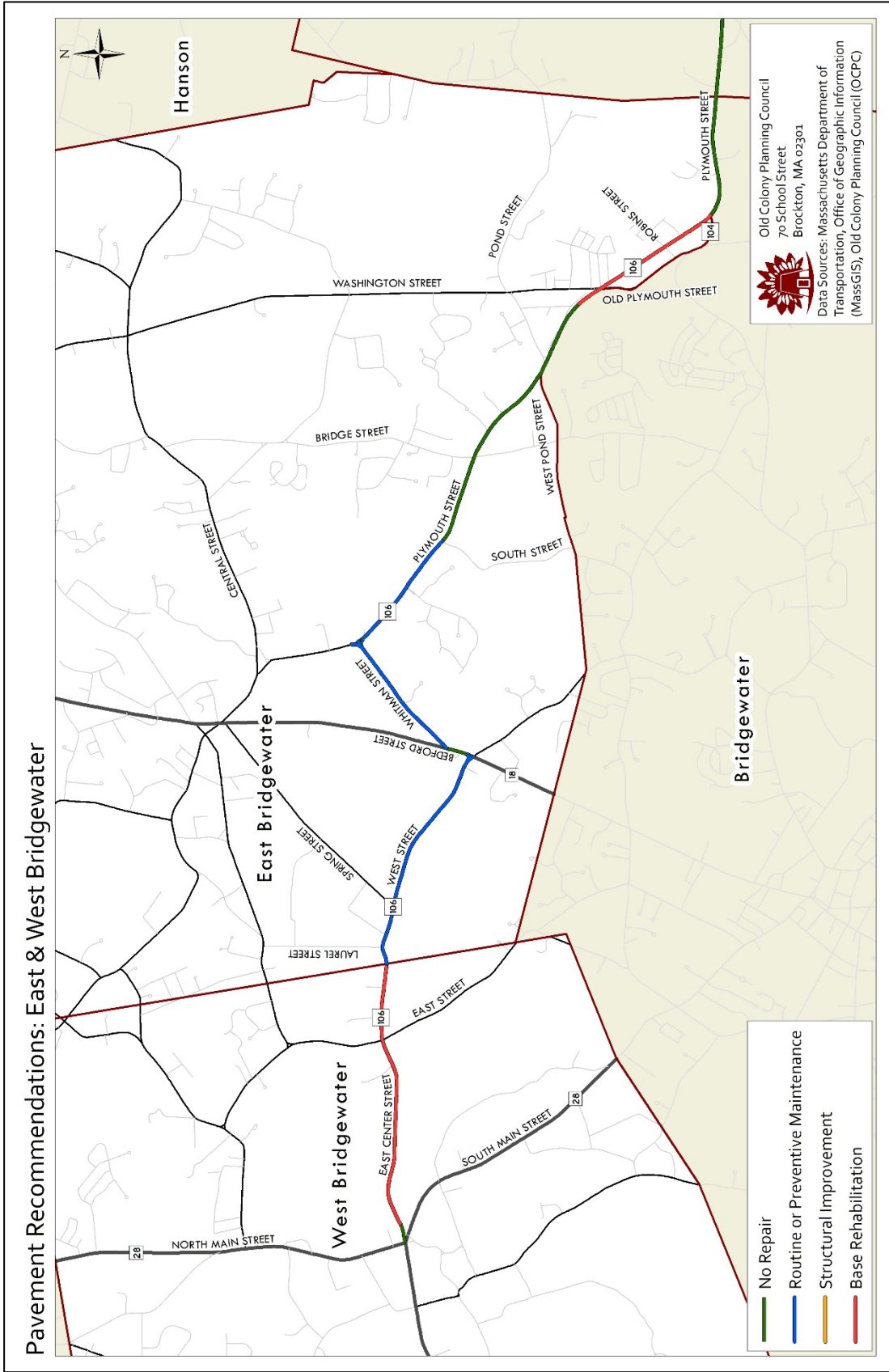
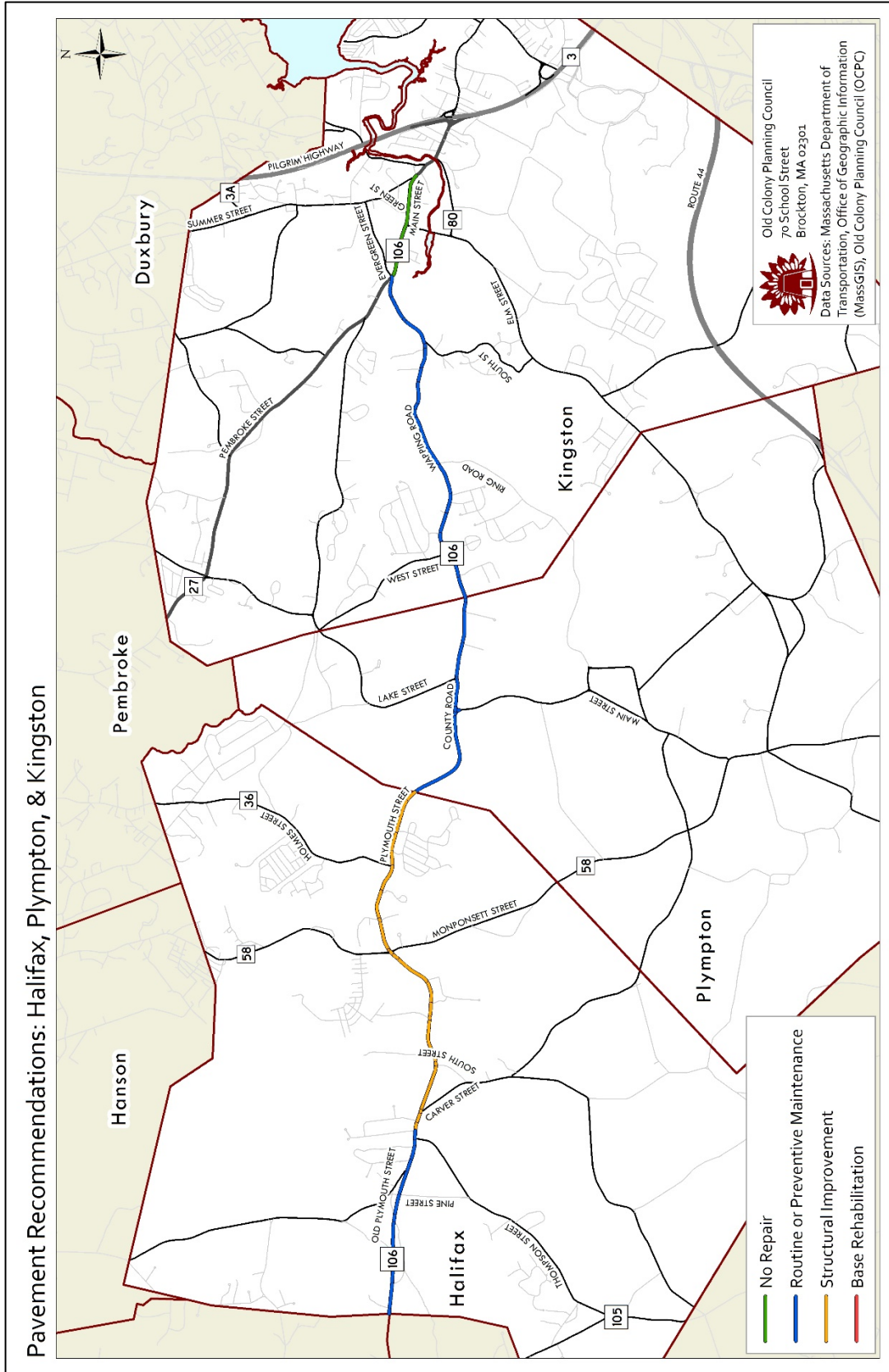


Figure 11



4.5 Environmental Issues

Any improvements for safety and/or to relieve congestion should take into account the diversity of environmental features in a particular area. The study area along Route 106 is urban and developed, especially in the vicinity of major intersections (Route 28 in West Bridgewater, Route 18 in East Bridgewater, Route 58 in Halifax, and Route 3A in Kingston). Route 106 is mostly rural in character interspersed with residential and commercial uses. Drainage issues can be a concern especially within specific areas within the study area. There are a number of streams and brooks that intersect the road, as well as ponds and wetlands along the corridor. These are not usually visible from the road.

In West Bridgewater, the Town River intersects Route 106 between Route 28 and East Street. In East Bridgewater the Matfield River intersects Bedford Street (Route 106/Route 18). Further west on Route 106 in East Bridgewater, the Sawtucket River runs beneath Route 106 at the Whitman Street/Plymouth Street (Route 106) intersection.

In Halifax, Robbins Pond is located just north of Route 106 between Route 104 and Route 105. In addition, there are wetlands in this area to the south of Route 106. In addition, Monponsett Pond is located off of Route 58 in Halifax just north of the Route 106/Route 58 intersection. In Kingston, the Jones River runs beneath Wapping Road (Route 106) just west of the Wapping Road, Evergreen Street/Main Street intersection.

5 Future Conditions and Operations

5.1 Future Traffic Analysis (NO-BUILD)

A five-year time horizon (Year 2023) has been chosen for analysis of future conditions, which is consistent with state guidelines for traffic studies. An average annual growth rate of 1.0 percent was used as a background growth rate to increase 2018 traffic to approximate future 2023 No-Build conditions. The average annual growth rate was derived from the overall regional growth for roads and arterials similar to the study area based on previous traffic counts in the OCPC region and archived by OCPC in its automatic traffic count program. These archived traffic counts are included in the appendix to this report.

No-Build conditions assume there are no improvements made to the intersection within the next five years. Intersection peak hour levels-of-service for the morning and afternoon peak hours were performed for the future morning and afternoon peak hour turning movement traffic estimates. Table 12 summarizes the intersection levels-of-service for the study area intersections under No-Build peak hour conditions for the study area intersections.

Table 12 shows that the levels-of-service (LOS) from existing to the future No-Build LOS at the study area intersections will remain mostly the same, except for some slight changes at some of the study area locations. Most of these occur in East Bridgewater. At the West Street (Route 106) at Spring Street intersection, the LOS during the AM peak for the Spring Street Southbound left, through, and right movement, will go from LOS "C" to LOS "D". At the signalized West Street (Route 106) at Bedford Street (Route 18) and East Street intersection in East Bridgewater, the LOS is expected to go from LOS "B" to LOS "C" during the PM peak hour. At the unsignalized Plymouth Street (Route 106)/Bridge Street intersection in East Bridgewater, the LOS is expected to go from LOS "D" to LOD "E" for the Bridge Street northbound left, through, and right shared lane during the AM peak hour. The Plymouth Street (Route 106) at Washington Street and Old Plymouth Street intersection in East Bridgewater is expected to LOS experience changes at the northbound and southbound approaches from existing to No-Build conditions. The northbound shared lane will go from LOS "D" to "E" during the PM peak and the southbound shared lane

will go from LOS “C” to “D” during the AM peak. At the Plymouth Street (Route 106) at Old Plymouth Street (Route 104) intersection in East Bridgewater, the Northbound left and right turn shared lane is expected to go from LOS “B” to “C” during the AM peak hour.

Table 12 shows that in Halifax, at the Plymouth Street (Route 106) at Thompson Drive (Route 105) intersection, the LOS is expected to go from LOS “B” to “C” on the northbound shared left and right turn lane during the AM peak hour. In Kingston, there are changes at two intersections. The Main Street (Route 106) at Elm Street intersection will experience a drop from LOS “C” to LOS “D” during the AM peak hour, and the Main Street (Route 106) at Summer Street (Route 3A) intersection will go from LOS “D” to “E” during the PM peak hour.

Table 12 - No-Build 2023 Route 106 Intersection Levels-of-Service

	Intersection	Community	Traffic Control	Existing AM LOS	Existing PM LOS	2023 No-Build AM LOS	2023 No-Build PM LOS
1	East and West Center Street (Route 106) at Route 28	W Bridgewater	Signal	F	F	F	F
2	East Center Street (Route 106) at East Street	W Bridgewater	Signal	B	B	B	C
3	West Street (Route 106) at Spring Street	E Bridgewater	Stop Sign				
	Spring Street Southbound left/through/right			C	F	D	F
	West Street (Route 106) eastbound left			A	A	A	A
4	West Street (Route 106) at Bedford Street (Route 18) and East Street	E Bridgewater	Signal	B	B	B	C
5	Bedford Street (Route 18/106) at Whitman Street (Route 106)	E Bridgewater	Signal	B	B	B	B
6	Whitman Street (Route 106) at Plymouth Street (Route 106)	E Bridgewater	Stop Sign				
	Whitman Street (Route 106) Northbound left/right			F	F	F	F
	Plymouth Street (Route 106) westbound left			A	A	A	A
7	Plymouth Street (Route 106) at South Street	E Bridgewater	Stop Sign				
	South Street Northbound left/right			B	C	B	C
	Plymouth Street (Route 106) Westbound left			A	A	A	A
8	Plymouth Street (Route 106) at Bridge Street	E Bridgewater	Stop Sign				
	Bridge Street Northbound left/through/right			D	F	E	F
	Bridge Street Southbound left/through/right			C	E	C	E
	Plymouth Street (Route 106) Eastbound/Westbound left			A	A	A	A
9	Plymouth Street (Route 106) at West Pond Street	E Bridgewater	Stop Sign				
	West Pond Street Northbound left/right			A	B	A	B
	Route 106 Westbound left turn			A	A	A	A
10	Plymouth Street (Route 106) at Pond Street	E Bridgewater	Stop Sign				
	Pond Street Southbound left/right			B	D	B	D
	Plymouth Street (Route 106) Eastbound left			A	A	A	A
11	Plymouth Street (Route 106) at Washington Street and Old Plymouth Street	E Bridgewater	Stop Sign				
	Old Plymouth Street Northbound left/through/right			E	D	E	E
	Washington Street Southbound left/through/right			C	F	D	F
	Plymouth Street (Route 106) Eastbound/Westbound left			A	A	A	A
12	Plymouth Street (Route 106) at Old Plymouth Street (Route 104)	E Bridgewater	Stop Sign				
	Old Plymouth Street (Route 104) Northbound left/right			B	C	C	C
	Plymouth Street Westbound left			A	A	A	A
13	Plymouth Street (Route 106) at Old Plymouth Street (western intersection)	Halifax	Stop Sign				
	Old Plymouth Street (west section) southbound left/right			B	B	B	B
	Route 106 Eastbound left turn			A	A	A	A
14	Plymouth Street (Route 106) at Pine Street	Halifax	Stop Sign				
	Pine Street Northbound left/through/right			D	E	D	E
	Pine Street Southbound left/through/right			C	E	C	E
	Plymouth Street (Route 106) Eastbound/Westbound left			A	A	A	A

Table 12 - No-Build 2023 Route 106 Intersection Levels-of-Service (continued)

	Intersection	Community	Traffic Control	Existing AM LOS	Existing PM LOS	2023 No-Build AM LOS	2023 No-Build PM LOS
15	Plymouth Street (Route 106) at Old Plymouth Street (eastern intersection)	Halifax	Stop Sign				
	Old Plymouth Street (eastern) southbound left and right			C	E	C	E
	Plymouth Street (Route 106) Eastbound left turns			A	A	A	A
16	Plymouth Street (Route 106) at Thompson Drive (Route 105)	Halifax	Stop Sign				
	Thompson Drive Northbound left/right			B	C	C	C
	Plymouth Street (Route 106) Westbound through			B	A	B	A
	Plymouth Street (Route 106) Westbound left			A	A	A	A
17	Plymouth Street (Route 106) at Carver Street	Halifax	Stop Sign				
	Carver Street Northbound left/right			F	F	F	F
	Plymouth Street (Route 106) Westbound through/left			A	A	A	A
18	Plymouth Street (Route 106) at South Street	Halifax	Stop Sign				
	South Street Northbound left/right			B	C	B	C
	Plymouth Street (Route 106) Westbound through/left			A	A	A	A
19	Plymouth Street (Route 106) at Stop and Shop Plaza	Halifax	Signal	A	B	A	B
20	Plymouth Street (Route 106) at Wal-Mart	Halifax	Signal	C	C	C	C
21	Plymouth Street (Route 106) at Monponsett Street (Route 58)	Halifax	Signal	C	C	C	C
22	Plymouth Street (Route 106) at Holmes Street (Route 36)	Halifax	Stop Sign				
	Holmes Street (Route 36) Southbound left/right turns			C	C	C	C
	Plymouth Street (Route 106) Eastbound left turns			A	A	A	A
23	County Road (Route 106) at Main Street	Plympton	Stop Sign				
	Main Street Northbound left/right turns			B	B	B	B
	County Road (Route 106) Westbound through/left turns			A	A	A	A
24	County Road (Route 106) at Lake Street	Plympton	Stop Sign				
	Lake Street Southbound left/right turns			B	B	B	B
	County Road (Route 106) Eastbound through/left turns			A	A	A	A
25	Wapping Road (Route 106) at Ring Road	Kingston	Stop Sign				
	Ring Road Northbound left/right turns			B	B	B	B
	Wapping Road (Route 106) Westbound through/left turns			A	A	A	A
26	Wapping Road (Route 106) at South Street	Kingston	Stop Sign				
	South Street Northbound left/right			B	B	B	B
	Wapping Road (Route 106) Westbound through/left turns			A	A	A	A
27	Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street	Kingston	Signal	D	D	D	D
28	Main Street (Route 106) at Elm Street	Kingston	Stop Sign				
	Elm Street Northbound left/right turns			C	F	D	F
	Main Street westbound left turns			A	B	A	B
29	Main Street (Route 106) at Green Street	Kingston	Stop Sign				
	Green Street Southbound left and right turn			B	C	B	C
	Main Street (Route 106) Eastbound left turns			A	A	A	A
30	Main Street (Route 106) at Summer Street (Route 3A)	Kingston	Stop Sign				
	Main Street (Route 106) Eastbound Right Turns			C	D	C	E
	Main Street (Route 3A) northbound left turns			A	A	A	A
31	Main Street (Route 3A) at Evergreen Street	Kingston	Signal	B	B	B	B

6 Conclusions and Recommendations

A number of alternative recommendations are considered in this study based on the public outreach program, which included stakeholder meetings and public workshops. OCPC conducted a broad based comprehensive outreach program, which included reaching out to local public officials in the study area communities and meetings regarding their vision for the corridor. Previous studies that focused on the study area were also taken into consideration as well as proven techniques to ameliorate specific congestion and safety problems. In addition, improvement techniques and best practices presented as alternative solutions for consideration were derived from those outlined in the National Cooperative Highway Research Program (NCHRP) Report 500 series. The reports documented best practices in different areas of emphasis (safety at signalized intersections, un-signalized intersections, pedestrian and bicycle safety, etc.) The study goal is to identify and develop short-term and long-term actions and specific improvements that will enhance circulation and traffic flow, improve safety, improve bicycle and pedestrian accommodation, and reduce gaps to essential services. In addition, OCPC analysis efforts were undertaken to enhance safety and protect regional mobility, which is a stated goal in the *Old Colony Regional Transportation Plan*. Build peak hour levels-of-service were performed using the No-Build volumes under Build conditions. Build conditions assume the potential improvements are in place.

6.1 Corridor Wide Issues and Recommendations

Heavy peak period traffic volumes within the Route 106 corridor, especially in West Bridgewater and East Bridgewater, combined with limited availability of dedicated turning lanes results in traffic congestion and vehicle queuing along the corridor, especially within the morning and afternoon peak hours. In addition, vehicles attempting to enter Route 106 from the side streets or driveways, especially during the peak hours, experience frustration due to the lack of sufficient gaps in the Route 106 traffic stream. This creates “forced flow” conditions on some of the unsignalized side roads where vehicles force their way to the main Route 106 traffic flow creating unsafe turning movements.

Corridor-wide improvements include restriping faded lines and pavement markings, replacing faded signs and updating retro-reflectivity of signs to the latest MUTCD standards, updating signal-timing and phasing, including signal coordination, and updating antiquated signal equipment including overhead signal facing.

MassDOT typically categorizes short-term (<1 year), midterm (1 to 3 years), or long-term (typically >3 years). Long-term improvements are typically considered to be substantial improvements with an expected time frame for implementation greater than 3 years. The costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,000).

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

Overall short-term improvements:

- Pavement marking revision and re-striping (centerlines, crosswalks, fog lines, side street stop lines), and improved markings for bicycle lanes.
- Re-evaluate crosswalk locations and strategic use of the Rapid Rectangular Flashing Beacon (RRFB).
- Evaluate potential changes in lane usage.
- New and revised signing upgraded to meet MUTCD reflectivity standards.
- Replace missing or damaged signs and or post legal limit signs where none exist.
- Post signs for shared use bicycle paths where feasible.
- Improve lighting along the road and at intersections.

- Construct, reconstruct, and replace sidewalks and add curb ramps in conformance with the Americans with Disabilities Act.
- Enhance speed management by providing immediate and strict speed enforcement.
- Traffic signal updates and modifications (improvements to equipment, coordination, and timing and phasing).
- Enhance street lighting in the corridor.

Overall long-term improvements:

- Continue to utilize pavement management system.
- Request that OCPC routinely monitor traffic conditions as part of its regional growth monitoring efforts.
- Study area communities should continue to participate in the Joint Transportation Committee (JTC) and Metropolitan Planning Organization (MPO) meetings.

6.2 Potential Recommendations Summary

Table 13 summarizes the study findings, recommended improvements, and estimated implementation periods for the study area corridor and intersections.

Table 13 – Potential Recommendations Summary

Location	Findings	Potential Recommendations	Future Plans
West Bridgewater - Main Street (Route 28)/East Center Street (Route 106)	Heavy volumes on Route 106 lead to long queues during morning and afternoon peak hours. There are a high number of crashes at the intersection. This intersection is also included in the OCPC region top 5 percent crash clusters (HSIP eligible).	This intersection is a five-way intersection, which was redesigned and reconstructed in 2016.	This intersection was redesigned and reconstructed in 2016; the heavy peak volumes on Route 106 should be monitored.
West Bridgewater – East Center Street (Route 106) at East Street	Morning and afternoon peak hour levels-of-service are at “F” (failed) for the minor street (stop sign) northbound and southbound approaches. Poor sight distances on the minor street approaches, high number of crashes and crash rate. This intersection is also included in the OCPC region top 5 percent crash clusters (HSIP eligible).	The intersection has been reconstructed and signals installed.	Construction is completed.
East Bridgewater – Whitman Street (Route 106) at Plymouth Street (Route 106)	This intersection has experienced a fatal crash within the last three years. The Whitman Street stop sign approach experiences LOS “F” during the morning and afternoon peak hours.	The reconstruction and signalization of this intersection was included in a Project Notification Form (PNF) submitted by the town. The PNF stated that this intersection satisfied Warrant 3 for signal installation.	The town is considering resubmitting a PNF that includes this project.
East Bridgewater – Plymouth Street (Route 106) at Bridge Street	There is poor sight distance on the stop signed minor street Bridge Street approach. The intersection experiences failed (LOS “E” and “F”) on the northbound and southbound minor street approaches.	Improvements, realignment of the northbound approach, at this intersection were included in a Project Notification Form (PNF) previously submitted by the town. The PNF also includes adding flashing beacons, (red on the stop sign approaches and yellow on the Route 106 major street approach.	The town is considering resubmitting a PNF that includes this project, which includes shifting the Bridge Street northbound approach west to improve alignment and sight distances, as well as adding flashing beacons.
East Bridgewater – Plymouth Street (Route 106) at Pond Street	The intersection is poorly aligned with sight distance problems on the Pond Street southbound approach. The Pond Street southbound approach has a large island with traffic entering and exiting Route 106 at both sides of the island (thereby creating two separate “T” intersections).	The reconstruction and realignment of this intersection was included in a Project Notification Form (PNF) previously submitted by the town. Pond Street would be realigned through the middle of the existing island to create one “T” type intersection with Route 106. A small island on the Route 106 westbound approach would be added to channelize right turns from Route 106.	The town is considering resubmitting a PNF that includes this project.
East Bridgewater – Plymouth Street (Route 106) at Washington Street and Old Plymouth Street	This intersection is poorly aligned with dramatically skewed approaches to Route 106. There are a high number of crashes and the crash rate is double the average. The LOS is “E” and “F” for the PM peak hour.	The recommendations include reconstructing and realigning the intersection and installing traffic signals.	The town is expected to submit a PNF to District 5 for improvements and has already developed design plans for interim improvements.

Table 13 – Potential Recommendations Summary (continued)

Location	Findings	Potential Recommendations	Future Plans
Halifax – Elementary School	Queued vehicles on Halifax Elementary pick-up and drop-off site back up onto Route 106 creating safety hazards.	Improve Halifax Elementary School on site pick-up and drop-off area to get queued vehicles off of Route 106.	Town has approved a plan to improve safety at the Halifax Elementary School- improvements to the site access for drop off pick up storage to get queued vehicles off Route 106
Halifax – Route 106 at three signalized intersections, Route 106 at Stop and Shop, Route 106 at Wal-Mart, and Route 106 at Route 58	The signals and signal timing and phasing are antiquated.	Update the signal equipment and timing and phasing to include actuation and signal coordination.	
Kingston - Wapping Road (Route 106) at Pembroke/Evergreen	High crash location, poor alignment.	Re-align the intersection to create a conventional four-way intersection.	
Kingston – Main Street (Route 106) between Evergreen Street and Route 3A	High peak hour volumes on Main Street (Route 106) create long delays for vehicles entering from side Streets, LOS “F” for the PM peak for vehicles entering from Elm Street to Main Street.		Kingston initiative to create an historic district and Complete Streets roadway improvements.
Kingston – Main Street (Route 106) at Summer Street (Route 3A)	Poor alignment and sight distance on the Main Street (Route 106) eastbound approach.	Realign the intersection and consider signalization.	

6.2.1 West Bridgewater – East Center Street (Route 106) at East Street

The East Center Street (Route 106)/East Street four-way intersection has been the subject of previous local transportation studies conducted by OCPC for the Town of West Bridgewater. In a previous local study, OCPC determined that conditions warranted installation of traffic signals at the intersection, and that traffic signals are likely the most appropriate form of traffic control for this intersection, based on guidance from the *Manual On Uniform Traffic Control Devices (MUTCD)* and the analysis of data collection. In the local study, this intersection satisfied four of the eight warrants for traffic signal installation published in the *Manual On Uniform Traffic Control Devices*.

This intersection is a high crash location, (HSIP eligible 5% cluster). The intersection is misaligned requiring geometric improvements as well as the installation of a traffic signal. The Town of West Bridgewater passed a town warrant to provide \$511,000 in funds for signal installation and the project has been completed. Table 14 summarizes the previous stop sign conditions, and existing signalized peak hour levels-of-service. Table 14 summarizes the crash data and the existing and future levels-of-service. Table 14 shows that the signal installation, which is now completed, improved the existing levels-of-service to “B” during the AM peak hour and “C” during the PM peak hour.

Table 14 Summary of Existing and Future Conditions for the East Center Street (Route 106)/East Street Intersection

Jurisdiction	Crashes	Crash Rate	AM Peak LOS (Stop Sign minor street)	PM Peak LOS (Stop Sign minor street)	Existing (Signalized) AM LOS	Existing (Signalized) PM LOS
Town of West Bridgewater	21	1.05	F	F	B	B

Figure 12 shows the East Center Street (Route 106)/East Street Intersection.

Figure 12 East Center Street (Route 106)/East Street Intersection



6.2.2 East Bridgewater – Whitman Street (Route 106) at Plymouth Street (Route 106)

Whitman Street (Route 106) at Plymouth Street in East Bridgewater forms a “T”-type intersection east of Bedford Street (Route 18). The intersection is stop controlled on the Whitman Street approach and has three islands. The islands channel right turns from Whitman Street northeast approach to Plymouth Street and Plymouth Street right turns from Plymouth Street southeast to Whitman Street southwest. The intersection lacks sidewalks on the Plymouth Street approaches as well as ADA accessible ramps. Although the intersection crash rate is below the state and MassDOT District 5 average, this intersection experienced a fatal crash within the study three year crash history. There is an old factory located on the south west corner of the intersection, adjacent to Whitman Street and the Satucket River, which flows beneath the intersection (the river at one time was used to power the factory). Table 15 summarizes the existing crash and existing and future peak hour levels-of-service (LOS) for the intersection. The existing and future No-Build LOS (stop sign controlled) is at LOS “F” and the future signalized LOS is expected to be at LOS “B” for MA and PM peak hours. Improvements for this intersection were included in a Project Notification Form

(PNF) submitted to MassDOT by the town for federal funding (2007); however, at the time, the improvement funding was not approved at that time. The improvements included adding sidewalks and signaling the intersection, (the PNF showed that the intersection satisfied signal warrants as published in the FHWA’s *Manual On Uniform Traffic Control Devices*.

Table 15 Summary of Existing and Future Conditions for the Whitman Street (Route 106)/ Plymouth Street Intersection

Jurisdiction	Crashes	Crash Rate	AM Peak LOS (minor street)	PM Peak LOS (minor street)	No-Build AM LOS (minor street)	No-Build PM LOS (minor street)	Build (Signalized) AM LOS	Build (Signalized) PM LOS
Town of East Bridgewater	11	0.42	F	F	F	F	B	B

6.2.3 East Bridgewater – Plymouth Street (Route 106) at Bridge Street

This intersection is a conventional four-way intersection located east of the Whitman Street (Route 106) at Plymouth Street (Route 106) intersection in East Bridgewater. The stop signs are located on the Bridge Street (minor street) approach. Improvements to this intersection were also included in the Project Notification Form (PNF) submitted to MassDOT in 2007. These improvements include shifting the northbound approach to the west to better align with the southbound approach and improve sight distances. It includes removing a vertical curve on Route 106 as well to improve sight distances. The improvements include adding flashing beacons, (red on the stop signed northbound and southbound approaches and yellow on the Route 106 approaches).

Table 16 Summary of Existing and Future Conditions for the Plymouth Street (Route 106)/ Bridge Street Intersection

Jurisdiction	Crashes	Crash Rate	AM Peak LOS (minor street)	PM Peak LOS (minor street)	No-Build AM LOS (minor street)	No-Build PM LOS (minor street)
Town of East Bridgewater	13	0.86	D	F	E	F

6.2.4 East Bridgewater - Plymouth Street (Route 106) at Pond Street

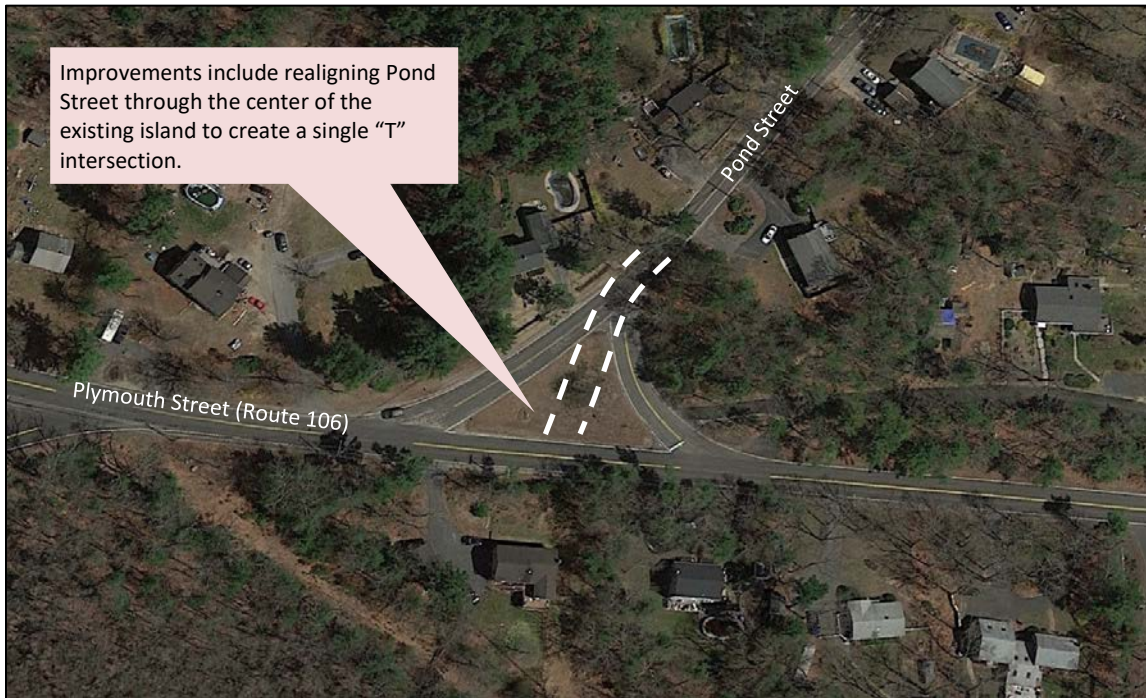
Plymouth Street (Route 106) at Pond Street is a poorly aligned intersection with sight distance problems on the Pond Street southbound approach. The Pond Street southbound approach has a large island with traffic entering and exiting Route 106 at both sides of the island, thereby creating two separate “T” intersections. Table 17 summarizes the existing and future conditions at the intersection.

Table 17 Summary of Existing and Future Conditions for the Plymouth Street (Route 106)/Pond Street Intersection

Jurisdiction	Crashes	Crash Rate	AM Peak LOS (minor street)	PM Peak LOS (minor street)	No-Build AM LOS (minor street)	No-Build PM LOS (minor street)
Town of East Bridgewater	6	0.60	B	D	B	D

The reconstruction and realignment of this intersection was included in the 2007 Project Notification Form (PNF) submitted by the Town of East Bridgewater. Pond Street would be realigned through the middle of the existing island to create one “T” type intersection with Route 106. A small island on the Route 106 westbound approach would be added to channelize right turns from Route 106. Figure 13 shows the Plymouth Street at Pond Street intersection.

Figure 13



6.2.5 East Bridgewater - Plymouth Street (Route 106) at Washington Street and Old Plymouth Street

Plymouth Street (Route 106) Washington Street and Old Plymouth Street in East Bridgewater intersect as a four-way unsignalized intersection, but at highly skewed angles. The intersection features the intersection of two main roads, Plymouth Street (Route 106) and Washington Street/Old Plymouth Street. In addition, a local minor street (Murray Road) intersects the Washington Street southbound approach and another local minor street, Beverly Circle intersects the Old Plymouth Street northbound approach. There are splitter islands on the northbound and southbound approaches to channel right turns. Figure 14 shows the intersection.

The intersection sometimes operates as two separate intersections with Plymouth Street (Route 106) as the major street. Vehicles were observed on the Washington Street southbound approach to turn right at the splitter island, then left onto Route 106 and then left again to continue southbound onto Old Plymouth Street instead of staying through on Washington Street southbound through the intersection to Old Plymouth Street southbound. Vehicles headed northbound on the Old Plymouth Street approach often do the same in the opposite direction; turning right at the splitter island, then left onto Route 106, and then right again onto Washington Street northbound. These extra turning movements at the intersection create additional conflicts and driver confusion at the intersection.

Washington Street and Old Plymouth Street are classified as Urban Minor Arterials, and Murray Road and Beverly Circle are local roads (Beverly Circle is in Bridgewater and Murray Road is in East Bridgewater). The intersection is under the jurisdiction of the Town of East Bridgewater. A restaurant is located on the northwest corner of the intersection, and multiple dwelling condominium structures are located southeast of the intersection. The remaining of the surrounding area features single family residences and undeveloped woodland. Each leg of the intersection features single lane, shared movement approaches. Plymouth Street (Route 106) is uncontrolled, while all other approaches are controlled by stop signs. Both the Washington Street southbound approach and Old Plymouth Street northbound approach feature, islands, flared turning channels, for right turns out of Washington Street as well as for receiving left turns from Plymouth Street. None of the roadways include shoulders, and there are no sidewalks in the area except on Beverly Circle. Table 18 summarizes existing and future conditions for the intersection.

Table 18 Summary of Existing and Future Conditions for the Plymouth Street (Route 106)/Washington Street/Old Plymouth Street Intersection

Jurisdiction	Crashes	Crash Rate	AM Peak LOS (minor street)	PM Peak LOS (minor street)	No-Build AM LOS (minor street)	No-Build PM LOS (minor street)	Build (Signalized) AM LOS	Build (Signalized) PM LOS
Town of East Bridgewater	18	1.30	E	F	E	F	B	B

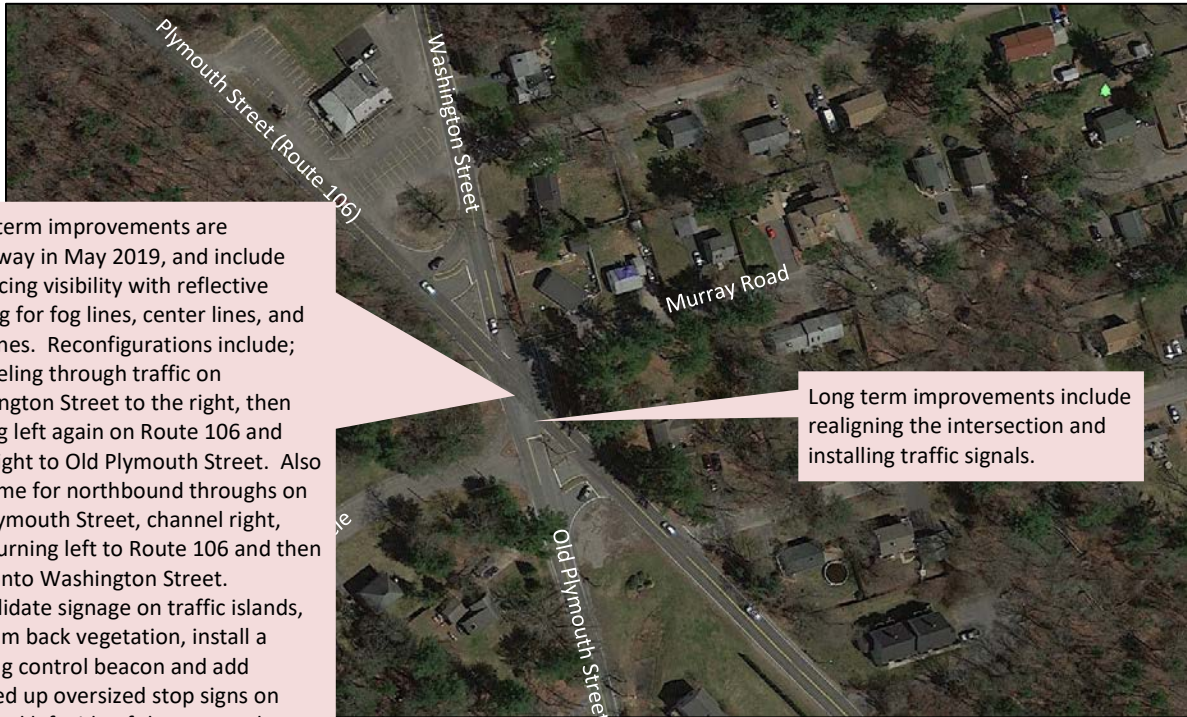
This intersection has been the subject of previous traffic studies, including the Plymouth Street (Route 106) at Washington Street, East Bridgewater Road Safety Audit, which was completed for the Town of East Bridgewater in 2011. This intersection was also included in the town’s 2007 Project Notification Form. The recommended improvements for this intersection include short term improvements as well as long term improvements.

The 2011 Road Safety Audit completed for this intersection concluded that this is a highly complex intersection, with driver confusion due to acutely skewed approaches on the northbound and southbound approaches. This leads to a high frequency of crashes especially crashes involving personal injury (as there are high travel speeds through the intersection). In addition, the sight lines between Washington Street and Plymouth Street are obscured by signage and roadside vegetation. Drivers frequently run the stop signs on the minor street Washington Street approach. There is also a lack of infrastructure for pedestrians and bicyclists. Figure 14 shows the Plymouth Street (Route 106)/Washington Street/Old Plymouth Street Intersection.

Recommended improvements include:

- Enhance the intersection layout with pavement striping that includes highly reflective striping for fog lines, center lines, and stop lines. In the interim, test reconfigurations that include channeling all approaching vehicles from Washington Street to the right with temporary traffic control devices (portable barriers).
- Enhanced speed enforcement.
- Reassess and consolidate signage on traffic islands, and trim back vegetation at the side of the road for better sight lines.
- Install a flashing control beacon and add doubled up oversized stop signs on right and left side of the approaches.
- Reconstruct and realign the intersection to eliminate the skewing, and install traffic signals.

Figure 14



Short term improvements are underway in May 2019, and include enhancing visibility with reflective striping for fog lines, center lines, and stop lines. Reconfigurations include; channeling through traffic on Washington Street to the right, then turning left again on Route 106 and then right to Old Plymouth Street. Also the same for northbound throughs on Old Plymouth Street, channel right, then turning left to Route 106 and then right onto Washington Street. Consolidate signage on traffic islands, and trim back vegetation, install a flashing control beacon and add doubled up oversized stop signs on right and left side of the approaches.

Long term improvements include realigning the intersection and installing traffic signals.

6.2.6 Halifax - Elementary School

The Halifax Elementary School is located on Plymouth Street (Route 106) just east of South Street. The school lot has three curb cuts onto Route 106, with the west most curb cut being located opposite Hemlock Lane. Parking for the school is located in the front of the school with the east most lot located to the side of the school. In 2011, OCPC completed a Road Safety Audit for the school upon a request of the Town of Halifax. Since that time, the school adjusted its pick-up and drop-off procedures as a result of the audit, and has currently approved a revised plan to improve safety by expanding the east most lot at the school to provide additional storage area for vehicles as they pick-up and drop-off students. The additional area will help prevent vehicle back-ups from the school from extending onto Route 106. Figure 15 shows the Halifax Elementary School.

The RSA findings included:

- Sidewalk discontinuity on Route 106.
- Low visibility of crosswalks on Route 106 to approaching motorists.
- Signage inconsistent with pavement striping, not supported by MUTCD, or not placed in most advantageous location.
- Vegetation blocking signs.
- High travel speeds along Route 106.

The recommendations included:

- Construct sidewalks on the north side of Route 106.
- Update signage and relocate signs to be consistent with pavement markings.
- Enhance speed enforcement efforts.

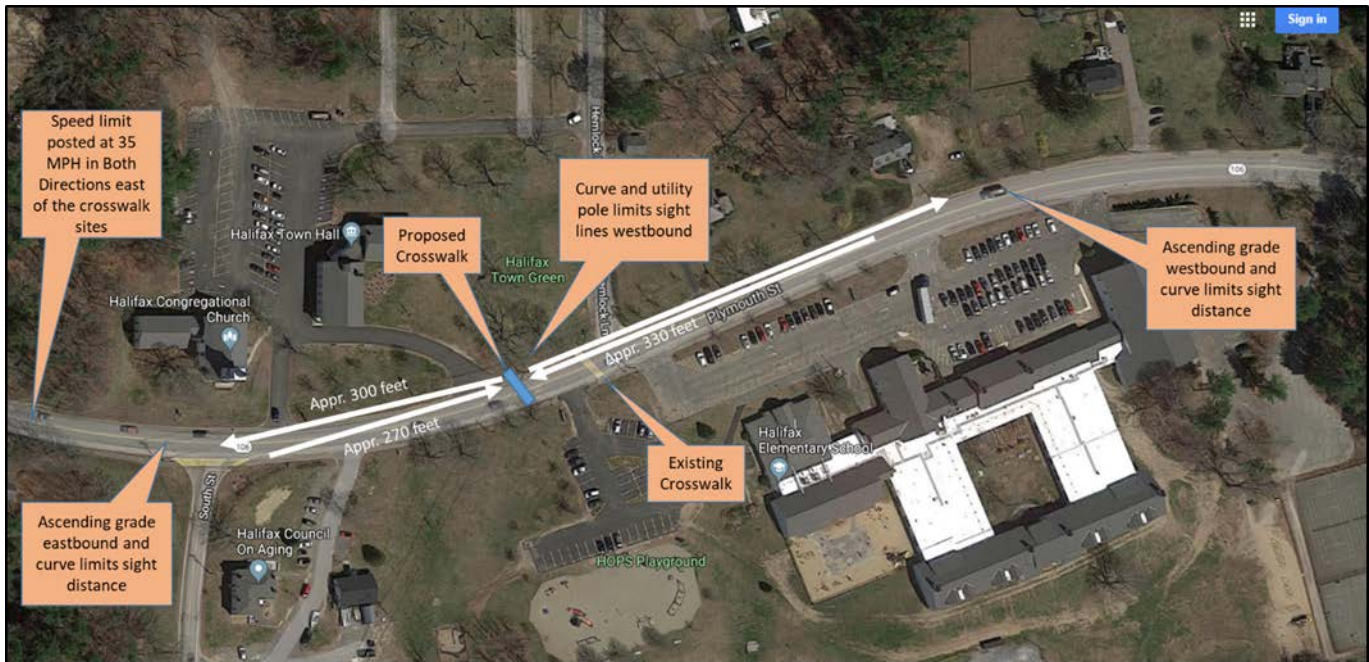
Figure 15 Halifax Elementary School



6.2.7 The Relocation of Route 106 Crosswalk at Hemlock Lane

At the request of the town, and in coordination with the Route 106 corridor study, the Old Colony Planning Council completed an assessment of the relocation of crosswalk next to Hemlock Lane, (just west of the Halifax Elementary School) on Plymouth Street (Route 106). The assessment included sight distance evaluations. Figure 16 shows the location and conditions.

Figure 16



On Route 106 eastbound, approaching the location of the existing and proposed crosswalk, the sight distance is limited due to ascending grade and vertical curve. The posted speed limit on this approach is 35 miles per hour Eastbound, it is also posted 35 miles per hour westbound west of the existing and proposed crosswalk location. On Route 106 westbound approaching the location of the existing and proposed crosswalk, the sight distance is limited due to ascending grade and vertical curve. A utility pole interferes with sight lines for the proposed Crosswalk location. The speed limit is posted at 35 miles per hour westbound but the speed limit sign is located west of the existing and proposed crosswalk locations. The 85th percentile speeds (the prevailing speeds at which 85 percent of the traffic is traveling), is 38 miles per hour eastbound and 37 miles per hour westbound. This is based upon a previous automatic traffic recorder count taken by the Old Colony Planning Council

The posted speed limit on Route 106 is 35 miles per hour in the vicinity of the proposed sidewalk. Vehicles at this speed requires 305 feet of distance for stopping according to The American Association of State Highway and Transportation Officials (AASHTO), in their publication, "A Policy on the Geometric Design of Highways and Streets". The field measurements showed that there is more than 305 feet of sight distance available for the proposed crosswalk location for vehicles traveling at the posted speed limit of 35 MPH, except for the eastbound approach, which only has 270 feet of stopping sight distance. However, the Town should take caution in relocating the crosswalk because the actual prevailing speeds on Route 106 in the eastbound and westbound directions exceed the posted speed limit. The 85th percentile, which is the speed at which 85 percent of the traffic is traveling at or below, is 38 MPH eastbound and 37 MPH westbound. This is based on historic data, automatic traffic counts taken by OCPC. These speeds require about 360 feet of stopping sight distance. The proposed crosswalk location lacks the adequate sight distance to the west for eastbound vehicles approaching the proposed crosswalk eastbound at the 85th percentile speed of 38 MPH (and for speeds above the 85 percentile) and for pedestrians crossing looking west. It also lacks adequate sight distance for vehicles approaching the proposed crosswalk westbound at the 85th percentile of 37 MPH and above. In addition, a utility pole, along with the vertical curve creates sight line issues for westbound traffic.

6.2.8 Halifax - Route 106 at three signalized intersections, Route 106 at Stop and Shop, Route 106 at Wal-Mart, and Route 106 at Route 58

The three signalized intersections including, Route 106 at Stop and Shop, Route 106 at Wal-Mart, and Route 106 at Route 58, are located in close proximity to one another in succession in Halifax. The western most intersection is at the Route 106 and Stop and Shop intersection located about 500 feet from the Route 106/Wal-Mart intersection. The Route 106/Wal-Mart intersection is located approximately 350 feet west of the Route 106/Route 58 intersection. These intersections are close enough to one another that the signals can be included in a coordinated system. Table 19 summarizes the existing and future conditions for the three intersections.

Table 19

Intersection	Crashes	Crash Rate	AM Peak LOS (signalized)	PM Peak LOS (signalized)	No-Build AM LOS (signalized)	No-Build PM LOS (signalized)	Build (coordinated optimized) AM LOS	Build (coordinated optimized) PM LOS
Route 106 at Stop and Shop	7	0.21	A	B	A	B	A	A
Route 106 at Wal-Mart	1	0.05	C	C	C	C	B	B
Route 106 at Route 58	28	1.15	C	C	C	C	C	C

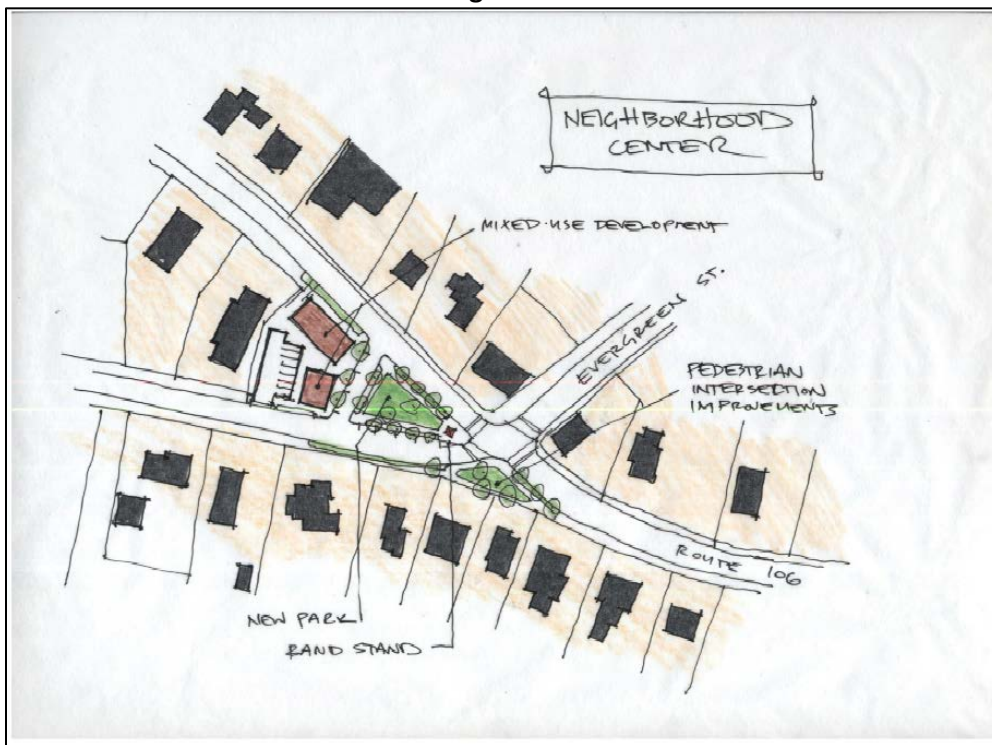
6.2.9 Kingston - Wapping Road (Route 106) at Pembroke Street (Route 27)/Evergreen Street

Wapping Road (Route 106) meets Pembroke Street (Route 27) and Evergreen Street in Kingston to form a signalized non-conventional, four-way intersection. The intersection is not aligned as a conventional four-way intersection. Figure 17 shows conceptual improvements to the intersection. Wapping Road (Route 106) enters from the west (eastbound) and continues on as Main Street (Route 106). Pembroke Street (Route 27) enters the intersection from the west in a southeast approach. Evergreen Street enters from the north east in a southwest direction and Main Street (Route 106) enters westbound from the east. Table 20 summarizes the existing conditions at the intersection. Long term improvements to the intersection include geometric improvements to help with pedestrian accommodations and alignment as well as traffic signal upgrades.

Table 20 Summary of Existing and Future Conditions for the Wapping Road (Route 106)/Pembroke Street (Route 27)/Evergreen Street

Jurisdiction	Crashes	Crash Rate	AM Peak LOS	PM Peak LOS	No-Build AM LOS	No-Build PM LOS	Build AM LOS	Build PM LOS
Town of Kingston	25	1.25	D	D	D	D	D	D

Figure 17

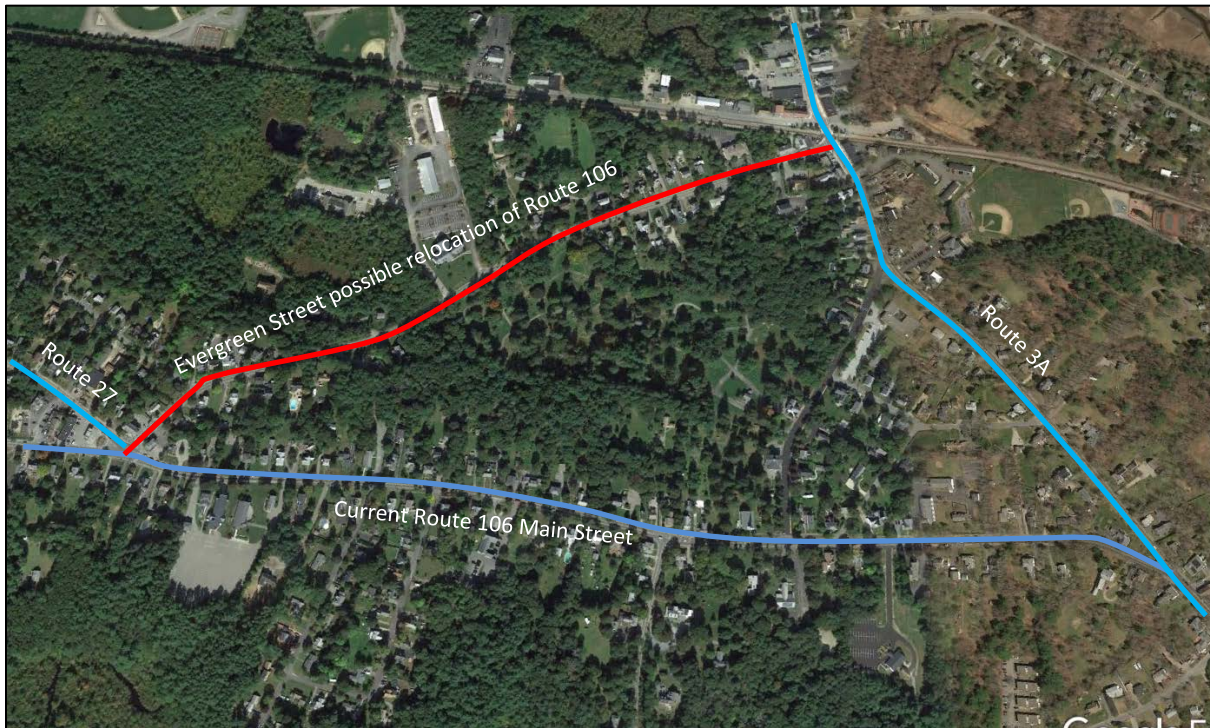


6.2.10 Kingston – Main Street (Route 106) between Summer Street (Route 3A) and Pembroke Road (Route 27) at Evergreen Street

The Town of Kingston has discussed, at its local transportation committee meeting, an option that would relocate Route 106 designation from its current alignment on Main Street to Evergreen Street. Such a move would relocate the junction of Route 3A and Route 106 from the Main Street and Summer Street intersection to the Summer Street and Evergreen Street intersection. The proposed move would be aimed

at reducing vehicular trips on Main Street and reducing turning movements at the Main Street and Summer Street intersection. The Town would also make improvements to Main Street, in conjunction with the re-designation of Route 106 to Evergreen Street, which would include resurfacing the road and adding Complete Streets treatments such as bicycle lanes and pedestrian crossings. Figure 18 shows the alternative Route 106 designation along Evergreen Street.

Figure 18



The Town discussed two potential alternative plans for implementing complete streets and keeping within context sensitive design for Main Street. The first alternative plan includes transferring National Highway System (NHS) designation to Evergreen Street to avoid NHS design standards on that portion of Main Street. The second alternative would be to leave the NHS designation on Main Street in place but request design exemptions, which are allowed by the FHWA and MassDOT. The FHWA was consulted regarding the two alternatives. It was suggested that the Town work with MassDOT District 5 regarding their preferences. The Town, after consultation with the district, and reaching a decision regarding an alternative, was encouraged to write to the district requesting to begin the process.

6.2.11 Kingston – Main Street (Route 106) at Summer Street (Route 3A)

Main Street (Route 106) and Summer Street (Route 3A) form a “T” type intersection. This intersection is poorly aligned and there is a descending grade on the eastbound and southbound approaches. This limits poor sight distances on the Main Street (Route 106) eastbound approach. Right turns only are allowed with left turns prohibited on the Route 106 eastbound approach due to these sight distance limitations. A realignment of the intersection would require right of way takings; however, this would disturb historic properties on the northwest corner of the intersection. Potential improvements include signalization. Table 21 shows the existing and future conditions at the intersection.

Table 21 Summary of Existing and Future Conditions for the Main Street (Route 106)/Route 3A Intersection

Jurisdiction	Crashes	Crash Rate	AM Peak LOS	PM Peak LOS	No-Build AM LOS	No-Build PM LOS	Build AM LOS (signal)	Build PM LOS (signal)
Town of Kingston	16	0.78	C	D	C	E	B	C

7 Funding for Improvements

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 publication, *Project Development and Design Guide*, explains the project development process in Massachusetts and design standards for transportation projects.

MassDOT initiates new projects through a formal 3-step process using the Massachusetts Project Intake Tool (MaPIT). A GeoDOT account to log into MaPIT is needed to initiate new projects.

Step one – The proponent identifies the project need.

Step two – Using MaPIT, project proponent works with a MassDOT District Office (District 5) or other MassDOT Section to define project scope, costs, timeline, impacts and responsibilities.

Step Three – The District Office or other MassDOT Section submits project to the Project Review Committee for approval.

The MassDOT project development process includes the following:

- Problem/Need/Opportunity Identification
- Planning (A project planning report is completed)
- Project Initiation
 - ✓ Identification of Appropriate Funding
 - ✓ Definition of Appropriate Next Steps
 - ✓ Project Review Committee Action
- Environmental Design and Right of Way (ROW) Process (Includes Plans, Specifications, and Estimates, P, S, & E)
 - ✓ Environmental Studies and Permits
 - ✓ Right-of-Way Plans
 - ✓ Permits
- Programming (Old Colony TIP and State Transportation Improvement Program, STIP)
 - ✓ Programming of Funds
- Procurement (Construction bids and contractor selection)
- Construction
- Project Assessment

On sections of roadway owned and maintained by the municipality, the community typically initiates a project (utilizing MaPIT), and providing for project planning and design. Similarly, for state owned facilities, the MassDOT initiates projects, providing 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:** This program 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:** This 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:** This program provides State 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:** This 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):** This 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.
- **Highway Safety Improvement Program (HSIP):** This program is a core Federal-aid program with the objective of achieving a significant reduction in traffic fatalities and injuries.
- **National Highway System (NHS):** This 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):** This program 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.
- **Surface Transportation Block Grant Program (STBG):** This 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 Alternative Program (TAP):** The TAP program provides Federal-aid funding for programs and projects defined as transportation alternatives, including on and off road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation; recreational trail program projects; safe routes to school projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways.
- **Transportation Bond Bill (TBB):** This 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:** These allocate federal funding for federal aid eligible projects.
- **Massachusetts Complete Streets Program:** This program provides \$12.5 million dollars for two years beginning in 2016 to municipalities to implement Complete Streets projects. Municipalities must adopt Complete Streets policies, develop a priority plan, and send staff for training for eligibility.
- **MassWorks Infrastructure Program:** In September of 2010, the MassWorks Infrastructure Program was instituted to provide a one-stop shop for municipalities and other eligible public entities seeking public infrastructure funding to support economic development and job creation in Massachusetts. The Program is an administrative consolidation of six former grant programs:

Public Works Economic Development Grant (PWED)
Community Development Action Grant (CDAG)
Growth Districts Initiative (GDI) Grant Program
Massachusetts Opportunity Relocation and Expansion Program (MORE)
Small Town Rural Assistance Program (STRAP)
Transit Oriented Development (TOD) Program

The MassWorks Infrastructure Program is administered by the Executive Office of Housing and Economic Development, in cooperation with the Department of Transportation and Executive Office for Administration & Finance.

8 Appendices

Automatic Traffic Recorder Counts
Turning Movement Counts
Intersection Levels-of-Service
Signal Warrant Analysis
Intersection Crash Rate Calculation