

Chapter 4 Recommendations and Implementation

The goal of the I-495 & Route 9 Interchange Improvement Study is to develop viable transportation improvements that address the existing and future transportation needs in the study area. As documented in Chapter 3, a broad range of alternatives were developed to address the identified congestion and safety issues, and to support future commercial and industrial growth in the area consistent with its designation as a Priority Development Area. The alternatives were evaluated and reviewed by MassDOT, the Study Advisory Group, and community and public stakeholders through a series of meetings to identify feasible solutions. Based on this review it was determined that no one alternative alone addressed all of the study area issues; rather, a multi-modal solution consisting of a range of viable highway, transit, pedestrian and bicycle improvement strategies was recommended.

Taken as a whole, the recommended actions comprise a “Master Plan” of transportation improvements and policies to meet the needs of the study area. Each of the recommended actions serves an independent function and can be implemented separately as resources allow. They include relatively low-cost and easy to implement actions, such as new signage; actions that require no new right-of-way (ROW) and have no expected environmental impacts, such as signal optimization or expanding bus service; as well as major infrastructure improvements that have significant capital cost, design and permitting requirements, such as the proposed improvements to the Route 9 and I-90 interchanges with I-495.

Given transportation funding constraints, prioritization of the recommendations for implementation will need to be established regionally by the Central Massachusetts Metropolitan Planning Organization (MPO) and the Boston Region MPO in partnership with their member communities and MassDOT, particularly for major infrastructure investments. Continued coordination among the transportation agencies, planning organizations, municipalities and stakeholders represented in the Study Advisory Group will be required to implement the recommendations of this study. Therefore, an overarching recommendation from this study is that this group should continue to meet periodically to develop an approach and strategy for implementation of the recommended actions and to monitor their progress.

This chapter presents the recommended actions and the factors to be considered in implementing them. The implementation steps for each of the recommended actions will vary depending on the cost and complexity of the recommended improvement and the responsible parties. Lower cost actions that are the responsibility of a single entity, such as new signage, can be implemented quickly; complex actions that have high capital costs and require coordination and decision-making by multiple agencies, such as the proposed interchange improvements, will take a much longer time to move from concept to construction.

The recommendations have been grouped into the following categories according to the responsible entities, complexity and cost considerations, and the process required for implementation:

- **Highway Improvements**
 - **Major Infrastructure Investments**
 - **Roadway and Intersection Congestion and Safety Improvements**
 - **Highway Maintenance**
 - **Regional Highway Considerations**

- **Multimodal Enhancements –Transit, Pedestrian and Bicycle Improvements**

The following sections discuss each of the recommended alternatives according to their implementation categories. More detailed descriptions of each alternative are provided in Chapter 3. The recommended plan of action is summarized in Table 4-1 and their locations are shown on Figure 4-1 at the end of the chapter.

4.1 Recommended Highway Improvements - Major Infrastructure Investments

In framing the study's recommendations, major infrastructure investments include projects that cost over \$10 million dollars, or add capacity to the transportation system. These types of projects need to be reflected in the MPO's Regional Transportation Plan (RTP), which is a 20-25 year, fiscally-constrained plan that sets regional priorities for funding transportation projects within that region. The RTP must demonstrate project need, the MPO's ability to fund the recommended improvements, and regional air quality conformity under the federal Clean Air Act, assuming the projects included in the RTP are built.¹ Such major projects must also appear on the RTP in order to be included in that MPO's Transportation Improvement Program (TIP), a shorter-range, four-year document that must include any projects receiving federal funds.

The project study area encompasses two MPO regions, with the town of Westborough in the Central Massachusetts MPO region, and the towns of Southborough and Hopkinton in the Boston Region MPO region. As such, interregional coordination will be an important factor in advancing the major infrastructure investments identified in this study. Projects may be delayed if sufficient funding is not available within the region.

It is expected that MassDOT would be responsible for project development, design, and implementation of the major infrastructure investment projects described in this section for several reasons. These projects are on highways that are under MassDOT jurisdiction. They are more complex, expensive and take a longer time to plan, design, and construct.

The major infrastructure projects will also require environmental review under the National Environmental Policy Act (NEPA) and/or the Massachusetts Environmental Policy Act (MEPA), which will include coordination with federal and state regulatory agencies. The extent of environmental review will vary depending on the complexity of the project and the potential for impact. For example, projects such as the I-495/I-90 Interchange Ramp Modification, which is located within an Area of Critical Environmental Concern, would require more extensive environmental review than the I-495/Route 9 Braided Ramps, for which only minor environmental issues have been identified. Actions that involve interstate highways will also require an additional level of review and coordination with the Federal Highway Administration (FHWA).

The recommended major infrastructure investments include:

- **I-495/Route 9 Braided Ramps (HT 3)**
- **I-495/I-90 Interchange Ramp Modifications (HT 10)**

¹ An air quality determination is required by the 1990 federal Clean Air Act Amendments (CAAA) to demonstrate that a MPO's plans, programs, and projects are consistent with the State Implementation Plan for attaining federal air quality standards. The federal CAAA requirement to perform a conformity determination ensures that the federal government approves and funds only those transportation activities that are consistent with air quality goals. Projects which increase capacity have the potential to increase the vehicle miles travelled with an associated increase in emissions; hence, the requirement for an air quality conformity determination.

Implementation of each of these projects will require the following steps:

- Complete the MassDOT Project Approval process, including a Project Needs Form (PNF), Project Initiation Form (PIF), and a planning report,
- Prepare an Interchange Modification Report for review and approval by the FHWA,
- Identify sufficient funding for the project (may be from multiple sources),
- Request the responsible MPO (Boston Region MPO and/or the Central Massachusetts MPO) list the project in their Long Range Regional Transportation Plan,
- Conduct MEPA/NEPA environmental review and preliminary design, including a detailed alternatives analysis,
- Hold a 25% Design Public Meeting,
- Complete final design development (75% through 100% plans, specifications and estimates), ROW plans, and obtain permits,
- Request the Boston Region MPO and/or the Central Massachusetts MPO to list the project in the Transportation Improvement Program (TIP), and
- Once the funds are programmed in the TIP, advertise and construct the project.

4.1.1 I-495/Route 9 Braided Ramps (HT 3)

Construction of a set of new braided ramps is recommended for the I-495/Route 9 interchange. The new braided ramps would separate merging and diverging traffic by creating a bridge to elevate one ramp over the other. This would improve safety and eliminate the congestion caused by the weaving maneuvers currently required on I-495 northbound and southbound. Traffic operations on all ramps would improve during the morning peak hour, except for the northbound off-ramp from I-495. This is due to the high volume of traffic exiting from I-495. During the afternoon peak period, traffic operations on all ramps improve. The new ramp configuration can be constructed within the existing highway ROW and no environmental impacts were identified at this level of analysis. The estimated cost of the I-495/Route 9 Braided Ramps is \$25 million (2012\$).

Figure 4.1-1: I-495/Route 9 Braided Ramps

4.1.2 I-495/I-90 Interchange Ramp Modifications (HT 10)

As previously discussed in this report, the I-495/I-90 interchange was included as part of this study due to its proximity and potential interaction with the I-495/Route 9 interchange. It was determined that issues related to the I-495/Route 9 interchange could affect the I-495/I-90 interchange, and therefore some alternatives for the I-495/Route 9 interchange had the potential to involve changes to the I-495/I-90 interchange.

However, it was found through analysis of the alternatives that there was no combined alternative that addressed the needs of both interchanges, and that the preferred alternative for the I-495/Route 9 interchange does not directly involve the I-495/I-90 interchange. Nevertheless, the study analysis and review of the I-495/I-90 interchange resulted in at least one concept that appears to have potential benefits. The following improvements are recommended at the I-495/I-90 interchange to improve traffic and safety conditions along I-495:

- Constructing a new I-495 northbound off-ramp to I-90 eastbound,
- Widening of the I-495 southbound on-ramp to two lanes,
- Extending the I-495 southbound on-ramp,
- Creating an auxiliary lane for the I-495 southbound off-ramp to I-90,
- Separating movements on the toll plaza to eliminate weaves by giving each move its own lane, and
- Modifying the I-495 southbound on-ramp from I-90 westbound so that it crosses over the I-495 on-ramp from I-90 eastbound on a bridge. These two ramps would then converge at the two-lane on-ramp to I-495 southbound.

This alternative also requires adjustments to the I-495 mainline (shown in purple in Figures 4.2 and 4.3) to accommodate the ramp modifications. The estimated cost for the I-495/I-90 Ramp Modifications as proposed is \$100 + million (2012\$).

The recommended concept minimizes the potential impact to environmental resources within the Cedar Swamp Area of Critical Environmental Concern by keeping the modifications within the existing highway right-of-way to the greatest extent possible. However, there is a potential for wetland impacts from the new I-495 northbound ramp to I-90 eastbound, and a potential for noise impacts to residences in Hopkinton south of the toll plaza from the elevated I-90 westbound ramp to I-495 southbound. Quantification of these impacts and the strategies to mitigate these impacts will be determined in the preliminary engineering and environmental permitting stages of the project's development.

It is important to note that the improvements recommended above did not result from a comprehensive alternatives analysis at this location. It is recommended that additional alternative analysis be developed for the issues along I-90 that take into account the Commonwealth's approach to the Massachusetts Turnpike corridor as a whole. For the recommendation presented in this report to advance, it will also require a more comprehensive and focused alternatives development and analysis study before following the general implementation process for Major Infrastructure Investments as previously described. However, the alternative for the I-495/I-90 interchange included here offers significant enough potential benefits that it is worth further consideration.

Additional Implementation Considerations

Tolling - The proposed I-495/I-90 Ramp Modifications would work with the existing toll booths in place, but each lane would require its own toll booth(s) for both E-ZPass and cash operations, limiting the efficiency of the toll plaza. A new toll booth or other tolling technology would be required for the new I-495 northbound lane to I-90 eastbound, although an isolated tollbooth separated from the main plaza creates safety concerns for the toll taker. The proposed interchange modifications would work more effectively with All-Electronic Tolling (AET) gantries in place of the toll booths, which would improve traffic operations at the current toll plaza and thereby reduce congestion. AET would also allow more area for lane improvements and channelization at the existing toll plaza area to improve safety.

Subsequent to the development of the I-495/I-90 Ramp Modifications alternative, MassDOT began work to implement statewide All-Electronic Tolling (AET), to replace the existing toll plazas on the Massachusetts Turnpike, Tobin Bridge, and Harbor Tunnels with overhead gantries to be installed along the highways. Cash will be eliminated from the system entirely, as all transactions will be conducted using either the current E-ZPass system or through video tolling (in which invoices are sent to customers whose license plates are recorded by the AET camera system).

Coordination with I-495 Bridge Projects - The I-495/I-90 Interchange Ramp Modification concept developed for this study assumes that the existing overhead bridges along I-495 at Fruit Street, Hopkinton and the I-495 northbound ramps to I-90, and the I-495 mainline bridges over I-90 and the MBTA Framingham/Worcester commuter rail line, remain in place. Work is underway to replace the bridge deck for the I-495 ramps to I-90 (MassDOT Project Number 605774), with construction scheduled to be completed by the fall of 2013. Future rehabilitation or replacement of these bridges should be designed (to the extent possible) to accommodate appropriate long term interchange and I-495 mainline modifications.

Figure 4.1-2: I-495/I-90 Interchange Ramp Modifications showing I-495 Mainline Adjustments

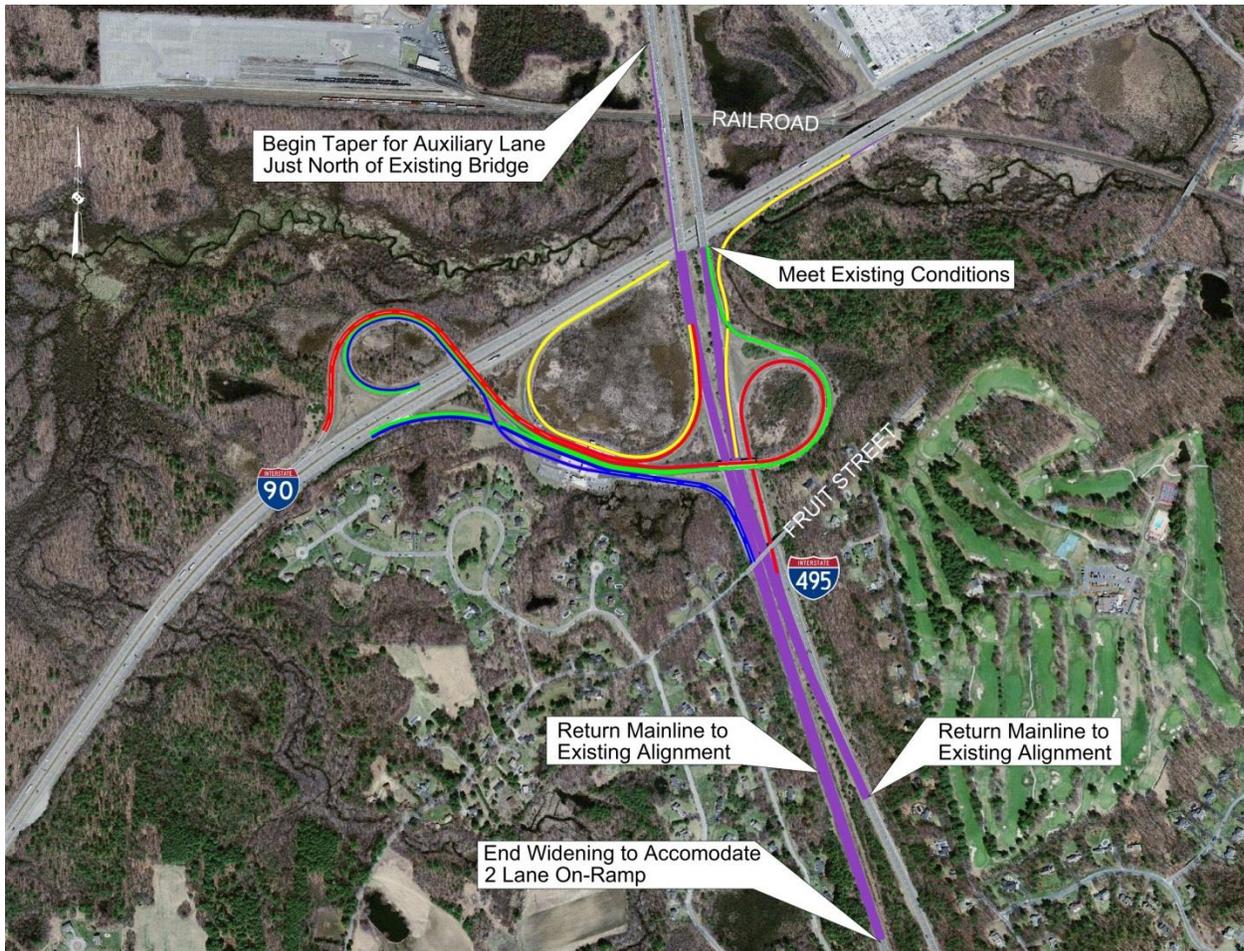
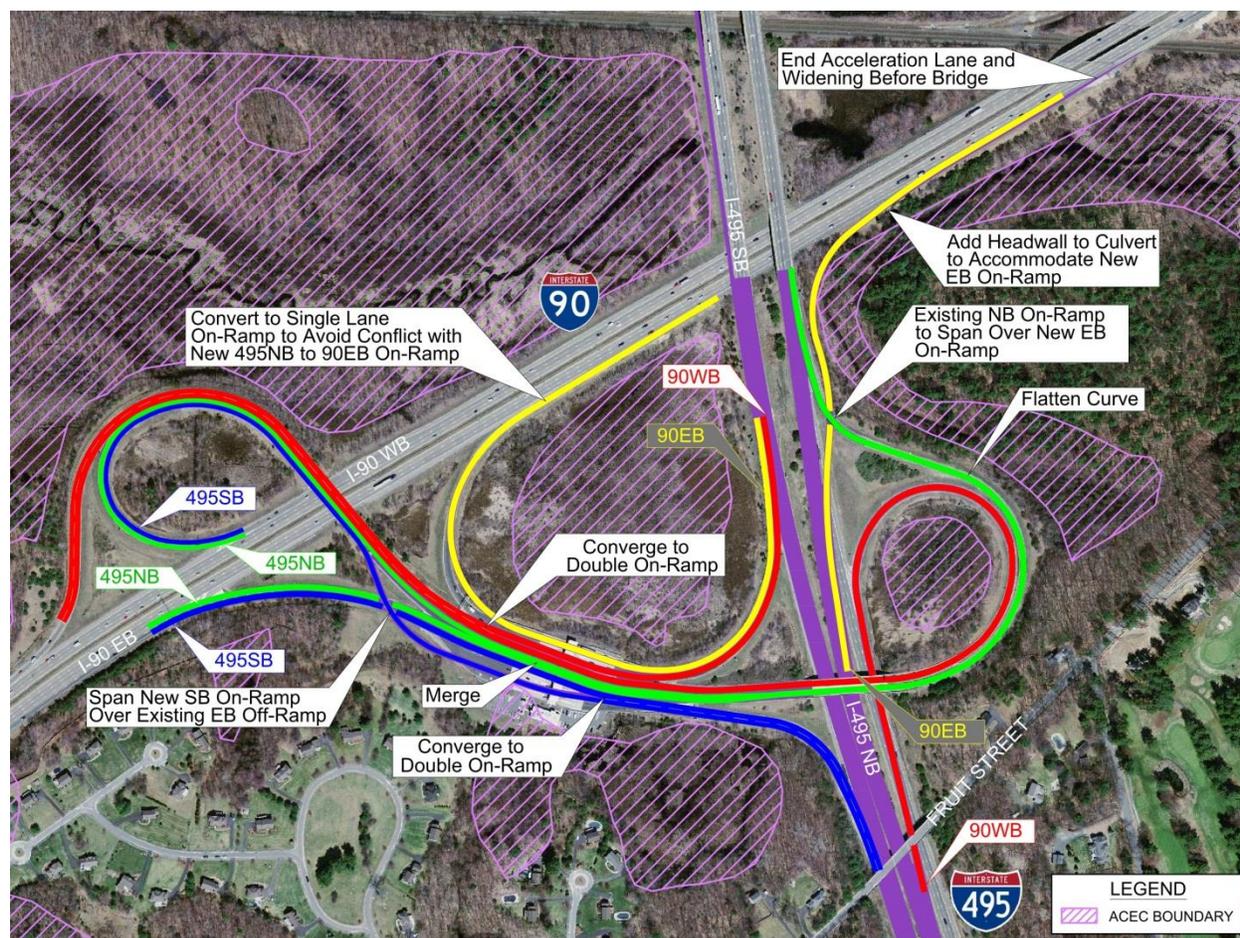


Figure 4.1-3: I-495/I-90 Interchange Ramp Modifications



4.2 Recommended Highway Improvements – Roadway and Intersection Congestion and Safety Improvements

Each of the recommended actions within this category has an estimated cost of less than \$10 million. The proponents of these actions will vary between MassDOT, private land developers, and/or other public/private partnerships, depending on the scale of the costs and benefits provided by each recommendation, as well as the roadway jurisdiction. MassDOT would most likely be responsible for projects on the MassDOT highway system that have more regional benefits, such as the flattening of the curve on the I-90 ramp to I-495 northbound (HT 9B). Private developers or other entities would most likely be responsible for projects with more localized benefits, especially benefits to specific parcels or developments. Examples of these types of projects include the Park Central Drive to Flagg Road Egress Modification (HT 6).

Projects to be constructed by MassDOT would need to be included on the TIP for funding. Many of the private development mitigation projects would be addressed through the Section 61 findings of the MEPA process. Many private development mitigation projects may also be eligible for economic development infrastructure funding from Executive Office of Housing and Economic Development (EOHED), such as MassWorks Infrastructure Program grants. The municipality would be the proponent for projects funded through the MassWorks program.

Recommended highway improvements include:

- **I-495/ I-90 Safety Improvements (HT 9 B) - Flatten the I-495 Northbound On-Ramp from I-90 to Reduce the Potential for Truck Roll-overs**
- **Route 9 Widening (HT 5)**
- **Research Drive/Connector Road Improvements (HT 8)**
- **Route 9/Crystal Pond Road Intersection Improvements (HT 11)**
- **Park Central Drive to Flagg Road Egress Modification (HT 6)**
- **Consolidate Driveways on Route 9 east of I-495 (HT 7)**

4.2.1 I-495/I-90 Safety Improvements (HT 9B)

This recommended project would improve the curvature of the I-495 northbound on-ramp from I-90 to reduce the potential for truck roll-overs. The cost of this improvement is approximately \$3 million (2012\$)

This project should be considered in the context of the larger I-495/I-90 Interchange project. This project is closely related to the larger interchange project, and should be considered for inclusion in that project, depending upon the interchange project's scale and schedule. If it were determined that this smaller ramp project has independent utility, and a high enough degree of utility that it should be pursued on a nearer-term schedule, the implementation steps are as follows:

- Complete the MassDOT Project Approval process, including a Project Needs Form (PNF), Project Initiation Form (PIF), and a planning report,
- Prepare plans, specifications and estimates, environmental studies, ROW plans and obtain permits,
- Identify federal and state funding sources and request the Boston Region MPO to list the project in the Transportation Improvement Program (TIP), and
- Once the funds are programmed in the TIP, advertise and construct the project.

Figure 4.2-1: I-495/I-90 Safety Improvements: Flatten the I-495 Northbound On-Ramp from I-90



4.2.2 Route 9 Widening (HT 5)

The recommended actions also include widening Route 9 to three lanes westbound from Computer Drive in Westborough to Deerfoot Road in Southborough. Route 9 eastbound would be widened from Coslin Drive (Southborough) to Deerfoot Road. The widening would primarily occur within the existing ROW by utilizing the median to accommodate the third travel lane in each direction. However additional ROW, which includes areas of wetlands, will be required along the north side of Route 9 at the former Verizon property in Southborough to accommodate the third lane. The cost of the Route 9 widening as proposed is approximately \$9.2 million (2012\$).

Such a highway mainline widening is generally a last resort. However, this location represents enough of a systemic bottleneck that the congestion and safety benefits merit consideration of a targeted widening project.

Implementation steps include:

- Complete the MassDOT Project Approval process, including a Project Needs Form (PNF), Project Initiation Form (PIF), and a planning report,
- Prepare plans, specifications and estimates, environmental studies, ROW plans and obtain permits,

- Identify federal and state funding sources and request the Central Massachusetts MPO (for work in Westborough) and the Boston Region MPO (for work in Southborough) to list the project in the Transportation Improvement Program (TIP), and
- Once the funds are programmed in the TIP, advertise and construct the project.

Figure 4.2-2: Route 9 Westbound Widening West of I-495

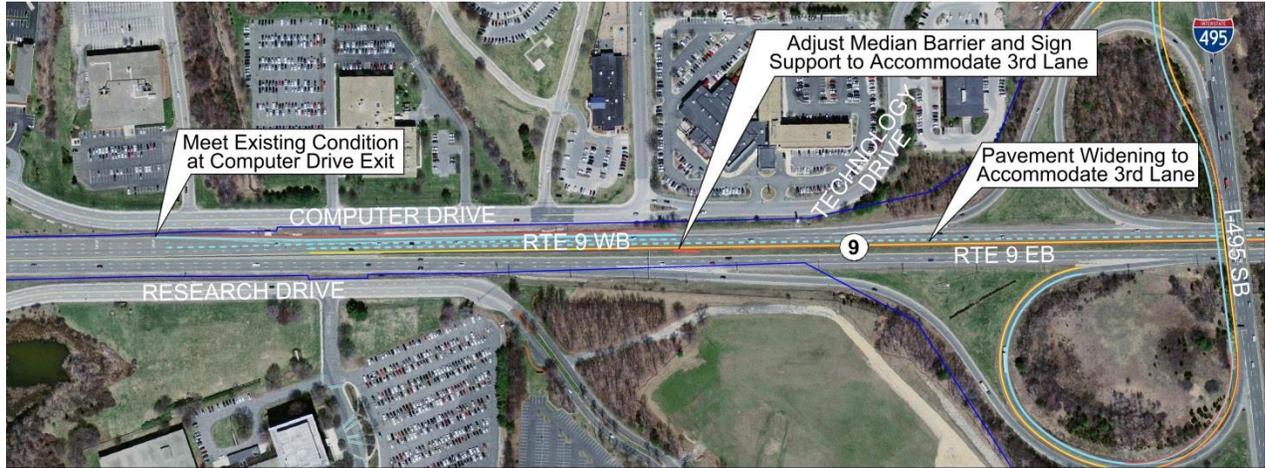


Figure 4.2-3: Route 9 Westbound Widening East of I-495



Figure 4.2-4: Route 9 Westbound Widening and Eastbound Widening East of Coslin Drive



4.2.3 Research Drive/Connector Road Improvements (HT 8)

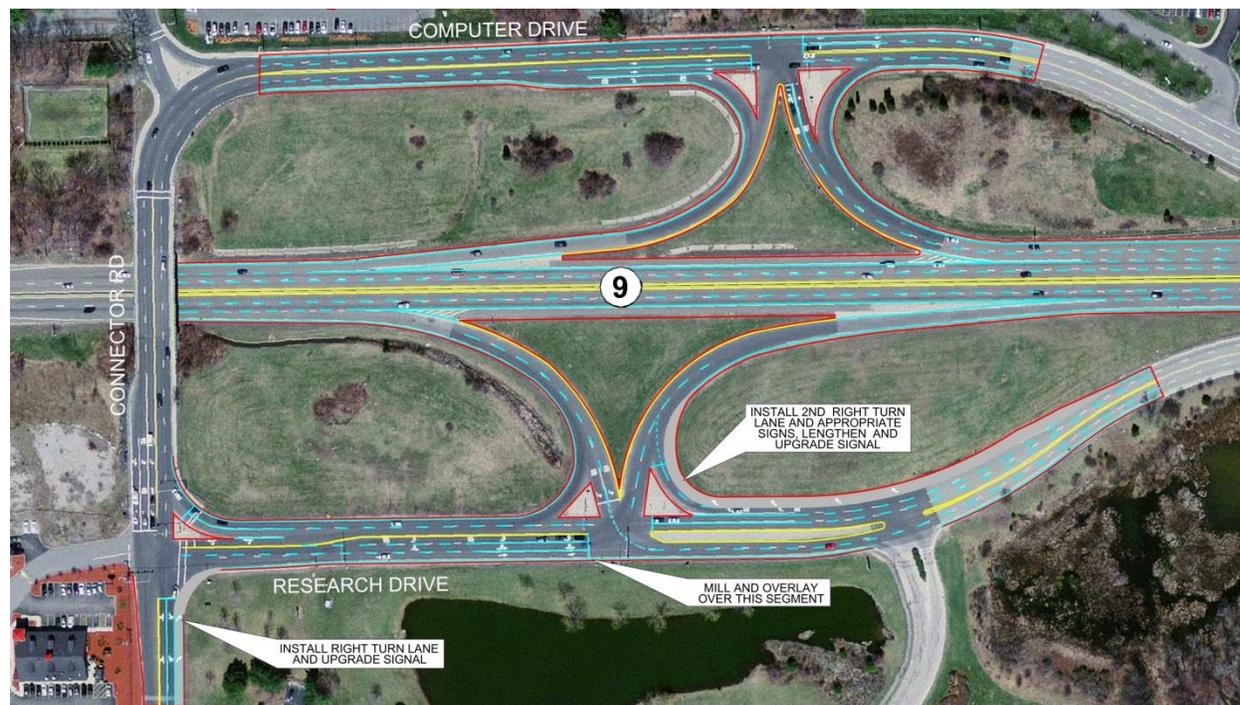
Connector Road/Research Drive – This recommendation would add a new northbound right turn lane and upgrade the traffic signal equipment as necessary. Upgrades would include new optimized signal timing and phasing patterns, detection equipment, and signage and pavement markings. The cost of these improvements is approximately \$250,000 (2012\$)

Research Drive and Route 9 Eastbound Ramps – This recommendation would install a second westbound right turn lane; and upgrade signal equipment as necessary; Upgrades would include new optimized signal timing and phasing patterns, detection equipment, and signage and pavement markings. The cost of these improvements is approximately \$435,000 (2012\$).

A small amount of additional ROW is required for the new right-turn lane at Connector Road/Research Drive. The improvements at the Route 9 eastbound ramps are within the existing ROW. No environmental impacts are anticipated for either of the Research Drive improvements.

These improvements would primarily benefit the priority development areas within the study area. Therefore, the implementation steps assume action by a private developer. Implementation steps include the following:

- Private developer initiates action,
- Review of private development traffic impacts and establishment of traffic mitigation through the Massachusetts Environmental Policy Act (MEPA) environmental review process,
- Environmental studies, design and permitting by developer,
- MassDOT District 3 and Town of Southborough reviews design,
- MassDOT District 3 issues Access Permit for construction, and
- Advertisement and construction by developer.

Figure 4.2-5: Research Drive/Connector Road Improvements

4.2.4 Route 9 at Crystal Pond Road Intersection Improvements (HT 11)

This recommendation would realign and reconstruct the Crystal Pond Road intersection with Route 9 in Southborough to accommodate the added traffic anticipated from proposed development, and re-align the Verizon site driveway to form a 4-way intersection. An eastbound jug-handle would be added to eliminate the existing Route 9 eastbound-to-westbound u-turn and eastbound left turns. The cost of the Route 9/Crystal Pond Road intersection improvements is approximately \$2.1 million (2012\$).

This alternative would require acquisition of new ROW for the realignment of Crystal Pond Road and the jug-handle as well as new ROW for widening Route 9 westbound to accommodate additional turn lanes at the intersection. The ROW required for the intersection improvements includes areas of wetlands adjacent to Crystal Pond Road and Route 9. Quantification of any environmental impacts and the strategies to mitigate these impacts will be determined in the preliminary engineering and environmental permitting stages of the project's development.

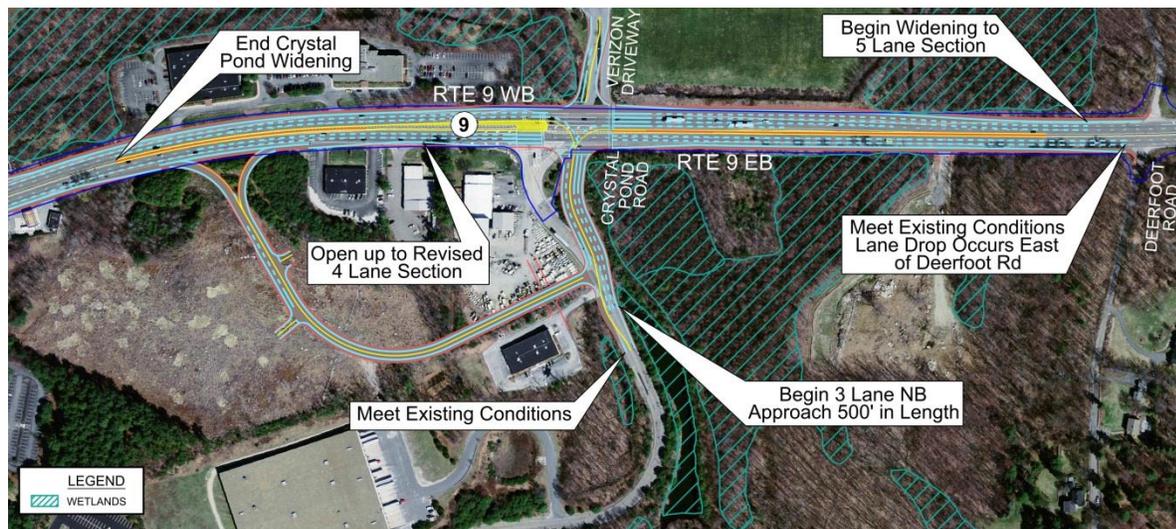
This project provides the potential for a public/private partnership in that the developer of the proposed Madison Place 40B project in Southborough has agreed to provide the ROW for the jug-handle section of the intersection improvement. Design preparation by private developer(s) who would benefit from the intersection improvements could support a grant application by the Town of Southborough for an infrastructure funding grant to construct the project.

Implementation steps under this scenario include the following:

- Private developer and/or Town of Southborough initiate action and coordinates with MassDOT District 3,
- Review of private development traffic impacts and establishment of traffic mitigation through the Massachusetts Environmental Policy Act (MEPA) environmental review process,

- Environmental studies, design and permitting by developer(s),
- MassDOT District 3 reviews design,
- MassDOT District 3 issues Access Permit for construction, and
- Advertisement and construction by developer/Town of Southborough.

Figure 4.2-6: Route 9 at Crystal Pond Road Intersection Improvements



4.2.5 Park Central Drive to Flagg Road Egress Modification (HT 6)

In this recommendation, the southbound right turn from Park Central Drive to Route 9 would be eliminated to improve safety by eliminating a weave for vehicles entering the I-495 northbound on-ramp. A new connector road between Park Central Drive and Flagg Road would be provided to allow egress to Route 9 westbound. Left turns from the new connector road would be prohibited to reduce traffic on Flagg Road, a narrow roadway which serves a residential neighborhood. The left turns would be restricted by both geometric channelization and signage. The connector road will require new ROW. It would cross an unnamed stream at two locations. Determining the final design for this recommendation will require coordination with the Town of Southborough and any property owners that would be affected by the roadway reconfiguration. The cost of the Park Central Drive to Flagg Road egress modifications is approximately \$1.5 million (2012\$)

Implementation steps include the following:

- Private developer initiates action as an element of a site development plan for property accessed via Park Central Drive,
- Review of private development traffic impacts and establishment of traffic mitigation through the Massachusetts Environmental Policy Act (MEPA) environmental review process,
- Environmental studies, design and permitting by developer,
- MassDOT District 3 and Town of Southborough reviews design,
- MassDOT District 3 issues Access Permit for construction, and
- Advertisement and construction by developer.

Figure 4.2-7: Route 9 Improvements at Park Central Drive to Flagg Road Egress Modification



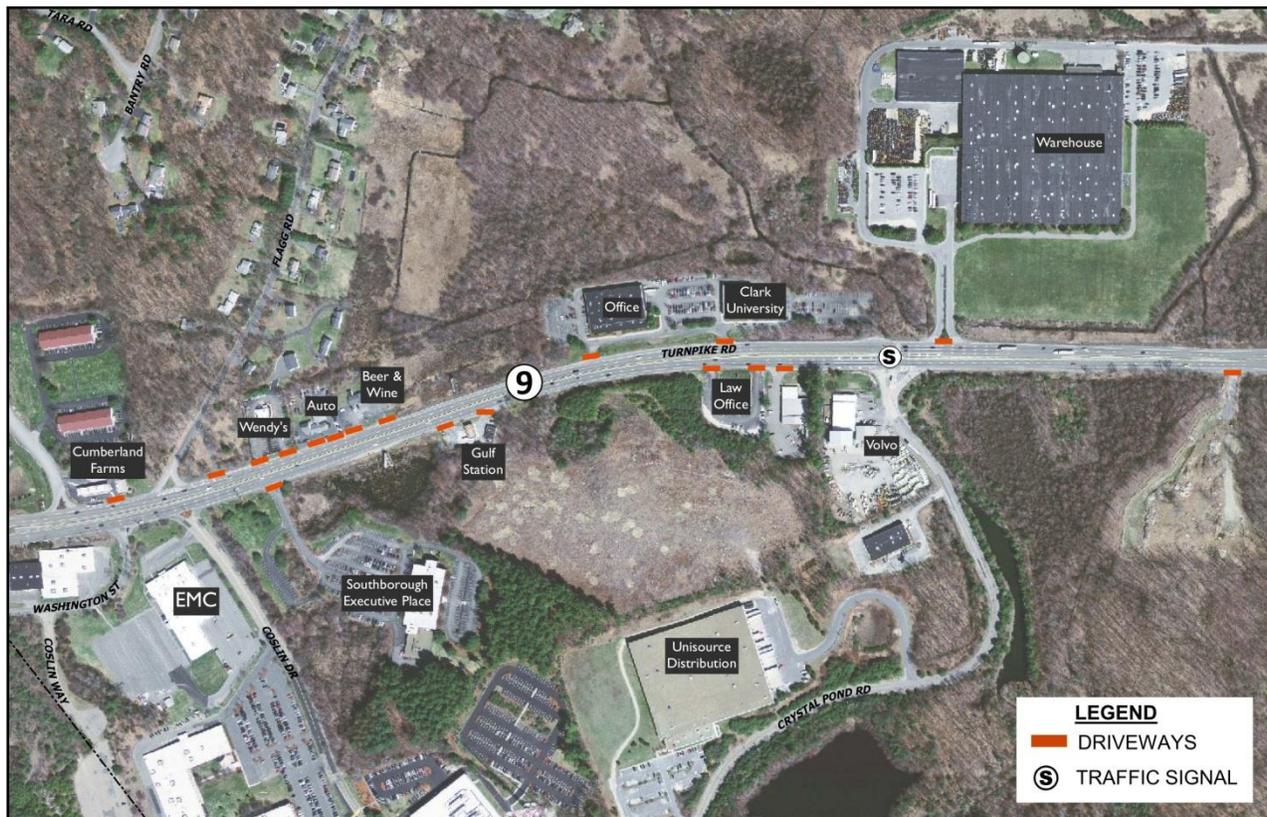
4.2.6 Consolidate Driveways on Route 9 East of I-495 (HT 7)

This action would reduce the number of driveways accessing Route 9 by seeking opportunities for consolidating/sharing driveways as properties are developed or redeveloped. The cost to implement a driveway consolidation will vary, depending on the specific conditions and design for each driveway location.

Implementation steps include the following:

- Town of Southborough establishes a driveway consolidation policy in coordination with the MassDOT District 3 office,
- Town of Southborough reviews driveway consolidation through the Site Plan Review process as parcels of land are developed or redeveloped, and coordinates review with MassDOT District 3,
- Design and permitting by developer if opportunities for consolidation are identified,
- MassDOT District 3 issues Access Permit for construction, and
- Construction by developer.

Figure 4.2-8: Consolidate Driveways on Route 9 East of I-495



4.3 Recommended Highway Improvements – Highway Maintenance

Actions under this category would be the responsibility of MassDOT and would be implemented using state-funded maintenance contracts. They only require internal MassDOT coordination. Actions in this category are generally low-cost signage and striping safety improvements that can be implemented in the short term (less than one year). The recommended action is:

- **I-495/ I-90 Safety Improvements (HT 9) - Provide additional advance E-ZPass/Cash Only Lane signs on the I-495 Southbound On-Ramp to I-90**

Since the development of this recommendation, MassDOT has begun to implement All Electronic Tolling statewide. New temporary and permanent signage is being developed for this ramp and others at the interchange as part of MassDOT's AET Turnpike project. These will include new directional interstate signs on the southbound I-495 off-ramp for I-90 eastbound and westbound, and signage indicating that no tolls will be collected ahead. The cost for the proposed improvements is approximately \$60,000 (2012\$)

Figure 4.3-1 I-495/I-90 Safety Improvements: Provide Additional Advance E-ZPass/Cash Only Lane Signs



4.4 Regional Highway Considerations

Several recommendations were identified that address both study area and regional issues. Actions within this implementation category include Intelligent Transportation Systems (ITS) and toll collection technologies that would be implemented by MassDOT as part of system-wide improvements beyond the immediate I-495/Route 9 Interchange Study area. They include:

- **Add ITS Signage on Route 9 (HT 12B)**
- **Consider Alternate Tolling Technologies (HT 13)**
- **Add ITS Signage on I-495 (HT 12A)**

4.4.1 Add ITS Signage on I-495 (HT 12A) and Route 9 (HT 12B)

Development of ITS is coordinated with the statewide ITS master plan program. The following is a list of goals adopted by the MassDOT ITS Program that will provide benefits to the I-495 & Route 9 study area:

- Improve incident management,
- Reduce incident response and clearance times,
- Improve congestion management,
- Improve real-time traveler information,

- Integrate arterial management with freeway management,
- Promote greater transit usage,
- Enable real-time management for special events,
- Address impacts of truck congestion,
- Improve safety and security,
- Improve safety within work zones, and
- Provide weather and road condition information.

MassDOT is currently implementing a regional ITS program on I-495 from Hopkinton to Andover. New ITS technology (cameras/communication infrastructure) will be provided in the project area (at/near the interchanges of I-90 and Route 9) as part of the ITS project that will help meet the mobility and safety goals above. Construction is anticipated to begin in the winter of 2013/2014.

One of the goals of the MassDOT ITS Program is to integrate arterial management with freeway management. As part of the I-495 ITS project, new ITS infrastructure would be provided at/near the Route 9 interchange. It is recommended that as MassDOT continues work on the ITS Program and Strategic Plan, the Route 9 arterial be considered for ITS communications infrastructure. The intent of new ITS VMS signage on Route 9 would be to alert motorists of incidents, weather conditions, or other conditions that would reduce travel time on Route 9 or accessibility. The VMS boards should be provided at locations where the information gives motorists an opportunity to divert to alternate routes as necessary based on the information provided. Potential locations for new VMS boards on Route 9 would be near Route 30 in Westborough west of I-495, and near Route 85 in Southborough east of I-495. These VMS boards can potentially be tied in with the I-495 Advanced Transportation Management System (ATMS) being implemented by MassDOT.

4.4.2 Consider Alternate Tolling Technologies (HT 13)

As previously discussed as part of the I-495/I-90 Interchange Ramp Modifications, this study recommends evaluation of alternate tolling technologies as an action to reduce congestion and improve safety. Switching to an electronic toll collection technology would allow the removal of the toll booths and allow the proposed interchange modifications to function more efficiently. Any change to the toll collection technology would need to be evaluated for the overall tolling system along I-90, and implemented on a system-wide basis.

Since this recommendation was developed, MassDOT has begun work to implement statewide All-Electronic Tolling (AET), to replace the existing toll plazas on the Massachusetts Turnpike, Tobin Bridge, and Harbor Tunnels with overhead gantries to be installed along the highways. Cash will be eliminated from the system entirely, as all transactions will be conducted using either the current E-ZPass system or through video tolling (in which invoices are sent to customers whose license plates are recorded by the AET camera system). This concept will lessen congestion, improve air quality, and reduce operating costs. Further development of the I-495/I-90 Interchange Ramp Modifications (HT 10) project therefore requires coordination with the plans for AET implementation.

4.5 Recommended Multimodal Enhancements- Transit/TDM Actions, Pedestrians and Bicycles

This group of recommendation includes actions to increase multimodal travel options beyond just single-occupancy vehicle (SOV) to and within the study area, consistent with MassDOT's GreenDOT sustainability initiative. The goals of the GreenDOT implementation plan supported by these recommendations include: design a multi-modal transportation system, triple the mode share of bicycling, transit and walking by 2030, and promote healthy transportation and livable communities². Application of Smart Growth principles to encourage mixed land uses as the study area develops will help to support transit and other alternate modes of travel.

4.5.1 Multimodal Enhancement - Transit/TDM Actions

The existing land use pattern in the study area of auto-oriented business parks presents challenges for the development of transit service. There is currently no fixed route transit service in the area, which is located on the boundary of the Worcester Regional Transit Authority (WRTA) and the MetroWest Regional Transit Authority (MWRTA). The recommendations in this category include actions to initiate transit service and provide alternatives to travel via single-occupancy vehicle. Implementation of these actions will require continued coordination with the WRTA, MWRTA, MBTA, CMRPC, MAPC, the Metro/West 495 Transportation Management Association (TMA) and the MassDOT Rail and Transit Division, as well as with businesses within the study area. The recommended actions include:

- Implement connecting bus service along Route 9 between the Worcester Regional Transit Authority (WRTA) and the MetroWest Regional Transit Authority (MWRTA) to provide transit access to job centers and enhance inter-regional mobility. (TR 1)
- Implement bus shuttle service from the Westborough Commuter Rail Station to job centers in the I-495/ Route 9 area. (TR 2A)
- Implement bus shuttle service from the Southborough Commuter Rail Station to job centers in the I-495/ Route 9 area. (TR 2B)
- Consider the use of employer-sponsored or TMA bus shuttles to provide access from the intermodal facility (TR 4) to locations within the business and office parks in the I-495/Route 9 area.
- Evaluate the feasibility of increasing MBTA Worcester Line outbound commuter rail trips during peak hours to support reverse commuting.
- Support the development of a park-and-ride lot and intermodal facility in the vicinity of Connector Road and Research Drive in Westborough to encourage carpooling and to provide a location for passengers to access WRTA and MWRTA bus service, or other bus shuttles. (TR 3)
- Encourage increased employer participation in the MetroWest 495 Transportation Management Association. (TR 4)
- Encourage Westborough and Southborough to revise zoning codes to provide for more transit supportive development.

Implementation steps for instituting bus and shuttle services include:

- Identification of a source of operating funds, and
- Development of a service plan.

² MassDOT, *Final GreenDOT Implementation Plan*, December 12, 2012.

Initial progress has been made on the transit service recommendations. The WRTA is planning on starting a shuttle service from the Westborough MBTA Commuter Rail Station to business parks along Route 9 in the fall of 2013 utilizing funding from the Town of Westborough MBTA assessment. The service would run two peak morning trips, a midday trip and two peak evening trips. The MWRTA received a Jobs Access Reverse Commute (JARC) grant to extend their Route 1 Green Line shuttle service, currently operating between the MBTA Woodland Green Line station and Staples Drive in Framingham, to the Westborough Technology Park, which is within the WRTA service area. This service will connect to the WRTA commuter rail shuttle service, and will begin operations in the fall of 2013 once the WRTA service is operating. The MWRTA will include a stop at the Southborough station on their extended Route 1 Green Line Shuttle. Connecting transit service on Route 9 will be provided via transfers between the WRTA and MWRTA shuttle service routes.

Implementation of additional commuter rail service on the Worcester line to support reverse commuting requires further evaluation by the MBTA to determine feasibility, and identification of a source of additional operating funds to support the service, if proven feasible.

Development of a park-and-ride facility would be the responsibility of MassDOT working in cooperation with the WRTA, MWRTA, and Town of Westborough to define the facility requirements and opportunities for funding the facility. A specific site for the facility would need to be selected via a competitive selection process.

The MetroWest/495 TMA is responsible for marketing their services to employers within their service area.

The Towns of Westborough and Southborough would be responsible for undertaking a planning process to review their zoning by-laws and developing revisions to support more transit-friendly land use patterns. Planning assistance may be available from the Central Massachusetts Regional Planning Commission (Westborough) and the Metropolitan Area Planning Commission (Southborough). The Massachusetts Department of Housing and Economic Development also provides technical assistance to communities for smart growth development. Changes to zoning by-laws require approval by Town Meeting.

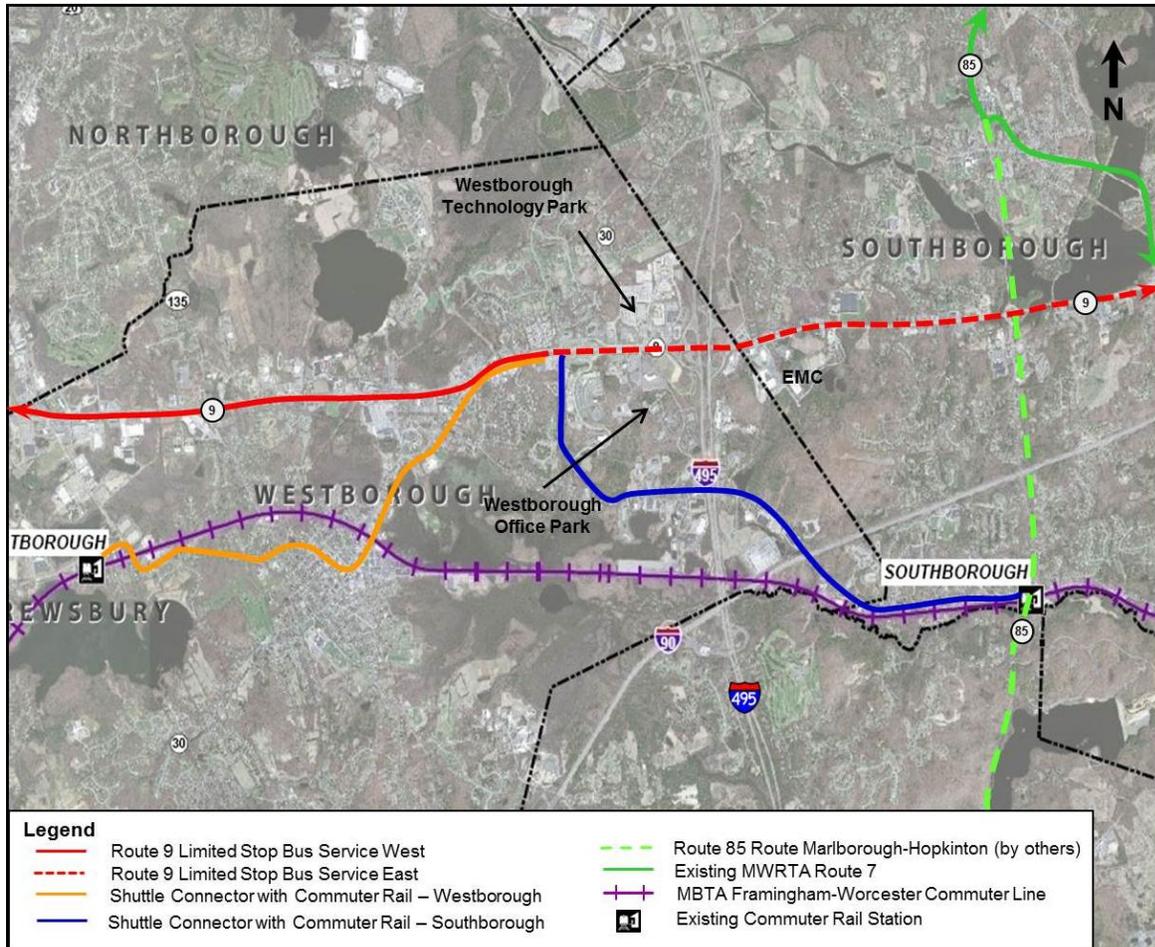
4.6 Multimodal Enhancements – Pedestrians (WB 1)

Existing conditions within the study area create challenges for pedestrians. There are extensive areas of auto-oriented office and industrial land uses with large parking lots, with few residential neighborhoods in proximity. The recommended actions in this category include actions to enhance pedestrian accommodations and encourage walking for trips within the study area. Implementation of these actions is primarily the responsibility of the Towns of Southborough and Westborough, working in coordination with private developers. MassDOT is responsible for incorporating pedestrian accommodations in their projects where appropriate. The recommended actions include:

- Conduct a sidewalk inventory to identify gaps or segments requiring repair or reconstruction.
- Install sidewalks and improve on-site pedestrian amenities within private developments as they are constructed or reconstructed.
- Provide better sidewalk connections from business parks north and south of Route 9 to public sidewalks on Computer Drive and Research Drive.
- Upgrade/install handicap ramps as intersections and driveways are reconstructed as part of redevelopment projects.
- Accommodate pedestrians where transit service is provided.

- Upgrade pedestrian signals at Route 9/Crystal Pond Road in conjunction with the intersection improvements (HT 11).
- Upgrade pedestrian signal equipment in conjunction with improvements to the Research Drive/Connector Road intersection (HT 8).
- Encourage Westborough and Southborough to revise zoning codes to provide for smaller-scale retail/service development within walking distance to support the needs of employees within the office/industrial parks in the study area.

Figure 4.6-1: Transit Recommendations



Implementation steps include:

- The Central Massachusetts and Boston Region MPO's undertake a pedestrian and bicycle study to include an inventory of existing facilities and an identification of gaps,
- Identify funding sources and/or incorporate improvements as parcels are developed or redeveloped, and
- The Towns of Westborough and Southborough revise zoning to provide for allow smaller-scale retail/service uses within industrial zones. Changes to zoning by-laws require approval by Town Meeting.

4.7 Multimodal Enhancements – Bicycles (WB2)

The recommended actions in this category include actions to enhance bicycle accommodations and encourage biking as an alternative mode of travel. Recommendations are directed toward local streets serving the study area such as Flanders Road and Connector Road, as Route 9 is a limited access highway from the I-495 interchange west within the study area. Implementation of these actions will require continued coordination with the Towns of Southborough and Westborough, private developers, the MetroWest/495 TMA, and MassDOT. The recommended actions include:

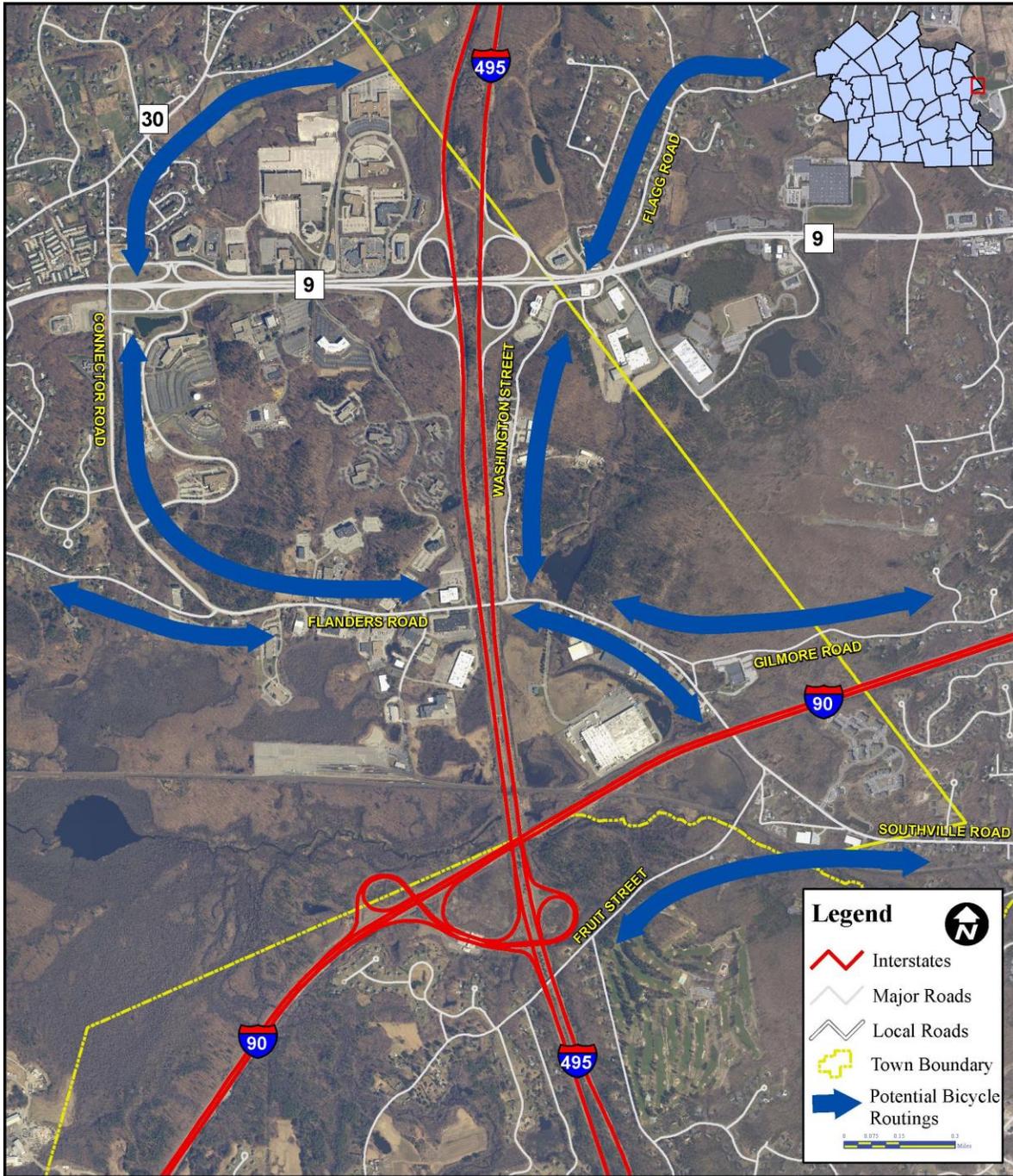
- Undertake a bicycle study to include an inventory of existing facilities and an identification of gaps, to be done by the Central Massachusetts and Boston Region MPOs. (This could be combined with the pedestrian facility study as discussed in Section 4.6)
- Improve options for bicycling commuting at business parks and park-and-ride lots such as dedicated all-weather parking, storage, and showers.
- Evaluate further development of the bike path proposed by the Town of Westborough along the former Boston and Worcester trolley ROW that runs through the study area. A section of this former trolley line located within the Walkup Robinson Memorial Reservation Park abutting Friberg Parkway.
- Incorporate bicycle route connections as development/redevelopment occurs.
- Provide bike accommodations (lanes, shoulders) where appropriate on local roadways connecting with the study area, i.e. Flanders Road. (See Figure 4-14)
- Coordinate with the MetroWest/495 TMA and encourage participation in their Bike Group.

Private developers and businesses would be responsible for incorporating bicycle facilities within their developments and encouraging employees to participate in the TMA Bike Group.

Implementation steps by the Towns of Westborough and Southborough include:

- Develop a bicycle master plan,
- Incorporate bicycle accommodations as roads are repaved/ reconstructed,
- Include requirements for bicycle accommodations under site plan review for development/redevelopment, and
- For the Town of Westborough to conduct a feasibility study of a bike path along the former Boston and Worcester trolley ROW, prepare design plans, and identify potential funding sources.

Figure 4.7-1: Potential Local Bike Routes



Source: CMRPC, 2012

4.8 Next Steps

The I-495 & Route 9 Interchange Improvement Study has identified a broad range of alternatives to address the identified congestion and safety issues, and to support future commercial and industrial growth in the area. While, available commercial and industrial space exceeds the projected short-term (2011-2016) demand due to the economic climate created by the 2008 recession, the area around the I-495/ Route 9 Interchange is a regional employment center that has been designated as a Priority Development Area (PDA) by the MetroWest Compact Plan. Employment forecasts suggest that over the long term (2035), there will be a demand for additional commercial space in Westborough and Southborough. The ability of the transportation infrastructure to support this desired development is a key factor in achieving these economic development objectives.

There is general consensus on the recommended plan for transportation improvements, but implementation will be more challenging. While the primary responsibilities for implementation vary among MassDOT, private developers, municipalities, and the Regional Transit Authorities (RTA), implementation of the components of this “master plan” will require close coordination between these groups. Implementation is further complicated by fact that the area is split between two Regional Transit Authorities and two Metropolitan Planning Organizations. Given the constraints on transportation funding, particularly for major infrastructure projects with high capital costs, there will need to be additional discussions and decisions regarding regional priorities for transportation investment.

While this study has identified a series of recommendations to address the needs of the study area, there are also other projects within the broader 495/MetroWest region, such as improvements to the I-495/I-290 interchange, that are also needed to address highway congestion and safety issues. The transportation agencies, planning organizations, municipalities and stakeholders required to make these decisions have successfully worked together as the Study Advisory Group to develop the recommended plan and will need to continue to do so to implement the recommendations of this study. An important next step will be to determine which recommendations should receive priority within the context of the broader regional needs, and to identify funding to implement the projects. MassDOT has initiated *The Way Forward: A 21st Century Transportation Plan* that presents a case for additional investment in the Commonwealth’s transportation system. As a result, the Massachusetts Legislature has identified new revenue to fund transportation investments, which is one possible source for moving the recommendations in this study on the on road to implementation. The information and proposals included in *The Way Forward* are the subject of further discussions related to the development of the Commonwealth’s state fiscal year 2014 budget.

Table 4-1: Recommended Actions

Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
I-495/I-90 Safety Improvements (HT 9 A and 9B)						(See 1 on Figure 4-1)
Provide additional advance E-ZPass/Cash-only Lane Signs (HT9A)	\$60,000	Highway Improvements - Roadway and Intersection Congestion and Safety Improvements	MassDOT	MassDOT Transportation Funding	Signage improvements can be implemented independently	
Flatten the curve on the I-90 ramp to I-495 NB (HT9B)	\$3 million	Highway Improvements - Highway Maintenance	MassDOT	Federal Funding Programs State funds	Ramp improvements can be implemented independently	
I-495/I-90 Interchange Ramp Modifications (HT 10)						(See 2 on Figure 4-1)
Modify the interchange to: <ul style="list-style-type: none"> • Add a new NB I-495 ramp to I-90 EB • Widen the SB I-495 on-ramp from I-90 to two lanes and extend it • Separate movements at toll plaza area • Add an auxiliary lane to the I-495 SB on-ramp to I-90 • Adjust the I-495 mainline to accommodate the ramp modifications 	\$100 + million	Highway Improvements - Major Infrastructure Investment	MassDOT	Federal Funding Programs State funds	New NB I-495 ramp to I-90 EB Auxiliary lane for I-495 SB ramp to I-90 Widen SB I-495 on-ramp from I-90 to two lanes and extend it	Coordinate with MassDOT planning and schedule for implementing electronic toll collection for the Massachusetts Turnpike (I-90). Coordinate with schedule for existing I-495 bridge replacement, so that the design of the replacement bridges will accommodate the I-495 mainline adjustments required for the interchange ramp modifications. Conduct additional alternatives analysis to refine the design concept. Environmental impact studies and design development are needed to better define project costs and opportunities for phased construction.

Interstate 495 & Route 9 Interchange Improvement Study

Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
I-495/Route 9 Braided Ramps (HT 3) (See 3 on Figure 4.14)						
Replace existing ramps at the I-495/Route 9 interchange with braided ramps.	\$25 Million	Highway Improvements - Major Infrastructure Investment	MassDOT	Federal Funding Programs State funds	I-495 NB/Route 9 ramp and I-495 SB/Route 9 ramp can be constructed independently	
Route 9 Widening (HT 5) (See 4 on Figure 4-1)						
<p>Provide three lanes on Route 9 in each direction between Computer Drive/Research Drive ramps, Westborough and Deerfoot Road, Southborough:</p> <ul style="list-style-type: none"> Add a lane to Route 9 WB Add a lane to Route 9 EB east of Coslin Drive, Southborough <p><i>Note: Route 9 Eastbound has three lanes from the Research Drive ramps to the I-495 Interchange and from the I-495 Interchange to Coslin Drive under existing conditions.</i></p>	\$9.2 million	Highway Improvements - Roadway and Intersection Congestion and Safety Improvements	MassDOT	MassDOT transportation funds and/or private development mitigation funds.	WB widening and EB widening can be constructed independently	<p>Monitor traffic volumes and implement action based on future development traffic generation.</p> <p>Coordinate with the Route 9/Crystal Pond Road Intersection Improvements.</p>
Add ITS Signage on I-495 (HT 12A)						
Implement a system coordinated with regional and state ITS technology that includes permanent ITS VMS boards and cameras to provide real-time travel information for I-495	TBD based on system design	Highway Improvements - Regional Highway Considerations	MassDOT	Federal Funding State Funding		MassDOT is currently implementing an ITS system on I-495 between Hopkinton and Andover.

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Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
Add ITS Signage on Route 9 (HT 12B)						
Implement a system coordinated with regional and state ITS technology that includes permanent ITS VMS boards and cameras to provide real-time travel information for Route 9	TBD based on system design	Highway Improvements - Regional Highway Considerations	MassDOT	Federal Funding State Funding		Coordinate with MassDOT plans for implementation of ITS on Route 9 on a broader regional basis beyond the study area.
Consider Alternate Tolling Technologies (HT 13)						
Evaluate alternate tolling technologies such as electronic toll collection to allow the removal of toll booths at the I-495/I-90 Interchange	TBD based on system design	Highway Improvements - Regional Highway Considerations	MassDOT	Federal Funding State Funding		MassDOT will implement All- Electronic Tolling (AET) technology on the Massachusetts Turnpike (I-90).
Route 9/Crystal Pond Road Intersection Improvements (HT 11)						(See 5 on Figure 4-1)
<p>Realign Crystal Pond Road and the Verizon site driveway to provide a four-way intersection</p> <p>Provide an EB jug-handle to eliminate the existing EB to WB Route 9 U-turn</p> <p>Add an additional left-turn lane to Route 9 WB.</p>	\$2.1 million	Highway Improvements - Roadway and Intersection Congestion and Safety Improvements	<p>Private developer(s) with MassDOT review and permit</p> <p>Town of Southborough if MassWorks funding sought.</p>	<p>Private funding</p> <p>MassWorks Infrastructure Program or other state funding</p>		<p>Assumes that the developer of Madison Place 40 B to provide ROW for jug-handle.</p> <p>Coordinate with Route 9 widening; the intersection improvements can be implemented independently of the widening.</p> <p>Requires additional ROW.</p> <p>Accommodates traffic generated by 1.2 million SF of development. Existing development is approximately 700,000 SF, allowing 500,000 SF additional development</p>
Research Drive/Connector Road Improvements (HT 8)						(See 6 on Figure 4-1)
Improve Connector Rd/Research Drive Intersection by adding a NB right-turn lane, upgrading signal equipment, and optimizing signal timing and phasing	\$250,000	Highway Improvements - Roadway and Intersection Congestion and Safety Improvements	Private developer(s) design/construct with MassDOT review	MassDOT transportation funds and/or private development mitigation funds.	Connector Rd/ Research Drive and Research Drive/RT 9 ramp improvements could be implemented independently	Could be mitigation for future development
Improve Research Drive at Route 9 EB ramps by adding a second WB right-turn lane, upgrading signal equipment, and optimizing signal timing and phasing	\$435,000					

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Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
Route 9 /Park Central Drive to Flagg Road Egress Modification (HT 6)						(See 7 on Figure 4-1)
Provide a new connector road from Park Central Drive to Flagg Road Eliminate the SB right-turn from Park Central Drive to Route 9 Westbound.	\$1.5 million	Highway Improvements - Roadway and Intersection Congestion and Safety Improvements	Developer with Town of Southborough and MassDOT District 3 review	Privately funded	Would need to be constructed in its entirety	Could be mitigation for future development. Early coordination with MassDOT District 3 is important. Requires further design development to better define ROW and permitting needs.
Consolidate Driveways on Route 9 east of I-495 (HT 7)						(See 8 on Figure 4-1)
Consolidate driveways as private properties are developed or redeveloped, as feasible.	TBD on case by case basis	Highway Improvements - Roadway and Intersection Congestion and Safety Improvements	Town of Southborough for policy Developer(s) with Town of Southborough and MassDOT District 3 review for each site	Privately funded	Driveway consolidations would be implemented incrementally	Early coordination with MassDOT District 3 is important to develop options before developer commits to site design or local permits issued.
WRTA/MWRTA Route 9 Connector Service (TR 1)						(See 9 on Figure 4-1)
Extend WRTA and MWRTA bus service along Route 9 to a common meeting point in Westborough to serve the job centers in the I-495/Route 9 area and to allow transfers between the services.	TBD based on length of route, span of service, frequency	Multimodal Enhancements- Transit/TDM	WRTA/ MWR TA MassDOT Rail & Transit	Federal Funding Programs State funds	N/A	The MWRTA received a \$600,000 Job Access and Reverse Commute (JARC) grant from the MassDOT Community Transit Grant Program to extend their Route 1 Green Line Shuttle to the Westborough Technology Park, which is within the WRTA service area. The WRTA will operate a shuttle service from the Westborough commuter rail station to the business parks on Route 9. The two services will meet to provide a connection between WRTA and MWRTA services. This service is planned to begin in the fall of 2013.
Westborough Commuter Rail Shuttle (TR 2A)						(See 10A on Figure 4-1)
Provide shuttle service between the Westborough Commuter Rail Station and job centers along Route 9	TBD based on length of route, span of service, frequency	Multimodal Enhancements- Transit/TDM	WRTA MetroWest/ 495 TMA MassDOT Rail & Transit	Federal Funding Programs State funds Private funding	N/A	The WRTA is planning on starting a shuttle service serving the Westborough Commuter Rail Station and business parks in Westborough in the fall of 2013 by using funds from the annual \$100,000 Westborough MBTA assessment.

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Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
Southborough Commuter Rail Shuttle (TR 2B)						(See 10B on Figure 4-1)
Provide shuttle service between the Southborough Commuter Rail Station and job centers along Route 9	TBD based on span of service/frequency	Multimodal Enhancements-Transit/TDM	MWR TA MetroWest/495 TMA MassDOT Rail & Transit	Federal Funding Programs State funds Private funding	N/A	The MWRTA is planning on adding a stop at the Southborough commuter rail station on the extension of their Route 1 Green Line Shuttle to the Westborough Technology Park.
Park-and- Ride Intermodal Facility (TR 3)						(See 11 on Figure 4-1)
Develop a park-and-ride lot in the vicinity of Research Drive/Connector Road Incorporate an intermodal facility to accommodate proposed WRTA/MWRTA and commuter rail shuttle services	TBD based on site selected and design.	Multimodal Enhancements-Transit/TDM	WRTA/ MWR TA MassDOT Rail & Transit MetroWest/495 TMA	Federal Funding Programs State funds Private funding	N/A	Intermodal facility might be developed as a public/private partnership.
Expand Transportation Management Association (TMA) Participation (TR 4)						
Encourage additional employers to join the MetroWest /495TMA Encourage employees to participate in TMA programs	Set by TMA	Multimodal Enhancements-Transit/TDM	MetroWest/495 TMA	Membership Dues	N/A	

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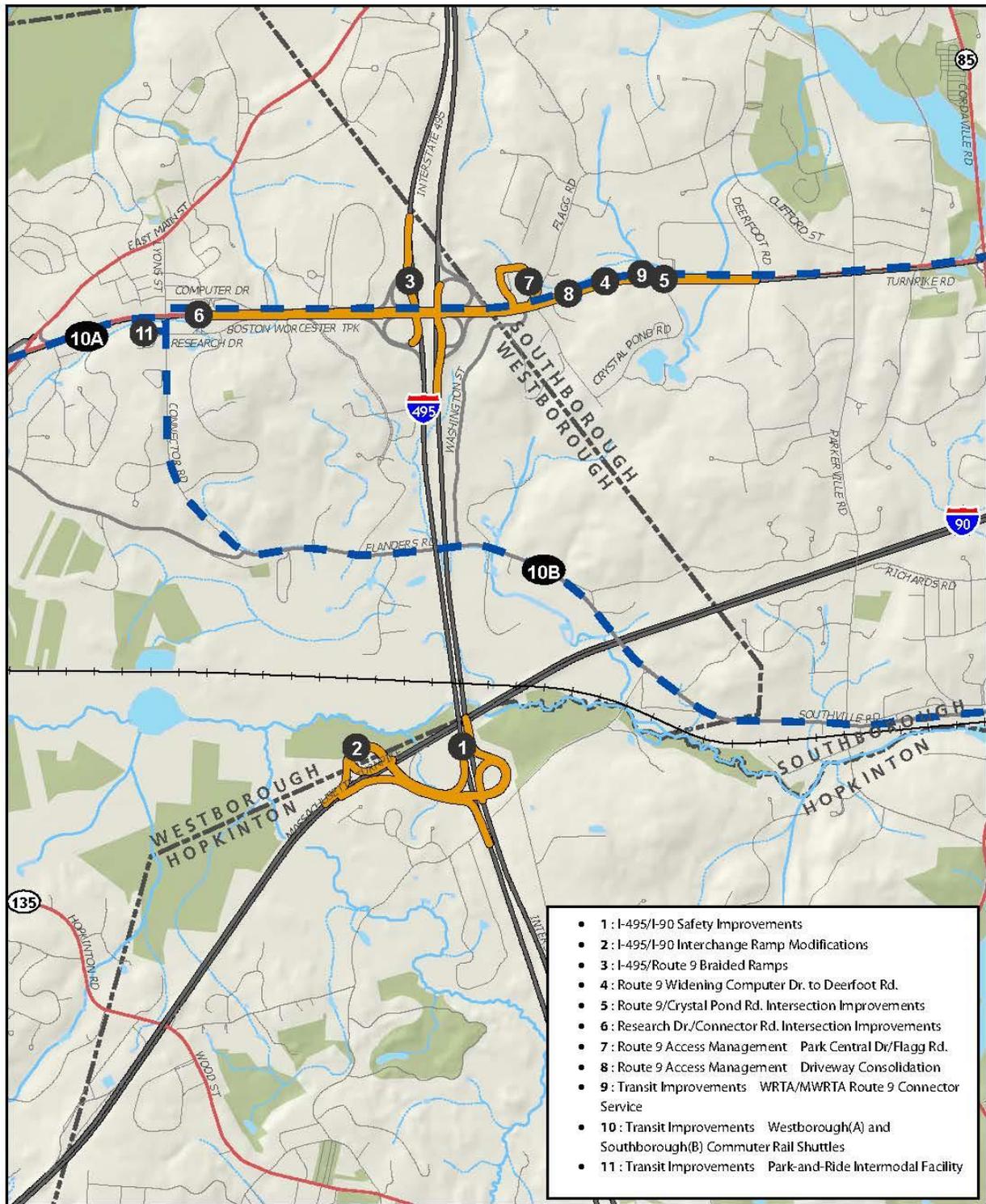
Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
Pedestrian Improvements (WB 1)						
<p>Accommodate pedestrians where transit service is provided.</p> <p>Install sidewalks and improve on-site pedestrian amenities within private developments</p> <p>Provide better sidewalk connections from business parks north and south of Route 9 to public sidewalks on Computer Drive and Research Drive</p> <p>Upgrade pedestrian signals at Route 9/Crystal Pond Road in conjunction with HT-11</p> <p>Upgrade pedestrian signal at Research Drive and Connector Road in conjunction with HT8.</p> <p>Upgrade/install handicap ramps as intersections and driveways are reconstructed as part of redevelopment projects along Route 9.</p>	<p>TBD on case by case basis</p>	<p>Multimodal Enhancements- Pedestrians</p>	<p>Town of Southborough</p> <p>Town of Westborough</p> <p>Private developers</p> <p>MassDOT for MassDOT projects</p>	<p>State funding</p> <p>Local funding</p> <p>Private funding</p>	<p>Projects can be implemented individually</p> <p>May be incremental improvements as properties develop/redevelop</p>	

Recommended Action	Cost (2012\$)	Implementation Category	Responsibility	Potential Funding Sources	Potential Elements for Phasing	Additional Considerations
Bicycle Improvements (WB 2)						
<p>Improve options for bicycling commuting at business parks and park-and-ride lots such as dedicated all-weather parking, storage, and showers</p> <p>Encourage participation in MetroWest/495 TMA bike program</p> <p>Incorporate potential future bicycle route connections as development/redevelopment occurs</p> <p>Undertake a feasibility study for development of the bike path proposed by the Town of Westborough along the former Boston and Worcester trolley ROW that runs through the study area. A section of this former trolley line is located within the Walkup Robinson Memorial Reservation Park abutting Friberg Parkway.</p> <p>Encourage towns to consider providing bike accommodations (lanes, shoulders) where appropriate on local roadways connecting with the study area, i.e. Flanders Road.</p> <p>Incorporate a bicycle storage facilities at the proposed park-and-ride intermodal facility (TR3)</p>	<p>TBD on case by case basis</p>	<p>Multimodal Enhancements- Bicycles</p>	<p>Town of Southborough</p> <p>Town of Westborough</p> <p>Private developers</p> <p>MassDOT for MassDOT projects</p>	<p>State funding</p> <p>Local funding</p> <p>Private funding</p>	<p>Actions can be implemented independently of each other</p>	

Legend: N/A = Not Applicable

TBD = To be determined

Figure 4-1: Recommended Actions



Base map data provided by MassGIS.

