

Memorandum for the Record
Transportation Planning and Programming Committee of the
Boston Region Metropolitan Planning Organization (MPO)

April 22, 2010 Meeting

10:00 AM – 12:45 PM, State Transportation Building, MPO Conference Room, Suite 2150, 10 Park Plaza, Boston

David Mohler, Chair, representing Jeffrey Mullan, Secretary and Chief Executive Officer, Massachusetts Department of Transportation (MassDOT)

Decisions

The Transportation Planning and Programming Committee voted to take the following actions:

- recommend MPO approval of Amendment Four of the federal fiscal years (FFYs) 2010 – 2013 Transportation Improvement Program (TIP)
- move \$10,000 from the *Safety Assessment Coordination Program* into the *Community Transportation Technical Assistance Program* in the FFY 2010 UPWP budget, as recommended by the UPWP Subcommittee
- approve the proposed functional classification designation of the proposed Weymouth-Rockland Parkway
- approve the minutes, with changes to page 2, of the meeting March 18, 2010,
- approved, by consensus, the Visions and Policies, as revised, for use in further developing the long-range transportation plan, *Paths to a Sustainable Region*, and guiding MPO decision making

Meeting Agenda

1. Public Comments

There were none.

2. Chair's Report – D. Mohler, MassDOT

MassDOT is preparing a five-year capital spending plan as required by the state's transportation reform legislation. MassDOT will be holding public hearings about this plan across the Commonwealth in the coming weeks.

3. Subcommittee Chairs' Reports – Jim Gallagher, Metropolitan Area Planning Council (MAPC), and Arnie Soolman, Director, Central Transportation Planning Staff (CTPS)

The Clean Air and Mobility Subcommittee will meet this afternoon to review applications for funding in this program.

The Unified Planning Work Program (UPWP) Subcommittee met on April 15. The Subcommittee reviewed CTPS's quarterly status report and recommended that two projects be combined. (This action will be taken up during agenda item #8.) The Subcommittee also discussed potential UPWP projects for FFY 2011. About half of the 32 proposed projects were discussed. Some proposed projects come from ideas that were

aired during the development of the FFY 2010 UPWP, others came from ideas posed by members of the public in comments to the MPO, from MPO staff members, and from the federal transportation agencies. The federal agencies have directed the MPO to consider livability, infrastructure at risk of flooding, and pavement management. The next UPWP meeting will be held on April 29 at 9 AM.

4. Regional Transportation Advisory Council – *Schuylar Larrabee, Regional Transportation Advisory Council*

The next Advisory Council meeting will be held on May 12. Paul Nelson, MassDOT, has been invited to discuss the statewide freight and rail plan.

The Advisory Council's Freight Committee is planning to hold a freight panel.

The Advisory Council is considering the Route 128 Business Council's request for membership.

5. Director's Report – *Arnie Soolman, Director, CTPS*

There was no Director's Report.

6. Draft Amendment Four of the FFYs 2010 – 2013 Transportation Improvement Program – *Joe Cosgrove, MBTA, and Hayes Morrison, TIP Manager, MPO Staff*

The draft Amendment Four of the FFYs 2010 – 2013 TIP includes the addition of a \$20 million Transportation Investment Generating Economic Recovery (TIGER) grant for the construction of the Wonderland Transit Oriented Development (TOD) Plaza in Revere.

City of Revere Mayor Thomas Ambrosino expressed his support for the amendment. He noted that the Wonderland TOD Plaza project would substantially improve Wonderland Station and provide pedestrian access to the beach. He added that the TIGER funds are specifically for this project and cannot be allocated elsewhere. The City has met with the MBTA and the Federal Transit Administration (FTA) about this project and the City is moving forward and planning to meet its deadlines. FTA requires that the project be included in the TIP in order for the City to receive the grant.

Staff received no other public comments regarding the amendment.

A motion to approve Amendment Four of the FFYs 2010 – 2013 TIP was made by Brian Kane, MBTA Advisory Board, and seconded by Ginger Esty, Town of Framingham. The motion passed unanimously.

7. Long-Range Transportation Plan Visions and Policies – *Pam Wolfe, Manager of Certification Activities, MPO Staff*

Members continued their discussion of the vision and policies for the next long-range transportation plan (LRTP), *Paths to a Sustainable Region*. Staff distributed a handout showing consensus items from the discussions of the meetings of March 25 and April 15, with redlined text showing comments received from members. (See attached.) Members discussed the proposed changes under seven topic areas: system preservation,

modernization, and efficiency; livability; mobility; environment; regional equity; climate change; and safety and security.

The sections below include the complete set of vision and policy statements upon which the members reached consensus. Revisions and additions made based on the discussion at this meeting are highlighted.

System Preservation, Modernization, and Efficiency

Members accepted the proposed changes to the visions and policies for this topic.

Vision statements:

- System is maintained in a state of good repair (SGR)
- System achieves maximum efficiency, reliability, and mobility (regionwide) through system preservation, ITS, technology, management and operations (M&O) programs, and a balanced program of strategic investments
- Expansion comes through strategic investments, based on a regional needs assessment
- Innovative approaches reduce auto dependency and actively promote other modes
- Modernization of the existing system provides accessibility and access for all; serves more people.

Policy statements:

- Adapt to fiscal constraints by developing needs-based, low-cost strategies for addressing mobility, access, and accessibility, and by pursuing alternative funding sources and mechanisms
- Put a priority on programs, services, and projects that maximize efficiency through ITS, technology, TSM, and M&O; turn to technology before expansion
- Bring and keep the network (particularly the transit, bike, and pedestrian facilities) into a SGR; set funding objectives for this
- For roadway investments, give priority to maintaining regional network of bridges and roads
- The MPO supports increased Chapter 90 funding from the state so that local road maintenance can remain focused on that program

Livability

Schuyler Larrabee, Advisory Council, raised the issue of whether the MPO would be encouraging the private sector to invest in areas of dense development. G. Esty suggested that mixed-use zoning could be used to encourage private sector development in established areas. She added that consideration would have to be given as to whether older existing infrastructure could withstand increased development. Jim Gallagher, MAPC, stated that the MPO could use the TIP criteria for evaluating projects to determine if a project better serves a mixed-use area.

Following that discussion, members accepted the proposed changes to the visions and policies for this topic.

Vision statements:

- Land use policies and transportation investments give all residents the opportunity to move (affordably) among where they live, work, get services, and play, using healthy transportation options; promoting a healthy lifestyle
- Multimodal transportation serves business, residential, and mixed-use centers; investments focus on existing activity centers, where density will be encouraged
- The transportation network will play its part as a foundation for economic vitality
- Community centers thrive with implementation of complete streets and context-sensitive design
- Mobility for persons with disabilities is improved
- Energy use is managed efficiently and alternative energy sources are used

Policy statements:

- Invest in projects and programs that are consistent with MetroFuture land use planning (serving already-developed areas; locations with adequate sewer and water; areas identified for economic development by state, regional, and local planning agencies; and density)
- Support health-promoting transportation options; expand and close gaps in the bicycle and pedestrian networks; promote a complete-streets philosophy
- Support urban and context-sensitive design to protect cultural, historic, and scenic resources, community cohesiveness, quality of life; fund enhancements at reasonable cost
- Support state-of-the-practice parking policies
- Use economic impacts (local and regional) as criteria for evaluating projects and programs; recognize that economic vitality plays a role in community livability

Mobility

Members discussed a proposed policy point that states that the MPO would “improve mobility for all; support improvements in all corners of the region, urban and suburban.” The statement was removed because it is too general a statement.

Members then accepted the proposed changes to the visions and policies for this topic.

Vision statements:

- System provides improved access to jobs; education and training; health services; social and recreational opportunities
- There are more transportation options and accessibility for all; all modes (including freight); all corridors
- System provides reliable service; delays, congestion, and travel time are reduced
- Transit ridership and use of sustainable options are increased
- The system meets people's needs; funding is guided by attention to customer service
- Existing transit, bicycle, and pedestrian facilities are linked in a network

Policy statements:

- Strengthen connections between modes; close gaps in the existing network
- Improve access and accessibility to transit
- Improve transit frequency, span, and reliability
- Expand transit, bicycle, and pedestrian networks; focus bicycle investments (lanes and paths) on moving people between activity centers (and access to transit)
- Integrate payment methods for fares and parking across modes
- Support TDM, TMAs, shuttles, and carpooling
- Address low cost capacity constraints and bottlenecks in the existing system before expansion

Environment

Members discussed how the MPO would fulfill one of the proposed policy points that states that the MPO will “avoid funding projects that increase exposure of at-risk populations to ultra-fine particulates.” Several members made suggestions for revisions, which included changing the statement to indicate that the MPO will incorporate early mitigation planning into projects that have potential impacts, or that the MPO will consider funding projects that decrease exposure to ultra-fine particulates. David Koses, City of Newton, and M. Pratt expressed that the MPO should be concerned with exposure to “all populations” rather than only at-risk populations. S. Larrabee noted that other pollutants (such as light pollution) should also be considered. Members agreed to revise one of the policy statements, as highlighted below, to reflect these thoughts.

Members then accepted the proposed changes to the visions and policies for this topic.

Vision statements:

- Human and environmental health are considered in decision making
- Greenfields are preserved and clean-up of brownfields facilitated as a result of transportation investments in areas of existing development
- Air quality is improved; vehicle emissions (carbon monoxide, nitrogen oxides, volatile organic compounds, carbon dioxide, and particulates) are reduced to required and/or target levels
- Impacts to wetlands, soil, water and other environmental resources from transportation projects are avoided or minimized

Policy statements:

- Avoid investments that increase pressure on developing greenfields; support investments that facilitate clean-up of brownfields
- Promote fleet management and modernization
- Support high-occupancy-vehicle travel options
- Protect natural and cultural resources and public health; plan early to avoid and mitigate impacts, such as stormwater and groundwater impacts and air quality impacts, including introduction of additional fine particulates
- Promote energy conservation and use of alternative energy sources

- Avoid funding projects that increase exposure of at-risk populations to ultra-fine particulates
- Promote investments and give priority to projects and programs with lower life-cycle costs and emissions
- Invest so as to increase mode share of transit and nonmotorized modes
- Work with environmental and cultural resource agencies to reach environmental objectives

Regional Equity

Members discussed a proposed policy point that states that the MPO will “address identified equity needs related to service, and removing or minimizing burdens (air pollution, unsafe conditions, community impacts); give these priority over everything except bridge/tunnel maintenance.”

Tom Kadzis, City of Boston, noted that the federal government defines “equity” largely in terms of access to education, healthcare, and jobs. He stated that it would be prudent of the MPO to think about whether it should broaden its definition without commensurate federal investment. J. Gallagher advocated for the MPO to have a policy that goes beyond that definition and to prioritize funding for projects that fix burdens that have been placed on communities.

Members debated whether the MPO should give priority to projects that reduce a transportation burden on a population over other needs and interests, such as supporting economic development. M. Pratt expressed concern that such a policy would penalize municipalities that had good vision (and that seek to avert problems early on) and reward those that do not.

D. Koses expressed that the MPO needs more flexibility to address issues such as economic development and should not prioritize this single criteria. He also pointed out that the MPO already funds many projects that address inequities. Richard Reed, Town of Bedford, agreed and stated that communities have many interests and priorities that need to be addressed, and equity should not be given priority above all others.

Members agreed to modify the statement, with J. Gallagher’s objection, to remove the statement that requires giving priority to projects that address equity over all other needs.

Then they discussed a new proposed policy statement that calls for the MPO to “give priority to heavily used services, such as those serving low-income and minority neighborhoods, over new, yet-to-be-proven services.” D. Koses suggested modifying the statement to focus on transit services. The changes are highlighted below.

Following the discussion, members agreed on the following statements for this topic:

Vision statements:

- There is equitable mobility, quality, affordability, and access to jobs, educational institutions, and services for low-income and minority residents, the elderly, youth, and persons for whom English is a second language
- Environmental burdens from transportation (existing and future) are minimized; low-income and minority populations are not inequitably burdened
- Expansion projects address regional needs

Policy statements:

- Continue outreach and analysis to identify equity needs; continue to monitor system performance
- Address identified equity needs related to service and removing or minimizing burdens (air pollution, unsafe conditions, community impacts)
- Track implementing agencies' actions responding to transportation needs identified in MPO outreach and analysis; encourage action to address needs
- Strengthen avenues for involvement of low-income and minority persons in decision-making
- Reduce trip times for low-income and minority neighborhood residents and increase transit service capacity
- Give priority to heavily used transit services over new, yet-to-be-proven services

Climate Change

D. Mohler announced that the Commonwealth will be setting greenhouse gas reduction targets for the state. Targets will be set for the transportation sector as part of the statewide target. The Commonwealth will not set a target for MPOs, but MPOs may choose to set their own targets or even more ambitious targets than the state mandates. The measurement of reductions from this sector will probably be done on a statewide level. Under the Global Warming Solutions Act, the Executive Office of Energy and Environmental Affairs will have regulatory control over this initiative.

M. Pratt stated that the Commonwealth should not “trade off” emission reductions in different parts of the state, and that the larger reductions should occur in the more polluted areas of the state.

T. Kadzis expressed support for having the MPO work to comply with the state targets, but noted that the MPO should not set a goal that exceeds the state goal.

B. Kane commented on a proposed policy statement that calls for the MPO to “take action to meet defined targets for reducing vehicle-miles traveled (VMT).” He expressed support for reducing VMT, but pointed out that doing so would reduce toll and gas tax revenues.

Members agreed on the following statements for this topic:

Vision statements:

- Greenhouse gas (GHG) emissions are reduced to Global Warming Solutions Act levels
- The MPO has adopted GHG reduction goals and is acting to meet them
- Transportation infrastructure is protected

Policy statements:

- Take action to meet defined targets for reducing vehicle-miles traveled (VMT)
- Pursue stronger land use and smart-growth strategies
- Tie transportation funding to VMT reduction
- Increase transit, bicycle, and pedestrian options
- Invest in adaptations that protect critical infrastructure
- Encourage transportation demand management (TDM) commuter strategies
- Invest in projects and programs for fleet management and modernization, idling reduction, alternative fuels
- Energy use will be part of the environmental impact analysis of all projects. Total energy use in the Plan will be (x%) less than 1990 transportation-related energy use in the MPO region

Safety and Security

Members agreed on the following statements for this topic:

Vision statements:

- The transportation system provides safe transportation (personal and operational) on all modes
- The number and severity of crashes are reduced
- The viability of transportation infrastructure critical to emergency response and evacuations is protected from natural and man-made threats
- Transit has state-of-the-practice ITS and communication systems; transit malfunctions are reduced

Policy statements:

- Implement actions stemming from all-hazards planning
- Maintain the transportation system in an SGR
- Use state-of-the-practice safety elements; address roadway safety deficiencies (after safety audits) and transit safety (including federal mandates)
- Support incident management programs and ITS
- Protect critical infrastructure; address transit security vulnerabilities; upgrade key transportation infrastructure to a "hardened" design standard
- Improve safety for pedestrians and cyclists; ensure that safety provisions are incorporated into shared-use corridors
- Give priority to safety projects that reduce the severity of crashes, especially those that improve safety for all
- Promote safety through supporting the reduction of base speed limit (municipalities) to 25 miles per hour and education and enforcement on rules of the road, all modes

8. Unified Planning Work Program – *Stephen Woelfel, MassDOT Highway Division*

On April 15, the UPWP Subcommittee voted unanimously to recommend that the Transportation Planning and Programming Committee move \$10,000 from the *Safety Assessment Coordination Program* into the *Community Transportation Technical Assistance Program* in the FFY 2010 UPWP budget.

A motion to move \$10,000 from the *Safety Assessment Coordination Program* into the *Community Transportation Technical Assistance Program* in the FFY 2010 UPWP budget, as recommended by the UPWP Subcommittee, was made by M. Pratt, and seconded by Brian Kane, MBTA Advisory Board. The motion passed, unanimously. The Town of Braintree abstained.

9. Functional Classification Designation – *David Mohler, MassDOT*

Members were provided with a document describing the technical details of the proposed Weymouth-Rockland Parkway project, part of the Southfield redevelopment project in Weymouth. (See attached.) MassDOT proposed that the MPO vote to change the functional classification of the roadway system that will connect Route 18 to Route 3 from a “local” designation to an “urban collector” designation. The change in designation would make the roadway federal aid eligible.

A motion to approve a Federal Functional Classification designation for the proposed East-West Parkway as an “urban collector” when complete, and designate Shea Drive/Shea Memorial Drive, and Reservoir Park Drive t as “urban collectors” was made by John Romano, MassDOT Highway, and seconded by M. Pratt. The motion passed unanimously.

During a discussion of the motion, J. Gallagher, M. Pratt, and Michael Lambert, City of Somerville, expressed that, while they are support of this action, members should have more time to discuss such decisions in the future.

D. Mohler and Karl Quackenbush, Deputy Technical Director of CTPS, noted that MPO staff believes the “urban collector” designation is the correct technical designation for the roadway.

10. Minutes – *Pam Wolfe, Manager of Certification Activities, MPO Staff*

A motion to approve the minutes of the meeting of March 18 – with changes to page 2 as recommended by M. Pratt, and J. Gallagher – was made by T. Kadzis, and seconded by J. Romano. The motion passed unanimously.

11. Work Program for HOV Lane and I-93 Access Improvements in the South Bay/Savin Hill Area – *Karl Quackenbush, Deputy Technical Director of CTPS*

Members were provided with a draft of the work program for the *HOV Lane and I-93 Access Improvements in the South Bay/Savin Hill Area*. (See attached.) The UPWP Subcommittee approved this project idea.

The proposed study would examine the possibility of increasing capacity on Interstate 93 in the South Bay and Savin Hill area. This section of highway is the most heavily traveled in the region and experiences heavy congestion at peak travel times. The study would investigate two ideas: connecting the HOV zipper lane with the Central Artery HOV lane, and restoring a southbound on-ramp (at its original location or elsewhere) that existed temporarily during Central Artery construction.

Staff would conduct a planning level study that would involve identifying construction issues, land takings that would be necessary, and options for on-ramp locations. Staff would also consider the implications for the adjacent MBTA commuter rail corridor, which could include opportunities for adding a new depressed track. The body of material generated from the study would serve as the basis for future planning. The study could be done within the current UPWP cycle.

Members discussed the proposed work program.

J. Gallagher advised staff to conduct a more comprehensive study and recommended expanding the alternatives for study to also consider the possibility of depressing an HOV lane, converting a general-purpose lane into an HOV lane, or converting an HOV lane into a HOT lane. K. Quackenbush replied that staff is limited to what it can do within the study's timeframe and budget. Bill Kuttner, MPO staff, noted that those solutions would also require some land takings, due to the need to add right-of-way and to have space for operating and storing the zipper truck.

Members expressed their opinions about the scope of the study with some advocating for conducting the study as described in the work program, others advocating for a more comprehensive study, and still others advocating for reducing the scope or not conducting the study at all.

Christine Stickney, Town of Braintree, expressed support for the approach recommended by staff, and suggested that other options could be studied in phases to follow. She noted the importance of addressing this congestion problem, which affects the South Shore communities, and noted that issues may arise regarding adding fees on HOV lanes. She remarked that the study is well in-line with the MPO's visions and policies for the long-range transportation plan and that the study should be done in full.

M. Pratt expressed support for a phased approach.

B. Kane stated that recommendations for improvements for this study would likely be extremely costly, not fundable under current financial conditions, and would require many land takings. He advised spending the funds for the study on more feasible UPWP projects, or reducing the scope of the study to exclude the HOV extension. He stated that the MPO will never be able to fund the HOV portion of the project and that the MPO should be realistic about what it chooses to study and fund.

J. Romano expressed support for the study, especially the portion looking at the restoration of the on-ramp given that many members of the public expressed opposition when the temporary ramp was closed when the Central Artery/Tunnel project was completed. D. Koses, G. Esty, and M. Pratt suggested shortening the work program to address only the on-ramp portion of the project.

Steve Olanoff, Advisory Council, noted that the Advisory Council supported the study during the UPWP development as an economic development opportunity. K. Quackenbush noted that the study, as written, does not include an economic development analysis. Staff did not express an intention to include any economic development analysis in this work program.

T. Kadzis remarked on the City of Boston's interest in addressing this congestion issue, and raised the idea that the larger vision that includes a unified HOV system should be considered. He expressed support for looking at all options. J. Romano added that the congestion problem is large enough to warrant a full study.

Staff was asked to prepare an alternate work scope that includes only the study of the on-ramp. K. Quackenbush stated that for the same amount as the original scope, staff could factor in traffic modeling work.

Members will vote on the work program in the next meeting following the Municipal TIP Input Days.

12. Work Program for Wellesley Transit Study – Karl Quackenbush, Deputy Technical Director of CTPS

Members were provided with a draft of the work program for the *Wellesley Transit Study*. (See attached.)

The Town of Wellesley requested that the MPO staff provide planning assistance for coordinating transit services operating in the town or adding new transit services, as part of its intra-town transit plan. Existing transit service in the town includes three commuter rail stations, college shuttle services, and two nearby Green Line stations.

Staff would work with town officials to collect data from primary and secondary sources and determine where potential demand for service exists. Data would be collected by the following means:

- a survey of the parents of high school and middle school students (in light of the fact that the rebuilding of the high school will result in a loss of student parking and concerns about student's transportation to after-school programs)
- a license plate survey at the three commuter rail stations and the Green Line stations to determine origins of drivers
- information from the three colleges about where students and staff live

The Town of Wellesley would fund the study. This study would not be conducted this quarter.

Members discussed the work program.

G. Esty recommended first evaluating THE RIDE service in Wellesley. K. Quackenbush stated that the work would be included in Task 1 of the work program.

D. Koses noted that staff would not be capturing all the potential demand in Task 3.2 because it would not be capturing information about commuters who park on-street rather than in the MBTA lots.

Members will vote on the work program in the next meeting following the Municipal TIP Input Days.

13. Safety Analysis of Transportation Improvement Program Projects – Karl Quackenbush, CTPS, and Seth Asante, MPO Staff

Members were provided with a memorandum titled, “Safety Evaluation of Transportation Improvement Program Projects.” (See attached.)

K. Quackenbush introduced the report by noting that the safety aspects of TIP projects were discussed at the TIP Criteria Subcommittee meetings in 2008 and subsequently, MPO staff prepared a work program to assess the safety impacts of TIP projects.

The MPO’s current process for conducting safety evaluations for projects involves looking at the numbers of crashes and fatalities at the project location, the number of crashes that involve bicycles and pedestrians, how the location ranks among the top crash locations in the state, and crash rates.

In this pilot study, staff used a more predictive method – employing *crash reduction factors (CRF)* – to look at the potential of project elements to reduce crashes, and applied the technique to seven project locations. This method requires staff to be able to obtain functional design reports (FDRs). This exercise tested the MPO’s ability to obtain those reports and to determine if they contained the necessary information.

Seth Asante provided details about the approach staff took on the pilot project.

To select the projects for study, staff selected those in the Universe of TIP Projects that were at the 25% design and 75% design stage, and then requested FDRs from MassDOT. (The FDRs contain project need and safety information, and details on planned improvements.) Staff received 25 of 50 FDRs requested and selected seven of those projects for study.

For the projects studied, staff identified safety needs and assessed whether the planned treatments in the FDRs address those needs. For each treatment proposed in the FDR, staff applied CRFs from the National Database and tallied a combined CRF for the entire project to determine the potential for reducing crashes.

Staff concluded that the overall approach is theoretically sound. There were, however, several problems associated with implementing it. First, the National Database uses different methodologies to develop CRFs. (So there is some inconsistency in the CRFs.) Secondly, some of the FDRs did not contain enough information about safety needs and, for example, lacked crash diagrams that provide insight into crash patterns. Thirdly, the process would be expensive for the MPO to conduct given the time required to conduct the quantitative analysis. And lastly, CRFs from the National Database are not tailored to conditions in Massachusetts.

Members had several comments:

M. Pratt noted that detailed crash information would be available in police reports. S. Asante explained that some of the FDRs did not have the crash diagrams that show overall crash patterns. Only knowing the crash frequency does not allow staff to understand the reasons that the crashes are occurring. It would be costly and time consuming for staff to have to request the individual crash reports from police, and to develop the necessary crash diagrams.

D. Koses inquired as to whether any nearby states have developed CRFs. S. Asante stated that no New England states have developed CRFs. Florida has developed its own CRFs.

J. Gallagher commended staff for their work on this project. He commented that the expense of conducting this type of evaluation would be worth the cost and beneficial for the MPO members when they consider programming the TIP, as long as the results are believable. He asked whether staff believed that the rankings developed from this process were accurate. K. Quackenbush replied that the results from the pilot study were very close to the results obtained through the MPO's traditional methods, though the pilot study did not use a statistically valid sample. H. Morrison added that for the past two years staff has been using the FDRs to rank project effectiveness.

Considering the problems identified by staff during this presentation and that the pilot project's results were comparable to those produced by staff using the current methods, the MPO staff is not recommending that the MPO use this approach at this time.

14. Members Items

P. Wolfe drew members' attention to materials at their places: a revised logo for the new long-range transportation plan, *Paths to a Sustainable Region*, and a summary of the proposed UPWP projects. (See attached.)

J. Romano announced that MassDOT will be holding its next community forum on May 4 from 5-6:30 PM.

D. Mohler announced a room change for Municipal TIP Input Day on May 6.

15. Adjourn

A motion to adjourn and convene the MPO meeting was made by B. Kane, and seconded by J. Romano. The motion passed unanimously.

Transportation Planning and Programming Committee Meeting Attendance
Thursday, April 22, 2010, 10:00 AM

Member Agencies

MassDOT
MassDOT Highway

City of Boston
City of Newton
City of Somerville
MAPC
MBTA
MBTA Advisory Board
Regional Transportation
Advisory Council
Town of Bedford
Town of Braintree
Town of Framingham
Town of Hopkinton

Representatives and Alternates

David Mohler
John Romano
Stephen Woelfel
Thomas Kadzis
David Koses
Michael Lambert
Jim Gallagher
Joe Cosgrove
Brian Kane
Schuyler Larrabee

Richard Reed
Christine Stickney
Ginger Esty
Mary Pratt

MPO Staff/CTPS

Mike Callahan
Maureen Kelly
Bill Kuttner
Hayes Morrison
Sean Pfalzer
Karl Quackenbush
Arnie Soolman
Mary Ellen Sullivan
Pam Wolfe

Other Attendees

Lynn Ahlgren

Mayor Thomas Ambrosino
Sue McQuaid

Steve Olanoff

Karen Pearson

MetroWest Regional Transit
Authority
City of Revere
Neponset Valley Chamber of
Commerce
Regional Transportation
Advisory Council
MassDOT Office of
Transportation Planning

IDEAS for VISIONS and POLICIES for the 2035 PLAN

April 22, 2010

VISIONS

System Preservation, Modernization, and Efficiency Vision

- System is maintained in state of good repair (SGR)
- System achieves maximum efficiency, **reliability (CB)**, and mobility (regionwide) through system preservation, IIS, technology, management and operations (M&O) programs, and a balanced program of strategic investments
- Expansion comes through strategic investments, based on regional needs assessment
- Innovative approaches reduce auto dependency and actively promote other modes
- Modernization of the existing system provides accessibility and access for all; serves more people

Livability Vision

- Land use policies and transportation investments give all residents the opportunity to move (affordably) between where they live, work, get services, and play, using healthy transportation options; promoting a healthy lifestyle
- Multimodal transportation serves business, residential, and mixed-use centers; investments focus on existing activity centers, **where density will be encouraged**
- **Moved to previous bullet. In 2035, there will be more density (residential, business, services)**
- **The Transportation network will play its part as a foundation for economic vitality (CB)**
- Community centers thrive with implementation of complete streets and context-sensitive design
- Mobility for persons with disabilities is improved
- Energy use is managed efficiently and alternative energy sources are used

Mobility Vision

- System provides improved access to jobs; education and training; health services; social and recreational opportunities
- There are more transportation options and accessibility for all; all modes (including freight); all corridors
- **System provides reliable service (CB);** delays, congestion, and travel time are reduced; **reliability is increased**
- Transit ridership and use of sustainable options are increased
- The system meets people's needs; funding is guided by attention to customer service
- Existing transit, bicycle, and pedestrian facilities are linked in a network

Environment Vision

- Human and environmental health are considered in decision making
- Greenfields are preserved and clean-up of brownfields facilitated as a result of transportation investments in areas of existing development
- Air quality is improved; vehicle emissions (carbon monoxide, nitrogen oxides, volatile organic compounds, carbon dioxide, and particulates) are reduced to required and/or target levels
- **Impacts to wetlands, soil, water and other environmental resources from transportation projects are avoided or minimized (JGa) Project design processes protect wetlands and minimize soil, water, and other environmental impacts**
Moved to Policies (JG) • Transportation agencies work with environmental and cultural resource agencies

Regional Equity Vision

- There is equitable mobility, quality, affordability, and access to jobs, educational institutions, and services for low-income and minority residents, the elderly, youth, and persons for whom English is a second language
- Environmental burdens from transportation (existing and future) are minimized; low-income and minority populations are not inequitably burdened
- Expansion projects address regional needs
Move to Policies (JGa) • Heavily used services, such as those serving low income and minority neighborhoods, are given priority over new, yet to be proven services

Climate Change Vision

- Greenhouse gas (GHG) emissions are reduced to Global Warming Solutions Act levels
- **The MPO remains engaged as a regional participant in climate change related actions; t (JG) The MPO has adopted GHG reduction goals and is acting to meet them**
- Transportation infrastructure is protected

Safety and Security Vision

- The transportation system provides safe transportation (personal and operational) on all modes
- The number and severity of crashes are reduced
- **The MPO continues to support all hazards planning; t (JGa) The viability of transportation infrastructure critical to emergency response and evacuations is protected from natural and man-made threats**
- Transit has state-of-the-practice IIS and communication systems; transit malfunctions are reduced

POLICIES

System Preservation, Modernization, and Efficiency Policies

- **Adapt to fiscal constraints by developing needs-based, low-cost strategies for addressing mobility, access, and accessibility and by pursuing alternative funding sources and mechanisms (CB)**
- Put a priority on programs, services, and projects that maximize efficiency through IIS, technology, TSM and M&O; turn to technology before expansion
- Bring and keep the network (particularly the transit, bike, and pedestrian facilities) into an SGR; set funding objectives for this
- For roadway investments, give priority to maintaining regional network of bridges and roads
- **The MPO supports increased Chapter 90 funding from the state so that Refocus local road maintenance can remain focused on that program (RR, TK) toward Chapter 90 programs**

Livability Policies

- Invest in projects and programs that are consistent with MetroFuture land use planning (serving already-developed areas; locations with adequate sewer and water; areas identified for economic development by state, regional, and local planning agencies; and density)
- Support health-promoting transportation options; expand and close gaps in the bicycle and pedestrian networks; promote a complete-streets philosophy
- **Support (TK) Consider** urban and context-sensitive design to protect cultural, historic, and scenic resources, community cohesiveness, quality of life; fund enhancements at reasonable cost
- Support state-of-the-practice parking policies
- **Use economic impacts (local and regional) as a criteria for evaluating projects and programs; recognize that economic vitality plays a role in community livability (CB)**

Mobility Policies

- Improve mobility for all; support improvements in all corners of the region, urban and suburban
- Strengthen connections between modes; close gaps in the existing network
- Improve access and accessibility to transit
- Improve transit frequency, span, and reliability
- Expand transit, bicycle, and pedestrian networks; focus bicycle investments (lanes and paths) on moving people between activity centers (and access to transit)
- Integrate payment methods for fares and parking across modes.
- Support TDM TMAs, shuttles, and carpooling
- Address low cost capacity constraints and bottlenecks in the existing system before expansion

Environment Policies

- Avoid investments that increase pressure on developing greenfields; support investments that facilitate clean-up of brownfields
- Promote fleet management and modernization
- Support high-occupancy-vehicle travel options
- Protect natural and cultural resources; plan early to avoid and mitigate impacts, **such as stormwater and groundwater impacts (MP)**
- Promote energy conservation and use of alternative energy sources
- Avoid funding projects that increase exposure of at-risk populations to ultra-fine particulates **How? (TK)**
- Promote investments and give priority to projects and programs with lower life-cycle costs and emissions
- Invest so as to increase mode share of transit and nonmotorized modes
- **Work with environmental and cultural resource agencies to reach environmental objectives (JGa)**

Regional Equity Policies

- Continue **MPO (JGa)** outreach and analysis to identify equity needs; continue to monitor system performance
- Address identified equity needs related to service and removing or minimizing burdens (air pollution, unsafe conditions, community impacts); give these priority over everything except bridge/tunnel maintenance **How? (TK)**
- **Track Work with implementing agencies' actions responding to transportation needs identified in MPO outreach and analysis; encourage action to address needs (JGa)**
- **Strengthen avenues for involvement of low-income and minority persons in decision-making (JGa) Follow environmental justice principles**
- Reduce trip times for low-income and minority neighborhood residents and increase transit service capacity
- **Give priority to heavily used services, such as those serving low-income and minority neighborhoods, over new, yet-to-be-proven services (JGa)**

Climate Change Policies

- **Take action to meet Ddefined (JGa) targets for reducing vehicle-miles traveled (VMT) and act to meet them**
- Pursue stronger land use and smart-growth strategies
- Tie transportation funding to VMT reduction
- Increase transit, bicycle, and pedestrian options
- Invest in adaptations that protect critical infrastructure
- Encourage transportation demand management (TDM) commuter strategies
- Invest in projects and programs for fleet management and modernization, idling reduction, alternative fuels
- Energy use will be part of the environmental impact analysis of all projects. Total energy use in the Plan will be (x%) less than 1990 transportation-related energy use in the MPO region

Safety and Security Policies

- **Implement actions stemming from (JGa) Continue to participate in all-hazards planning and take appropriate actions**
- Maintain the transportation system in an SGR
- Use state-of-the-practice safety elements; address roadway safety deficiencies (after safety audits) and transit safety (including federal mandates)
- Support incident management programs and IIS
- Protect critical infrastructure; address transit security vulnerabilities; upgrade key transportation infrastructure to a "hardened" design standard
- Improve safety for pedestrians and cyclists; ensure that safety provisions are incorporated into shared-use corridors
- Give priority to safety projects that reduce the severity of crashes, especially those that improve safety for all
- **Promote safety through supporting the Support reduction of base speed limit (municipalities) to 25 miles per hour and education and enforcement on rules of the road, all modes (MP)**

EXHIBIT A

PROPOSED WEYMOUTH-ROCKLAND PARKWAY PHASE 1 TECHNICAL DETAILS

Weymouth-Rockland Parkway Phase 1 Summary

Phase 1 of the Weymouth-Rockland Parkway will provide an east-west connection between Route 18 (via Shea and Shea Memorial Drives) and Hingham Street/Route 3 (via Reservoir Park Drive). In addition to this regional connection, the Parkway will also provide access to existing and proposed land uses adjacent to the facility's alignment. Phase 1 of the proposed Parkway will consist of three distinct segments:

1. Shea Drive/Shea Memorial Drive (existing)
2. East-West Parkway (proposed)
3. Reservoir Park Drive (existing)

During the weekday commuter peak hours, Phase 1 of the Parkway is projected to process approximately 1,050 vehicles per hour (morning) and 900 vehicles per hour (afternoon). On a daily basis approximately 14,600 vehicles are projected to use the Phase 1 Parkway.

As defined by AASHTO's *Policy on Geometric Design of Highways and Streets*, and MassDOT's *Project Development and Design Guide*, the function of collector roadways are equally divided between providing an intra-regional level of mobility (i.e., connecting the arterial network with the local roadways) and providing access to adjacent land uses. Since the roadway link comprised of the East-West Parkway Phase 1 and Shea/Shea Memorial Drives will provide a connection between Route 18 (an Urban Principal Arterial) and Weymouth Street (an Urban Minor Arterial), as well as provide access to existing and proposed land uses along the facility's alignment, it appears that designating the functional classification of Phase 1 of the Parkway Shea/Shea Memorial Drives as Urban Collectors is appropriate. Reservoir Park Drive would also be upgraded to an Urban Collector, as this facility will also serve the dual function of providing access for adjacent land uses and providing connections between arterials (Weymouth Street and Hingham Street).

From a design perspective, all three segments of the Weymouth-Rockland Phase 1 Parkway will meet the AASHTO and MassDOT standards for collector roadways. These standards include a minimum pavement width of 30 feet, minimum lane widths of 10 to 12 feet, minimum design speed of 30 mph, accommodations for pedestrians and bicycles, and the provision of turn lanes to facilitate vehicular movements where required.

Table 1 provides a summary of the Collector Road design and functionality criteria for each of the three segments of the Parkway.

Table 1 Collector Road Design Criteria

Criteria	AASHTO Minimum Requirements	East-West Parkway Phase 1	Shea Drive/ Shea Mem. Dr.	Reservoir Park Drive
Pavement Width	30 ft.	30 ft. – 52 ft.	30 ft. – 50 ft.	36 ft. – 40 ft.
Lane Width	10 – 12 ft.	11 ft	13 ft. – 15 ft.	10 ft.- 19 ft.
Design Speed	30 mph	40 mph	30 mph	30 mph
Pedestrian Accommodations	Yes	Yes	Yes	Yes
Bicycle Accommodations	Yes	Yes	Yes	Yes
Provides Turn lanes at intersections where needed	Yes	Yes	Yes	Yes
Intra-Regional Mobility	Yes	Yes	Yes	Yes
Land Use Access	Yes	Yes	Yes	Yes

Exhibit A-1 illustrates the approximate Phase 1 alignment of the Weymouth-Rockland Parkway as well as the regional context of the proposed facility. Each of the segments is discussed in detail in the following sections.

Shea Drive/Shea Memorial Drive

OWNERSHIP: South Shore Tri-Town Development Corporation

Shea Drive/Shea Memorial Drive will become the western segment of the Parkway Phase 1 alignment and currently provides a connection between Route 18 (a Principal Urban Arterial) and the former South Weymouth Naval Air Station property (the Base). This existing facility is known as Shea Drive from Route 18 to the intersection with Memorial Grove Ave. East of Memorial Grove Drive the road is known as Shea Memorial Drive.

In the Phase 1 condition, Shea Drive/Shea Memorial Drive will provide a connection between Route 18 and the proposed East-West Parkway, as well as providing access to the existing and proposed land uses on the Base. Shea Drive has recently been reconstructed between Route 18 and Memorial Grove Avenue. At its intersection with Route 18, Shea Drive has an approximate 65-foot wide roadway cross-section consisting of two 12-foot eastbound travel lanes (toward the former Base), a 1-foot median offset, a 15-foot landscaped median, a 1-foot median offset, a 12-foot westbound left-turn lane (to Route 18 south), and a 12-foot right-turn lane (to Route 18 north). There is also a grass strip and an approximate 10-foot sidewalk/multi-use path located along the south side of the roadway. The existing roadway configuration of this portion of Shea Drive is shown in Figure 1.

Approximately 1,000 feet east of Route 18 Shea Drive narrows in width from approximately 65 feet to approximately 38 feet. At this point, the cross-section is comprised of a 6-foot bike lane, two 13-foot travel lanes, and another 6-foot bike lane. There is also a grass strip and an approximate 6-foot sidewalk on the south side of the roadway. The roadway configuration of this

portion of Shea Drive is shown in Figure 2. This configuration continues to a point just west of its intersection with Memorial Grove Avenue.

East of Memorial Grove Avenue, Shea Memorial Drive has not yet been reconstructed, however, the pavement surface is in good shape. Currently, the traffic volumes on this segment of Shea Memorial Drive are light, as most of the former uses on the Naval Air Station property are no longer in use. Along this eastern portion of Shea Memorial Drive (from Memorial Grove Avenue to the former SWNAS large hangar building) there is fairly uniform cross-section of approximately 30 feet, which is typically composed of a 15-foot travel lane in each direction. There is sidewalk located on at least one side of the road for this entire portion of Shea Memorial Drive, primarily located on the north/east side of the road. Along one segment of the roadway (in the vicinity of the former athletic center), sidewalks are provided on both sides of the road. Two typical roadway configurations along the eastern portion of Shea Memorial Drive are shown in Figures 3 and 4. The speed limit is posted at 25 miles per hour (mph) along the entire length of Shea Memorial Drive, both east and west of Memorial Grove Avenue.



Figure A-1 Shea Drive looking west toward Route 18



Figure A-2 Shea Drive looking west (West of Memorial Grove Avenue)



Figure A-3 Shea Memorial Drive looking west (East of Memorial Grove Avenue)



Figure A-3 Shea Memorial Drive looking east (Near former athletic center)

East-West Parkway Phase 1

OWNERSHIP: South Shore Tri-Town Development Corporation / Town of Rockland

The westerly portion of the proposed East-West Parkway Phase 1 will be designed and constructed by MassDOT. This portion of the Parkway is approximately one mile in length and will run from the southern terminus of Shea Memorial Drive to a point approximately 3,600 feet west of Reservoir Park Drive along the final East-West Parkway geometric alignment (please see **Exhibit C** attached to the SSTTDC Eligibility Letter). The East-West Parkway section to be designed and constructed by MassDOT will generally have a 52-foot roadway cross-section consisting of a 4-foot shoulder, four 11-foot travel lanes, and another 4-foot shoulder. At the intersection with Shea Memorial Drive, the cross-section is expected to be widened to 63 feet, to provide a dedicated westbound left-turn lane (11-foot wide).

At a point approximately 300 feet east of the Weymouth/Rockland town line, at the proposed location of a pedestrian crosswalk and flashing signal, the roadway cross-section will be widened from 52 feet to 62 feet and will provide a 4-foot shoulder, two 11-foot travel lanes, a 2-foot median offset, a 6-foot raised median, a 2-foot median offset, two 11-foot travel lanes, and a 4-foot shoulder. Approximately 2,000 feet west of the eastern end of the MassDOT segment, MassDOT's contractor will design and build a roundabout. Approximately 600 feet east of the roundabout, the roadway will taper down to a 30-foot cross-section consisting of a 4-foot shoulder, two 11-foot travel lanes, and another 4-foot shoulder. This cross-section continues to the end of work by MassDOT. A 10- to 12-foot multi-use path will be constructed adjacent to the Parkway along the entire segment to be constructed by MassDOT. The design speed of the

MassDOT portion of the East-West Parkway is 40 miles per hour. Within the MassDOT portion of the East-West Parkway, there are only two proposed vehicular access points proposed: at the terminus of Shea Memorial Drive and at the proposed roundabout which will provide access to other parts of the proposed Base redevelopment.

The second portion of the East-West Parkway will be designed and constructed by the South Shore Tri-Town Development Corporation (SSTDC). This portion of the Parkway will be designed and constructed as a two-lane roadway connecting the MassDOT portion to Reservoir Park Drive and Weymouth Street at the eastern terminus of the East-West Parkway. The cross-section of the western portion of the SSTDC segment of the Parkway will be identical to the cross-section on the eastern portion of the MassDOT segment described above. The SSTDC segment will also include a 10- to 12-foot multi-use path constructed adjacent to the roadway alignment.

At the approach to Reservoir Park Drive/Weymouth Street, the Parkway cross-section will be approximately 73 feet in width and will be comprised of a 4-foot shoulder, an 11-foot eastbound right turn lane, an 11-foot eastbound through lane, an 11-foot eastbound left-turn lane, a 2-foot median offset, a 6-foot raised median, a 2-foot median offset, two 11-foot westbound travel lanes, and a 4-foot shoulder. At the intersection with Reservoir Park Drive, the Weymouth Street approaches will also be modified slightly from the existing conditions. On the Weymouth Street northbound approach, the through lane will be converted to a shared left-through lane. On the Weymouth Street southbound approach, the through lane will be converted to a shared through-right lane. Both of these changes are provided to allow access to the Parkway from Weymouth Street.

Reservoir Park Drive

OWNERSHIP: Town of Rockland

Reservoir Park Drive, which the Town of Rockland has requested to be upgraded to a Collector Road designation, will become the eastern segment of the Weymouth-Rockland Parkway Phase 1 alignment. Reservoir Park Drive provides a connection from Weymouth Street (Urban Arterial) to Hingham Street (Urban Arterial) and Route 3 (Principal Arterial). In the Phase 1 condition, the roadway configuration of Reservoir Park Drive will not change from existing conditions. In general, the pavement along Reservoir Park Drive is in good condition and the pavement markings are readily visible.

At Weymouth Street, Reservoir Park Drive is approximately 36 feet wide, consisting of a 15-foot eastbound travel lane, a 10-foot westbound left-turn lane, and an 11-foot westbound right-turn lane. This section of roadway is shown in Figure 5. As the roadway continues east, the roadway cross-section remains approximately 36 feet and is comprised of a 17-foot eastbound travel lane and a 19-foot westbound travel lane. This portion of Reservoir Park Drive is shown in Figure 6. At the intersection with Hingham Street, which is the eastern terminus, Reservoir Park Drive has an approximate 40-foot wide cross-section consisting of a 17-foot westbound travel lane, an 11-foot eastbound left-turn lane (toward Route 3), and a 12-foot eastbound right turn lane. This portion of Reservoir Park Drive is shown in Figure 7. There is a sidewalk along the entire length of Reservoir Park Drive on the north side of the roadway.



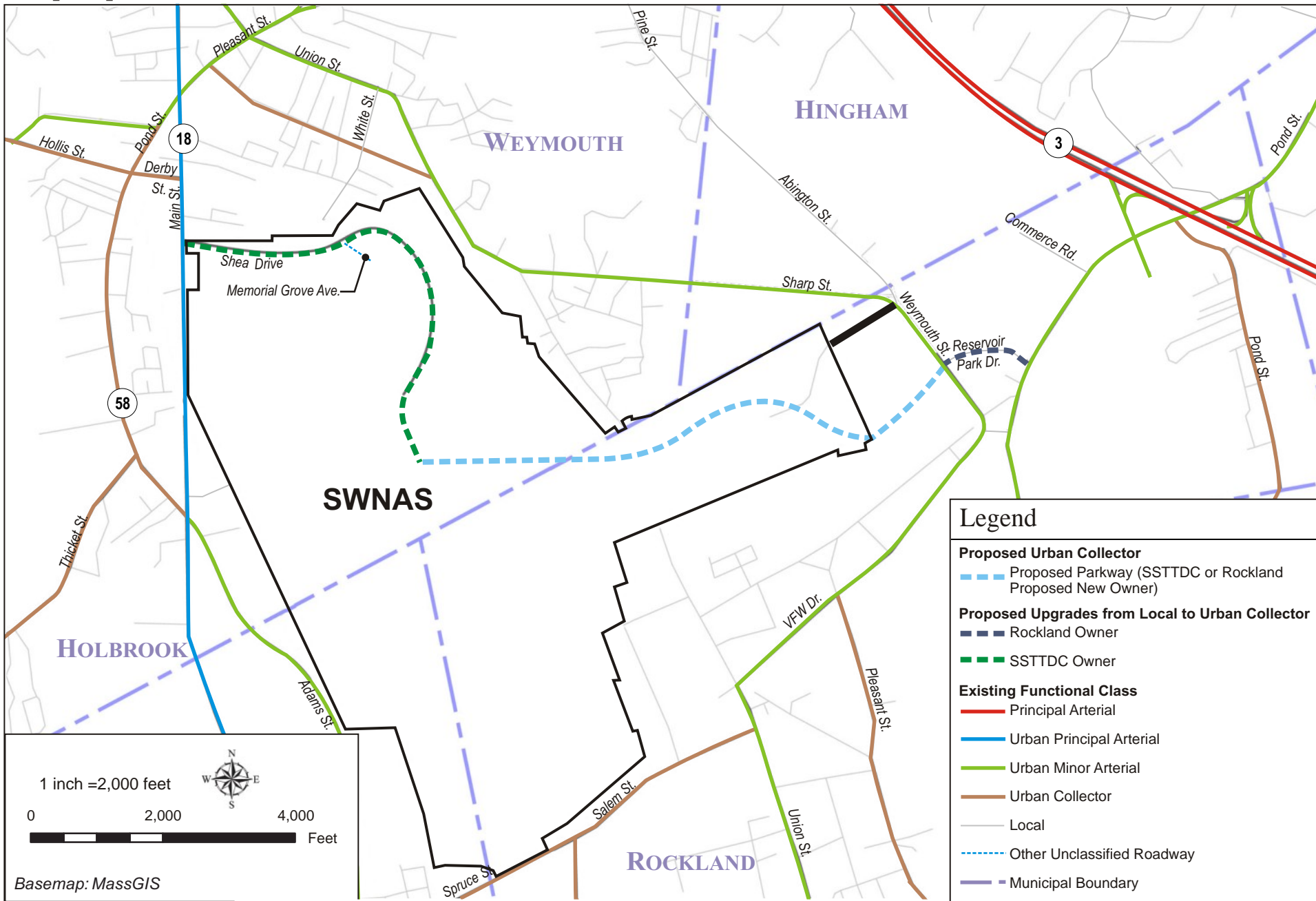
FigureA-4 Reservoir Park Drive looking west toward Weymouth Street



Figure A-5 Reservoir Park Drive looking east (Between Weymouth Street and Hingham Street)



Figure A-6 Reservoir Park Drive looking east toward Hingham Street





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Jeffrey B. Mullan
MassDOT Secretary and CEO
and MPO Chairman

Arnold J. Soolman
Director, MPO Staff

The Boston Region MPO,
the federally designated
entity responsible for
transportation decision-
making for the 101 cities
and towns in the MPO
region, is composed of:

MassDOT Office of Planning and
Programming
City of Boston
City of Newton
City of Somerville
Town of Bedford
Town of Braintree
Town of Framingham
Town of Hopkinton
Metropolitan Area Planning Council
Massachusetts Bay Transportation
Authority Advisory Board
Massachusetts Bay Transportation
Authority
MassDOT Highway Division
Massachusetts Port Authority
Regional Transportation Advisory
Council (nonvoting)
Federal Highway Administration
(nonvoting)
Federal Transit Administration
(nonvoting)

MEMORANDUM

DATE May 20, 2010
TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization
FROM Arnold J. Soolman, CTPS Director
RE Work Program for: HOV Lane and I-93 Access Improvements in the
South Bay/Savin Hill Area

ACTION REQUIRED

Review and approval

PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization vote to approve the work program for HOV Lane and I-93 Access Improvements in the South Bay/Savin Hill Area in the form of the draft dated May 20, 2010.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification

Planning Studies

CTPS Project Number

22122

Client

Boston Metropolitan Planning Organization

CTPS Project Supervisors

Principal: Karl Quackenbush

Manager: William Kuttner

Funding

MassDOT FTA \$5303 Transit Planning Contract #80-0004;

MassDOT 3C PL Highway Planning Contract #59796

IMPACT ON MPO WORK

This is MPO work and will be carried out in conformance with the priorities established by the MPO.

BACKGROUND

The Southeast Expressway portion of I-93 is a key north-south link in the regional expressway system, with individual sections handling as many as 250,000 vehicles per day. Between Braintree and Massachusetts Avenue in Boston there are eight travel lanes. Since 1995, capacity of the Southeast Expressway has been effectively enhanced by the use of a reversible high-occupancy-vehicle (HOV) lane, known as the “zipper lane,” reflecting the process of opening and closing its northbound and southbound components over the course of each weekday.

The zipper lane operates between Braintree and Savin Hill, and allows five lanes of northbound traffic during the AM peak period, and five lanes of southbound traffic during the PM peak period. While the zipper lane is in operation, the off-peak direction has only three lanes available. During the midday period and at night, four travel lanes are available in each direction. Eligibility for zipper lane use is currently set at 2+ occupants.

Because of the right-of-way (ROW) requirements to implement the zipper lane, the northern terminus of this facility was placed just south of Savin Hill, about a mile south of Columbia Road. For over two miles north of the zipper facility, the Southeast Expressway operates as a conventional eight-lane expressway, with four lanes in each direction. These four-lane northbound and southbound sections act as bottlenecks and cause traffic queues, congestion, and delay every weekday.

At Massachusetts Avenue, the Southeast Expressway meets a newly constructed Central Artery/Tunnel (CA/T) Project expressway segment with greater capacity in both directions including a pair of newly built HOV lanes, available to vehicles with 2+ occupancy at all times. Connecting the zipper lane HOV facility with the CA/T HOV lanes has long been viewed as desirable for two reasons:

- Adding capacity in the peak direction would reduce congestion.
- Buses and other HOVs would receive much greater benefit than they do now.

During the recent reconstruction of the Central Artery, a number of different ramp configurations were used to enter or exit the Southeast Expressway in the vicinity of the project’s southern limit. During one phase of construction, there was an additional southbound on-ramp at the Massachusetts Avenue connector. While this on-ramp was not part of the final project design, it exhibited certain traffic flow benefits while it was in operation, and interest in restoring it or adding a comparable ramp is ongoing.

Adding an HOV facility in the gap between the northern terminus of the zipper lane and the CA/T HOV lanes would require widening the Southeast Expressway. Some of this widening may be able to be accommodated within the existing highway ROW. It is certain, however, that adjacent land now used by private owners or other government agencies would need to be incorporated into an expanded Southeast Expressway corridor.

During the planning of the CA/T project there was some consideration of extending the project limits to the south and adding a frontage road system. These plans, as well as other potential modifications of the arterial road system in the study area, will be reviewed, and promising approaches may be cited as part of this study.

At Savin Hill it is highly likely that this study will determine that part of an MBTA rail corridor would be needed in order to accommodate an HOV lane extension. This would in turn require the MBTA to extensively rebuild and perhaps bury one or more tracks in that corridor. If such a reconstruction were undertaken, an opportunity of adding a second track for a portion of the Old Colony commuter rail line would open up.

OBJECTIVES

The principal objectives of this work program are:

1. To identify and describe one or more feasible options for implementing a new HOV lane connecting the existing Southeast Expressway HOV facilities.
2. To identify options in the South Bay area for adding a southbound entry ramp to the Southeast Expressway, especially in conjunction with the construction of a new HOV facility.
3. To identify likely land takings and major construction efforts that would be required to implement the HOV and entry ramp improvements.
4. To analyze the potential for commuter rail capacity improvements that might be achieved in conjunction with the construction of a new HOV facility.
5. To gather and organize documents and other materials which can be used, along with this study's products, in support of further planning and design efforts.

WORK DESCRIPTION

The work required to accomplish the study objectives has been grouped into six tasks:

Task 1 Gather Right-of-Way (ROW) and Traffic Data

Peak period traffic volumes and travel speeds will be updated as required for all relevant travel lanes and ramps. Available roadway and transit plans, profiles, and ownership boundaries will be obtained from MassDOT operating agencies or the City of Boston.

Product of Task 1

Collection of readily available roadway, land use, traffic, and operations information

Task 2 Develop an HOV Extension Strategy

Implementing a new HOV lane in the study area would require expanding the Southeast Expressway ROW. The location and extent of required land takings will be directly related to design issues such as the location of HOV lane entries and exits as well as standards regarding lane width and separation barriers. The information gathered in Task 1 will be used to define a general design for a new HOV facility. Industry literature and consultation with agency personnel will be utilized to develop a conceptual plan that adheres to safety and operational requirements.

Product of Task 2

Conceptual plan for design and operation of a new HOV facility

Task 3 Identify a Second Southbound On-Ramp Option in the South Bay Area

While adding a second southbound on-ramp is not strictly contingent on extending the HOV lane, the land takings required to extend the HOV lane will influence or even determine the design and location of the second ramp. Adding the ramp itself may require further land takings and possible reconfiguration of the frontage and other local roads. A manual local-area traffic assignment as well as a spot operations analysis may be required as part of this task.

Product of Task 3

Conceptual plan for a new southbound on-ramp to the Southeast Expressway

Task 4 Identify Possible Rail Improvements

At this point this study assumes that expanding the Southeast Expressway corridor at Savin Hill will require the incorporation of land that is currently part of the MBTA Red Line/Old Colony Line rail corridor. The required reconstruction of the various MBTA rail lines, and perhaps even the Savin Hill station, would likely be one of the most expensive aspects of building the envisioned HOV lane extension.

It is possible, however, that this investment could complement long-range MBTA capital plans. For instance, rebuilding the rail corridor so some tracks are underground, with other tracks at grade above, would present an opportunity to add a second track to the mostly single-track Old Colony line. The extent and usefulness of such a plan will be considered in consultation with MBTA staff and with reference to past engineering studies.

Also, throughout the MBTA system major infrastructure elements are approaching the end of their design lives and major reconstruction is an appropriate investment in its own right. Accommodation of the HOV lane extension might be envisioned as part of an ongoing capital program.

Product of Task 4

Conceptual strategies for improving and reconfiguring the MBTA rail corridor

Task 5 Prepare Compilation of Materials on Existing Conditions

The materials gathered in Task 1 will allow the planning in Tasks 2, 3, and 4 to proceed. Task 5 will put the collected materials into a form in which they are useful as a planning resource going forward. Freestanding publications will need to be catalogued and synopsized in a bibliography, and field notes will need to be incorporated into memoranda as appropriate.

It is not known at this time what formats the maps and technical materials available at the operating agencies are in. CTPS technical resources will be used to put these materials into electronic formats most useful for this and subsequent studies.

Product of Task 5

Compilation of materials on existing conditions

Task 6 Document Possible Improvements

It is anticipated that because of the severe constraints in this corridor there will be one basic HOV strategy, perhaps with some minor variants. This HOV alternative will be described and analyzed using the available technical resources, as will a proposed southbound on-ramp. Input and comment from professionals both inside and outside of the agencies will be sought. Required land takings will be highlighted.

A range of potential improvements to the commuter rail corridor will be described. These analyses will be very preliminary, but they will utilize input from Rail Operations.

Product of Task 6

Memorandum describing possible improvements

ESTIMATED SCHEDULE

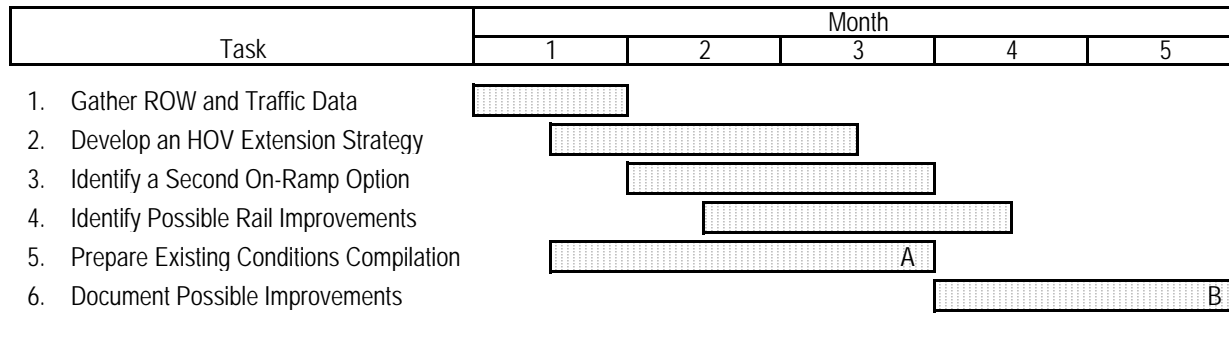
It is estimated that this project will be completed five months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be \$79,957. This includes the cost of 29.5 person-weeks of staff time, overhead at the rate of 88.99 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/WSK/wsk

Exhibit 1
ESTIMATED SCHEDULE
HOV Lane and I-93 Access Improvements in the South Bay/Savin Hill Area



Products/Milestones

- A: Existing conditions compilation
- B: Memorandum describing possible improvements

Exhibit 2

ESTIMATED COST

HOV Lane and I-93 Access Improvements in the South Bay/Savin Hill Area

Direct Salary and Overhead	\$79,157
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Task	Person-Weeks							Direct Salary	Overhead (@ 88.99%)	Total Cost
	M-1	P-5	P-4	P-2	P-1	Temp	Total			
1. Gather ROW and Traffic Data	0.0	3.0	0.0	0.0	0.0	3.0	6.0	\$6,313	\$5,618	\$11,931
2. Develop an HOV Extension Strategy	0.5	1.0	0.0	0.0	0.0	0.0	1.5	\$2,414	\$2,148	\$4,562
3. Identify a Second On-Ramp Option	0.5	1.0	0.0	0.0	0.0	0.0	1.5	\$2,414	\$2,148	\$4,562
4. Identify Possible Rail Improvements	0.0	1.0	0.0	0.0	0.0	0.0	1.0	\$1,595	\$1,420	\$3,015
5. Prepare Existing Conditions Compilation	0.0	4.0	1.0	0.0	0.0	0.0	5.0	\$7,601	\$6,764	\$14,365
6. Document Possible Improvements	2.0	10.0	1.0	0.5	1.0	0.0	14.5	\$21,547	\$19,175	\$40,722
Total	3.0	20.0	2.0	0.5	1.0	3.0	29.5	\$41,884	\$37,273	\$79,157

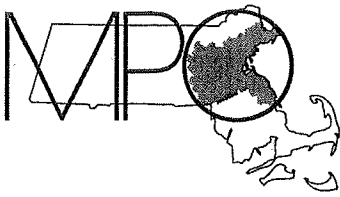
Other Direct Costs	\$800
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Travel \$800

TOTAL COST	\$79,957
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Funding

MassDOT FTA §5303 Transit Planning Contract #80-0004; MassDOT 3C PL Highway Planning Contract #59796



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Jeffrey B. Mullan
MassDOT Secretary and CEO
and MPO Chairman

Arnold J. Soolman
Director, MPO Staff

The Boston Region MPO,
the federally designated
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transportation decision-
making for the 101 cities
and towns in the MPO
region, is composed of:

MassDOT Office of Planning and
Programming
City of Boston
City of Newton
City of Somerville
Town of Bedford
Town of Braintree
Town of Framingham
Town of Hopkinton
Metropolitan Area Planning Council
Massachusetts Bay Transportation
Authority Advisory Board
Massachusetts Bay Transportation
Authority
MassDOT Highway Division
Massachusetts Port Authority
Regional Transportation Advisory
Council (nonvoting)
Federal Highway Administration
(nonvoting)
Federal Transit Administration
(nonvoting)

MEMORANDUM

DATE May 13, 2010

TO Transportation Planning and Programming Committee
of the Boston Region Metropolitan Planning Organization

FROM Arnold J. Soolman, CTPS Director

RE Work Program for: Wellesley Transit Study

ACTION REQUIRED

Review and approval

PROPOSED MOTION

That the Transportation Planning and Programming Committee of the Boston Region Metropolitan Planning Organization vote to approve the work program for Wellesley Transit Study in the form of the draft dated May 13, 2010.

PROJECT IDENTIFICATION

Unified Planning Work Program Classification
Planning Studies

CTPS Project Number
53310

Client
Town of Wellesley

CTPS Project Supervisors
Principal: Elizabeth M. Moore
Manager: Annette Demchur

Funding
Future contract with the Town of Wellesley

IMPACT ON MPO WORK

The MPO staff has sufficient resources to complete this work in a capable and timely manner. By undertaking this work, the MPO staff will neither delay the completion of nor reduce the quality of other work in the UPWP.

BACKGROUND

The Town of Wellesley has become increasingly concerned about traffic congestion in town, particularly along Routes 9, 16, and 135 during the commuter peak periods and during the morning and afternoon student arrival and departure times. The town's most recent comprehensive plan update delineated several goals aimed at improving transportation and circulation within the town. Among these were the encouragement of alternative means of transportation and the reduction of traffic volumes. The objectives outlined to meet these goals include creation of an intratown transit system and the provision of links to existing and planned suburban transit stations. Currently, transit service in Wellesley is limited to MBTA commuter rail service, bus service for residents who are senior citizens or have disabilities, and college shuttles. The Town has requested that CTPS conduct a transit planning study to examine the options for a shuttle system.

OBJECTIVES

CTPS will assist the Town of Wellesley in studying the potential for transit service within the town and to nearby major destinations, including MBTA transit stations. The study will include an inventory of existing transit services and an examination of the potential for coordinating these services with any proposed new services. Possible new services will be described at a conceptual level, identifying major activity hubs to be served and potential general routes and vehicles to be used.

WORK DESCRIPTION

Task 1 Inventory Existing Transit Service

This task involves gathering information on all transit services operating in and near the Town of Wellesley, including MetroWest Regional Transit Authority, college shuttles, school buses, and social service vans. In collaboration with town representatives, staff will interview existing service providers to determine the potential for coordination among existing services or between existing services and any proposed new services.

Product of Task 1

Written description and map of existing transit services.

Task 2 Screen Potential Target Markets

CTPS will analyze information about the demographic characteristics and geographical distribution of the residents of Wellesley to determine where the potential demand for transit services is expected to be greatest. In addition, CTPS will identify the locations of major trip generators. This task will result in the identification of areas in and adjacent to Wellesley where trip-generating densities are highest by analyzing the following characteristics.

- **Residential population densities and transit dependency:** Areas with the highest population densities and those with the highest concentrations of people who may be transit-dependent represent areas where transit services could be targeted. Data concerning household income, auto ownership, age, disability status, and the locations of low-income and elderly housing will be used to identify populations most likely to be transit-dependent.
- **Employment densities:** Employment centers generate many trips, mainly during the peak periods, and are potential target areas for transit service. The location of employment centers, combined with information concerning residential population densities and U.S. census journey-to-work data, could be used to plan potential routes, including reverse-commuting routes.
- **Locations of other activity generators:** Downtown business centers, shopping centers, public schools, colleges, hospitals and medical centers, and government services centers are all trip-generating centers.
- **Locations of existing transit centers:** Connections with commuter rail and rapid transit stations would facilitate single-transfer traditional- and reverse-commute travel that is currently not possible on the existing transit network.

This information will be utilized to produce maps showing population and employment densities, the major trip generators, and the locations of existing transit facilities in order to visualize where new services could be most effective.

Products of Task 2

Maps showing demographics and major trip generators in relation to existing facilities

Task 3 Collect and Analyze Data

Subtask 3.1 Develop a Survey to be Distributed at Wellesley Middle School and High School

In this task, CTPS will work with the Town of Wellesley to develop a short survey form to determine the transportation needs of students at Wellesley Middle and High Schools. The Town will be responsible for printing and administering the survey and compiling the data (including data entry). CTPS will analyze the results to evaluate the potential for meeting students' transit needs.

Subtask 3.2 Analyze License-Plate-Survey Data

CTPS will analyze vehicle license-plate data (collected by the Town of Wellesley) from the three Wellesley commuter-rail parking lots, as well as from the Riverside and Woodland Green Line parking lots in Newton, to ascertain the origins of trips made to the stations. These data will be used to evaluate the potential for shuttles between Wellesley neighborhoods and the stations.

Subtask 3.3 Contact Colleges to Obtain Commuter Data

Town representatives will contact the three area colleges to request information they may have and are willing to share regarding the home locations of off-campus students and staff. CTPS will use these data to evaluate the potential for shuttles between Wellesley neighborhoods and the schools, and for coordinating any new service with existing campus shuttle services.

Products of Task 3

- Survey form for Wellesley middle and high school parents and students
- Summary of data analysis

Task 4 Determine Potential Transit Services and Outline Service-Contracting Process

CTPS will utilize the results of the previous tasks to define potential new transit services, as well as opportunities to connect the new services with existing transit services, including the MetroWest Regional Transit Authority. The identification of potential routes will take into consideration the physical layout of the road network, and both the human-made and natural features of the area. Both fixed-route and demand-responsive services will be considered.

Additionally, CTPS will outline a flow chart of the processes used to contract for transit service and identify the principal service contractors in Eastern Massachusetts. CTPS will also provide a review of techniques that other

transit systems use to brand and market transit service that could be applicable to the new service.

Product of Task 4

Final technical memorandum

ESTIMATED SCHEDULE

It is estimated that this project will be completed six months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

ESTIMATED COST

The total cost of this project is estimated to be \$33,359. This includes the cost of 15.4 person-weeks of staff time, overhead at the rate of 88.99 percent, and travel and other direct costs. A detailed breakdown of estimated costs is presented in Exhibit 2.

AJS/AD/ad

Exhibit 1
ESTIMATED SCHEDULE
Wellesley Transit Study

Task	Month					
	1	2	3	4	5	6
1. Inventory Existing Services		A				
2. Screen Potential Markets		B				
3. Collect and Analyze Data			C	D		
4. Define Potential Transit Services					E	

Products/Milestones

- A: Description and map of existing transit services
- B: Demographic and trip generator maps
- C: Middle and High School survey form
- D: Summary of data analyses
- E: Final technical memorandum

Exhibit 2
ESTIMATED COST
 Wellesley Transit Study

Direct Salary and Overhead **\$33,159**

Task	Person Weeks					Total	Direct Salary	Overhead (@ 88.99%)	Total Cost
	M-1	P-5	P-4	P-3	P-2				
1. Inventory Existing Services	0.2	0.4	0.2	1.0	0.0	1.8	\$2,239	\$1,992	\$4,231
2. Screen Potential Markets	0.2	0.8	0.0	1.0	2.0	4.0	\$4,341	\$3,863	\$8,204
3. Collect and Analyze Data	0.2	0.4	0.0	3.0	0.0	3.6	\$4,053	\$3,606	\$7,659
4. Define Potential Transit Services	1.0	0.0	1.6	2.4	1.0	6.0	\$6,913	\$6,152	\$13,065
Total	1.6	1.6	1.8	7.4	3.0	15.4	\$17,545	\$15,613	\$33,159

Other Direct Costs **\$200**

Travel \$200

TOTAL COST **\$33,359**

Funding
 Future contract with the Town of Wellesley

MEMORANDUM**To: Transportation Planning and Programming
Committee****April 22, 2010****From: Seth Asante and Efi Pagitsas****Re: Safety Evaluation of Transportation Improvement Program Projects****BACKGROUND**

In the recent past, the issue of safety, as it relates to the process of project selection in the Transportation Improvement Program (TIP) of the Boston Region Metropolitan Planning Organization (MPO), has been discussed at meetings of the Transportation Planning and Programming Committee (TPPC) and its subcommittees. TPPC members expressed interest in the feasibility of predicting how well a given project selected for funding in the TIP would address safety concerns at that location.

Currently, project proponents are asked to discuss the safety issues associated with a project area, and the way in which the proposed project would address those issues. This tends to elicit fairly qualitative information from proponents. MPO staff then provide information necessary for rating projects on the basis of the project's:

- Rank: Is it on the list of the top 200 crash locations?
- Three-year crash total
- Fatal crashes
- Bicycle- and pedestrian-involved crashes
- Crash rates

All of this information, qualitative and quantitative, helps to illuminate safety-related need for a particular project. None of this, however, provides the Boston Region MPO with any rigorous assessment of whether the design of a project, as proposed, would definitely reduce crashes at the project location.

To address the TPPC's interest in a detailed safety analysis that would assess the safety potential of a TIP project, staff proposed an approach¹ As a result, the Boston Region MPO approved in their FFY 2009 UPWP the funding of this pilot study to explore the merits of such an approach. This study analyzed the proposed two-step process: the first step would entail a more thorough

¹ Karl H. Quackenbush and Efi Pagitsas, "Proposed Approach for Evaluating the Safety Implications of Projects Proposed for the TIP," memorandum, April 2008.

evaluation of current crashes at a project location than is generally done in the current process, while the second would involve predicting the crash reduction potential of a proposed project.

OBJECTIVE

The purpose of this study was to select several TIP projects in order to evaluate the potential of the proposed improvements to reduce crashes for each project. To this end, the staff pursued the following objectives:

- Identified TIP projects to analyze for safety
- Evaluated each project's recent crash experience
- Evaluated each project's crash reduction potential
- Documented and presented the findings

IDENTIFY WHICH TIP PROJECTS TO ANALYZE FOR SAFETY

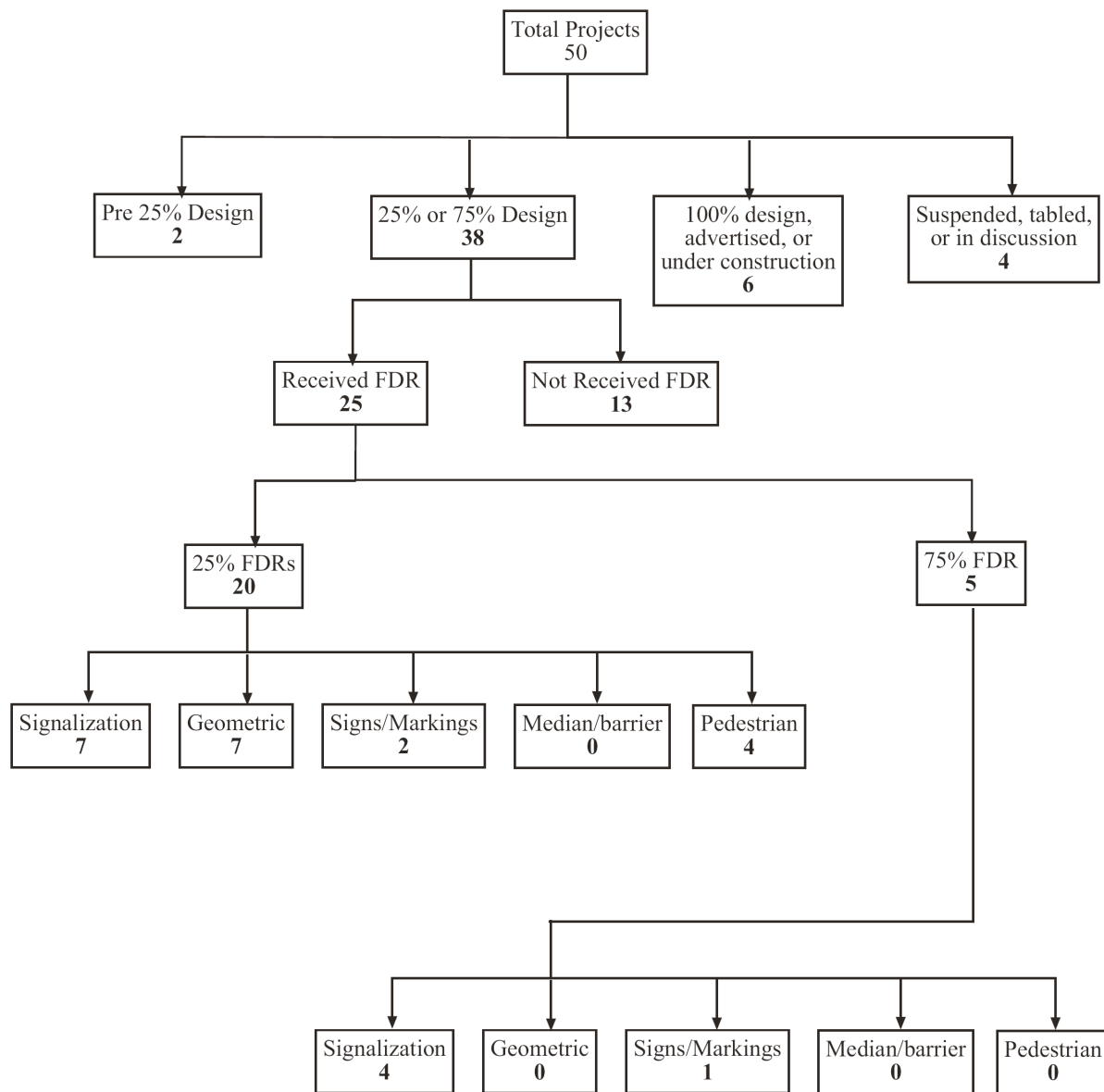
Review of TIP Projects

TIP projects with 25 percent or 75 percent design status and an available functional design report (FDR) would qualify for analysis. The reason for choosing 25 percent or 75 percent design was that project plans at these stages are better defined and therefore ready for the MPO comments on the appropriateness of the safety improvements that are included in the plans related to the identified safety needs.

MPO staff obtained a list of the TIP universe of projects in late November 2008. From this list, they selected all those projects at 25 percent or 75 percent design status for further evaluation. There were 50 projects in this category. Staff then used the MassHighway Project Information database to verify the current status of each project. Staff also called and visited MassDOT Highway Division (then MassHighway) project managers to discuss the status of each project and to obtain additional information on current plans and design reports. This task began in early December and lasted for about three weeks. The results of the evaluations, which are illustrated in a flow diagram (in Figure 1):

- Six TIP projects at 75 percent design status had already advanced to 100 percent design, and had been submitted and approved, advertised, or under construction. These projects were excluded from further evaluation.
- Four TIP projects had been suspended, tabled, or in were discussion. These projects were excluded from further evaluation.
- Two TIP projects were identified to be at pre-25-percent-design status. These projects were excluded from further evaluation.
- Thirty-eight projects, on the list were identified to meet the 25 percent or 75 percent design status for further evaluation.

FIGURE 1
Safety Evaluation in the Selection of Transportation Improvement Projects



Request for Functional-Design Reports

After reviewing the TIP projects, staff requested FDRs from MassDOT’s Highway Division for the 38 TIP projects that were at 25 percent or 75 percent design status. The purpose of the request was to obtain information on the following:

- The need for the project
- The crash data and information on safety
- The types of improvements proposed in the project

Staff received FDRs for 25 of the 38 TIP projects. Staff did not receive FDRs for the other 13 projects because those reports were not readily available; the project managers would have had to request them from a consultant or a municipality. Overall, it took about two weeks to receive the 25 reports. Table A-1 (Appendix A) shows the projects for which we obtained an FDR—they are indicated by a blue background. TIP projects for which we were unable to obtain an FDR reports are indicated by a white background. TIP projects that are pre-25 percent or post-75 percent design, suspended, tabled, or in discussion are indicated by a yellow background. After receiving the FDRs, staff reviewed them.

Review of Project Safety Needs

Table A-1 (Appendix A) provides, for each project, a description the project's safety needs, safety information, and recommended improvements. Staff used the MassDOT Highway Division's 2004–2006 crash data and intersection crash-cluster information to determine the current Equivalent Property Damage Only (EPDO) for each project, which is presented in Table A-1. The EPDO method takes into account the total number of crashes at a location and the severity of each crash. The MassDOT Highway Division currently uses this system in its development of the list of the top 1,000 high-crash locations in Massachusetts. The EPDO method is a system of ranking intersections in terms of safety. The system is point based (weighted), with different types of crashes receiving different weights: 1 point for a property-damage-only crash or not reported/unknown severity crash, 5 points for an injury crash, 10 points for a fatal crash. The formula for determining the EPDO is as follows:

$$\text{EPDO} = (1 \times \text{number of property-damage-only crashes}) + (5 \times \text{number of injury crashes}) + (10 \times \text{number of fatal crashes})$$

In addition, staff determined whether or not a project is included in the list of the top 200 intersection crash clusters for Massachusetts or in the top 5 percent of intersection clusters for the Boston Region MPO area. These thresholds are project selection criteria for the Highway Safety Improvement Program (HSIP) to reduce the number of fatal and injury crashes by targeting high crash location.

As part of the review, staff determined whether the project safety recommendations were based on simple crash totals and frequencies, calculations of crash rates, or detailed collision diagrams. The majority of the safety analyses in the FDRs were based on crash totals and frequencies and calculations of the crash rates, which were then compared to MassDOT Highway Division district averages (see Table A-1). Very few FDRs contained detailed collision diagrams, which show the specific locations and movements of vehicles involved in crashes. Collision diagrams help to display and identify similar crash patterns, and they are used to evaluate specific sites for possible causes of crashes.

Furthermore, many of the projects serve a dual purpose—to address both safety and traffic operations problems—because high-crash locations are usually locations with high-volume traffic operations. There were few projects that addressed a single intersection; the majority of the projects covered sections of roadways that have more than one intersection.

Selection of Projects for Evaluation

After reviewing the 25 TIP projects, MPO staff selected seven projects for evaluation. The focus was to select a variety of projects with the following types of improvements: signalization, geometric improvements, signs and markings, pedestrian/bicycle improvements, and roadway segment improvements. Other selection criteria included geographic location, a combination of improvements, and whether or not adequate crash data were available for use in proposing the improvements. While crash totals and frequencies and rates indicate the need for safety improvements, they do not in themselves provide any information on the effectiveness of proposed improvements. Examination of the collision diagrams of crashes, which show vehicle maneuvers, the location of the crashes, and crash patterns, is needed to determine the possible causes of the crashes and evaluate the effectiveness of the proposed safety improvements.

Of the 25 TIP projects, only five had collision diagrams. Those five projects were selected for further evaluation. In addition, two other projects without collision diagrams were selected for evaluation. The reasons for selecting these two projects were that the FDRs explicitly identified the crash patterns and the primary movements involved in the crashes and gave the primary cause of the crashes. The seven projects are presented in Table 1.

TABLE 1
Projects Selected for Evaluation

Project	Location	Collision Diagram
Trapelo Road and Belmont Street Corridor Improvements	Belmont	Yes
Route 16 Traffic Signal Improvements	Milford	Yes
Route 53 (Washington Street)/Middle Street	Weymouth	Yes
Reconstruction of Temple Street	Somerville	Yes
Central Avenue Rehabilitation Project	Milton	Yes
Highland Avenue Corridor Improvements	Needham	No
Route 139 (Plain Street) Corridor Improvement Study	Marshfield	No

CRASH REDUCTION FACTORS

Crash Reduction Factors (CRFs) are defined as “mathematical and statistical tools used to estimate the effects on safety of planned improvements to streets and highways.”² CRFs are developed using data on vehicle crashes, roadway geometric data, traffic volume data, and other types of roadway and traffic data. CRF values are typically obtained from before-and-after studies on selected sites for which safety improvements are done. In some cases, they are obtained from statistical methods such as regression analysis, cross-sectional studies, controlled experiments, and empirical Bayes methods.

² U.S. Department of Transportation, Federal Highway Administration, *Desktop Reference for Crash Reduction Factors*, Publication No. FHWA-SA-07-015, September 2007.

CRFs provide a quick way of estimating crash reductions associated with highway safety improvements in order to measure the effectiveness of safety improvements. CRFs are used by many states and local jurisdictions in program planning to decide whether to implement a specific treatment and/or to quickly determine the costs and benefits of selected alternatives.

The next section describes impediments in the use of CRFs in safety evaluations.

CONSIDERATIONS FOR USING CRFs

Accurate CRFs are required in order to achieve the greatest return on investment when choosing among alternative treatments. Reliable CRFs may also be used in the development of broad-based policy decisions related to project planning and design. Given the importance of CRFs in decision-making processes, it is critical to address the impediments that prevent more extensive use of CRFs. These impediments include the following.³

Origins and Transferability

The origins of CRFs are not always clear to the end user. Some states have developed CRFs using their own crash data. Other states have simply adopted CRFs that were developed in other states. The extent to which CRFs are valid when transferred to places beyond the development domain (for example, from one state to another), where roadway, traffic, weather, driver characteristics, crash investigation practices, and other relevant characteristics are different, is unknown.

Methodological Issues

Many existing CRFs are derived from before-and-after analysis of actual improvement implementation. Indeed, such before-and-after studies, as opposed to cross-sectional regression analysis, produce the best CRF estimates, but only if conducted properly. Unfortunately, many current studies reflect changes in crash characteristics resulting from improvements at sites that had experienced unusually high crash rates in the before-treatment period. The selection bias inherent in this approach often results in significantly exaggerated CRF estimates due to the phenomenon of regression to the mean.

Crash Migration and Spillover Effects

After improvements have been implemented at a particular location, crashes may migrate to adjacent locations. For example, the prohibition of left turns at an intersection may lead to an increase in left-turn crashes at upstream and downstream intersections. Existing CRFs rarely account for this phenomenon. For CRFs to be useful, they have to account for these effects, or at least recognize their existence.

³ Transportation Research Board of the National Academies, *Research Results Digest 299*, National Cooperation Highway Research Project, Washington, DC, November 2005.

Lack of Information on Effectiveness

CRFs have not been developed for many intelligent transportation systems (ITS) treatments or other operational strategies. For example, on many freeways, safety service patrols have become more common as a way of reducing the impact of incidents and reducing secondary crashes. However, no CRFs exist for this improvement. Other ITS treatments of interest for which no reliable CRFs exist include pedestrian safety treatments, such as in-pavement lighting and dynamic or changeable message signs, including those related to variable speed limits.

Combinations of Treatments

Most CRFs are designed for individual treatments. However, when a facility is being rebuilt, there are usually multiple treatments and states use different formulas for combining individual CRFs when considering multiple treatments. Since there is very little sound research on the multitude of actual combinations of treatments currently in use, it is unknown whether current predictions based on combining individual CRFs accurately capture the combined effect of multiple treatments.

Publication and Citation Issues

Another issue of concern that is prevalent in much of the research is the quality of the material that is available and often used in the development of CRFs. Specific problems include:

- Publication bias (the tendency to only publish studies that produced favorable results for the treatment being evaluated).
- Selective citing of results (for example, the tendency to ignore negative aspects of results, such as declining effects over time or unintended consequences that would lead to increases in some types of crashes). In some cases, a sponsoring organization may not want negative results published if they invested significant funds in an improvement program.

THE EFFECTS OF USING MULTIPLE IMPROVEMENTS

As identified above, it is typically the case that more than one treatment is used at the same location (an intersection or roadway segment). For example, for a section of two-lane roadway where there are safety problems due to a bottleneck and high volumes of turning traffic, an attempt may be made to expand the roadway section to four lanes, install left-turn bays, and make improvements in traffic signal phasing. Although in some cases there is clearly a primary treatment (one treatment that will provide the main crash reduction benefit), in other cases several treatments may act together to improve safety, as in the example below.

One example is a hypothetical case where, when three treatments are being considered in one location, with respective CRFs of 40 percent, 25 percent, and 45 percent, simply adding them would result in a 110 percent reduction. This implies that the treatments will not only prevent future crashes altogether but also prevent crashes that have already occurred. Thus, the example shows the importance of applying a reasonable methodology when calculating the combined

effects of multiple treatments to account for the diminishing benefit from using multiple treatments due to interactions among the treatments.

Combining Crash Reduction Factors for a Single Location

For a project location such as an intersection or roadway segment, a review of the literature revealed that the commonly used equation that creates a single crash reduction factor for multiple treatments applied at the location is described below (Equation 1).⁴

(Equation 1)

$$CRF_t = 1 - (1 - CRF_1)(1 - CRF_2)(1 - CRF_3) + \dots + (1 - CRF_i)$$

where CRF_t = total crash reduction, and

CRF_i = individual crash reduction factors for a given treatment and crash type.

Using the example above, the total or combined crash reduction factor was calculated as:

$$\begin{aligned} CRF_t &= 1 - (1 - 0.4)(1 - 0.25)(1 - 0.45) \\ &= 1 - (0.6 \times 0.75 \times 0.55) \\ &= 0.75, \text{ or a 75\% reduction in crashes} \end{aligned}$$

A 75 percent reduction in crashes is obviously less than the 110 percent reduction that would be calculated if the reductions were just added together.

Expected Crash Reduction

The expected number, by crash type, of crashes reduced is determined by multiplying the number of crashes before treatment by the crash reduction factor. The number of crashes reduced needs to be corrected by the projected growth in traffic after treatment. The following equation calculates the expected number of crashes reduced by treatments at a given location.

(Equation 2)

$$N_r = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

Where

N_r = total number of crashes reduced

ADT_a = projected ADT (average daily traffic) at location after treatment

ADT_b = ADT for the analysis period (before)

N_b = number of crashes in crash type i during analysis period

⁴ J. Kevin Lacy, Recommended Procedure for Combining Crash Reduction Factors, Highway Safety Research Center, North Carolina Department of Transportation, Raleigh, North Carolina, May 2001; and D. W. Harwood, F. M. Council, E. Hauer, W. E. Hughes, and A. Vogt, *Prediction of The Expected Safety Performance of Rural Two-Lane Highways*, Federal Highway Administration, Washington, DC, December 2000.

CRF_i = crash reduction factor for crash type i due to treatment (may be combined crash types, e.g., all crash types, left-turn, and pedestrian)
 i = different crash types that treatments affect at the treated location

Combining Crash Reduction Factors for More than One Location

Many projects encompass a long stretch of roadway and have more than one treatment location where one type of treatment may be applied, such as adding left-turn lanes at several different intersections along a corridor and widening the paved shoulder along the entire project limits. Determining the number of crashes reduced in these cases is very similar to the method used in the previous section (Equation 2, on page 8). However, one will need to complete the analyses for each location and treatment. The total number of crashes reduced on a project is the sum of the crashes reduced for each location, based upon all the treatments applied in the project. For combining crash reduction factors affecting more than one location, such as a roadway segment (multiple locations), Equation 3 is used to calculate the total number of crashes reduced, where i and j indicate the different crash types and different entities, respectively.

(Equation 3)

$$N_r = \sum_j \left[\sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i \right]$$

Where

N_r = total number of crashes reduced
 ADT_a = projected ADT at location after treatment
 ADT_b = ADT for the analysis period (before treatment)
 N_b = number of crashes in crash type i during analysis period
 CRF_i = crash reduction factor for crash type i
 i = different crash types that treatments affect at the treated location
 j = different entities within the treatments area

Validation of Equations

None of three equations above appears to have been validated with empirical data. An attempt at validation was made based on New Zealand crash-monitoring data.⁵ The analysis was undertaken on the crash reduction effectiveness of several single treatments, and this information was compared with the effect of using these same treatments in combination. The results showed that the equations overestimate the benefits of combined treatments. Based on the results of that analysis, the authors recommended that in order to provide a more accurate estimate of crash reduction, the combined crash reduction estimates derived using these equations should be multiplied by 0.66. Thus, in the example above, instead of a 75 percent reduction, the treatments would result in a 50 percent reduction. Of course, more empirical data are needed to validate these

⁵ Blair Turner, Senior Research Scientist of ARRB Group. Abstract of his presentation at the Australasian Road Safety Research Policing and Education Conference, "Research to Improve the Accuracy of Economic Evaluations in Road Safety," October 17–19, Melbourne, Australia. [To read the abstract, use a search engine; search on author's name and title of abstract. Select the correct link to directly download the abstract (there is no URL that will link to the abstract.)]

formulas for conditions in the U.S., and the Boston Region MPO could choose not to apply this factor in their evaluations. Since the literature suggests that CRFs are optimistic and overestimate benefits of improvements, the 0.66 factor was applied in this pilot study.

SAFETY EVALUATIONS

To properly evaluate safety for the selected projects, staff first looked at the crash information provided in the functional design reports (FDRs). Staff inspected the crash totals, frequencies, and characteristics for each project, and then looked at the crash rates and determined whether they exceeded MassDOT Highway Division district averages. Staff then reviewed the project's crash patterns by inspecting the crash diagrams to identify similar crash patterns and possible causes of crashes. Two of the selected projects did not have crash diagrams, as discussed above, but contained explicit descriptions of the locations and causes of the crashes.

After reviewing the crash information, staff assessed the improvements included in the projects to ascertain if they addressed the safety needs identified for the projects. They then looked up the CRFs for each of the proposed improvements. (CRFs are used to evaluate the effectiveness of a treatment in reducing certain types of crashes.) The CRFs for the proposed improvements were obtained from the Federal Highway Administration's Desktop Reference for Crash Reduction Factors.⁶ After obtaining the CRFs, staff used the equations described above (on pages 7 and 8) to calculate the reductions in crashes for each of the projects. The reductions were based of the 2004–2006 crash database to provide a baseline for comparison (note that the FDRs were prepared in different years and use different databases). Figure 2, below, is a flow chart showing the safety evaluation process. The following sections describe the safety evaluations of the selected projects.

TRAPELO ROAD AND WALTHAM STREET⁷

Project Need

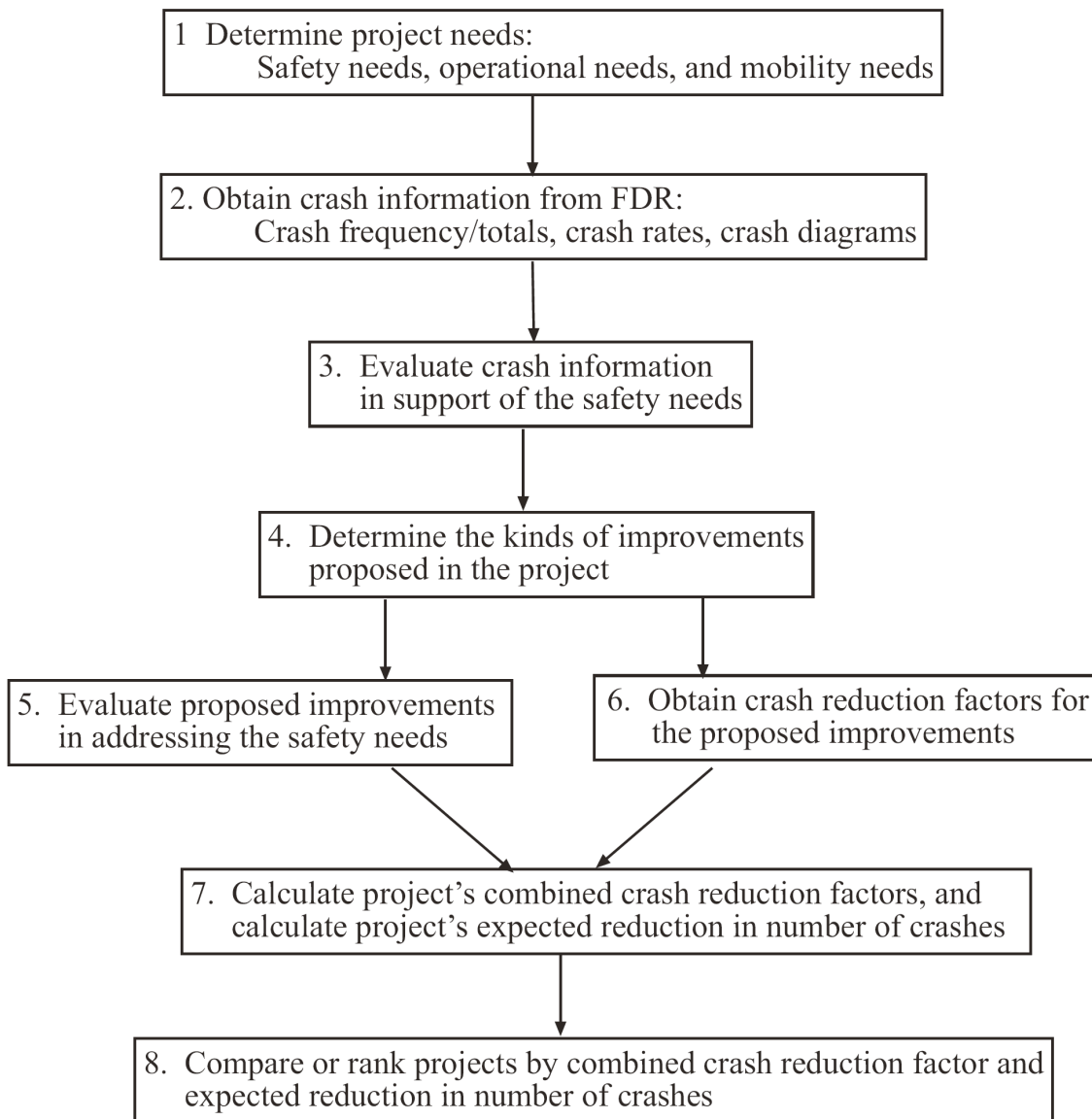
According to the FDR, this project is located in Belmont and would reconstruct Trapelo Road and Belmont Street from the Cambridge city line to the Waltham city line. The report indicates that the project corridor experiences excessive traffic delays at certain intersections, and the closely spaced signalized intersections are not interconnected or coordinated for efficient traffic operations. In addition, safety is an issue in the corridor for pedestrians, bicyclists, and motorists.

The project would update signals and timing and improve roadway conditions to accommodate increased traffic volumes; specific improvements proposed in the corridor include widening to two travel lanes in each direction at some segments of the corridor, install interconnected, coordinated traffic control, and provide exclusive left-turn lanes and phases in the project area. Improved

⁶ U.S. Department of Transportation, Federal Highway Administration, *Desktop Reference for Crash Reduction Factors*, Publication No. FHWA-SA-07-015, September 2007.

⁷ BSC Group, *Functional Design Report, Trapelo Road/Belmont Street Corridor Improvements*, prepared for the Town of Belmont, Boston, MA, August 2007.

FIGURE 2
Safety Evaluation Process



pedestrian access, shortened crosswalks, and bicycle accommodation would also address pedestrian and bicycle needs in the project area.

Safety Assessment

Table B-1, in Appendix B, shows the crash frequencies and rates for the Trapelo Road and Waltham Street project. Only one intersection exceeded the MassDOT Highway Division average. In the corridor, there were 180 crashes between 2003 and 2005 at the intersections, according to the FDR. The 2004–2006 crash database indicates that there were 317 crashes in the intersection clusters for this project corridor. For consistency, the 2004–2006 crash database was used in the analysis to provide a consistent baseline for all the projects in this study. Collision diagrams had

been prepared for only five intersections; they are in Appendix C. The collision diagrams show that rear-end and angle collisions constituted the majority of the crashes in the corridor. The angle collisions involved left turns at signalized and unsignalized intersections that lacked turn bays. They also involved cross movements at four-legged intersections, where drivers run red lights or enter the intersection with an insufficient gap for safely crossing the intersection. Rear-end collisions were also common at intersections throughout the corridor. There were two pedestrian crashes were at Trapelo Road and Belmont Street.

Crash Reduction

Table 2 shows the major improvements proposed in the project and their effectiveness in reducing crashes. All of the proposed improvements addressed safety needs in the corridor for pedestrians, bicyclists, and vehicular traffic. The individual improvements have positive CRFs ranging between 15 percent and 58 percent. The entire 2.6-mile project corridor, with more than 50 intersections, was divided into three uniform sections based on the type of treatment. The lengths of Sections 1, 2, and 3 are 0.9 miles, 1.2 miles, and 0.5 miles, respectively, and each of the three sections has uniform treatments throughout. It would require tremendous work and time to analyze each intersection and roadway segment in between them as separate locations, and it would provide little benefit.

One can clearly see, from looking at the improvements in Table 2, the effects of multiple treatments. The interconnection and coordination of traffic control, exclusive left-turn lanes and signal phases, and widened of the roadways to two traffic lanes in each direction have common effects on certain crash types. For example, widening Trapelo Road to two travel lanes in each direction would not only make it easier to coordinate traffic control throughout the corridor, but the provision of exclusive left-turn lanes and phases would also facilitate traffic control coordination. Thus, in this project, some of the treatments may act together to improve safety. Using the formula for multiple treatments, the expected combined CRF for each section was calculated using Equation 1 (on page 8):

$$\begin{aligned}
 \text{Section 1: } CRF_{11} &= 1 - (1 - 0.15)(1 - 0.58)(1 - 0.50) \\
 &= 1 - (0.85 \times 0.42 \times 0.50) \\
 &= 1 - 0.18 \\
 &= 0.82, \text{ or an 82\% reduction in crashes}
 \end{aligned}$$

$$\begin{aligned}
 \text{Section 2: } CRF_{12} &= 1 - (1 - 0.58)(1 - 0.15)(1 - 0.25)(1 - 0.50) \\
 &= 1 - (0.42 \times 0.85 \times 0.75 \times 0.50) \\
 &= 1 - 0.13 \\
 &= 0.87, \text{ or an 87\% reduction in crashes}
 \end{aligned}$$

$$\begin{aligned}
 \text{Section 3: } CRF_{13} &= 1 - (1 - 0.20)(1 - 0.50) \\
 &= 1 - (0.80 \times 0.50) \\
 &= 1 - 0.40 \\
 &= 0.60, \text{ or a 60\% reduction in crashes}
 \end{aligned}$$

TABLE 2
Trapelo Road and Waltham Street:
Effectiveness of the Proposed Improvements

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
<i>Section 1: Waverly Oaks Road to Hull Street (0.9 miles)</i>				
Install interconnected, coordinated traffic control throughout the corridor	Reduce stops and hence rear-end crashes	All	All	15
Provide exclusive left-turn lane and add left-turn phase (several locations)	Reduce left-turn-related crashes	All	All	58
Provide bicycle accommodation by widening lanes	Reduce bicycle-related crashes	All	All	50
<i>Section 2: Hull Street to School Street (1.2 miles)</i>				
Provide exclusive left-turn lane and add left-turn phase (several locations)	Reduce left-turn-related crashes	All	All	58
Interconnected, coordinated traffic control throughout the corridor	Reduce stops and hence rear-end crashes	All	All	15
Install raised median	Reduce crashes	All	All	25
Provide bicycle accommodation by widening lanes	Reduce bicycle-related crashes	All	All	50
<i>Section 3: School Street to Brimmer Street (0.5 miles)</i>				
Widen Trapelo Road to two lanes throughout the corridor	Reduce rear-end crashes	All	All	20
Provide bicycle accommodation by widening lanes	Reduce bicycle-related crashes	All	All	50

The combined CRF estimate for each section was multiplied by 0.66; this would result in a 54 percent, 57 percent, and 40 percent reduction in crashes for Sections 1, 2, and 3, respectively. According to the 2004–2006 crash database, there were 161 crashes in Section 1, 95 crashes in Section 2, and 61 crashes in Section 3. Assuming that average daily traffic (ADT) will remain the same after treatment, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 2 (on page 8) for each of the three roadway sections.

$$\text{Expected reduction in number of crashes} = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

$$\text{Expected reduction in number of crashes in Segment 1} = 1 * \frac{161}{3} * 0.54 = 29 \text{ crashes per year}$$

$$\text{Expected reduction in number of crashes in Segment 2} = 1 * \frac{95}{3} * 0.57 = 18 \text{ crashes per year}$$

$$\text{Expected reduction in number of crashes in Segment 3} = 1 * \frac{61}{3} * 0.40 = 8 \text{ crashes per year}$$

Finally, the expected reduction in number of crashes per years for all of the sections combined was calculated using Equation 3 (on page 9).

$$\text{Expected reduction in number of crashes} = 29 + 18 + 8 = 55 \text{ crashes per year}$$

ROUTE 16 TRAFFIC SIGNAL IMPROVEMENT PROJECT⁸

Project Need

According to the FDR, this project, located in the downtown area of Milford, begins at the intersection of Route 16 and Route 109, and continues southward along Route 16 approximately 1.5 miles to the intersection of Route 16, South Main Street/Congress Street, and Water Street. The report indicates that seven traffic signals in the project area would be retimed, interconnected, and coordinated as they are currently not operating efficiently, and are experiencing excessive traffic delay, a higher-than-expected number of crashes, and pedestrian mobility problems. All of the seven traffic signal controls are missing essential signal equipment or are currently using outdated signal equipment, resulting in less-than-optimal operational conditions. The proposed improvements would establish fully optimized signal operations and improve safety along the corridor to allow safe and efficient traffic flow while addressing pedestrian needs.

Safety Assessment

Table B-2, in Appendix B, shows the crash frequencies and rates for the project intersections. The crash rates of three intersections exceeded the MassDOT Highway Division district average; these were the intersections for which collision diagrams had been prepared (see Appendix C). According to the FDR, there were 170 crashes between 2001 and 2003 at the study intersections in the corridor. The 2004–2006 crash database indicates that there were 142 crashes in the corridor. For consistency, the 2004–2006 crash database was used in the analysis to provide a consistent baseline for all the projects in this study.

According to the 2001–2003 collision diagrams prepared for the FDR and the 1997–1999 collision diagrams prepared by CTPS for the project area and documented in the report *Traffic Congestion in the SouthWest Advisory Planning Subregion*, rear-end and angle collisions constituted the majority of the crashes in the corridor.⁹ The angle collisions involved left turns and cross movements at intersections, where drivers turn through insufficient gaps, run red lights, or enter the intersection with insufficient time to safely cross the intersection. The rear-end collisions were also common at intersections throughout the corridor, due to peak-hour traffic

⁸ MS Transportation Systems Inc., *Traffic Analysis/Functional Design Report, Route 16 Traffic Signal Improvements*, prepared for the Town of Milford and Massachusetts Highway Department, Framingham, MA, March 2006.

⁹ Seth Asante, *Traffic Congestion in the SouthWest Advisory Planning Subregion*, October 2002.

congestion. The reports cited pedestrian crashes at three intersections along Route 16: Route 109, Route 85, and South Main Street/Congress Street.

Crash Reduction

Table 3 shows the major improvements proposed in the project and their effectiveness in reducing crashes. All of the improvements have positive CRFs, ranging from 8 percent to 70 percent. The multiple treatments suggested for the corridor implies some treatments may have common effects. The traffic control interconnection and fully actuated controller make it easier to implement optimized signal timing and emergency preemption. Pedestrian phases with push buttons and pedestrian countdown signals all help to reduce pedestrian crashes and therefore may complement each other.

The CRF resulting from the provision of emergency preemption affects only collisions involving emergency vehicles. No emergency-vehicle-related crashes were reported for the corridor during the 2004–2006 period. Similarly, the CRF for pedestrian countdown signals affects only crashes involving pedestrians. There were six pedestrian crashes during the 2004–2006 period. The entire 1.6-mile project corridor is considered a single roadway segment, as the types of improvements at each of the closely spaced signalized intersections are the same throughout the corridor. The suggested improvements would even impact some of the minor unsignalized intersections, which are not included in the optimization and coordination of traffic signal controls. The improvements that affect specific crash types, such as emergency-vehicle and pedestrian crashes, were treated separately.

TABLE 3
Route 16 Traffic Signal Improvement Project:
Effectiveness of the Proposed Improvements

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
Install fully actuated traffic signal controller	Reduce left- and right-turn related crashes	All	All	40
Optimize traffic signal timing	Reduce rear-end crashes	All	All	8
Replace signal lenses with 12" LED type	Reduce crashes involving running red lights	All	All	10
Provide pedestrian phase with push buttons	Reduce pedestrian-related crashes	All	All	20
Provide emergency pre-emption for all approaches	Reduce crashes involving emergency vehicles	Emergency vehicle	All	70
Provide countdown pedestrian signals	Reduce pedestrian-related crashes	Pedestrian	Injury/fatal	34

The expected combined CRF for the treatments, with the exception of the emergency preemption and countdown pedestrian signal, was calculated using Equation 1 (on page 8):

$$\begin{aligned} CRF_t &= 1 - (1 - 0.4)(1 - 0.08)(1 - 0.10)(1 - 0.2) \\ &= 1 - (0.60 \times 0.92 \times 0.90 \times 0.8) \\ &= 1 - 0.40 \\ &= 0.60, \text{ or a 60\% reduction in crashes} \end{aligned}$$

The combined CRF estimate of 60 percent is multiplied by 0.66; this would result in a 40 percent reduction in crashes for the project area. Assuming that ADT (average daily traffic) would remain the same after treatment, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 2 (page 8):

$$\text{Expected reduction in number of crashes} = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

$$\text{Expected reduction in number of crashes} = 1 * \frac{142}{3} * 0.40 = 19 \text{ crashes per year}$$

The expected combined CRF for emergency preemption and countdown pedestrian treatments, using Equation 1:

$$\begin{aligned} CRF_t &= 1 - (1 - 0.7)(1 - 0.34) \\ &= 1 - (0.30 \times 0.64) \\ &= 1 - 0.19 \\ &= 0.81, \text{ or an 81\% reduction in crashes} \end{aligned}$$

The combined CRF estimate of 81 percent is multiplied by 0.66; this would result in a 53 percent reduction in crashes for the project area. There were six pedestrian and no emergency vehicle related crashes during the 2004–2006 period. Assuming that the ADT would remain the same after treatment, the expected reduction in the number of pedestrian and emergency crashes would be $(0.53 \times 6) = 3$ or 1.5 per year.

The overall expected reduction in the number of crashes = $19 + 2 = 21$ crashes per year.

ROUTE 53 (WASHINGTON STREET) AND MIDDLE STREET, WEYMOUTH¹⁰

Project Need

According to the FDR, the intersections of Washington Street and Middle Street and Middle Street and Winter Street in Weymouth are not only operating with excessive delays but also have

¹⁰ VHB/Vanasse Hangen Brustlin Inc., *Functional Design Report, Middle Street – Two Locations*, prepared for Massachusetts Highway Department, Watertown, MA, June 1997; and John W. Diaz and Joseph P. Johnson, Greenman Pedersen Inc., “Route 53 at Middle Street and Winter Street at Middle Street,” technical memorandum to Thomas Currier, Massachusetts Highway Department, January 2009.

safety deficiencies. The report indicates that the existing traffic control system is old and outdated, and the need therefore exists to upgrade the traffic control signal system and implement geometric improvements to address pedestrian and traffic safety problems at the intersection. The project would widen the roadway, make geometric improvements, and install new sidewalks, signs, and pavement markings to address safety and operations needs.

Safety Assessment

This project comprises two signalized intersections, very close to each other, both of which have high crash rates that exceeded the MassDOT Highway Division district average. The Washington Street and Middle Street intersection is in the 2004–2006 statewide list of the top 200 high-crash intersection locations and also in the top 5 percent of high-crash locations in the Boston Region MPO area. There were 57 crashes from 1990 to 1993 at the Washington Street and Middle Street intersection, with a crash rate of 3.57 million entering vehicles (MEV), which exceeds the MassDOT Highway Division average for a signalized intersection. The 2004–2006 crash database shows that there were 77 crashes at the Washington Street and Middle Street intersection, a 35 percent increase over 1990–1993. In addition to the 77 crashes, there were 16 other crashes close to this intersection.

The collision diagrams for the 1990–1993 crashes used to prepare the FDR are included in Appendix C. The collision diagrams show that angle/sideswipes collisions constitute the majority of the crashes at this intersection (64 percent). These collisions involve drivers making left turns through insufficient gaps to safely cross the intersection.

At the Middle Street and Winter Street intersection, no crash data were provided in the FDR for the period 1990–1993. However, the 2004–2006 crash database indicated that there were 33 crashes at this intersection. No collision diagrams were provided for the intersection Middle Street and Winter Street.

Crash Reduction

Table 4 shows the improvements proposed in the project and their effectiveness in reducing crashes. All of the major improvements have positive CRFs ranging between 8 and 80 percent. The crash reduction factor of 80 percent for installing a fully actuated traffic signal is only for left-turn-related crashes. The multiple treatments have common effects at both intersections.

The entire project is considered as a single roadway segment because the two intersections are close to each other and are therefore each is affected by improvements at the other. Given the closely spaced intersections and the treatments' common effects, the expected combined CRF for all the treatments in this project was calculated using Equation 1 (on page 8):

$$\begin{aligned}
 CRF_t &= 1 - (1 - 0.58)(1 - 0.80 \times 0.64)(1 - 0.10)(1 - 0.15)(1 - 0.25)(1 - 0.18)(1 - 0.09) \\
 &= 1 - (0.42 \times 0.49 \times 0.90 \times 0.85 \times 0.75 \times 0.82 \times 0.91) \\
 &= 1 - 0.09 \\
 &= 0.91, \text{ or a 91\% reduction in crashes}
 \end{aligned}$$

TABLE 4
Route 53 (Washington Street) and Middle Street, Weymouth:
Effectiveness of the Proposed Improvements

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
Install left-turn lanes and phases at both intersections	Reduce left-turn-related crashes	All	All	58
Install fully actuated traffic signal controller	Reduce left- and right-turn related crashes	Left-turn	All	80
Upgrade signal heads to 12” LED	Reduce crashes involving running red lights	All	All	10
Provide signal coordination	Reduce rear-end crashes	All	All	15
Provide split phases for Middle Street approaches	Reduce left-turn-related crashes	All	All	25
Provide pavement markings	Reduce all types of crashes	All	All	18
Implement signs to MUTCD standards	Reduce all types of crashes	All	All	9

The combined CRF estimate of 91 percent is multiplied by 0.66; this would result in a 60 percent reduction in crashes for the project area. Assuming that the ADT would remain the same after treatment, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 2 (on page 8):

$$\text{Expected reduction in number of crashes} = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

$$\text{Expected reduction in number of crashes} = 1 * \frac{110}{3} * 0.60 = 22 \text{ crashes per year}$$

RECONSTRUCTION OF TEMPLE STREET, SOMERVILLE¹¹

Project Need

According to the FDR, Temple Street has been a concern of the City of Somerville regarding traffic flow and safety. It is located in a high-density mix of commercial and residential buildings, with many driveways to accommodate these uses. According to the FDR, the project corridor experiences traffic delay at the intersections during peak travel hours. In addition, the sidewalks are in poor to fair condition and there are no ramps in the project area that conform to

¹¹ Guertin and Associates Inc., *Functional Design Report, Reconstruction of Temple Street*, Somerville, prepared for the City of Somerville and the Massachusetts Highway Department, Stoneham, Massachusetts, October, 1999.

current Americans with Disabilities Act (ADA) standards. The FDR indicates that of particular concern is the horizontal curve between Derby Street and Memorial Road—during the three-year period 1996–1998, there were 16 crashes at this location. The project would reconstruct the pavement, install ADA-compliant sidewalks, and upgrade traffic control signals and coordination to improve safety and operations for vehicular traffic, pedestrians, and bicycles.

Safety Assessment

There were 43 crashes in the 1,500-foot section of Temple Street during the three-year period 1996 through 1998. The 2004–2006 crash database shows that there were 34 crashes in same section. Crash diagrams for the 1996–1998 crashes, which are in Appendix C, show that the existing curve in the roadway between Derby Street and Memorial Road present potential hazards to motorists, especially if excessive speed or poor weather are involved. Also at the Temple Street and Heath Street intersection, vehicles departing Heath Street caused most of the crashes, when they ran through a stop sign or made an improper turn maneuver.

Crash Reduction

Table 5 shows the improvements proposed in the project for addressing safety on Temple Street and their effectiveness in reducing crashes. The 1,500-foot corridor has four closely spaced intersections. Given the closely spaced intersections and common effects of the treatments, the expected combined CRF for all the treatments in this project was calculated using Equation 1 (on page 8):

$$\begin{aligned}
 CRF_t &= 1 - (1 - 0.25)(1 - 0.15)(1 - 0.18)(1 - 0.09) \\
 &= 1 - (0.75 \times 0.85 \times 0.82 \times 0.91) \\
 &= 1 - 0.48 \\
 &= 0.52, \text{ or a 52\% reduction in crashes}
 \end{aligned}$$

**TABLE 5
Reconstruction of Temple Street, Somerville:
Effectiveness of the Proposed Improvements**

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
Install new ADA-compliant sidewalks and wheelchair ramps	Reduce pedestrian-related crashes	All	All	25
Install interconnected, coordinated traffic control throughout the corridor	Reduce rear-end crashes	All	All	15
Provide pavement markings	Reduce all types of crashes	All	All	18
Implement signs to MUTCD standards	Reduce all types of crashes	All	All	9

The combined CRF estimate of 52 percent is multiplied by 0.66; this would result in a 34 percent reduction in crashes for the project area. Assuming that ADT would remain the same after treatment, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 2 (on page 8):

$$\text{Expected reduction in number of crashes} = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

$$\text{Expected reduction in number of crashes} = 1 * \frac{34}{3} * 0.34 = 4 \text{ crashes per year}$$

CENTRAL AVENUE REHABILITATION PROJECT, MILTON¹²

Project Need

According to the FDR, the intent of this project is to rehabilitate the existing roadway while providing improved pedestrian and bicycle amenities along Central Avenue. The land use along Central Avenue in the project area is primarily residential, except for Central Square area where there are small commercial businesses located on either side of Central Avenue. The FDR indicated that the concrete sidewalks have deteriorated and do not provide adequate width in accordance with MassDOT Highway Division guidelines. In addition, the existing driveway curb cuts are without standard wheelchair ramps and do not meet ADA standards.

The project would repave Central Avenue and reduce the pavement width to 35 feet in order to create a multiuse path along the east side of the street for pedestrians and bicyclists, and to reduce crossing distances to provide safety benefits for pedestrians. The existing right-of-way along Central Avenue ranges from 60 feet wide to 74 feet wide, so there would be no need for property acquisition for the proposed improvements. There is concern, however, about the excessive width of the crossing distances (44 feet) for pedestrians, particularly given the residential nature of the surrounding land use and the various neighborhoods that Central Avenue serves.

Safety Assessment

According to the current crash database, there were 39 crashes in the Central Avenue project area between 2004 and 2006. Twenty-six of the crashes occurred at the Central Avenue, Brook Road, and Reedsdale Road intersection and eight at the Central Avenue and Elliot Street intersection. The crash rates for the intersections in the project area were below the MassDOT Highway Division district averages. According to the Town of Milton, examination of collision diagrams indicated that 44 percent of the crashes were collisions with fixed objects, while 33 percent were rear-end collisions.

¹² Town of Milton Engineering Department, Central Avenue Rehabilitation Project, Footprint Roads Program, 25% Design Submittal Report, submitted to Massachusetts Highway Department, Milton, Massachusetts, April 2006; and Beta Group Inc., "Central Avenue in Milton," technical memorandum to Philip MacDonald, Massachusetts Highway Department, August 2008.

Crash Reduction

Table 6 shows the improvements proposed in the project and their effectiveness in reducing crashes. Evaluation of the 2004–2006 crash data indicates that there were no pedestrian- or bicycle-related crashes during this period. There are no major or closely spaced intersections in the project area, and the pedestrian improvements are applied throughout the corridor. Therefore, the entire corridor is considered a single roadway segment. Using the formula for multiple treatments, the expected combined CRF of all the improvements was calculated as:

$$\begin{aligned}
 CRF_t &= 1 - (1 - 0.25)(1 - 0.18)(1 - 0.09) \\
 &= 1 - (0.75 \times 0.82 \times 0.91) \\
 &= 1 - 0.56 \\
 &= 0.44, \text{ or a 44\% reduction in crashes}
 \end{aligned}$$

The combined CRF estimate of 44 percent is multiplied by 0.66; this would result in a 29 percent reduction in crashes for the project area. Assuming that the ADT would remain the same after treatment, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 2 (on page 8):

$$\text{Expected reduction in number of crashes} = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

$$\text{Expected reduction in number of crashes} = 1 * \frac{39}{3} * 0.29 = 4 \text{ crashes per year}$$

This project enhances bicycle and pedestrian mobility to be compatible with the land use in the area. It is not intended to address a high-crash location.

TABLE 6
Central Avenue Rehabilitation Project, Milton:
Effectiveness of the Proposed Improvements

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
Install new ADA-compliant sidewalks and wheelchair ramps	Reduce pedestrian-related crashes	All	All	25
Provide bicycle accommodations	Reduce bicycle-related crashes	Bicycle	All	36
Provide pavement markings	May reduce certain types of crashes	All	All	18
Implement signs to MUTCD standards	May reduce certain types of crashes	All	All	9

HIGHLAND AVENUE CORRIDOR IMPROVEMENTS, NEEDHAM¹³

Project Needs

According to the FDR, this project would reconstruct Highland Avenue from Webster Street to the Newton city line, excluding the Highland Avenue and I-95 interchange. The land use in the area is primarily commercial and industrial. The FDR indicated that the existing roadway in the project area is inconsistent in width, with a two-lane section west of the intersection of Highland Avenue and Gould Street/Hunting Road, and a four-lane section east of that intersection. This inconsistency in the width of the roadway creates a bottleneck as motorists try to merge. In addition, the FDR pointed out that unprotected turns at the intersections and midblock sections by motorists accessing businesses in the area create safety problems. The modifications proposed in the project are supposed to increase capacity and improve safety and mobility through the corridor.

Safety Assessment

According to the 2004–2006 crash database, there were 103 crashes in the Highland Avenue project area. The problem intersections on Highland Avenue are: Gould Street/Hunting Road (signalized, 32 crashes), Wexford Street (unsignalized, 25 crashes), and Second Avenue (signalized, 13 crashes). Of these intersections, only the Wexford Street intersection had a crash rate that exceeded the MassDOT Highway Division average for unsignalized intersections. For the remaining intersections, the crash rates were below average and did not meet the MassDOT Highway Division thresholds for signalization.

At the intersection of Highland Avenue and Gould Street/Hunting Road, 42 percent of the crashes were angle collisions and 35 percent were rear-end collisions. According to the FDR, the main reason for the crashes could be the failure to yield to an oncoming vehicle. At the Highland Avenue and Wexford Street intersection, 86 percent of the crashes were angle collisions resulting mainly from vehicles making U-turns at the intersection. At the Highland Avenue and Second Avenue intersection, 54 percent of the crashes were rear-end and 30 percent were angle collisions. According to the FDR, a possible cause of the crashes was the absence of exclusive left-turn lanes on Highland Avenue at some of the intersections.

Crash Reduction

Table 7 shows the improvements proposed in the Highland Avenue project and their effectiveness in reducing crashes. All of the major improvements have positive average crash reduction factors. The entire project corridor was considered as two separate roadway segments, since the I-95 and Highland Avenue interchange, which was excluded from this project, separates the project into two corridors (east corridor and west corridor). Each of the corridors is about 1,500 feet long and each corridor has about five intersections. Equation 1 (on page 8) was used to calculate the combined CRF for each of the corridors and Equation 3 (on page 9) is used to calculate the expected reduction in crashes for the entire project.

¹³ Vanasse and Associates Inc., *Functional Design Report, Highland Avenue Corridor Improvements*, prepared for the Town of Needham, Massachusetts, Andover, MA, August 2002.

**TABLE 7
Highland Avenue Corridor Improvements, Needham:
Effectiveness of the Proposed Improvements**

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
Widen Highland Avenue to two lanes from Gould Street/Hunting Road to Webster Street (<i>west corridor</i>).	May reduce certain types of crashes	All	All	10
Install fully actuated traffic signal controller at Wexford Street intersection (<i>east corridor</i>)	Reduce left- and right-turn related crashes	Left turn	All	80
Install left-turn lane and phase on Highland Avenue and Wexford Street (<i>east corridor</i>)	Reduce left-turn related crashes	All	All	58
Install interconnected, coordinated traffic control (<i>east corridor</i>)	Reduce stops and hence rear-end crashes	All	All	15

West Corridor

For the west corridor, there is only one proposed improvement (widen Highland Avenue to two lanes in each direction from Gould Street/Hunting Road to Webster Street), shown in Table 7. The CRF for this type of improvement is 10 percent. The CRF for the west corridor was not reduced by 0.66, because it is a single treatment and would not have the same effect as multiple treatments.

East Corridor

For the east corridor, there are three proposed improvements, described in Table 7. Improvements in this corridor have multiple-treatment effects. The expected combined CRF for all the treatments in the east corridor was calculated using Equation 1 (on page 8).

$$\begin{aligned}
 CRF_e &= 1 - (1 - 0.80)(1 - 0.58)(1 - 0.15) \\
 &= 1 - (0.2 \times 0.42 \times 0.85) \\
 &= 1 - 0.07 \\
 &= 0.93, \text{ or a 93\% reduction in crashes}
 \end{aligned}$$

The crash reduction estimate of 93 percent, derived using the above equation, was multiplied by 0.66, resulting in a 61 percent reduction in crashes for the east corridor.

Assuming that the ADT would remain the same after treatment in both west and east corridors, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 3 (on page 9):

$$\text{Expected reduction in number of crashes} = \sum_j \left[\sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i \right]$$

$$\text{Expected reduction in number of crashes} = \left(1 * \frac{38}{3} * 0.1\right) + \left(1 * \frac{65}{3} * 0.61\right)$$

$$\text{Expected reduction in number of crashes} = 1 + 13 = 14 \text{ crashes per year}$$

ROUTE 139 (PLAIN STREET) CORRIDOR IMPROVEMENTS, MARSHFIELD¹⁴

Project Need

According to the FDR, this project proposes transportation improvements on Route 139 between the School Street and Furnace Street intersections, a distance of approximately one mile. The FDR indicated that the existing roadway section (midblock) in the project area is inconsistent with the sections at the intersections, creating merging and bottlenecks that cause traffic delays and queues. In addition, the FDR indicated that Route 139 has only one sidewalk on the south side; hence, pedestrians on the north side must walk either in the grassy areas or in the shoulder. The project proposal consists of a four-lane section (with turn lanes at major intersections) and sidewalks to provide needed consistency, reduce traffic delay and queues, improve pedestrian safety, and be ADA-compliant.

Safety Assessment

Table B-3 (in Appendix B) shows the 2001–2003 crash frequencies and rates for the Route 139 project. Along the Plain Street corridor, during the 2004–2006 period, there were 116 crashes along the one-mile corridor at intersections and at non-intersection locations or driveways. This is an average of approximately 39 crashes per year. Approximately 28 percent of these were angle crashes, while 37 percent were rear-end. More than half resulted in property damage, and 25 percent involved personal injury. No fatalities were reported.

There are three major intersections in the one-mile project area. At the School Street and Plain Street intersection, there were 12 crashes during the 2004–2006 period; the crash rate, which was calculated to be 0.34, falls below the MassDOT Highway Division district average. At the intersection of Enterprise Drive and Plain Street, there were 27 crashes during the 2004–2006 period; the crash rate for this intersection was 0.85, which exceeded the MassDOT Highway Division average. The intersection of Furnace Street and Proprietor’s Way at Plain Street experienced 18 crashes during 2004–2006 period; the crash rate for this intersection was calculated to be 0.51, which falls below the MassDOT Highway Division average.

¹⁴ Tetra Tech Rizzo, *Functional Design Report*, Plain Street (Route 139), Marshfield, Massachusetts, submitted to Massachusetts Highway Department, December 2007.

Crash Reduction

Table 8 shows the improvements proposed in the Plain Street project and their effectiveness in reducing crashes. Because the major improvement (widening to four lanes from two lanes) was to be applied throughout the corridor, it made sense to treat the entire project corridor as a single roadway segment. Using the Equation 1 (on page 8) for multiple treatments, the combined CRF of all the improvements was calculated as:

$$\begin{aligned}
 CRF_t &= 1 - (1 - 0.10)(1 - 0.09)(1 - 0.22)(1 - 0.15) , \\
 &= 1 - (0.90 \times 0.91 \times 0.78 \times 0.85) \\
 &= 1 - 0.54 \\
 &= 0.46 \text{ or a 46\% reduction in crashes}
 \end{aligned}$$

The combined CRF estimate of 58 percent is multiplied by 0.66; this would result in a 30 percent reduction in crashes for the project area. Assuming that the ADT would remain the same after treatment, the expected reduction in the number of crashes, based on the 2004–2006 crash database, was calculated using Equation 2 (on page 8):

TABLE 8
Route 139 (Plain Street) Corridor Improvements, Marshfield:
Effectiveness of the Proposed Improvements

Improvement	Safety Need Addressed	Crash Type	Crash Severity	Crash Reduction Factor
Widen Plain Street to four lanes in the project area	Reduce rear-end crashes	All	All	10
Install six-foot shoulders on both sides of Plain Street	Reduce crashes between single vehicle and fixed object	All	All	9
Install fully actuated traffic signal controller at Plain Street and Furnace Street intersection	Reduce left- and right-turn-related crashes	Left turn	All	80
Install interconnected, coordinated traffic control throughout the corridor	Reduce rear-end crashes	All	All	15

$$\text{Expected reduction in number of crashes} = \sum_i \frac{ADT_a}{ADT_b} * N_b * CRF_i$$

$$\text{Expected reduction in number of crashes} = 1 * \frac{116}{3} * 0.30 = 12 \text{ crashes per year}$$

RESULTS OF THE EVALUATION

The results of the safety evaluations are presented in Table 9. The combined crash reduction (CRF) factors were used to calculate the effectiveness in reducing crashes of the proposed improvements in each project. The expected reduction in crashes is directly related to the number of crashes before treatment and the combined crash reduction factor. For project evaluation and selection purposes, both the combined crash reduction factor and the expected reductions in crashes should be considered. For example, the Trapelo Road and Belmont Street Corridor Improvements and Route 53 (Washington Street)/Middle Street projects have high combined crash reduction factors and, when constructed, they are expected to improve safety significantly. Both locations are included in the top five percent of intersection clusters for the Boston Region MPO area. The Route 53 (Washington Street)/Middle Street project is also in the top 200 intersection crash clusters for Massachusetts. These thresholds are part of the project selection criteria for the Highway Safety Improvement Program (HSIP) for reducing the number of fatal and injury crashes by targeting high-crash locations.

**TABLE 9
Estimated Project Safety Impacts**

Project	Location	Project Length (miles)	Number of Crashes in Project Area (2004–2006)	Combined Crash Reduction Factor (%)	Expected Reduction in Crashes (per year)	Expected Annual Reduction in Crashes (per Mile)
Trapelo Road and Belmont Street Corridor Improvements	Belmont	2.6	317	52	55	21
Route 53 (Washington Street)/Middle Street	Weymouth	Intersection	110	60	22	22
Route 16 Traffic Signal Improvements	Milford	1.5	142	40	19	13
Highland Avenue Corridor Improvements	Needham	0.7	103	41	14	20
Route 139 (Plain Street) Corridor Improvement Study	Marshfield	1.0	116	30	12	12
Reconstruction of Temple Street	Somerville	0.3	34	34	4	13
Central Avenue Rehabilitation Project	Milton	0.9	39	29	4	4

FINDINGS

1. The methodology developed and applied by MPO staff to evaluate the safety potential of TIP projects is sound. However, the national crash reduction factors (CRF) used in the analysis are not reliable. There are some concerns about the national CRFs used in this study regarding their transferability and the reliability of the research supporting them.
 - A review of the literature indicated that some states, such as California, are unwilling to employ national CRFs that have not been proven and validated with appropriate research and are adopting a wait-and-see approach. Florida has created its own CRFs but they are not available for public review. Other states, such as Kentucky, Texas, Oregon, and Washington, use the national CRFs to augment their locally developed CRFs when the national CRFs are deemed appropriate and are adequately supported by research. Minnesota is one of the states that use the Desktop Reference as its primary source of CRF data.
 - State and local jurisdictions with reliable and locally developed CRFs employ them in the following applications:
 - Estimating crash reductions associated with highway safety design elements—for example, measuring the safety effectiveness of various improvements in order to design and implement those that are most effective.
 - In program planning for deciding whether to implement a specific treatment and/or to quickly determine the costs and benefits of selected alternatives.
2. Several problems that were encountered in this pilot study need to be considered:
 - Functional design reports (FDRs) were not readily available to MPO staff, and it took some time to obtain them.
 - Some of the FDRs do not contain sufficient safety information for determining whether proposed improvements would address existing safety needs (for example, some contain only crash frequencies and rates). Additional safety information, such as collision diagrams, may be needed.
 - Using the CRF approach to evaluate safety improvements requires identifying safety needs, analyzing crash data, obtaining and applying CRFs, and evaluating how proposed improvements would address safety needs. It involves more quantitative analysis and requires more time than the method currently used by the Boston Region MPO. Consequently, it is expected to cost more to implement.

The efforts expended in this study cost \$25,100, and about half of that amount was spent for the seven intersections that were evaluated. This represents an average cost of \$1,800 per project. By comparison, the cost per project of the approach currently used by the MPO, which evaluates safety based on rankings of crash rates and equivalent property damage only (EPDO), is significantly lower.

RECOMMENDATION

Accurate CRFs are required in order to achieve the greatest return on safety investments when choosing among alternative treatments. The national CRFs contained in the Desktop Reference,¹⁵ which was used in this study, were collected from many studies in several different states. Its use raises concerns regarding: origin and transferability, methodological issues, and lack of information on effectiveness. Massachusetts has not developed a comprehensive CRF database for use in the commonwealth, so these issues may need to be addressed.

In closing, MPO staff consider using the crash reduction factor for TIP project evaluation to be a sound method, but they have reservations about recommending its adoption by the Boston Region MPO because the national data appear to inadequately represent local conditions. In addition, the cost of analysis associated with this method is higher than the cost of the method currently used by the Boston Region MPO.

EP/SAA/saa

¹⁵ *Desktop Reference for Crash Reduction Factors*, U.S. Department of Transportation, Federal Highway Administration, Publication No. FHWA-SA-07-015, September 2007.

APPENDIX A

List of Projects and Other Information

TABLE A-1
List of TIP Projects and Other Information

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604957	Route 14 Corridor	Pembroke	5	25% Submitted	Adam Hoey (7440)	Reconstruction, widening, drainage improvements, and related work on Route 14, from Route 53 to the Hanson town line.	The existing geometry along the Route 14 corridor project creates safety deficiencies and operations problems at certain locations. In addition, existing traffic signage and striping are in poor condition and the sidewalks are not continuous. The proposed roadway improvements would enhance safety and traffic flow.	No	Yes	Multiple locations EPDO = 148 Fatal = 0 Injury = 19 PDO = 53	2003-2005 No collision diagram	Roadway widening, sidewalks, curbing, signage, pavement markings, and drainage upgrades	12/9/2008	Yes	Called Dec. 5 and left message. Expediter has FDR. Received on December 9.
604688	Trapelo Road and Waltham Street	Belmont	4	25% Submitted	Albert (AI) Miller (7862)	Reconstruct Trapelo Road and Belmont Street from the Cambridge city line to the Waltham city line.	The project corridor experiences excessive traffic delays at certain intersections and the closely-spaced signalized intersections are not interconnected and coordinated for efficient traffic operations. Safety is an issue in the corridor for both pedestrians, bicyclists, and motorists. The proposed improvements would update signals and timings and improve roadway conditions to accommodate increased traffic volumes, improve pedestrian access, and provide bicycle accommodation.	No	Yes	Multiple locations EPDO = 665 Fatal = 0 Injury = 86 PDO = 231	2003-2005 With collision diagram	New traffic signals, bicycle accommodation, and drainage	12/9/2008	Yes	Called Dec. 5 and left message. Received FDR on December 9.
29492	Middlesex Turnpike/Crosby Drive Roadway Improvements Project, Phase 3	Bedford, Billerica, and Burlington	4	75% Submitted	Albert (AI) Miller (7862)	Widen Middlesex Turnpike from north of Crosby Drive from its two-lane cross section to a four-lane section having two lanes in each direction with a 16-foot median with left-turn lanes and signals at high-volume driveways and intersections.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Widening, left-turn lanes, signalization, median	No report received	No	Left message on Dec. 5. Expediter will search files for FDR.
604646	Route 62 (Main Street)	Concord		75% Submitted		Reconstruct Main Street from Water Street to Acton town line.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Install granite curbs, addition of sidewalk, and drainage upgrade	No report received	No	Left message on Dec. 5. This project was advertised for construction. 100% design submitted and approved.
604344	Needham Street	Newton	4	25% Submitted	Anyinla Madamidola (7361)	Needham Street Rehabilitation, from Needham town line to Winchester Street and Winchester Street from Needham Street to Route 9. The roadway will be rehabilitated and widened to accommodate bicycles. The project includes new sidewalks, reconfigured intersections.	The Needham Street project is justified for three major reasons. Existing geometry along the corridor causes excessive delay and safety deficiencies. The proposed modifications—signal installations and geometric improvements—would increase capacity and improve mobility through the corridor.	No	Yes	Multiple locations EPDO = 188 Fatal = 0 Injury = 27 PDO = 116	1998-2000 No collision diagram	Roadway widening, bicycle accommodation, new sidewalks, reconfigured intersections, revised traffic signals	12/5/2008	Yes	Called on Dec. 5. Received FDR on Dec. 5.
602053	Intersection Improvements at 3 Locations	Watertown		75% Submitted		Make intersection improvements at three locations: Arlington Street, Nichols Avenue, Coolidge Hill Road, and Crawford Street; Spring Street and Summer Street; and Mount Auburn Street and Summer Street.	The three locations in this project have safety and operational problems in terms of high crash rates and excessive traffic delays. The installation of traffic signals at two of the locations and a four-way stop control at a third location would improve safety. Geometric improvements, relocation of curb cuts, and roadway realignment are expected to improve both safety and operations.	No	No	Multiple locations EPDO = 92 Fatal = 0 Injury = 9 PDO = 47	1999-2001 No collision diagram	4-way stop control Traffic signal installations Roadway alignment Sidewalk/curbing/ramps	12/5/2008	Yes	25% in 2002. 75% in 2005. See if CTPS can get FDR from Watertown.
603462	Route 53/Winter Street	Duxbury	5	25% Submitted	Brian Chapman (7265)	Make improvements to the intersection of Route 53 and Winter Street.	At Route 53 and Winter Street, the high number of crashes involving cross-movement, rear-end, or head-on collisions is due to the flashing beacon controlling traffic operations at the intersection. The proposed fully actuated traffic control signal would reduce crashes and increase safety.	No	No	Multiple locations EPDO = 7 Fatal = 0 Injury = 0 PDO = 7	1999-2001 No collision diagram	New traffic signal Geometric improvements	12/5/2008	Yes	Called Dec. 5. Received FDR on Dec. 5
602639	Route 138 (Blue Hill Avenue) - Neponset Valley Parkway	Milton	4	25% Submitted		Upgrade the traffic signals at the intersection of Route 138 (Blue Hill Avenue) and Neponset Valley Parkway.	This intersection experiences excessive traffic delay during the AM peak on Neponset Valley Parkway, and it is also overrepresented in nighttime crashes (70%). The proposed traffic control signal and addition of a left-turn lane on Blue Hill Avenue would improve safety and traffic operations.	No	Yes	Single locations EPDO = 44 Fatal = 0 Injury = 7 PDO = 9	2001-2003 No collision diagram	New traffic signal Geometric improvements Drainage improvements Signs/pavement markings	12/5/2008	Yes	Called Dec. 5. Received FDR on Dec. 5
604811	East Main Street	Marlborough	3	25% Submitted	Carrie Lavallee (8834)	Reconstruct Route 20 (East Main Street)	The project is proposed in order to address concerns regarding the current substandard condition of the roadway and sidewalks to address demands associated with current and future projections. The reconstruction, in addition to minor changes in alignment, traffic management, sidewalk reconstruction, and curb replacement, would address this need.	No	Yes	Multiple locations EPDO = 135 Fatal = 0 Injury = 14 PDO = 65	None	Resurfacing	12/9/2008	No FDR; just design submission	Called Dec. 5 and left message. FDR in Projis file? Expediter can not send PDF. We may need to get a hard copy. Received 25% design submission on December 9.
604915	Route 139 Corridor Improvements	Marshfield	5	25% Submitted		Reconstruct Route 139	The existing roadway section in the project area is inconsistent. The sections at the intersections create merging and bottlenecks that cause traffic delays and queues. The proposed four-lane section and sidewalks would provide needed consistency and reduce traffic delay and queues, as well as improving pedestrian safety and achieving ADA compliance.	No	Yes	Multiple locations EPDO = 365 Fatal = 0 Injury = 40 PDO = 155	2003-2005 No collision diagram	Widening, geometric improvements, and sidewalks,	12/9/2008	Yes	FDR in Projis file? We may need to get a hard copy. Received FDR on December 9.
605122	Clippership Drive Reconstruction	Medford	4	25% Submitted		Improvements and realignment on Clippership Drive	The proposed project is Phase I of the Medford Square Master Plan to create a single identity for the Square, encourage mixed-use vibrancy, develop the pedestrian character, and balance transportation modes. The proposed project would narrow the roadway from two travel lanes to one travel lane and one parking lane; realign the roadway away from the Mystic River to expand parkland; and create a sidewalk on the north side of Clippership Drive.	No	No	Multiple locations EPDO = 37 Fatal = 0 Injury = 4 PDO = 19	2004-2006 No collision diagram	Roadway realignment Sidewalks/granite curbing Traffic calming	12/9/2008	Yes	FDR in Projis file? We may need to get a hard copy. Received FDR on December 9.
600219	Cabot Street	Beverly		25% Submitted		Reconstruct Cabot Street from Rantoul Street to Roosevelt Avenue. Work on this project includes traffic signals, sidewalks, drainage.	Cabot Street experiences excessive traffic delay and safety problems in the project area. The proposed reconstruction includes modifications that would increase safety and improve traffic flow.	No	Yes	Multiple locations EPDO = 437 Fatal = 0 Injury = 53 PDO = 172	1989-1991 No collision diagram	Minor widening Roadway realignment Signal upgrade, Turning lanes	12/8/2008	Yes	Town wishes to merge this and project below. From eight years ago, design may actually be at 75% or 100% but needs to be brought back to 25% as regulations have changed. No contract at present. Expediter will find FDR (DEC. 5) and call on week of Dec. 8. Received on December 8.

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600220	Route 1A (Rantoul Street)	Beverly	4	25% Submitted	Filbert Yee (7883)	Reconstruct and re-signalize Route 1A (Rantoul Street) from Cabot Street (South) to Cabot Street (North).	Rantoul Street experiences excessive traffic delay and safety problems in the project area. The proposed reconstruction include modifications that would increase safety and improve traffic flow.	No	No	Multiple locations EPDO = 30 Fatal = 0 Injury = 4 PDO = 10	1992-1994 No collision diagram	Add turn lanes Traffic signal upgrade Sidewalk/curbing/ramp	12/8/2008	Yes	None
601821	Temple Street	Somerville		25% Submitted		Reconstruct Temple Street from Broadway to Mystic Avenue.	Temple Street has been a concern of the City of Somerville regarding traffic flow and safety. The project corridor experiences long traffic delays at the intersections during peak travel hours. The project modifications, including pavement reconstruction, ADA-compliant sidewalks, traffic control signal reconstruction, and signal coordination, would improve operations and safety for vehicular traffic, pedestrians, and bicyclists.	No	Yes	Multiple locations EPDO = 74 Fatal = 0 Injury = 10 PDO = 24	1996-1998 With collision diagram	Roadway reconstruction Sidewalks/granite curbing Signs/pavement markings Drainage improvements	12/8/2008	Yes	Expediter will find FDR (Dec. 5) and call week of Dec. 8. Received on December 8.
602496	Route 115 (Pond/Pine Streets), Route 140	Foxborough, Norfolk, & Wrentham	5	75% Submitted	Gautam Sen (7889)	Reconstruct Route 115 (Pond Street and Pine Streets) from Needham Street in Norfolk to Route 140 in Foxborough.	Traffic safety and operations concerns in the corridor	No	No	n/a	n/a	Safety Improvements	12/10/2008	Yes	Called Dec. 5 and left message.
602078	Route 62 (Maple Street)	Middleton	4	25% Approved	Joseph Mumbrun (7876)	Reconstruct Route 62 (Maple Street) from Washington Street to the Ipswich River.	Project report unavailable to staff	No	No			Reconstruction	No report received	No	Called on Dec. 5. No FDR. Last correspondence June 2005 from Louis Berger about constructing sidewalk.
601553	Lebanon & Main Streets	Melrose		25% Submitted	Joseph Mumbrun (7876)	Reconstruct Lebanon Street and Main Street and upgrade signals.	The existing roadway in the project area has inadequacies as well as traffic safety and operational deficiencies. The proposed improvements include roadway and sidewalk rehabilitation, signal upgrade, new signs and pavement markings, and geometric improvement to address these deficiencies.	No	Yes	Multiple locations EPDO = 193 Fatal = 0 Injury = 32 PDO = 33	2003-2005 No collision diagram	Resurfacing, minor widening, sidewalks, wheelchair ramps, signal modifications and upgrades, pedestrian signal phasing, and crosswalk improvements	12/10/2008	Yes	Called on Dec. 5. Called Darshan Jhavis of Beta Group to get FDR (781-255-1982). 75% design is under review by MassDOT Highway Division. The District already reviewed 75% design. Beta Group will send a PDF of the FDR on Dec. 9.
601274	Tremont Street, Phase 1	Boston	4	25% Submitted	Kimberly (Kim) Sloan (7495)	Reconstruct Tremont Street from Court Street to Boylston Street.	Tremont Street experiences excessive delay currently, and it is expected to worsen in the future if improvements are not implemented. The proposed project would improve the existing geometric layout, upgrade traffic control signals, and install an interconnected cable system. The project would also improve lighting, signage, and striping.	No	No	Multiple locations EPDO = 110 Fatal = 0 Injury = 14 PDO = 40	1998-2000	Traffic signal upgrades, sidewalks/wheelchair ramps, signage, and pavement markings	12/5/2008	Yes	Called Dec. 5 and left message. Received FDR on Dec. 5.
600636	Massachusetts Avenue	Boston	4	75% Submitted	Kimberly (Kim) Sloan (7495)	Reconstruct Massachusetts Avenue from Westland Avenue to Albany Street.	Project report unavailable to staff	n/a	n/a	n/a	n/a	New lighting, urban design treatments, sidewalks and wheelchair ramps	No report received	No	Called Dec. 5 and left message. Project is 100% approved; opening bids soon.
600283	North Street	Foxborough	5	25% Approved	Manhar Patel (7217)	Reconstruct North Street from Route 1 to Route 140, and improve intersections, sidewalks, and drainage.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Sidewalks, wheelchair ramps, traffic signal installation, and signage, and pavement markings	No report received	No	Called Dec. 5. Project may be dropped; waiting to hear from District 5.
601705	West Street	Reading	4	75% Submitted	Manhar Patel (7217)	Reconstruct West Street from the intersection of Summer Avenue and Willow Street to the Woburn city line, including: signalization of three intersections, installation of a pedestrian signal, resurfacing the roadway, and installation of sidewalk and curb.	The project area along West Street has safety-deficient locations and operational problems, including, but not limited to, excessive traffic delays, absence of sidewalks and ADA-compliant street elements, and inconsistent roadway sections. The proposed modifications would provide consistent roadway cross sections, sidewalks for pedestrians, and accessible pedestrian facilities. It would also provide geometric improvements, interconnect existing signals, and provide new signals to improve safety and operations.	No	No	Multiple Locations EPDO = 61 Fatal = 0 Injury = 6 PDO = 31	2001-2003 No collision diagram	New sidewalks/curbing, drainage, and new traffic signals	12/8/2008	Yes	Expediter will get FDR week of Dec. 8. Received on December 8.
603134	Route 37 (Granite Street) at I-93	Braintree	4	75% Submitted	Manhar Patel (7217)	Reconstruct the I-93 northbound off-ramp to Granite Street (Route 37) and construct a new ramp (off the existing ramp) to connect to Forbes Road. Forbes Road will be connected to a relocated portion of Brooks Drive.	Project report unavailable to staff	n/a	n/a	n/a	n/a	New ramps and access improvements	No report received	No	Project was suspended.
601359	Pleasant Street	Franklin	3	75% Submitted	Manhar Patel (7217)	Reconstruct Pleasant Street from Main Street to Chestnut Street.	The Pleasant Street project area has operational deficiencies that impact safety in this corridor, including but not limited to poor geometry and sight distances, lack of turn lanes and crosswalks and handicap facilities, poor or substandard pavement, excessive delays, and drainage problems. The proposed improvements, consisting of exclusive turn lanes, signal upgrades and coordination, and improved sight distance, would address these deficiencies and improve safety and operations.	No	No	Multiple Locations EPDO = 67 Fatal = 0 Injury = 10 PDO = 17	1994-1996 No collision diagram	Shoulder widening, curbing, new traffic signal, signal upgrades, sidewalks, wheelchair ramps, signage, and pavement markings	12/8/2008	Yes	Expediter will get FDR week of Dec. 8. Received on December 8.
602081	Route 107 (Western Avenue)/Eastern Avenue	Lynn	4	25% Submitted	Marie Rose (7427)	Improve the intersection of Route 107 (Western Avenue) and Eastern Avenue.	Project report unavailable to staff	n/a	n/a	n/a	n/a	New traffic signal	No report received		Project in pre-25% design
6870	Boundary Street	Marlborough & Northborough	3	25% Submitted	Michael Papadopoulos (7356)	Reconstruct Boundary Street from Route 20 (West) to Goddard Road.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Realignment	No report received	Project inactive	Project inactive. It has been in pre-25% design since 1998. Northborough may not have had money to continue with design. There has been no 25% design public hearing.

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602378	Route 123	Norwell	5	25% Submitted	Michael-kosmas (Mike) Bloukos (7333)	Reconstruct Route 123 from just west of Dover Street to the Scituate town line.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Roadway alignment, sidewalks, wheelchair ramps, curbing, drainage, signage, and pavement markings	No report received	Project Suspended	Called Dec. 5 and left message. Project is from the 90s. At 25% hearing 3-4 years ago, there was opposition to the project that caused it to stall. Residents opposed to sidewalks and widening. They may want to resume project under principles of new Design Guidebook.
602382	Route 99 (Broadway)	Everett	4	25% Submitted	Muazzez Reardon (8437)	Reconstruct Route 99 (Broadway) from Sweetser Circle to the Boston city line at the traffic signals.	Broadway Street serves as a commuter route to other major highways north and south of Boston. This high travel demand, coupled with the intense parking and trucking activities, has caused traffic on Broadway to deteriorate, resulting in cut-through traffic in nearby residential areas. The proposed modifications reduce the peak-period congestion as well as cut-through traffic.	No	Yes	Multiple locations EPDO = 343 Fatal = 0 Injury = 52 PDO = 83	2003-2006 No collision diagram	Traffic signal upgrades	12/15/2008	Yes	Call last. Called Muazzez on Friday and left a message. Received the FDR on Monday, December 15.
114501	Route 53, Phase 1B	Hanover	5	75% Approved (100% design, under construction 40%, complete)	Peter Benkart, District 5	Widen Route 53 from two lanes to five lanes (two lanes in each direction with a bidirectional center turning lane) from Mill Street to Pond Street. In addition, Pond Street will be realigned to form a four-way intersection with Washington Street.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Widening (2 to 5 lanes), bidirectional center turn lane, intersection realignment	No report received	No	Under construction
604664	Quincy Center Concourse, Phase 2	Quincy	4	75% Submitted	Phillip McDonald (7552)	Construct the "East Side Link" of the Quincy Center Concourse. This project includes the construction of a roadway link between the "West Side Link" (Phase 1 of the project) and Mechanic Street, and Revere Road.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Roadway resurfacing, sidewalks, curbing, new traffic signals, and new alignment	No report received	No	Called Dec. 5 and left message. Waiting for District 4 75% comments. Will speak on Dec. 8 on getting the FDR. 75% traffic plans approved, 75% highway design awaiting approval.
604206	Central Avenue	Milton	4	25% Submitted	Phillip McDonald (7552)	Reconstruct Central Avenue from Brook Road to Eliot Street. The project includes roadway resurfacing, drainage improvements, signs, and pavement markings. Also included is the creation of a two-way multiuse path.	The intent of this project is to rehabilitate the existing roadway, providing improved pedestrian and bicycle amenities along Central Avenue.	No	Yes	Multiple locations EPDO = 79 Fatal = 0 Injury = 10 PDO = 29	2000-2002 With collision diagram	Drainage improvements, signage, and pavement markings	12/18/2008	Yes	Called Dec. 5 and left message. Will speak on Dec. 8 about getting the FDR. Received the FDR on Friday, December 18.
601820	Beacon Street	Somerville	4	75% Submitted	Shawn Holland (7242)	Reconstruct Beacon Street from Oxford Street to the Cambridge city line.	Project report unavailable to staff					New sidewalks, granite curbing, traffic signal improvements, and drainage	No report received	No	Called Dec. 5 and left message. Expediter does not have FDR. We need to call him so that he gets it from consultant or the City. Dec. 9: Expediter will call Charlie O'Brien, city engineer, to get a copy.
601704	Walnut Street	Newton	4	25% Submitted	Steven McLaughlin (7245)	Reconstruct Walnut Street from Homer Street to Centre Street, upgrade the signalization, and improve the drainage. This project also includes improvements to the Centre Street intersection from 100 feet east of Walnut Street to Route 9.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Traffic signal upgrades and reconstruction	No report received	No	25% was submitted and rejected. Expediter will get FDR, Dec. 5. Called Steven on December 15; he is still awaiting FDRs.
601017	Route 1A (Bridge Street)	Salem		25% Submitted		Reconstruct Route 1A (Bridge Street) from the Veterans' Memorial Bridge to Washington Street.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Sidewalk, wheelchair ramps, signage, and pavement markings	No report received	No	
5399	Bridge Street (Beverly/Salem Bridge)	Salem		25% Submitted		Reconstruct Bridge Street from Flint Street to Washington Street. Bridge Street will be widened from two to four travel lanes between Flint Street and the North Street interchange ramps. The project will also include new sidewalks and curbing.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Roadway widening, sidewalks, wheelchair ramps, curbing, drainage, and street lighting	No report received	No	
602984	Route 2 (Crosby's Corner)	Concord & Lincoln		75% Submitted		The purpose of this project is to provide safety improvements at Crosby's Corner (intersection of Route 2, Cambridge Turnpike, and Route 2A/Concord Turnpike). This will be accomplished by constructing neighborhood service roads to safely and efficiently accommodate traffic and to provide safe access to the residences and businesses located along the project corridor.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Limited-access-highway improvements	No report received	No	
601899	Commonwealth Avenue (Route 30), Phase 3	Newton		75% Submitted		Reconstruct Route 30 (Commonwealth Ave.) from Grant Avenue to the Boston city line.	Project report unavailable to staff	n/a	n/a	n/a	n/a	New sidewalks, granite curbing, and traffic signals	No report received	No	
601513	Route 1/Walnut Street	Saugus	4	75% Approved	Thomas Currier (7244)	Reconfigure the Route 1 and Walnut Street interchange by channeling all vehicles exiting from Route 1 onto a separate northbound or southbound exit ramp. Also, install traffic signals, consolidate driveways, eliminate sidewalks, and widen Walnut Street.	Safety concerns at the Route 1/Walnut Street interchange prompted improvements at the interchange and vicinity. The modifications proposed address both safety and operations.			Multiple Locations EPDO = 374	2002-2005 Collision diagram	Ramp modifications New traffic signals Interconnection of four traffic signals	12/10/2008	Yes	Called December 10. Tom said there are minor updates to this project and it is almost at 100%. FDR received.
602133	Route 2A and Waltham Street	Lexington	4	25% Submitted		Upgrade the signalization at the intersection of Route 2A and Waltham Street.	This intersection of Route 2A at Waltham Street experiences excessive traffic delay during the AM peak, and it is also overrepresented in crashes (1.53 crashes per MEV). The proposed geometric changes and traffic control signal upgrades and improvements to facilitate pedestrian movement and safety would address these needs.	No	Yes	Multiple Locations EPDO = 98 Fatal = 0 Injury = 14 PDO = 28	1999-2001 No collision diagram	Traffic signal improvements New traffic signal Sidewalks/wheelchair ramps Signs/pavement markings	12/10/2008	Yes	75% design submitted, FDR received on December 10.

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603867	Route 16 Signal Improvements	Milford	3	25% Submitted	Thomas Currier (7244)	This project begins at the intersection of Route 16 and Route 85 and Middleton Street, continuing southward along Route 16 approximately 1.5 miles to the intersection of Route 16, South Main Street, Congress Street, and Water Street. Seven traffic signals will be retimed, interconnected, and coordinated.	Route 16 corridor in the project area is not operating efficiently, as it experiences excessive traffic delay, a higher than expected number of crashes, and pedestrian mobility problems. All of the seven traffic signal controls are missing essential signal equipment or are currently using outdated signal equipment, resulting in less than optimal operational conditions. The proposed improvements would establish fully optimized signal operations and improve safety along the corridor to allow safe and efficient traffic flow while addressing pedestrian needs.	No	No	Multiple locations EPDO = 292 Fatal = 0 Injury = 33 PDO = 127	2002-2005 With collision diagram	Traffic signal retiming, interconnected signal coordination, and signal equipment upgrade	12/10/2008	Yes	Project is advancing to 75% design. FDR received on December 10.
601827	Highland Avenue	Needham	4	25% Submitted		Reconstruct Highland Avenue from Webster Street to the Newton city line.	The Highland Street project is justified for the following reason: existing geometry along the corridor causes excessive delay and safety deficiencies. The proposed modifications: signal installations and geometric improvements would increase capacity and improve mobility through the corridor.	No	Yes	Multiple Locations EPDO = 208 Fatal = 0 Injury = 21 PDO = 103	1998-2000 No collision diagram	Roadway widening, exclusive left-turn lanes, sidewalks, curbing, new traffic signals/upgrades, signage, pavement markings, and bicycle accommodation	12/10/2008	Yes	Project was delayed because of opposition from the towns. The District is working with them to resubmit the project. FDR received on December 10.
114906	Route 53 (Washington Street) and Middle Street	Weymouth	4	75% Submitted		Make safety improvements at the intersection of Route 53 (Washington Street) and Middle Street and Winter Street. The road will be widened and new sidewalks, signs, and pavement markings will be installed.	This intersection is not only operating with excessive delays, but also has safety deficiencies. The existing traffic control system is old and outdated. The need therefore exists to upgrade the traffic control signal system and implement geometric improvements to address pedestrian and traffic safety at the intersection.	Yes	Yes	Single locations EPDO = 214 Fatal = 0 Injury = 55 PDO = 104	1990-1992 With collision diagram	Traffic signal improvements, new traffic signals, widening, new sidewalks, signage, and pavement markings.	12/10/2008	Yes	FDR received on December 10.
602012	Chestnut Street	Needham	4	25% Approved	Tracy Wu (7556)	Reconstruct Chestnut Street.	The project area along Chestnut Street lacks pedestrian amenities, such as sidewalks, and the drainage system is in poor condition at some locations, as are the existing traffic signage and striping. Sections of Chestnut Street have substandard design and excessive traffic delays. The proposed modifications would address these deficiencies to improve safety and traffic flow. They include geometric improvements, widening, sight distance improvements, additional signing and striping, sidewalks, and a new fully actuated traffic control signal.	No	Yes	Multiple locations EPDO = 155 Fatal = 0 Injury = 22 PDO = 45	1996-1998 No collision diagram	Roadway widening, sidewalks, curbing, new traffic signals, signage, and pavement markings	12/10/2008	Yes	Called Dec. 5 and left message. Project at 25%, approved as of 3 years ago. There is a safety and design report that we can get from Tracy on Monday, December 8. Call first. Received FDR on December 10. Project is now at 75%, but it has been stalled for some time.
604812	Route 85/Washington Street	Hudson	3	25% Submitted	Victoria Sheehan	Reconstruct Route 85 (Washington Street).	Project report unavailable to staff	n/a	n/a	n/a	n/a	Minor widening Signal upgrade	n/a	n/a	Victoria now works in Bridge Division. Muazzez Reardon (x8437) has her projects. She works Mondays, Tuesdays, and Fridays.
604697	Farm Road	Marlborough	3	25% Submitted		Reconstruct Farm Road from Cook Lane to Route 20 (Boston Post Road, East).	Project report unavailable to staff	n/a	n/a	n/a	n/a	Reconstruction New sidewalks	n/a	n/a	
604916	Pleasant Street/Morse Street	Norwood	5	25% Submitted		Improve the intersection of Pleasant Street and Morse Street.	Project report unavailable to staff	n/a	n/a	n/a	n/a	Actuated traffic signals, exclusive pedestrian phase, and safety improvements	n/a	n/a	
602261	Route 1A (Main Street)	Walpole	5	25% Submitted		Reconstruct Route 1A (Main Street) from Front Street to the Norfolk town line, and replace the Route 1A Bridge (W-3-24).	Project report unavailable to staff	n/a	n/a	n/a	n/a	Intersection improvements Roadway reconstruction	n/a	n/a	
602593	Union Street	Braintree	4	75% Submitted		Reconstruct Union Street from the Route 3 rotary to Commercial Street.	Project report unavailable to staff	n/a	n/a	n/a	n/a	New traffic signal system Sidewalks/ramps Signs/pavement markings	n/a	n/a	
602493	Pulaski Boulevard, Phase 1	Bellingham	3	75% Submitted	William Chi (7802)	Reconstruct Pulaski Boulevard from Orchard Street to the Franklin town line, realign the Crooks Corner traffic signals, and install new traffic signals at warranted intersections. This project includes work on the intersection of Wrentham Road and Paine Street.	The purpose of this project is to improve traffic safety and operations for motorists and pedestrians. The proposed improvements for Pulaski Boulevard include widening the roadway, rehabilitating the pavement, improving the signals, and providing pedestrian safety improvements. This project includes the intersection of Wrentham Road and Paine Street for a total project length of 2.2 miles.	n/a	n/a	Multiple locations EPDO = 36	1998-2000 No collision diagram	Widening, pedestrian safety improvements, and improved signal timing.			Called Dec. 5. 100% design submitted.
602310	Collins Street	Danvers	4	75% Submitted	William Chi (7802)	Reconstruct Collins Street from Sylvan Street to the intersection of Holten and Centre Streets.	The unsignalized intersection is subject to poor traffic operations on the side street, with queues and delays. Crashes at the intersection are mainly cross-movement (angle collisions). The proposed fully actuated traffic control signal and geometric changes would improve safety and traffic operations.	No	No	Single locations EPDO = 8 Fatal = 0 Injury = 1 PDO = 3	2001-2003 No collision diagram	Roadway widening, sidewalks, curbing, new traffic signals, signage, and pavement markings	12/9/2008	Yes	Called Dec. 5. Project at 75% design and the District is reviewing it. Received FDR on December 9.

APPENDIX B

Project Crash Information

TABLE B-1
Trapelo Road and Belmont Street Corridor Improvements:
2003–2005 Crash Data Used in the Project’s Functional Design Report

Intersection with Trapelo Road	Crash Total	Crash Rate¹⁶	Exceeds MassDOT Average	Collision Diagram
Waverly Oaks Roads	10	0.34	No	No
Mill Street	27	0.70	No	Yes
Pleasant Street	25	0.69	Yes	No
Moraine Street	18	0.62	No	Yes
Lexington Street/Thayer Street	19	0.57	No	No
Church Street	8	0.35	No	Yes
Waverley Street/White Street	10	0.41	No	No
Beech Street	4	0.23	No	No
Slade Street/Harriet Street	5	0.26	No	No
Common Street/Cushing Street	16	0.59	No	No
Belmont Street	9	0.31	No	Yes
School Street	16	0.53	No	Yes
Grove Street/Arlington Street	13	0.45	No	No
Total study intersections (2003–2005)	180			
Total for corridor (2004–2006)	317			

TABLE B-2
Route 16 Traffic Signal Improvements:
2001–2003 Crash Data Used in the Project’s Functional Design Report

Intersection with Route 16	Crash Total	Crash Rate¹⁷	Exceed MassDOT Average	Collision Diagram
Medway Street	39	1.21	Yes	Yes
Cedar Street	27	1.00	Yes	Yes
Beach Street	25	0.61	No	No
Winter Street	18	0.46	No	No
School Street	19	0.57	No	No
Central Street	8	0.38	No	No
South Main Street	10	1.47	Yes	Yes
Total study intersections (2001–2003)	146			
Total for corridor (2004–2006)	142			

¹⁶ Crash Rate is measured in crashes per million entering vehicles (MEV)

¹⁷ Ibid.

TABLE B-3
Route 139 (Plain Street) Corridor Improvement Study:
2001–2003 Crash Data Used in the Project’s Functional Design Report

Intersection with Route 139	Crash Total	Crash Rate¹⁷	Exceed MassDOT Average	Collision Diagram
School Street	15	0.34	No	No
Village Street	3	0.07	No	No
Enterprise Drive	17	0.59	No	No
Furnace Street	18	0.84	No	No
Total study intersections (2001–2003)	53			
Total for corridor (2004–2006)	116			

¹⁷ Ibid.

APPENDIX C

Crash Diagrams

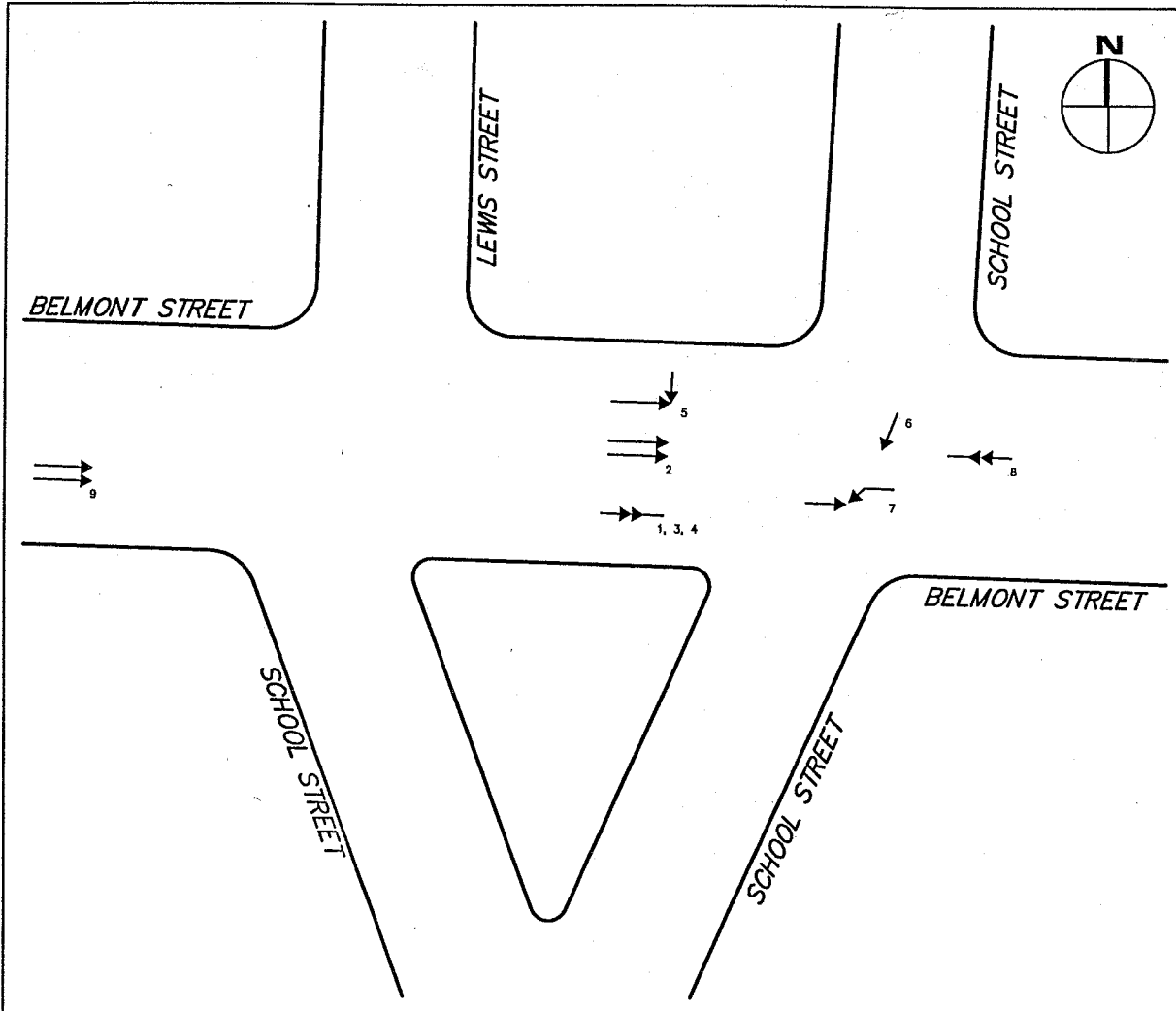
1. Trapelo Road and Belmont Street Corridor Improvements, Belmont
2. Route 16 Traffic Signal Improvements, Milford
3. Route 53 (Washington Street)/Middle Street, Weymouth
4. Reconstruction of Temple Street, Somerville
5. Central Avenue Rehabilitation Project, Milton

1. Trapelo Road and Belmont Street Corridor Improvements, Belmont

COLLISION DIAGRAM

PROJECT: TRAPELO ROAD, BELMONT
 JOB NUMBER: 2.8172.02

LOCATION: BELMONT STREET AT SCHOOL STREET
 DATE: 08/29/06 BY: JML



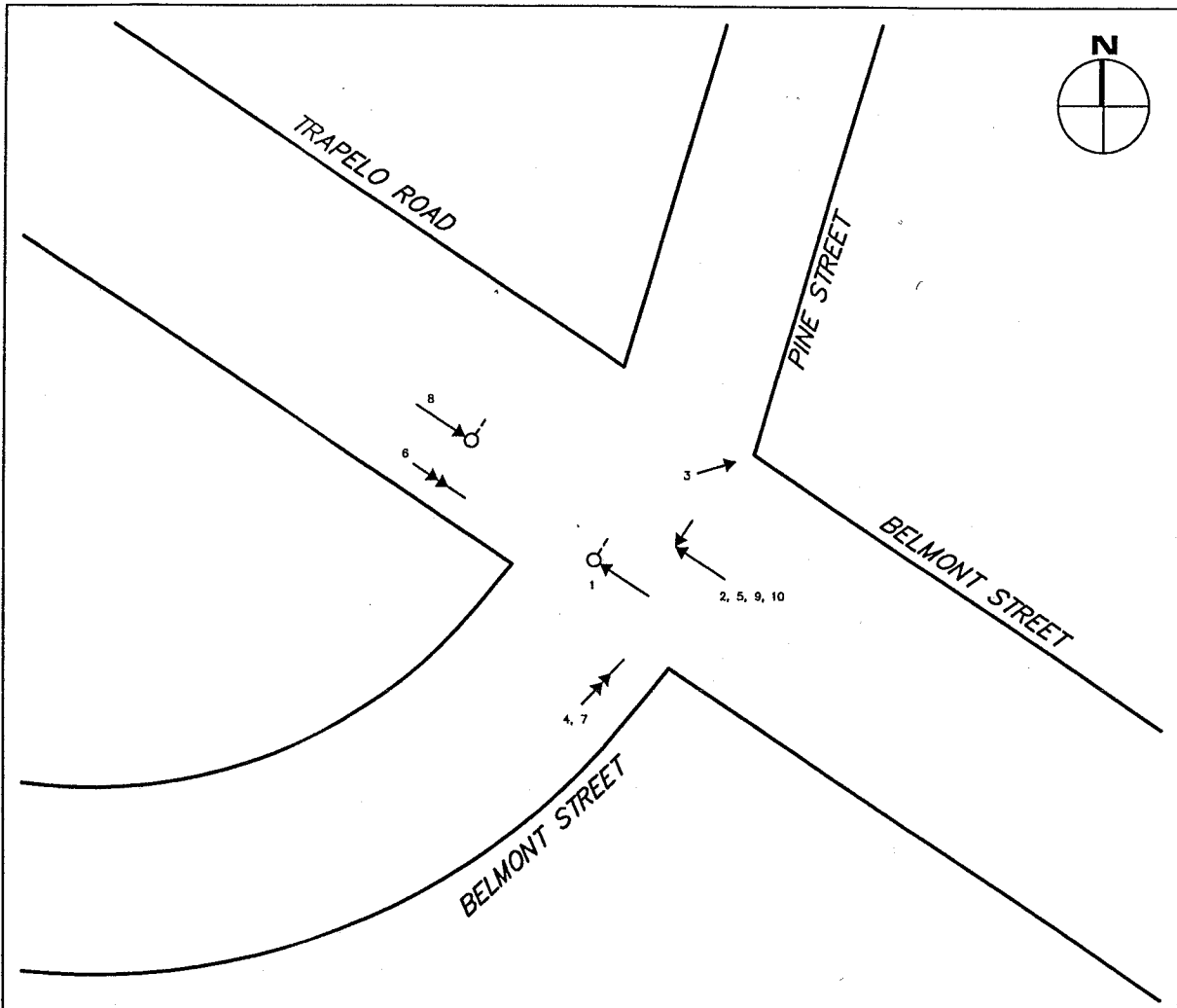
SYMBOLS				LIGHT CONDITIONS	VIOLATIONS
ANGLE → ↘	PEDESTRIAN → ○	FATAL ACCIDENT ●	1. DAYLIGHT	0. NO VIOLATIONS	7. WRONG SIDE OF ROAD
BACKING → ←←←	REAR END → →	INJURY ACCIDENT ○	2. DAWN OR DUSK	1. SPEED TOO FAST	8. IMPROPER TURNING
FIXED OBJECT → □	SIDE SWIPE → →	VEHICLE →	3. DARKNESS	2. FAILURE TO YIELD	9. IMPROPER BACKING
HEAD ON → →	TURNING MOVE → ↘	PEDESTRIAN → ○	4. UNKNOWN	3. RAN STOP SIGN	10. HAD BEEN DRINKING
OUT OF CONTROL → ○	CHANGE LANE → ↘	FATALITY F		4. RAN TRAFFIC SIGNAL	11. PEDESTRIAN VIOLATION
		PERSONS INJURED I		5. FOLLOWING TOO CLOSE	12. RECKLESS DRIVING
				6. IMPROPER PASSING	13. IMPROPER LIGHT OR BRAKES

	DATE	TIME	P.D.	F	I	L	R	V		DATE	TIME	P.D.	F	I	L	R	V
1	01/23/03	8:15 PM	YES	0	0	3	1		11								
2	06/11/03	5:23 PM	YES	0	0	1	2		12								
3	09/22/03	7:30 AM	YES	0	1	1	1	5	13								
4	10/31/03	11:58 AM	YES	0	0	1	1	5	14								
5	11/03/03	11:35 AM	YES	0	0	1	1	2	15								
6	06/03/04	7:36 PM	YES	0	1	2	2	0	16								
7	01/17/05	3:30 PM	YES	0	0	1	1		17								
8	10/01/05	9:18 AM	YES	0	0	1	1	5	18								
9	11/21/05	7:52 AM	YES	0	0	1	1	0	19								
10									20								

COLLISION DIAGRAM

PROJECT: TRAPELO ROAD, BELMONT
 JOB NUMBER: 2.8172.02

LOCATION: TRAPELO ROAD AT BELMONT STREET / PINE STREET
 DATE: 08/29/06 BY: JML



SYMBOLS				LIGHT CONDITIONS	VIOLATIONS
ANGLE → ↘	PEDESTRIAN → ○	FATAL ACCIDENT ●	1. DAYLIGHT	0. NO VIOLATIONS	7. WRONG SIDE OF ROAD
BACKING → ←←←	REAR END → →→	INJURY ACCIDENT ○	2. DAWN OR DUSK	1. SPEED TOO FAST	8. IMPROPER TURNING
FIXED OBJECT → □	SIDE SWIPE → →→	VEHICLE →	3. DARKNESS	2. FAILURE TO YIELD	9. IMPROPER BACKING
HEAD ON → ←→	TURNING MOVE → ↘	PEDESTRIAN → ○	4. UNKNOWN	3. RAN STOP SIGN	10. HAD BEEN DRINKING
OUT OF CONTROL → ○	CHANGE LANE → ↘	FATALITY F		4. RAN TRAFFIC SIGNAL	11. PEDESTRIAN VIOLATION
		PERSONS INJURED I		5. FOLLOWING TOO CLOSE	12. RECKLESS DRIVING
				6. IMPROPER PASSING	13. IMPROPER LIGHT OR BRAKES

	DATE	TIME	P.D.	F	I	L	R	V	DATE	TIME	P.D.	F	I	L	R	V
1	03/31/03	4:38 PM	YES	0	1	1	1	8	11							
2	11/01/03	3:40 PM	YES	0	0	1	1	2	12							
3	01/23/04	10:30 AM	YES	0	0	1	1	0	13							
4	04/07/04	3:57 PM	YES	0	0	1	1	5	14							
5	06/18/04	11:13 AM	YES	0	0	1	2	8	15							
6	08/03/04	8:30 PM	YES	0	0	3	1		16							
7	08/29/04	3:00 PM	YES	0	0	1	1		17							
8	03/15/05	7:53 PM	NO	0	1	1	1	2	18							
9	09/05/05	11:36 AM	YES	0	1	1	1	2	19							
10	10/13/05	5:17 PM	YES	0	1	2	2	0	20							

COLLISION DIAGRAM

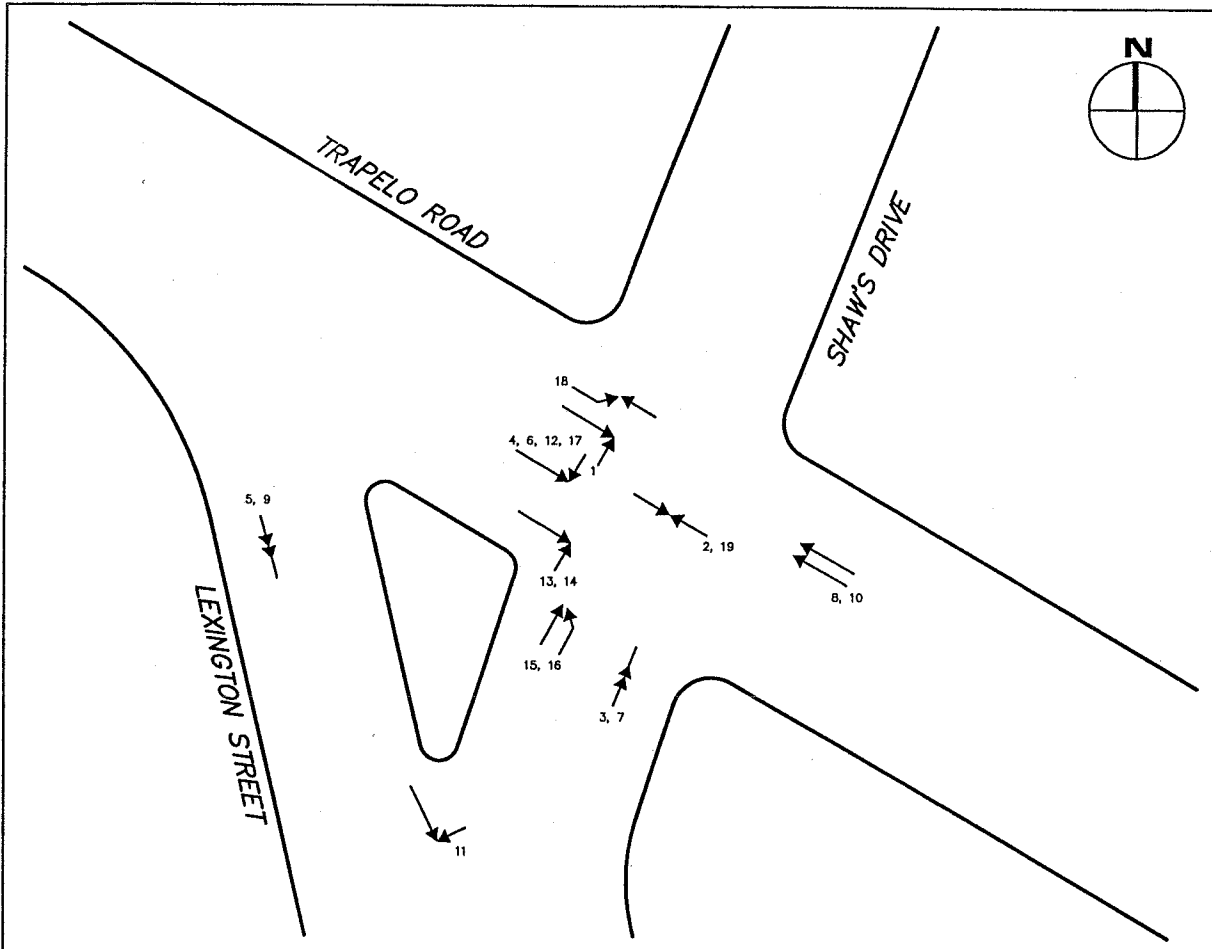
PROJECT: TRAPELO ROAD, BELMONT

LOCATION: TRAPELO ROAD AT LEXINGTON STREET

JOB NUMBER: 2.8172.02

DATE: 08/29/06

BY: JML



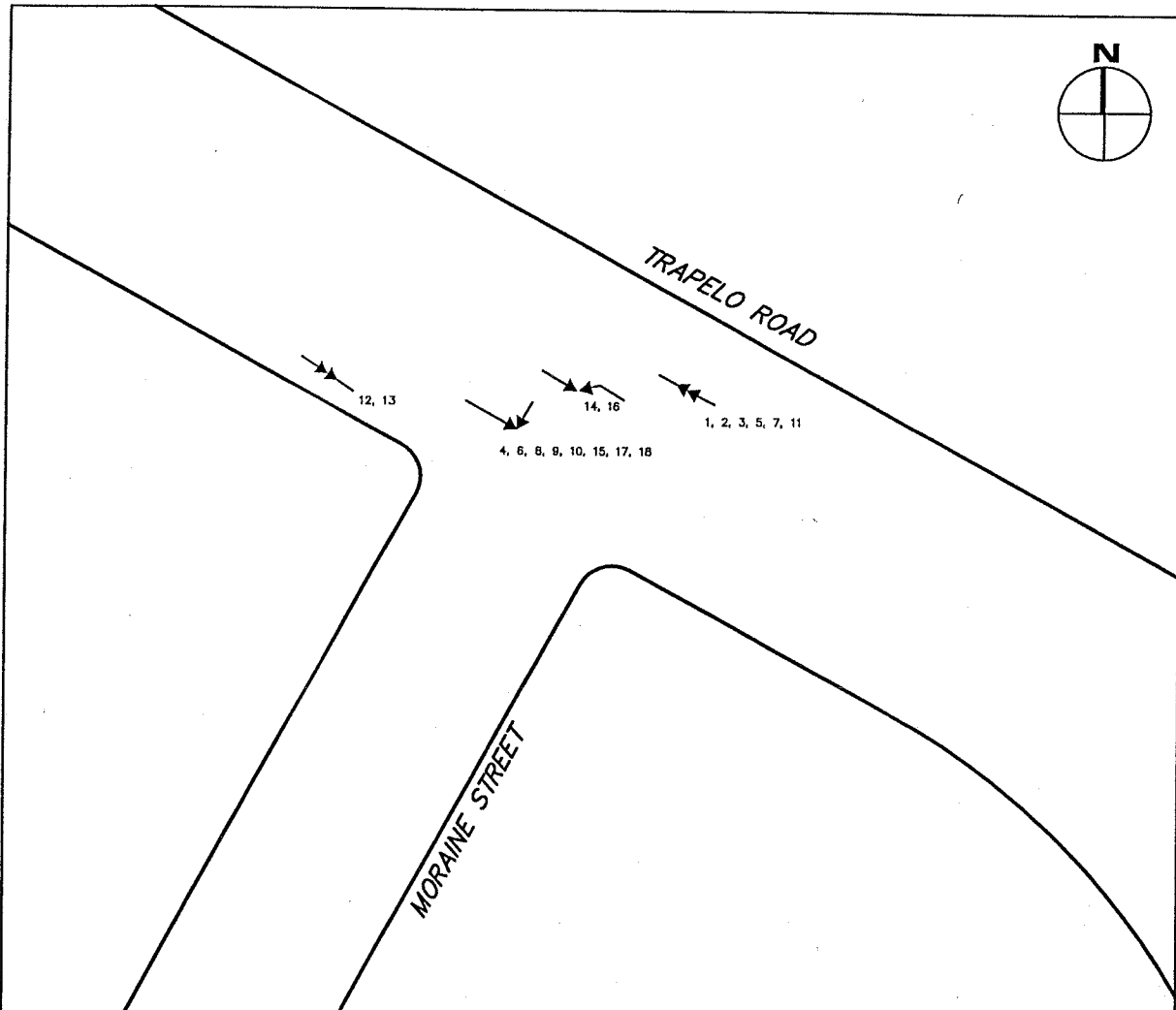
SYMBOLS				LIGHT CONDITIONS		VIOLATIONS	
ANGLE		PEDESTRIAN		1. DAYLIGHT	0. NO VIOLATIONS	7. WRONG SIDE OF ROAD	
BACKING		REAR END		2. DAWN OR DUSK	1. SPEED TOO FAST	8. IMPROPER TURNING	
FIXED OBJECT		SIDE SWIPE		3. DARKNESS	2. FAILURE TO YIELD	9. IMPROPER BACKING	
HEAD ON		TURNING MOVE		4. UNKNOWN	3. RAN STOP SIGN	10. HAD BEEN DRINKING	
OUT OF CONTROL		CHANGE LANE			4. RAN TRAFFIC SIGNAL	11. PEDESTRIAN VIOLATION	
		FATAL ACCIDENT			5. FOLLOWING TOO CLOSE	12. RECKLESS DRIVING	
		INJURY ACCIDENT			6. IMPROPER PASSING	13. IMPROPER LIGHT OR BRAKES	
		VEHICLE					
		PEDESTRIAN					
		FATALITY	F				
		PERSONS INJURED	I				

	DATE	TIME	P.D.	F	I	L	R	V	DATE	TIME	P.D.	F	I	L	R	V	
1	01/09/03	7:00 PM	YES	0	0	3	2	2	15	04/22/05	3:34 PM	YES	0	0	1	1	0
2	04/11/03	11:20 PM	YES	0	0	3	2	4	16	05/05/05	3:25 PM	YES	0	0	1	1	
3	05/20/03	3:50 PM	YES	0	0	1	1	5	17	10/08/05	6:00 PM	YES	0	0	1	2	0
4	09/13/03	12:20 PM	YES	0	0	1	1	4	18	11/04/05	3:49 PM	YES	0	0	1	1	2
5	09/25/03	5:30 PM	YES	0	0	1	1	2	19	11/15/05	6:35 PM	YES	0	1	1	2	0
6	11/01/03	12:00 PM	YES	0	0	1	1	0	20								
7	12/08/03	7:49 AM	YES	0	0	1	3	0	21								
8	12/10/03	6:05 PM	YES	0	0	1	1	0	22								
9	08/26/04	3:43 PM	YES	0	1	1	1	5	23								
10	09/28/04	2:10 PM	YES	0	0	1	1		24								
11	11/01/04	2:59 PM	YES	0	0	1	1	0	25								
12	11/03/04	8:49 PM	YES	0	0	3	1	0	26								
13	12/19/04	8:45 AM	YES	0	0	1	4	4	27								
14	12/26/04	4:54 PM	YES	0	1	3	3	4	28								

COLLISION DIAGRAM

PROJECT: TRAPELO ROAD, BELMONT
 JOB NUMBER: 2.8172.02

LOCATION: TRAPELO ROAD AT MORaine STREET
 DATE: 08/29/06 BY: JML



SYMBOLS										LIGHT CONDITIONS				VIOLATIONS			
ANGLE		PEDESTRIAN		FATAL ACCIDENT		ROAD CONDITIONS 1. DRY 2. WET 3. SNOW OR ICY 4. OTHER				VIOLATIONS 0. NO VIOLATIONS 1. SPEED TOO FAST 2. FAILURE TO YIELD 3. RAN STOP SIGN 4. RAN TRAFFIC SIGNAL 5. FOLLOWING TOO CLOSE 6. IMPROPER PASSING 7. WRONG SIDE OF ROAD 8. IMPROPER TURNING 9. IMPROPER BACKING 10. HAD BEEN DRINKING 11. PEDESTRIAN VIOLATION 12. RECKLESS DRIVING 13. IMPROPER LIGHT OR BRAKES							
BACKING		REAR END		INJURY ACCIDENT													
FIXED OBJECT		SIDE SWIPE		VEHICLE		ROAD CONDITIONS 1. DRY 2. WET 3. SNOW OR ICY 4. OTHER				VIOLATIONS 0. NO VIOLATIONS 1. SPEED TOO FAST 2. FAILURE TO YIELD 3. RAN STOP SIGN 4. RAN TRAFFIC SIGNAL 5. FOLLOWING TOO CLOSE 6. IMPROPER PASSING 7. WRONG SIDE OF ROAD 8. IMPROPER TURNING 9. IMPROPER BACKING 10. HAD BEEN DRINKING 11. PEDESTRIAN VIOLATION 12. RECKLESS DRIVING 13. IMPROPER LIGHT OR BRAKES							
HEAD ON		TURNING MOVE		PEDESTRIAN													
OUT OF CONTROL		CHANGE LANE		FATALITY	F	ROAD CONDITIONS 1. DRY 2. WET 3. SNOW OR ICY 4. OTHER				VIOLATIONS 0. NO VIOLATIONS 1. SPEED TOO FAST 2. FAILURE TO YIELD 3. RAN STOP SIGN 4. RAN TRAFFIC SIGNAL 5. FOLLOWING TOO CLOSE 6. IMPROPER PASSING 7. WRONG SIDE OF ROAD 8. IMPROPER TURNING 9. IMPROPER BACKING 10. HAD BEEN DRINKING 11. PEDESTRIAN VIOLATION 12. RECKLESS DRIVING 13. IMPROPER LIGHT OR BRAKES							
				PERSONS INJURED	I												

	DATE	TIME	P.D.	F	I	L	R	V	DATE	TIME	P.D.	F	I	L	R	V	
1	04/24/03	10:43 PM	YES	0	0	3	1	5	11	12/19/04	1:05 PM	YES	0	0	1	1	0
2	05/17/03	11:20 AM	YES	0	1	1	1		12	04/05/05	3:19 PM	YES	0	0	1	1	5
3	05/30/03	3:25 PM	YES	0	0	1	1	5	13	06/22/05	9:41 AM	YES	0	1	1	2	
4	12/24/03	7:15 AM	YES	0	1	1	1	8	14	07/02/05	3:31 PM	YES	0	0	1	1	8
5	02/11/04	10:28 AM	YES	0	1	1	1	0	15	07/14/05	5:02 PM	YES	0	1			
6	04/15/04	1:05 PM	YES	0	0	1	2	0	16	08/31/05	4:21 PM	YES	0	0	1	2	0
7	05/20/04	2:45 PM	YES	0	1	1	1	5	17	09/22/05	12:45 PM	YES	0	0			8
8	06/14/04	10:45 PM	YES	0	0	3	1	12	18	09/26/05	5:57 PM	YES	0	0			2
9	10/15/04	9:14 AM	YES	0	0	1	2	8	19								
10	11/15/04	3:15 PM	YES	0	0	1	1	2	20								

COLLISION DIAGRAM

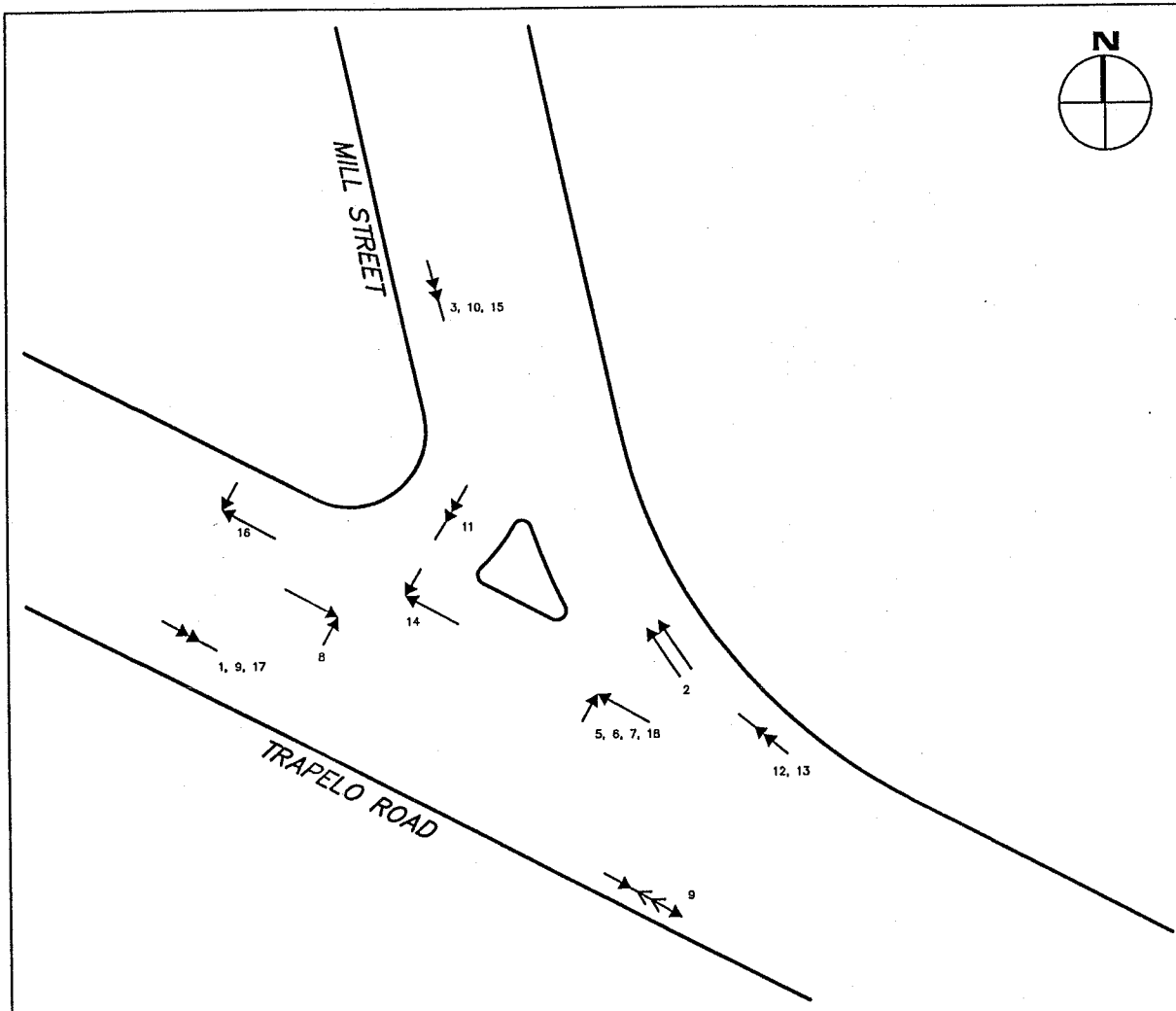
PROJECT: TRAPELO ROAD, BELMONT

LOCATION: TRAPELO ROAD AT MILL STREET

JOB NUMBER: 2.8172.02

DATE: 08/29/06

BY: JML



SYMBOLS					LIGHT CONDITIONS				VIOLATIONS				
ANGLE		PEDESTRIAN		FATAL ACCIDENT	●	ROAD CONDITIONS 1. DRY 2. WET 3. SNOW OR ICY 4. OTHER				VIOLATIONS 0. NO VIOLATIONS 1. SPEED TOO FAST 2. FAILURE TO YIELD 3. RAN STOP SIGN 4. RAN TRAFFIC SIGNAL 5. FOLLOWING TOO CLOSE 6. IMPROPER PASSING 7. WRONG SIDE OF ROAD 8. IMPROPER TURNING 9. IMPROPER BACKING 10. HAD BEEN DRINKING 11. PEDESTRIAN VIOLATION 12. RECKLESS DRIVING 13. IMPROPER LIGHT OR BRAKES			
BACKING		REAR END		INJURY ACCIDENT	○								
FIXED OBJECT		SIDE SWIPE		VEHICLE	→	ROAD CONDITIONS 1. DRY 2. WET 3. SNOW OR ICY 4. OTHER				VIOLATIONS 0. NO VIOLATIONS 1. SPEED TOO FAST 2. FAILURE TO YIELD 3. RAN STOP SIGN 4. RAN TRAFFIC SIGNAL 5. FOLLOWING TOO CLOSE 6. IMPROPER PASSING 7. WRONG SIDE OF ROAD 8. IMPROPER TURNING 9. IMPROPER BACKING 10. HAD BEEN DRINKING 11. PEDESTRIAN VIOLATION 12. RECKLESS DRIVING 13. IMPROPER LIGHT OR BRAKES			
HEAD ON		TURNING MOVE		PEDESTRIAN	○								
OUT OF CONTROL		CHANGE LANE		FATALITY	F	ROAD CONDITIONS 1. DRY 2. WET 3. SNOW OR ICY 4. OTHER				VIOLATIONS 0. NO VIOLATIONS 1. SPEED TOO FAST 2. FAILURE TO YIELD 3. RAN STOP SIGN 4. RAN TRAFFIC SIGNAL 5. FOLLOWING TOO CLOSE 6. IMPROPER PASSING 7. WRONG SIDE OF ROAD 8. IMPROPER TURNING 9. IMPROPER BACKING 10. HAD BEEN DRINKING 11. PEDESTRIAN VIOLATION 12. RECKLESS DRIVING 13. IMPROPER LIGHT OR BRAKES			
				PERSONS INJURED	I								

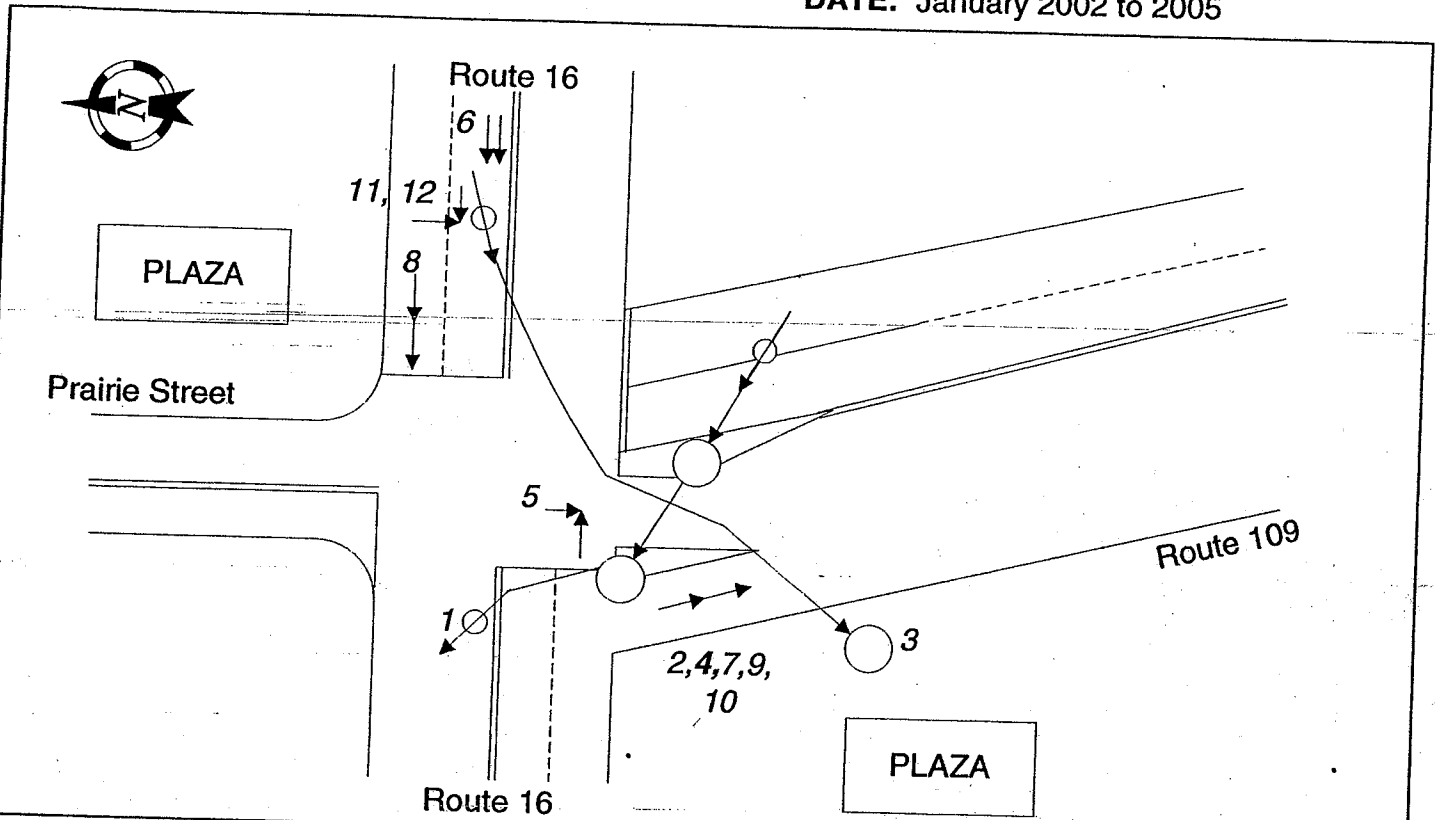
	DATE	TIME	P.D.	F	I	L	R	V	DATE	TIME	P.D.	F	I	L	R	V	
1	01/21/03	11:40 PM	YES	0	1	3	1	10	11	07/30/04	3:05 PM	YES	0	0	1	1	5
2	04/30/03	10:00 AM	YES	0	0	1	1	0	12	09/21/04	1:08 PM	YES	0	0	1	1	5
3	06/06/03	5:45 PM	YES	0	0	1	1	5	13	09/24/04	5:15 PM	YES	0	0	1	1	0
4	07/02/03	4:07 PM		0	0	1	1		14	09/29/04	2:40 PM	YES	0	0	1	1	4
5	07/29/03	3:30 PM	YES	0	1	1	1	0	15	10/29/04	11:15 AM	YES	0	0	1	1	0
6	08/05/03	9:00 PM	YES	0	2	3	1	2	16	11/16/04	3:37 PM	YES	0	0	1	1	0
7	01/05/04	9:45 PM	YES	0	0	3	2	2	17	02/15/05	11:36 AM	YES	0	0	1	1	
8	01/29/04	1:30 PM	YES	0	0	1	1	6	18	07/14/05	8:58 AM	YES	0	0	1	1	2
9	10/08/04	11:54 AM	YES	0	0	1	1	10	19								
10	06/16/04	3:50 PM	YES	0	0	1	1	5	20								

2. Route 16 Traffic Signal Improvements, Milford

Figure 8 COLLISION DIAGRAM

PROJECT: FDR - Route 16 (Milford Center)
JOB NUMBER: 811

LOCATION: Route 16 at Route 109
DATE: January 2002 to 2005



SYMBOLS

- | | | | |
|----------------|--|----------------------|--|
| Angle | | Side Swipe | |
| Rear End | | Turning Movement | |
| Backing | | Change Lane | |
| Fixed Object | | Fatal | |
| Head On | | Injury | |
| Out of Control | | Property Damage Only | |
| Pedestrian | | | |

LIGHT COND.

1. Daylight
2. Dawn/Dusk
3. Darkness
4. Unknown

ROAD COND.

1. Dry
2. Wet
3. Snow/Ice
4. Other

VIOLATIONS

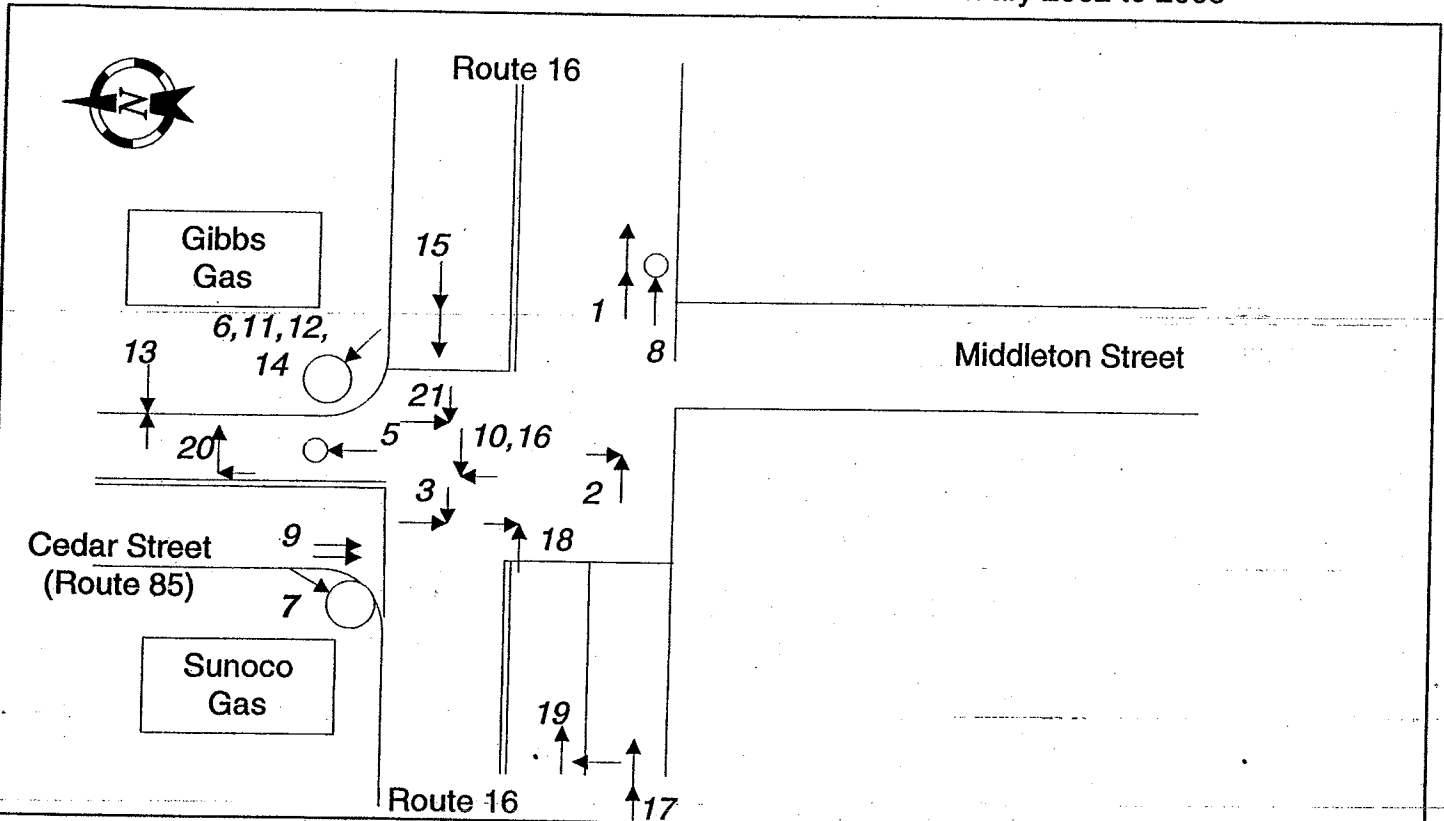
- | | |
|------------------------|-----------------------|
| 0. No Violations | 7. Wrong Side of Road |
| 1. Speed Too Fast | 8. Improper Turning |
| 2. Failure To Yield | 9. Improper Backing |
| 3. Ran Stop Sign | 10. Ped. Violation |
| 4. Ran Traffic Signal | 12. Reckless Driving |
| 5. Following Too Close | 13. Improper Lights |
| 6. Improper Passing | |
- * No Diagram Available ** Under Investigation

	DATE	TIME	DAY	SEV.	L	R	V
1	4/5/2002	300	Fri	PD	*	*	12
2	4/18/2002	1210	Thu	PD	1	1	0
3	4/28/2002	2008	Sun	PD	3	2	0
4	5/6/2002	1603	Mon	I	1	*	0
5	8/16/2002	1331	Fri	PD	1	1	0
6	9/4/2002	1024	Wed	PD	1	1	8
7	9/27/2002	1732	Fri	PD	1	1	0
8	10/9/2002	600	Wed	PD	2	1	5
9	10/29/2002	850	Tue	PD	1	1	0
10	11/23/2002	1202	Sat	PD	1	1	0
11	12/19/2002	2053	Thu	PD	3	1	0
12	9/18/2004	1239	Sat	PD	1	2	0
13							
14							
15							

Figure 9 COLLISION DIAGRAM

PROJECT: FDR - Route 16 (Milford Center)
JOB NUMBER: 811

LOCATION: Route 16 at Route 85
DATE: January 2002 to 2005



SYMBOLS

Angle		Side Swipe	
Rear End		Turning Movement	
Backing		Change Lane	
Fixed Object		Fatal	
Head On		Injury	
Out of Control		Property Damage Only	
Pedestrian			

LIGHT COND.

1. Daylight
2. Dawn/Dusk
3. Darkness
4. Unknown

ROAD COND.

1. Dry
2. Wet
3. Snow/Ice
4. Other

VIOLATIONS

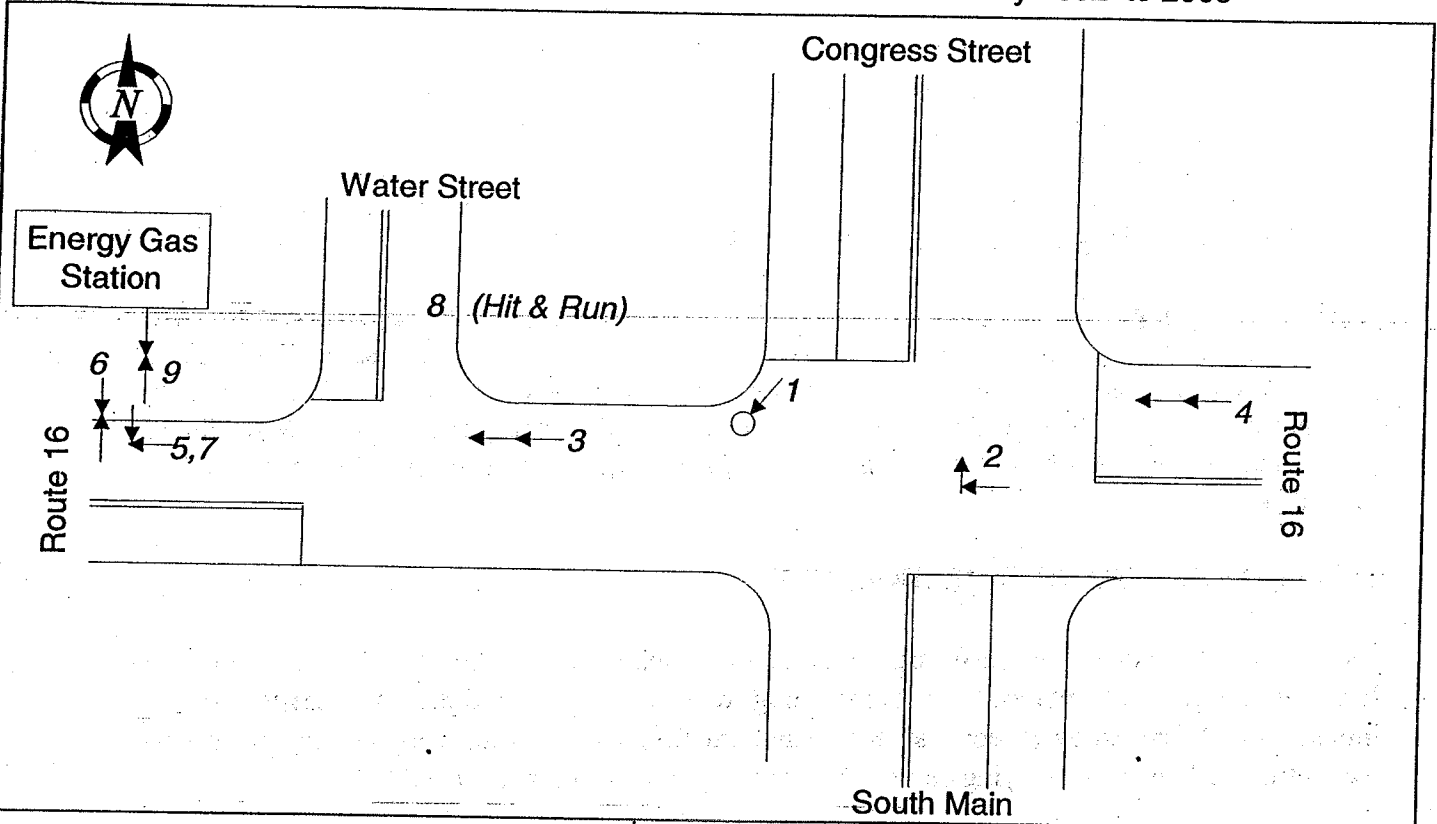
0. No Violations
 1. Speed Too Fast
 2. Failure To Yield
 3. Ran Stop Sign
 4. Ran Traffic Signal
 5. Following Too Close
 6. Improper Passing
 7. Wrong Side of Road
 8. Improper Turning
 9. Improper Backing
 10. Ped. Violation
 12. Reckless Driving
 13. Improper Lights
- * No Diagram Available ** Under Investigation

	DATE	TIME	DAY	SEV.	L	R	V		DATE	TIME	DAY	SEV.	L	R	V
1	3/27/2002	1045	Wed	PD	1	1	0	16	1/13/2004	1115	Tue	PD	1	1	0
2	4/23/2002	1251	Tue	PD	1	1	4	17	3/3/2004	1040	Wed	PD	1	1	0
3	4/24/2002	550	Wed	PD	2	1	4	18	6/11/2004	2056	Fri	I	1	1	4
*4	6/2/2002	1350	Sun	I	1	1	5	19	7/22/2004	943	Thu	PD	1	1	0
5	6/7/2002	*	Fri	PD	1	2	0	20	12/28/2005	855	Wed	PD	1	3	8
6	6/16/2002	1520	Sun	PD	1	1	0	21	4/2/2005	1556	Sat	PD	1	1	4
7	7/6/2002	1725	Sat	PD	1	1	0	22			Sat				
8	8/24/2002	1755	Sat	I	1	1	0	23			Sat				
9	9/4/2002	1605	Wed	PD	1	1	8	24			Sat				
10	11/13/2002	725	Wed	PD	1	1	2	25			Sat				
11	11/19/2002	1438	Tue	PD	1	1	0	26			Sat				
12	12/17/2002	1515	Tue	PD	1	1	0	27			Sat				
13	12/18/2002	1249	Wed	PD	1	1	0	28			Sat				
14	10/9/2003	843	Thu	PD	1	1	0	29			Sat				
15	11/10/2003	2058	Mon	PD	1	1	0	30			Sat				

Figure 10 COLLISION DIAGRAM

PROJECT: FDR - Route 16 (Milford Center)
JOB NUMBER: 811

LOCATION: Route 16 at South Main Street
DATE: January 2002 to 2005



SYMBOLS

- Angle Side Swipe
- Rear End Turning Movement
- Backing Change Lane
- Fixed Object
- Head On Fatal F
- Out of Control Injury I
- Pedestrian Property Damage Only PD

LIGHT COND.

- 1. Daylight
- 2. Dawn/Dusk
- 3. Darkness
- 4. Unknown

VIOLATIONS

- 0. No Violations
 - 1. Speed Too Fast
 - 2. Failure To Yield
 - 3. Ran Stop Sign
 - 4. Ran Traffic Signal
 - 5. Following Too Close
 - 6. Improper Passing
 - 7. Wrong Side of Road
 - 8. Improper Turning
 - 9. Improper Backing
 - 10. Ped. Violation
 - 12. Reckless Driving
 - 13. Improper Lights
 - 14. Revoked License
- * No Diagram Available ** Under Investigation

ROAD COND.

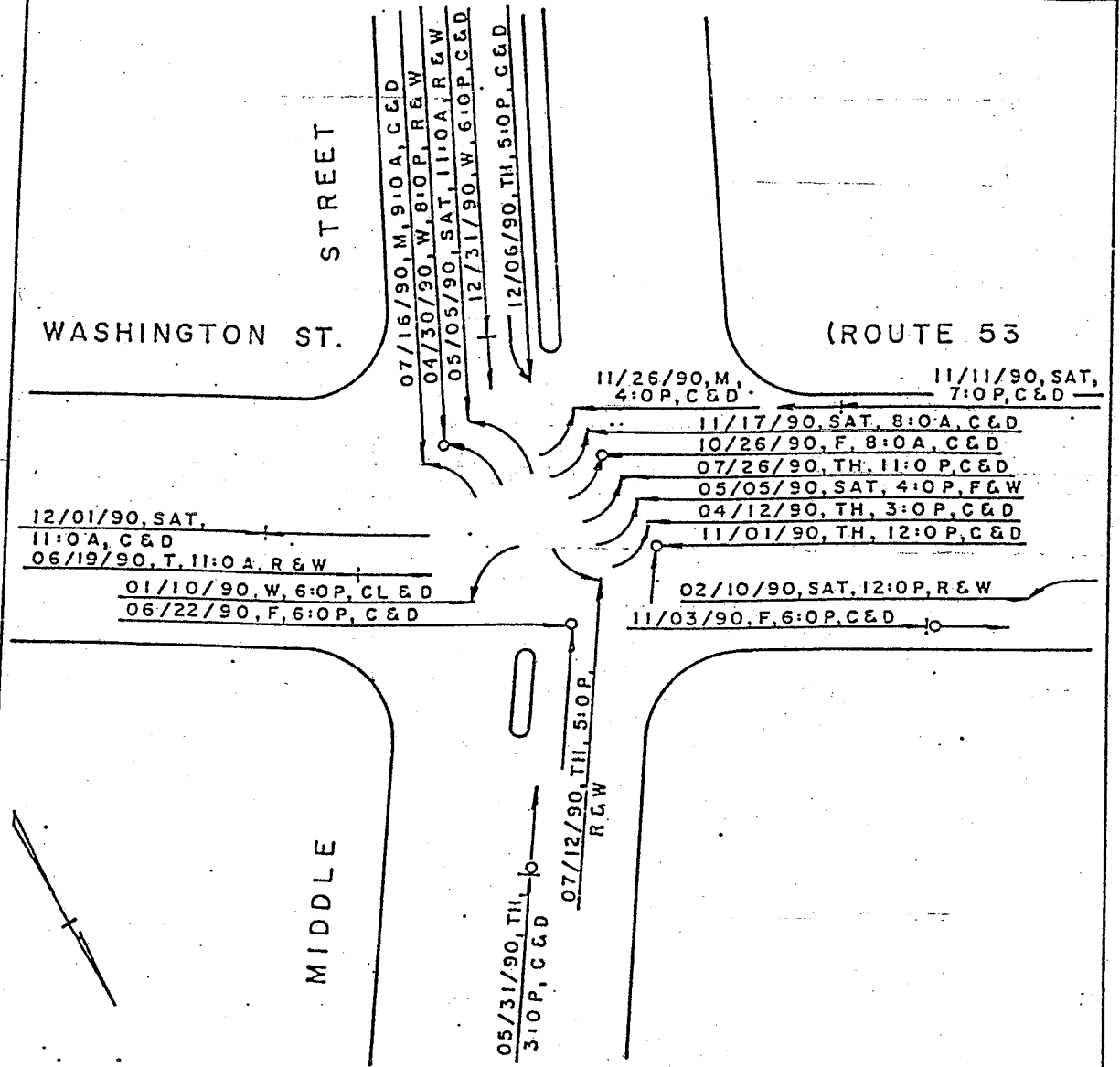
- 1. Dry
- 2. Wet
- 3. Snow/Ice
- 4. Other

	DATE	TIME	DAY	SEV.	L	R	V
1	3/7/2002	615	Thu	PD	2	1	10
2	6/3/2002	1154	Mon	PD	1	1	14
3	7/22/2002	1643	Mon	PD	1	1	0
4	11/11/2002	1130	Mon	PD	1	1	0
5	11/15/2002	1458	Fri	PD	1	1	0
6	7/29/2003	658	Tue	PD	1	1	8
7	11/28/2003	1927	Fri	PD	3	1	0
8	11/4/2004	2035	Thu	PD	3	1	*
9	1/6/2005	1311	Thu	PD	1	3	0
10			Sat				
11			Sat				
12			Sat				
13			Sat				
14			Sat				
15			Sat				

3. Route 53 (Washington Street)/Middle Street, Weymouth

COLLISION DIAGRAM

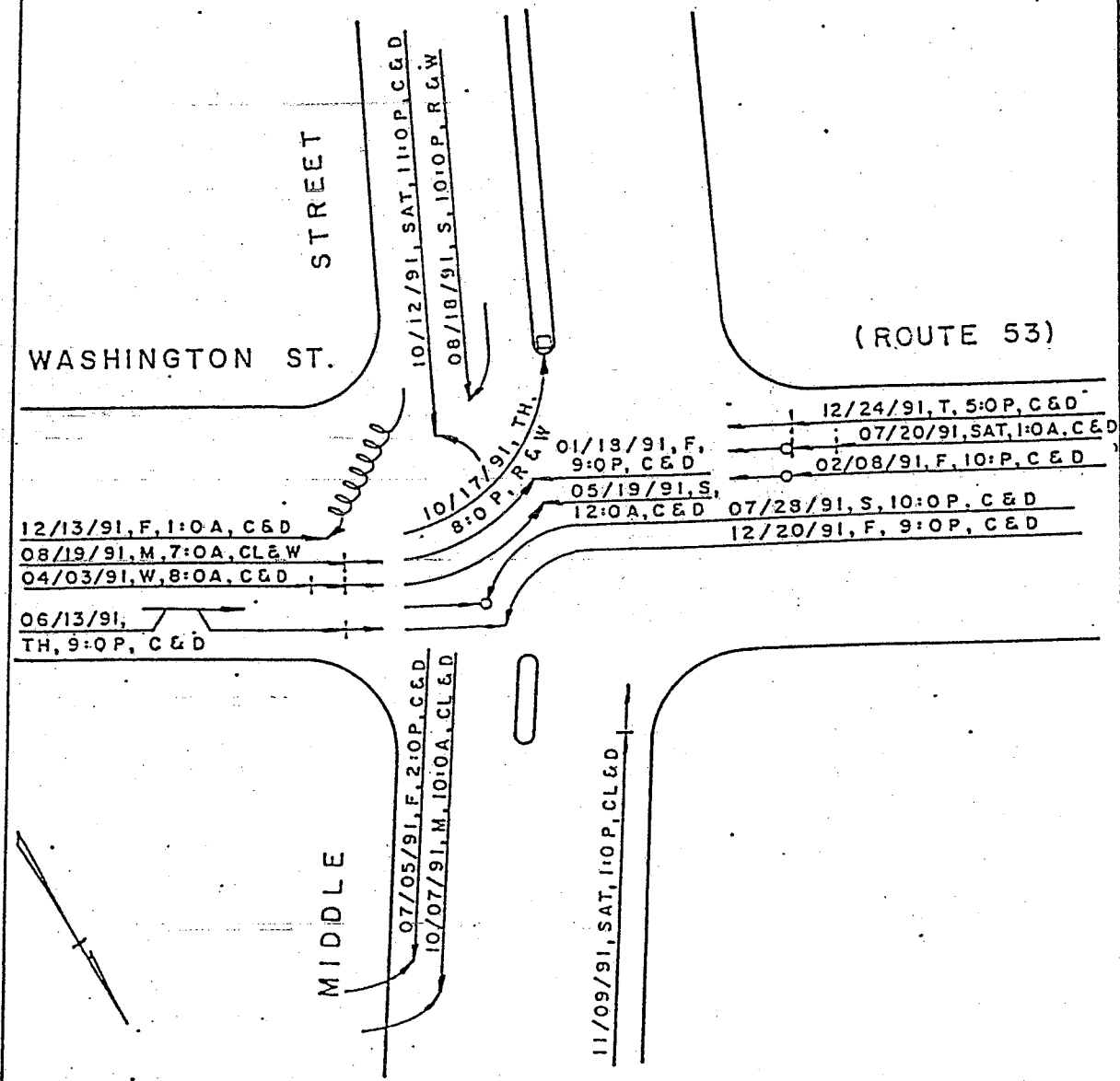
INTERSECTION WASHINGTON ST. (RTE. 53) AND MIDDLE STREET
 PERIOD 1990 FROM JANUARY TO DECEMBER
 CITY / TOWN WEYMOUTH PREPARED BY G. I. A.



NUMBER OF ACCIDENTS	SYMBOLS	TYPE OF COLLISIONS	SHOW FOR EACH ACCIDENT
— PROPERTY DAMAGE ONLY	→ MOVING VEHICLE	—+— REAR END	1. TIME, DAY, DATE 2. WEATHER AND ROAD SURFACE - IF UNUSUAL CONDITION EXISTED 3. NITE - IF BETWEEN DUSK AND DAWN
— INJURY OR FATAL	→ BACKING VEHICLE	—+— HEAD ON	
	→ NON-INVOLVED VEHICLE	—+— SIDE - SWIPE	
	→ PEDESTRIAN	—+— OUT OF CONTROL	
	▭ PARKED VEHICLE	—+— LEFT TURN	
	◻ FIXED OBJECT	—+— RIGHT ANGLE	
	• FATAL ACCIDENT		
	○ INJURY ACCIDENT		
TOTAL ACCIDENTS			

COLLISION DIAGRAM

INTERSECTION WASHINGTON ST. (RTE. 53) AND MIDDLE STREET
 PERIOD 1991 FROM JANUARY TO DECEMBER
 CITY / TOWN WEYMOUTH PREPARED BY G. I. A.



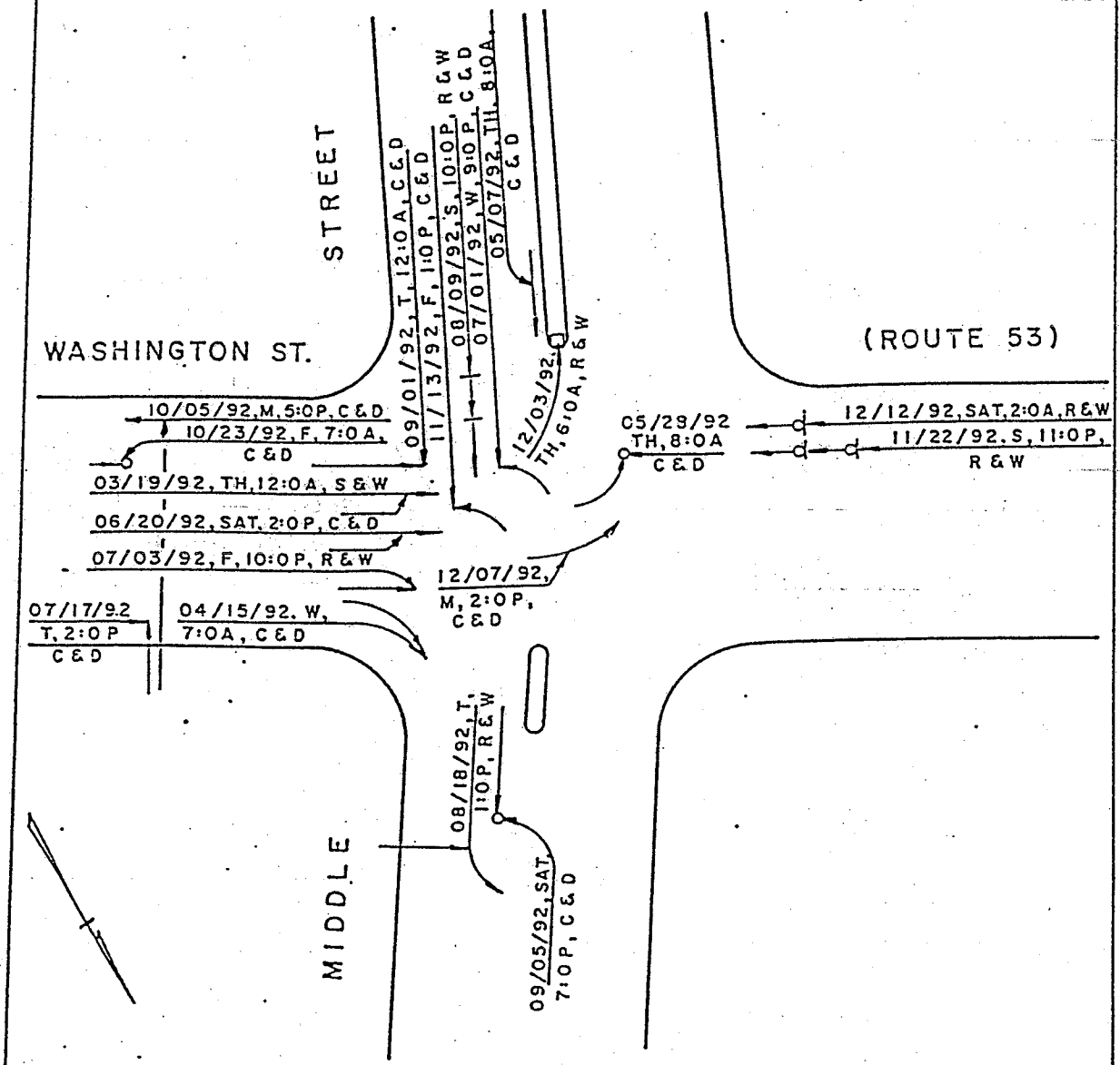
NUMBER OF ACCIDENTS	SYMBOLS	TYPE OF COLLISIONS	SHOW FOR EACH ACCIDENT
— PROPERTY DAMAGE ONLY	→ MOVING VEHICLE	—+— REAR END	1. TIME, DAY, DATE 2. WEATHER AND ROAD SURFACE - IF UNUSUAL CONDITION EXISTED
— INJURY OR FATAL	→ BACKING VEHICLE	—+— HEAD ON	
TOTAL ACCIDENTS	→ NON-INVOLVED VEHICLES	—+— SIDE - SWPCT	
	→ PEDESTRIAN	—+— OUT OF CONTROL	3. NIE - IF BETWEEN DUSK AND DAWN
	▭ PARKED VEHICLE	→ LEFT TURN	
	○ FIXED OBJECT	→ RIGHT ANGLE	
	● FATAL ACCIDENT		
	○ INJURY ACCIDENT		

COLLISION DIAGRAM

INTERSECTION WASHINGTON ST. (RTE. 53) AND MIDDLE STREET

PERIOD 1992 FROM JANUARY TO DECEMBER

CITY / TOWN WEYMOUTH PREPARED BY G. I. A.

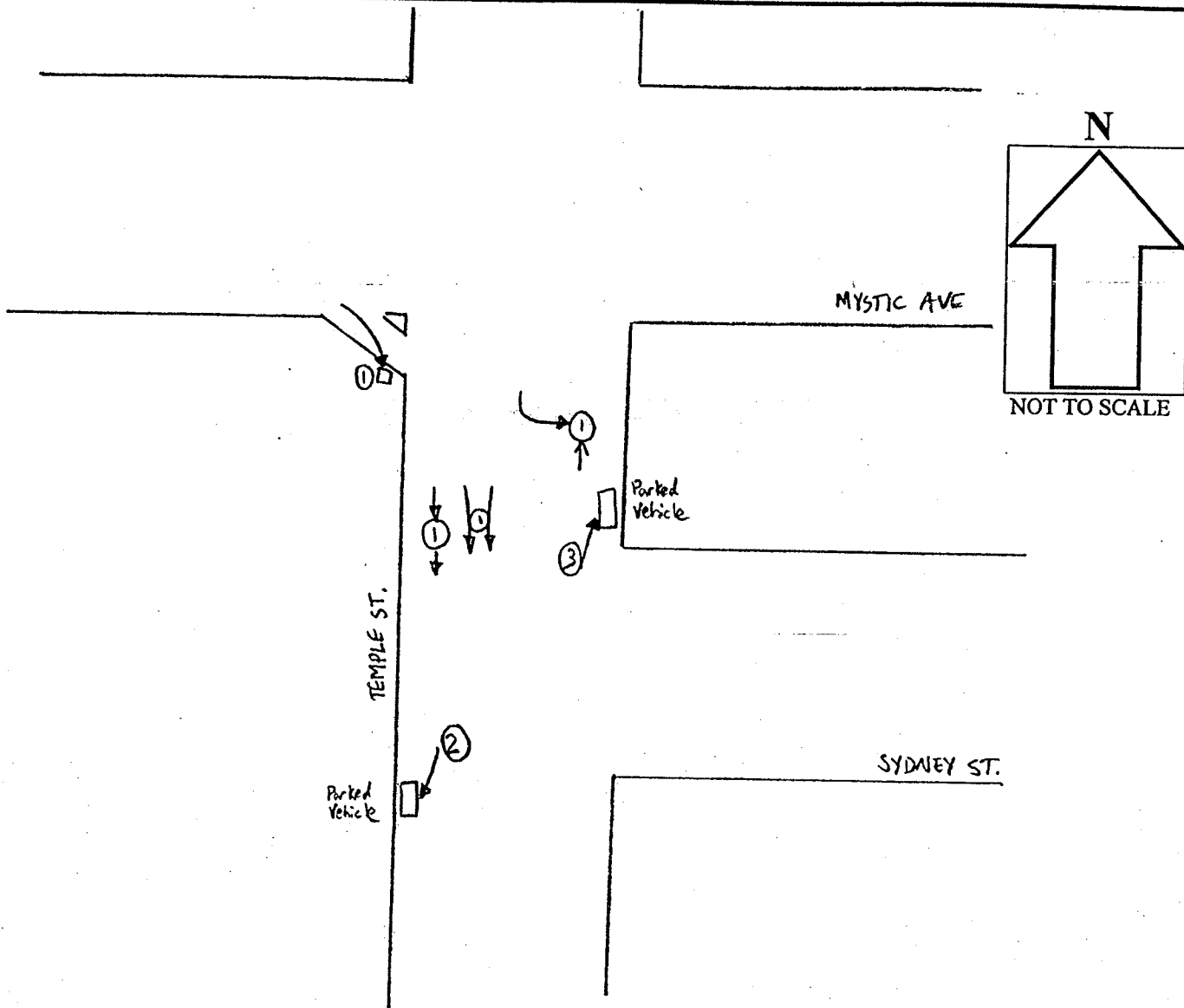








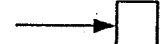
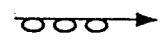

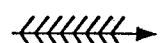

NUMBER OF ACCIDENTS	SYMBOLS	TYPE OF COLLISIONS	SHOW FOR EACH ACCIDENT
— PROPERTY DAMAGE ONLY	→ MOVING VEHICLE	—+— REAR END	1. TIME, DAY, DATE 2. WEATHER AND ROAD SURFACE - IF UNUSUAL CONDITION EXISTED 3. MIE - IF BETWEEN DUSK AND DAWN
— INJURY OR FATAL	→→→ BACKING VEHICLE	—+— HEAD ON	
TOTAL ACCIDENTS	--- NON-INVOLVED VEHICLES	—+— SIDE - SWIPE	
	--- PEDESTRIAN	—+— OUT OF CONTROL	
	□ PARKED VEHICLE	—+— LEFT TURN	
	○ FIXED OBJECT	—+— RIGHT ANGLE	
	● FATAL ACCIDENT		
	○ INJURY ACCIDENT		

4. Reconstruction of Temple Street, Somerville

ACCIDENT DIAGRAM

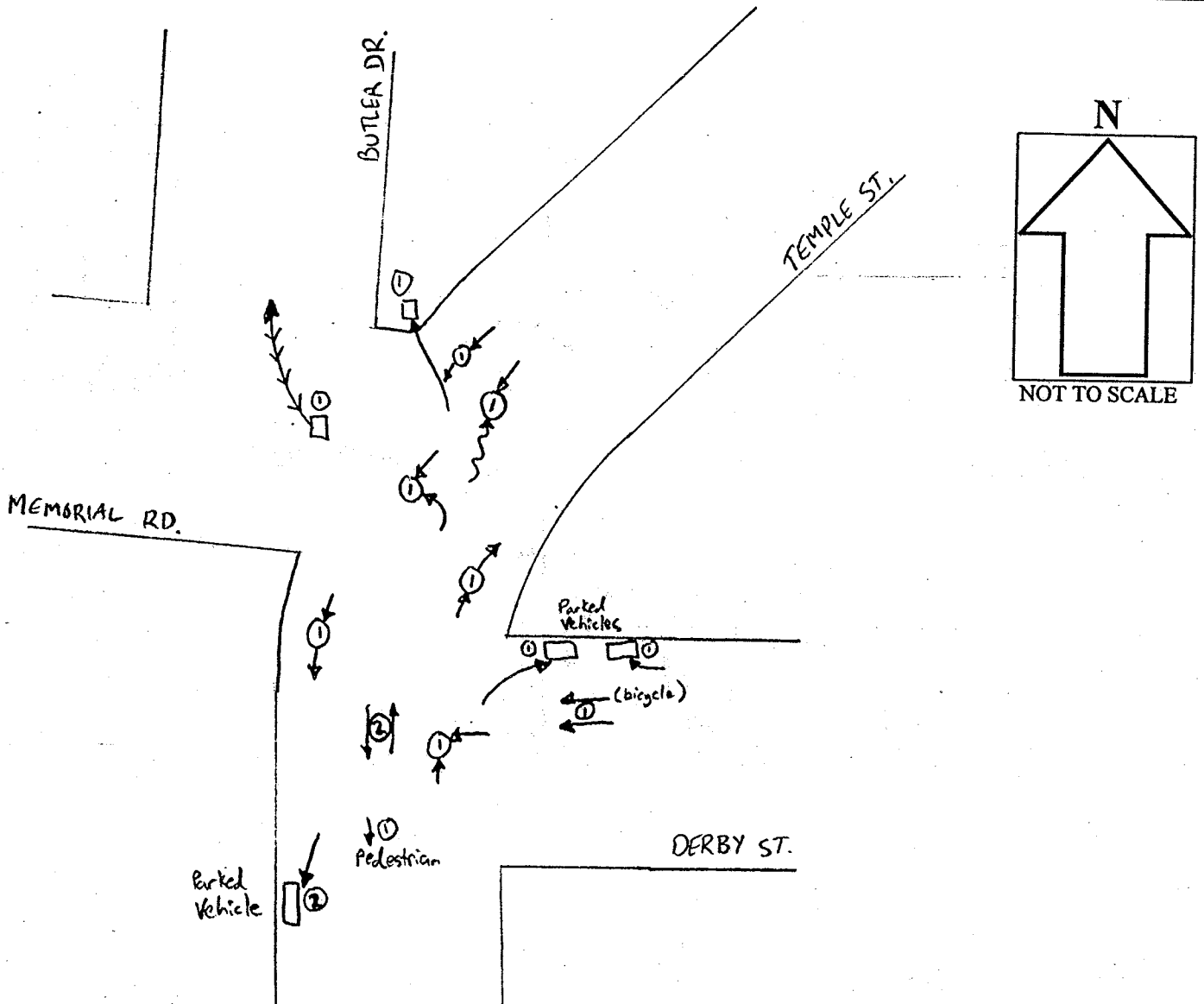
CITY NAME:	SOMERVILLE
MAJOR STREET:	TEMPLE ST.
MINOR STREET:	MYSTIC AVE./SYDNEY ST.






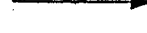







- | | |
|---|--|
| <ul style="list-style-type: none">  Head-on Accident  Right Angle Broadside Accident  Turning Movement Broadside Accident  Rear End Accident  Overtaking Sideswipe Accident  Head-on Sideswipe Accident | <ul style="list-style-type: none">  Hit Object Accident  Vehicle Rolled  Vehicle Out of Control  Vehicle Backing-up or Rolling Backwards  (#) Number of Similar Accidents at Same Location |
|---|--|

ACCIDENT DIAGRAM

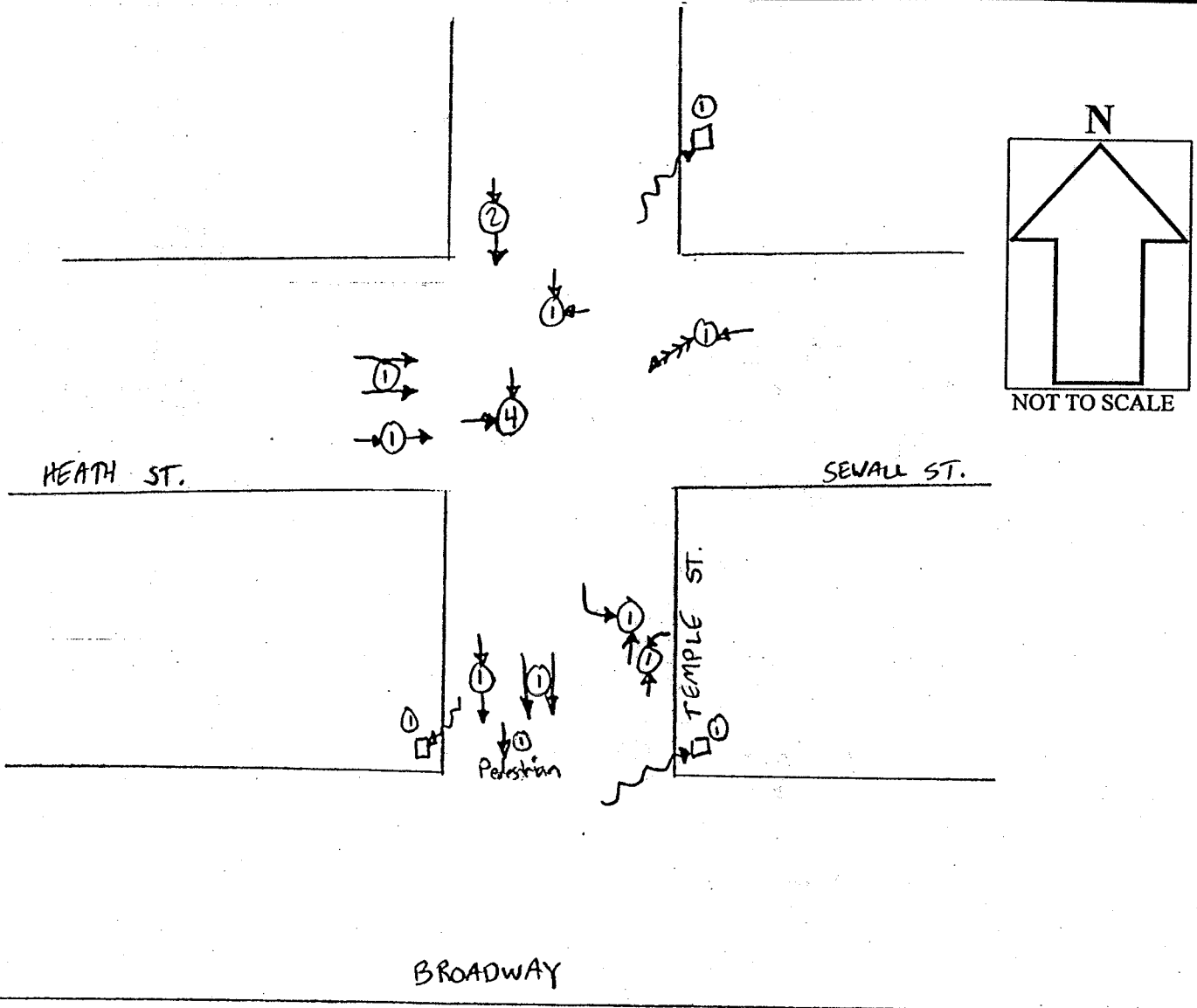
CITY NAME:	SOMERVILLE
MAJOR STREET:	TEMPLE ST.
MINOR STREET:	MEMORIAL RD./BUTLER DR./DERBY ST.



- | | |
|---|--|
| <ul style="list-style-type: none">  Head-on Accident  Right Angle Broadside Accident  Turning Movement Broadside Accident  Rear End Accident  Overtaking Sideswipe Accident  Head-on Sideswipe Accident | <ul style="list-style-type: none">  Hit Object Accident  Vehicle Rolled  Vehicle Out of Control  Vehicle Backing-up or Rolling Backwards  # Number of Similar Accidents at Same Location |
|---|--|

ACCIDENT DIAGRAM

CITY NAME:	SOMERVILLE
MAJOR STREET:	TEMPLE ST.
MINOR STREET:	BROADWAY/HEATH ST./SEWALL ST.

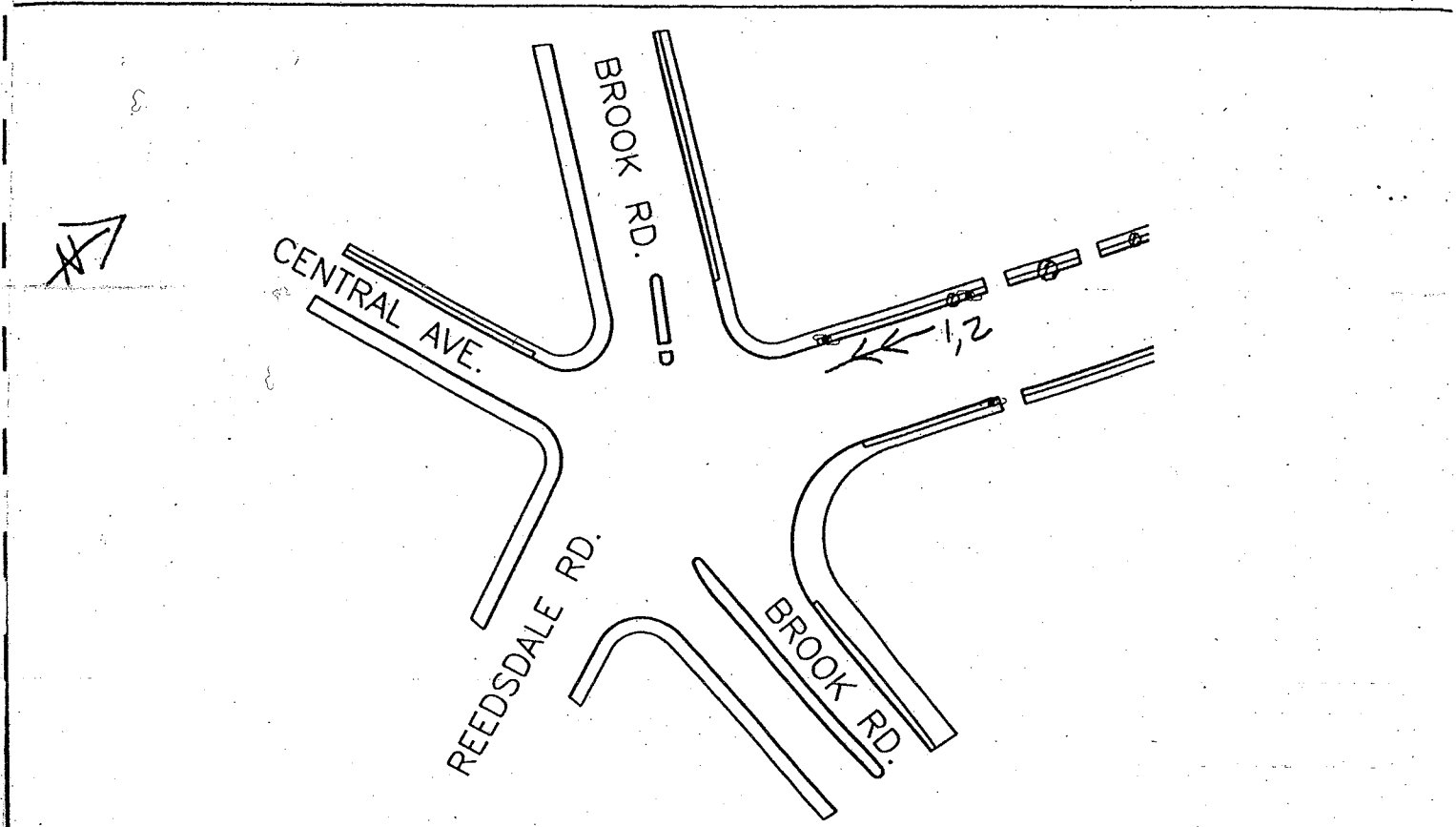


- | | |
|---|---|
| <ul style="list-style-type: none"> Head-on Accident Right Angle Broadside Accident Turning Movement Broadside Accident Rear End Accident Overtaking Sideswipe Accident Head-on Sideswipe Accident | <ul style="list-style-type: none"> Hit Object Accident Vehicle Rolled Vehicle Out of Control Vehicle Backing-up or Rolling Backwards Number of Similar Accidents at Same Location |
|---|---|

5. Central Avenue Rehabilitation Project, Milton

COLLISION DIAGRAM

PROJECT NEX-2003008-01 LOCATION CENTRAL AVE, BROOK ROAD, REEDSDALE RD
 JOB NO. Central Ave Rehabilitation DATE 8/14/03 BY LDS



SYMBOLS			LIGHT CONDITIONS	VIOLATIONS	
ANGLE	PEDESTRIAN	FATAL ACCIDENT	1. DAYLIGHT	0. NO VIOLATIONS	7. WRONG SIDE OF ROAD
BACKING	REAR END	INJURY ACCIDENT	2. DAWN OR DUSK	1. SPEED TOO FAST	8. IMPROPER TURNING
FIXED OBJECT	SIDE SWIPE	VEHICLE	3. DARKNESS	2. FAILURE TO YIELD	9. IMPROPER BACKING
HEAD ON	TURNING MOVE	PEDESTRIAN	4. UNKNOWN	3. RAN STOP SIGN	10. HAD BEEN DRINKING
OUT OF CONTROL	CHANGE LANE	PERSONS KILLED	ROAD CONDITIONS	4. RAN TRAFFIC SIGNAL	11. PEDESTRIAN VIOLATION
		PERSON INJURED	1. DRY	5. FOLLOWING TOO CLOSE	12. RECKLESS DRIVING
			2. WET	6. IMPROPER PASSING	13. IMPROPER LIGHT OR BRAK
			3. SNOW OR ICY		
			4. OTHER		

	DATE	TIME	P.D.	K	I	L	R	V	DATE	TIME	P.D.	K	I	L	R
1	6/01/01	8:57AM	✓	0	0	1	2	0	11						
2	6/07/01	10:48AM	✓	0	2	1	2	0	12						
3									13						
4									14						
5									15						
6									16						
7									17						
8									18						
9									19						
10									20						

BASED ON REPORTS FILED WITH TOWN OF MILTON POLICE DEPT.

MOBILITY

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2011 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and/or Active Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (CMP, RTP, PMT, YOUMOVE, METROFUTURE)	Comments
Low-cost Improvements to MPO Bottleneck Locations Phase II			The impetus for this study is a recommendation made by the Federal Highway Administration to identify the three worst bottlenecks in the region and study low cost countermeasures. CTPS staff will identify three bottlenecks that are among the worst in the region, relying on professional judgment and the support of the Congestion Management Process. Professional judgment will be an important component of the bottleneck selection process due to the conflicting results produced by different ways of measuring travel delay. Staff will then research and brainstorm potential low cost countermeasures, which may include: using the shoulder as a peak hour lane, re-stripping travel lanes in merge areas to improve traffic flow, ramp metering, improved traffic signal timing, and improving the dissemination of traffic information to drivers.	High priority - This would be a second phase of a study that is currently underway. This study is consistent with the Plan's topics of System Efficiency, Mobility, and Environment.	X			X	X				X	Could be useful in informing the RTP.
Development of a Planning Screening Tool for Roundabout Installations			Presently, MassDOT Highway Division is lacking a consistent policy that would govern the design and construction of roundabouts and a study such as this would make recommendations for the development of the right policy. This is especially important for federal aid-funded roundabout designs, which typically include state number routes, major and minor arterials and collectors. Roundabouts are often a more efficient and safer way to manage traffic at unsignalized intersections and sometimes at signalized intersections. If the conditions are right for a roundabout treatment, designing an intersection in this manner can increase its processing capacity. Demand for roundabouts throughout the state has risen in the last decade. The purpose of this study would be to develop screening planning tools for Highway Division's use when its staff reviews proposals for the construction of roundabouts. Some of the questions that this study will attempt to answer would include: 1. Desirable/optimum traffic volume conditions for considering a roundabout design, instead of a signalized intersection design 2. Conditions for a two-lane roundabout should be constructed 3. Range of left-turn traffic volumes for which a roundabout treatment would be appropriate 4. Appropriateness of roundabouts as speed control devices 5. Accommodation of bicycle and pedestrians when intersection is designed as a roundabout MPO staff will be responsible for this study and will work closely with MassDOT Highway Division and the Office of Transportation Planning. Work will include a review of literature on other states' guidelines on screening tools for considering roundabouts; identification of location and traffic characteristics under which a roundabout would be appropriate; and development of a procedure/policy for considering roundabout as viable intersection treatment at certain locations. The product of this study will be a roundabout planning guide for screening locations under roundabout design consideration for various roadway classifications in the Commonwealth.	High priority									X	Would be useful to all MPO municipalities.
Travel Demand Management Services Evaluation			The purpose of this project is to inventory current travel demand management (TDM) services with in the MPO region and to conduct a literature review of the current best practices for the implementation of TDM services. This review will provide a general overview of factors that influence the success of TDM services and case studies of services that have been implemented in other regions. This project addresses the youMove Massachusetts Themes of system maintenance, shared use of infrastructure, more-user friendly transportation system, serving more people, and minimizing environmental impacts.	Medium priority – Would support the MPO's Suburban Mobility/Transportation Demand Program and the Clean Air Mobility Program Subcommittee. Study promotes the vision of the Mobility topic and also may result in environmental benefits.			X				X		X	Updated text from Second Tier of FFY 2010 UPWP Project Universe with an estimated budget of \$15,000.
Revere Beach Parkway (Route 16) Safety and Operations Improvements, Everett to Chelsea			The 2.5-mile section of Revere Beach Parkway (Route 16) in Everett and Chelsea, from just east of Route 99 to the Chelsea Revere town line, has four intersections in the 2004-2006 statewide top 200 intersection crash list with safety concerns in the following ascending priority order along Revere Beach Parkway at: Second Street (Everett); Vine Street (Everett); Washington Avenue (Chelsea); and Garfield/Webster Avenue (Chelsea). Mass DOT Highway Division ranks range from 43 to 181 and MPO rank ranges from 20 to 73. This section is also congested and has traffic operations problems. This proposed study would provide detailed evaluation of the crash experience in this corridor (crash types, patterns, causes) and propose potential solutions to address the safety problems. In addition, this study would identify the operations problems in the same corridor and recommend improvements. An advisory task force would be put together to participate in the study by offering advice and input on data and potential solutions. This project qualifies for HSIP and efforts to improve safety at high crash locations. CTPS will conduct this study.	Medium priority - (Buses and heavy trucks are prohibited. This facility is a DCR Parkway.) Emphasis of study is on operational and safety problems and solutions. Judging by Figure 14-2 in the RTP, it may intersect multiple EJ zones.			X		X				X	From Second Tier of FFY 2010 UPWP Project Universe with an estimated budget of \$105,000.

MOBILITY (Cont.)

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2011 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and/or Active Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (CMP, RTP, PMT, YOUNG, METROFUTURE)	Comments
North Shore Subregional Study			To accomplish project objectives, the following tasks would have to be performed: Form an advisory task force, define safety and operations issues, collect and analyze data, recommend potential improvements, and document findings in a technical report. Route 35 corridor study; joint corridor study with MVPC of the Route 97 corridor from Haverhill south to Cummings Center in Beverly; joint corridor study with MVPC congested areas of Route 133 and Routes 1 and 97, especially downtown Georgetown; Routes 114/1A and 127 corridor study from Swampscott to Rockport to analyze strategies for improving bike facilities and bike-to-rail connections in the region; and a study of the feasibility of a new park-and-ride lot on Route 1 North for commuting into Beverly and Salem.	Low priority - These suggestions were received via a comment letter from the North Shore Task Force during the public review periods for the FFY 2009 and 2010UPWPs. It is proposed that staff explore these ideas for a possible subregional study. It was recommended that the Task Force call Merrimack Valley MPO for coordination opportunities. Recommendations to improve bicycle access to transit and studying the feasibility of park and ride lots is consistent with the Environment and Mobility topics of the RTP.	X				X					From Second Tier of FFY 2010 UPWP Project Universe with an estimated budget of \$150,000. <i>Follow-up : Call to MVPC needed to determine level of interest.</i>
Route 20 and Soldiers Field Road Intersection Area			Several roadways converge in this interchange area. These roadways carry traffic from Boston, Newton, Watertown, and other communities in the region. Traffic is congested during the morning and afternoon peak hours. Lane assignment signs to help navigating around this area may be inadequate. Traffic signal timings may not be optimal. A traffic simulation model could be developed for the area to examine the existing conditions and evaluate potential improvement alternatives. In addition, the study will examine pedestrian and bicycle circulation and safety in the area. CTPS would be responsible for carrying out the project. The task will include collecting existing traffic, transit, parking, pedestrian/bicycle, land use activities, and other data; performing data analyses; developing a traffic simulation model; evaluating improvement alternatives; and documenting findings in a report.	Low priority - Relationship to Nonantum Road DCR study and MPO's Newton Corner Study. Recommendations for improving mobility and safety are the emphasis of this project. The intersection also appears to be in the vicinity of TAZs that have been identified as EJ zones, but it's difficult to tell using Figure 14-2 of the RTP.			X	X	X		X			From Second Tier of FFY 2010 UPWP Project Universe with an estimated budget of \$75,000. <i>Follow-up: Karl to check on the scope of recent AARA project in the area.</i>
Route 37, Braintree Five Corners to Holbrook Town Line: Mobility and Traffic Operations Analysis			The study would include traffic operations and management at intersections and Route 37 roadway segments, including pedestrian and bicycle accommodation. The study will review the existing conditions and identify potential improvements for traffic operations, pedestrian and bicycle movements, and other needs in the corridor. The improvements will be beneficial to the town and the south shore area. CTPS would be responsible for this study.	Low priority - It could be expanded to include locations previously identified by the South Shore Coalition, which could be addressed in the Congestion Management Program; MassDOT District 4 Planning is also interested. Study is consistent with vision of the Mobility and System Preservation, Modernization, and Efficiency topics.			X		X				X	From Second Tier of FFY 2010 UPWP Project Universe with an estimated budget of \$80,000. <i>Follow-up: Check with the Town of Braintree re priority and buy-in for this study</i>

LIVABILITY

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG MOVE, METROFUTURE)	Comments
Bay Colony Shared Use Path Feasibility Study			The Boards of Selectmen of Dover, Medfield and Needham have requested that the Transportation Planning and Programming Committee authorize staff to undertake a study of the potential for a trail on the railroad right-of-way from Needham Junction through Dover to Medfield. The Mayor of Newton requested that the study also include the right-of-way from Needham Junction to Newton Upper Falls. The MBTA owns the right-of-way. The study would describe the adjacent land uses of the right-of-way and any environmental issues. Staff would identify nearby traffic generators, study all at-grade crossings, as well as estimate potential usage and construction and maintenance costs. Connections to public transportation as well as other trails, existing and planned, would be highlighted.	High priority						X	X		X	Estimated cost: \$33,400 <i>Follow-up: David Koses to check on Newton terminus.</i>
Bicycle Network Evaluation			The MPO has supported the establishment of trails in our region. The purpose of this project is to conduct a regionwide evaluation of the existing trail network to identify new connections. These connections could be to other trails, to transportation services, or to significant commercial, employment, and residential sites. The goal of this project is to create a more useful trail network in the region by identifying barriers and gaps in the existing network. New connections could be off-road or could use the street network. This project would further the mobility goals discussed in the Regional Transportation Plan, address the encourage shared use of infrastructure theme in the You Move Massachusetts interim report, and build on work carries out in the 2004 Mobility Monitoring System report. CTPS, in coordination with MassDOT's statewide bike plan, and in collaboration with MAPC, would be responsible for carrying out the project. The products of this project will include the following: 1. Maps describing the existing and proposed trail system, with major transportation services and significant commercial, employment, and residential sites. 2. An evaluation of potential connections among trails and activity centers. Evaluation criteria would include possible off-road connections; relative distances between trails and potential connections; a general idea of relative use of existing and proposed facilities; and conceptual costs of potential connections. Based on the above, and other possible criteria, a list of the relative priority of recommended connections.	High priority						X	X		X	Although recommended for \$40,000 in PL funding for the FFY 2010 UPWP, it was not funded. In its comment letter, RTAC requested that it be included in the FFY 2011 UPWP. <i>Follow-up: Karl to look at what has been already been done in previous studies.</i>
Community Transportation Technical Planning Assistance Pilot Program			Local community officials often identify transportation issues about which they would like to have technical advice. In this pilot project, a team of CTPS and MAPC engineers and planners would provide such advice. The team would meet with community officials to learn more about specific problems and provide advice on next steps. There would probably be a site visit to better understand the potential problem. Some general types of solutions might be recommended, along with contact information on whom to follow-up with. The advice might relate to such things as parking, traffic calming, walking or bicycling, or bus stop-related issues that the community might have identified. Descriptions of the various planning processes at MassDOT, the MBTA, and the MPO, and how communities can get involved might be appropriate. In any event, these are not design or planning studies that would be performed by the MPO staff. Rather, this is a mechanism for providing quick-response advice to communities on next steps for resolving the issues they have identified. This work would advance the MPO's goals for system preservation, modernization and efficiency; mobility; and land use and economic development. It would also be consistent with the MPO's CMP and other staff identified needs It would also include a safety component in which staff would respond to community requests for staff to conduct analyses at crash locations and recommend possible mitigation strategies. This service would be publicized through various channels, and MAPC and CTPS would coordinate and collaborate on a case-by-case basis. It is expected that 2-to-5 person days would be spent on each community problem identified. Requests for services will be fielded and prioritized by the CTPS Deputy Technical Director. Teams of professionals will be dispatched to client municipalities and memoranda on the consultations will document the work, recommendations and outcomes.	High priority - Begun last year as a pilot program, this project was very well received by communities. The description reflects an enhanced program that includes a safety component. Staff recommends at least doubling the budget. It would continue to be joint effort of MPO Staff and MAPC.	X		X		X	X	X		X	Begun as a \$30,000 pilot program conducted by MPO staff and MAPC in FFY 2010 UPWP with a 50/50 PL/5303 Split.

LIVABILITY (Cont.)

Project Name	Total Cost	FFY 2011	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG MOVE, METROFUTURE)	Comments
		Budget											
Livable Communities Workshops			<p>This program will expand the well-established MPO-supported Walkable Community Workshops to address other aspects of the built environment that affect livability. Ray LaHood, Secretary of the U.S. Department of Transportation, has offered the following definition of a livable community: "It's a community where if people don't want to have an automobile, they don't have to have one. A community where you can walk to work, your doctor's appointment, pharmacy, or grocery store. Or you could take light rail, a bus, or ride a bike." This definition indicates that livability is about expanding and improving transportation options in order to reduce auto dependency, which is important given the extraordinary environmental, health, and economic issues facing communities.</p> <p>Therefore, this program will study transportation and land use issues in communities and offer recommendations on improvements to the built environment that will give residents greater access to their everyday needs through walking, biking, and transit. Automobiles will continue to play an important role in communities, and this program can also help identify strategies to address their needs in a manner that supports all users of the system. These recommendations will encompass all modes, and possibly land use strategies with the assistance of MAPC. Six or more workshops in volunteer communities will be conducted this year.</p>	X			X		X		X		
System Consolidation based on Rapid Transit Walking Radius			<p>The current service delivery policy's coverage guideline states that, in areas that are served by bus and/or rapid transit with a population density of greater than 5,000 persons per square mile, no individual should need to walk farther than 0.25 miles to access a transit service. As part of this theoretical project, CTPS would analyze the potential and suggest possible system designs for local bus system consolidation if the 0.25-mile radius was relaxed to 0.33 miles, 0.4 miles, and 0.5 miles and the consolidated bus routes adhered to rapid transit service standards.</p>										
			<p>This modeling-based effort would build on the current Core Efficiencies study and would help the MPO better understand the implications of the trade-off between eliminating poor-performing local bus routes and increasing service on a smaller number of transit corridors. It considers the best option for providing mobility and accessibility through the bus network. The ultimate goal would be to increase transit mode shares. The study would also consider the equity implications and potential trade-offs of any of the potential systems.</p>			X			X		X	X	
Analysis of On-Street Parking by MBTA Commuters			<p>The objective of this project would be to assess the extent to which this phenomenon is actually occurring. The on-board MBTA survey is wrapping up now, and the data from it will be available by the end of this calendar year. One of the questions on the survey asks passengers for their access mode to the transit system. When the survey data are expanded we will have an estimate of how many passengers drove a car and parked at or near a particular transit station in order to access the system. Through the Congestion Management Process, we are counting parked cars at station parking lots. For any given station area, by subtracting the latter from the former, we can derive a rough estimate of how many car-access MBTA travelers are parking on street rather than at a station lot. We can, therefore, gain a sense of where in the system the phenomenon of on-street parking may be a problem. There has been some speculation that it may actually only be a serious issue in a handful of communities such as Newton and Boston. Through this analysis, we can put some numbers around that speculation.</p> <p>As a second step, we will perform some field verification work. That is, we will select a set of station areas that appear from the analysis to have significant on street commuter parking. We can discuss with local officials their sense of where, specifically, the commuters may be parking. We can then deploy field staff to observe and track individuals as they park cars and walk to the nearby transit stations. In this way, we will be able to verify our findings from the earlier, macro-level analysis, and for a selected set of station areas, provide detailed information about on-street commuter parking</p>				X	X	X	X		X	From Second Tier of FFY 2010 UPWP Project Universe with an estimated cost of \$60,000.

LIVABILITY (Cont.)

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG MOVE, METROFUTURE)	Comments
Analysis of On-Street Parking by MBTA Commuters (Cont.)			<p>The outcome of this project will be of immediate benefit to the communities in which the field verification work is conducted. Officials in those communities can use the information to inform policy decisions and enforcement efforts. More broadly, the outcome will be of use to the Boston Region MPO should it wish to use the information to inform its own policy deliberations and planning efforts. At the very least, to the extent that the phenomenon exists and is potentially exacerbated by parking fee increases, the MPO, as well as the MBTA, ought to know about this potential "cost" that may be associated with such fee increases.</p> <p>FFY 2010 Activities and Proposed Work Products Activities Staff will perform the first-stage evaluation by comparing results of the on-board MBTA survey with those from the transit station lot counts. Then, the second-stage analysis, in which specific station areas are field verified, will be performed. Analysis will be conducted and a report will be submitted to the TPPC</p>											
Transportation Access Pilot Studies of Commercial Business Districts			<p>Cities and towns have relatively little information on the characteristics of CBD patrons, and, as a result, the planning process for these areas is often governed by perceptions that may or may not be correct. Understanding the transportation access mode and spending and visiting characteristics of CBD patrons would help planners in their work with businesses to improve transportation access to CBDs. Other planning agencies have conducted similar surveys of business patrons about their transportation access mode (driving, public transit, bike, walk, taxi, other) and linked spending characteristics (amount spent per visit, number of visits per month, amount spent per month) with these transportation access modes. A transportation access study of a pilot CBD would provide a model methodology for evaluating how patrons access CBDs, with potential implications for facilitating the access of a CBD's most important customers</p>	Medium priority	X					X	X		X	
			<p>The pilot study would consist of several tasks. First, CTPS would conduct a literature review and summary of other transportation access studies and their conclusions. Second, CTPS would assemble a demographic and transportation profile of the pilot CBD. Third, CTPS would work with the town and any business associations to solicit business participation in the study. Businesses would first be asked to provide their perceptions on their customers' actual and preferred transportation access modes. Participating businesses would then be asked to encourage their customers to fill out a short, 4-question survey while they wait in line at the register. The questions would ask the transportation access mode, how much the patron is spending on this visit, how much the patron typically spends at this business per month, and how many times per month the patron typically visits this business.</p> <p>The pilot study would also consist of a parking-use study. This would include a license plate survey and a vehicle turnover count conducted every hour. Finally, CTPS would also conduct a CBD-user survey asking questions about demographics (age, income, vehicle availability, etc.) as well as users' stated preferences (i.e. what mode would users prefer for transportation access).</p> <p>The resulting summaries from this pilot study could be used to inform planning processes that are debating transportation access. Subsequent studies by CTPS could use the model refined by the pilot study to analyze transportation access in other areas.</p>		X					X	X		X	

ENVIRONMENT

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mhgmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNGMOVE, METROFUTURE)	Comments
Air Quality Support			<p>This work is part of the MPO's ongoing work and, as such, it is not part of this evaluation process. Rather, the FFY 2011 budget, activities and work products will be presented directly to the UPWP Subcommittee for its review.</p> <p>However if a project listed under another primary category in in this project universe has beneficial environmental implications, it is noted in the evaluation and checked in the column headed "Protecting Air Quality and Environment"</p>	N/A										

CLIMATE CHANGE

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mhgmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNGMOVE, METROFUTURE)	Comments
Evacuation and Hazard Mitigation Mapping, Phase II			<p>This study advances the MPO's Safety and Security policy of protecting the region from natural and human threats, and addresses the SAFETEA-LU planning factor for security. This study would continue the work started in the FFY 2010 UPWP work program for Emergency Evacuation and Hazard Mitigation Mapping, to incorporate new information and data that becomes available on natural hazards, evacuation plans, and critical infrastructure in the region.</p> <p>Building on the first study, Phase 2 will involve collecting and mapping critical infrastructure locations that have a bearing on the MPO's work to protect transportation infrastructure from storm damage and climate change impacts, as well as, security threats, and to protect the users of the transportation system.</p> <p>It will also involve identifying vulnerabilities in the region that, if damaged, could have an impact on the transportation system, or that would affect the transportation system as it is used by emergency responders. Such vulnerable facilities could, for example, include dams or LNG fuel facilities, as requested by TPPC members.</p>	<p>High priority – This project forwards MPO policy, responds to federal guidance and expands upon SAFETEA-LU and Environmental Planning Topics .</p>				X	X					First phase funded in the FFY 2010 UPWP for \$35,000.
Drainage Inventory			<p>This study advances the MPO's Safety and Security policy by supporting work aimed at protecting the region's transportation infrastructure from weather related-impacts. It responds to guidance that the MPO has received from the Federal Highway Administration and Federal Transit Administration calling for MPOs to "increase their capacity to address climate change in transportation."</p> <p>This study will take an inventory of transportation services and infrastructure that could be impacted by rising sea levels and flooding. Staff will work with the appropriate agencies to collect drainage plans to respond to the federal agencies' guidance that MPO's should review those plans to determine if the drainage is adequate to safeguard the structures.</p>	<p>High Priority - This task responds to the FHWA/FTA guidance that the MPO develop a scope by September 2010 for a study that would inventory transportation services and infrastructure that could be impacted by climate change and problems resulting from flooding and would identify a program of targeted studies to review drainage plans and ensure adequate sizing of drainage structures.</p>				X	X					Federal Guidance on Climate Change Mitigation

SYSTEM PRESERVATION, MODERNIZATION AND EFFICIENCY

Project Name	Total Cost	FFY 2011 UPWP Budget Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG, METROFUTURE)	Comments
Federal Guidance on Identifying Pavement Maintenance Costs		Discussions are underway both with MARPA and MassDOT on possible methods for conducting a study that identifies the cost of maintaining non federal arterial roadways and urban collectors in the MPO for use in developing the Regional Transportation Plan.	High Priority		X			X					
MPO Freight Rail Study, Phase II		<p>This study of freight activities in the Boston Region MPO area will advance the recommendations of the Massachusetts Department of Transportation's State Freight and Rail Plan and build upon the MPO Freight/Rail Study initiated in FFY 2010. One purpose of the MPO study initiated in FFY 2010 is to collect data that will help the MPO address freight problems in the region that are identified in the Statewide Freight and Rail Study, and during the development of the Long-Range Transportation Plan of the Boston Region MPO.</p> <p>The draft state plan, presented at public meetings in March 2010, indicates that the MPO studies may focus on improving truck and rail access to the port in South Boston, and make recommendations on how a greater share of freight in the region may be moved by rail, air, and water. The products of both parts of the MPO Freight/Rail Study may also provide additional information needed for understanding and evaluating existing and projected freight activities in the region, and possible identification of freight projects for consideration by the MPO, MassDOT, and other agencies involved in environmental issues and economic development. This project may also identify actionable programs for consideration for the MPO Long-Range Transportation Plan (LRTP) and the Transportation Improvement Program (TIP), and improve and expand upon the methods by which projects are evaluated for their effect on freight transportation.</p>	High priority - Study is consistent with Plan topics of System Preservation, Modernization and Efficiency, Mobility, and Environment. It's consistent with the latter two due to the emphasis on ways to reduce truck traffic and the potential resulting emissions benefits.	X				X				X	Received \$40,000 in PL funding in the FFY 2010 UPWP. No work scope to date since the Statewide Freight Plan has not been released. Funding needs for FFY 2011 will need to be identified.
Regional HOV Systems Planning		<p>Provision of HOV facilities can be helpful in making more efficient use of our existing express highways by providing a superior level of service for multiple occupancy vehicles and encouraging the use of public transportation. Potential types of HOV facilities may include queue bypasses, contraflow lanes on existing pavement, and separate new HOV lanes.</p> <p>The initial phase of an HOV study would be conceptual, where broad rule-of-thumb criteria would be used to gain some initial understanding of where HOV facilities might best be provided in the MPO region, including alternative HOV lane treatments. Emphases of the study would include nationwide collection of vehicle occupancy data and on development/calibration of the regional travel demand model set to allow its improved use in evaluating specific HOV proposals. A preliminary list of highway segments conducive to HOV treatments would be an end product of this study.</p>	<p>High priority - for multiple benefits (Reduced congestion, improved air quality, reduction in fuel dependency) and fewer roadway widening, we need to provide additional HOW lanes to attract HOV travelers systemwide.</p> <p>The Regional Transportation Advisory Committed is very interested in this work</p>			X	X					X	Recommended to the UPWP Subcommittee with \$100,000 total budget of which \$50,000 would have been spent in FFY 2010 (with a 50/50 PL/5303 split). It was not funded. The Advisory Council voiced strong support for the project for the FFY 2011 UPWP in its comment letter.
CharlieCard Trip Paths Pilot Study		<p>Automated Fare Collection (AFC) data is currently used to report boarding totals by rapid transit station, surface light rail route, and bus route. However, because the AFC system only collects boarding information (not alighting), these data have not been used to estimate trip paths. This study seeks to investigate whether boarding-only AFC data could be used to reliably estimate trip paths.</p> <p>The first task of this study would be to conduct a literature review of how boarding-only automated ridership counts have been used by other transit agencies to estimate trip paths. Various "rules" are typically used to translate boarding counts into detailed trip matrices. This task would summarize these rules and determine which rules to use in the subsequent tasks.</p> <p>In order to determine whether AFC can reliably estimate trip paths, CTPS would need to compare actual trip paths to those estimated by AFC. Travel diaries would be used in this study to obtain actual trip paths. As this is a small study to analyze the accuracy of AFC in estimating actual trip paths, and not the statistical validity of those estimates, the number of participants using the travel diary would not need to be large, though greater participation would provide more data. Participants would need to inform CTPS of their CharlieCard/CharlieTicket serial number and log in to a website each day to list their daily trip paths. One potential group of participants could be employees of CTPS or other transportation agencies.</p> <p>AFC-estimated trip paths would then be calculated using the AFC database and the participants' CharlieCard/CharlieTicket serial numbers and compared to the corresponding actual trip paths as reported by the participants (note that this study only refers to trip paths within the "closed" faregate system). A comparison of actual to estimated trip paths would then be made to determine the ability of AFC to accurately estimate trip paths.</p>	Medium priority			X		X	X			X	

SYSTEM PRESERVATION, MODERNIZATION AND EFFICIENCY (Cont.)

Project Name TIP Project Impacts Before/After Evaluation	Total Cost	FFY 2011	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG, METROFUTURE)	Comments	
		UPWP Budget													
	\$30,000	\$15,000	<p>This would be a pilot study to identify the effectiveness of Transportation Improvement Program projects. Measuring project effectiveness is important in order to know whether the employed strategies work well and are therefore suitable for application in similar situations.</p> <p>To this end, staff will select TIP projects that are programmed for construction during Spring 2010. It is likely that traffic and operations TIP projects will only be selected, as the construction period of projects in this category is shorter than other projects, such as the construction of freeway interchanges. The "before" data will be collected in early spring 2010, before the project begins. The "after" data will be collected upon project completion, which may be later than 2010.</p> <p>The type of "before" and "after" data that staff will collect depends on the nature of the project. Chances are that, for a traffic management and operations project, traffic flow, speed, delay, and safety information will be collected. If budget allows, the level of service and air quality information will also be calculated for the "before" and "after" conditions. Staff will compare the two sets of data and draw conclusions.</p>	<p>Medium priority - This study idea was proposed by the UPWP Subcommittee as an alternative to the Route 99 Everett-Malden Study previously included in the universe.</p>	X	X									<p>This was recommended to the UPWP Subcommittee with a \$30,000 total budget of which \$15,000 would have been spent in FFY 2010. It was not funded.</p>

SAFETY AND OPERATIONS

Project Name Effective Traffic-Signal Operations	Total Cost	FFY 2011	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG, METROFUTURE)	Comments
		UPWP Budget												
			<p>The issues to be addressed include a program and supporting systems (processes) that would trigger update of traffic signal equipments and timing reviews needed for formulating strategies to effectively manage and control the flow of traffic (pedestrians, bicyclists, and vehicular). The supporting systems would include the CMP, the traffic monitoring database, and pedestrian and bicycle data available at CTPS.</p> <p>A pilot study of the feasibility of this assessment is proposed as the first step. In the pilot study, MPO staff will survey the municipalities on policy and practice that has been adopted and/or implemented with respect to traffic signal operation. The survey would provide insight on current practices and what improvements are needed.</p>	<p>High priority - Traffic signals are one of the most visible points of service to the traveling public. They are the tools used to automate the safe assignment of right of way among conflicting traffic movements (pedestrians, bicyclists, and vehicular) to eliminate the need for full-time manual traffic control (police detail). However, management actions are needed in order for traffic signals to deliver efficient service. Reviewing and updating the timing and operational aspects of signalized intersections on a regular basis is extremely important, especially where changes in traffic volumes and/or adjacent land uses have occurred since the last review. This is important for all signalized intersections, regardless of whether they are isolated or coordinated or whether the coordination is provided by a central system or a smaller, more localized system comprising even a few intersections.</p>			X	X	X				X	
Safety and Operations of Intersections at Selected Locations in the MPO Region			<p>The purpose of this study is to act on the recommendation of the MPO's CMP (Congestion Management Process) to address safety and congestion problems at the Region's intersections. Of two similar studies in previous funding years, one is now complete and the other is under development. Municipalities in the region are very receptive of this program as it gives them a head-start on conceptual design solutions for the intersections in demand of attention for safety and congestion. These locations are usually selected by staff from the "Conceptual" and "pre-TIP" categories in the TIP. The final selection is based on interest during consultation with city and town officials. Recommendations are usually of the "operations and management" type, ranging from pavement markings for vehicles, bicycles, and pedestrians, to traffic signal designs and lane assignments to traffic.</p>	<p>High priority - CMP staff and MPO city/town interest. Study is consistent with safety and security topics of the Plan. It also furthers the goal of system efficiency and enhancing mobility.</p>			X	X	X			X	X	<p>Similar PL funded project in FFY 2010 for \$64,100</p>

SAFETY AND OPERATIONS (Cont.)

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG, METROFUTURE)	Comments
Route 1 Access/Interchange Improvements in Saugus			<p>This portion of Route 1 is a very congested stretch of express highway, with 1950s interchanges and virtually no safe access/egress provided between the main roadway and the almost constant strip commercial developments that are located along its entire length. Accident statistics reflect both the deficient interchange designs and the lack of access/egress to the strip commercial development.</p> <p>Although widening of this highway is not possible, provision of semi-continuous acceleration and deceleration lanes should be achievable at various locations. Minor improvements to the interchanges should also be possible (Some interchange improvements are being planned by MassDOT.) A planning study could be very helpful in determining what improvements are actually feasible for this extraordinarily deficient portion of Route 1 North with its most intractable of</p>	Medium priority - Consistent with System Preservation, Modernization, and Efficiency, Mobility, and Safety & Security topics. Efi or Tom can identify start and end points and any other location-specific issues this study will address.				X	X				X	From Second Tier of FFY 2010 UPWP Project Universe with an estimated budget of \$80,000.

REGIONAL EQUITY

Project Name	Total Cost	FFY 2011 UPWP Budget	Project Description	FFY 2010 UPWP Staff Evaluation	Link Land Use and Transportation.	Working w Limited Financial Resources	Using a Mngmt & Operations Approach	Protecting Air Quality and Environment	Preserving and Maintaining the System	Increasing Transit and Healthy Transportation Mode Share	Encouraging Sustainable Communities	Considering Regional Equity	Addresses Documented Need (from CMP, RTP, PMT, YOUNG, METROFUTURE)	Comments
Early Morning Transit Service			<p>The MBTA currently does not have a systematic way of evaluating the need for additional early morning bus service to provide mobility for shift workers in the service and medical industries, who tend to be minority and low-income. Presently there is a limited amount of early-morning service on a small number of routes, and when the MBTA has added earlier trips the service has been well utilized. This suggests there may be untapped demand for expansion of early morning service to other parts of the network, expanding mobility options in the region as a whole.</p>	High Priority			X			X		X	X	
Mapping Environmental-Justice-Areas and Identifying Transportation Options			<p>This study would look at existing early morning ridership and travel patterns across modes, would analyze AFC data for early morning rapid transit station arrivals, and would identify employers and types of jobs that require early arrival times. Areas where a larger demand exists for early service would be identified, potential new trips proposed, and operating costs and ridership estimated. The study might also examine the potential for forming partnerships with employers to fund these services.</p> <p>While conducting the MPO's Regional Equity Program, staff has heard complaints about locations that are not transit accessible when; in fact, the MBTA does provide service to some of those locations. The purpose of this project is to identify and map major locations (i.e. hospitals, government agencies, schools, social service agencies, and grocery stores) within selected Environmental Justice areas of the MPO frequented by people with low incomes and or disabilities and produce an overlay of existing transportation options in those areas. The estimated budget is \$50,000</p> <p>Tasks will include:</p> <ol style="list-style-type: none"> Selecting areas to include in the project Consulting with social service agencies serving the selected areas to determine major locations frequented by clients Mapping identified locations Overlay on the map known transportation options <p>Products to be produced include:</p> <ol style="list-style-type: none"> Memorandum detailing how and why study area was selected Memorandum summarizing the results of consultations with social service agencies A map of locations with an overlay of existing transit options 	Medium Priority						X	X	X	X	