



# BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

State Transportation Building  
Ten Park Plaza, Suite 2150  
Boston, MA 02116-3968  
Tel. (617) 973-7100  
Fax (617) 973-8855  
TTY (617) 973-7089  
www.bostonmpo.org

Richard A. Davey  
MassDOT Secretary and CEO  
and MPO Chairman

Karl H. Quackenbush  
Executive Director, MPO Staff

The Boston Region MPO is  
composed of:

Massachusetts Department of  
Transportation

Metropolitan Area Planning Council

Massachusetts Bay Transportation  
Authority Advisory Board

Massachusetts Bay Transportation  
Authority

Massachusetts Port Authority

Regional Transportation Advisory  
Council

City of Boston

City of Beverly

City of Everett

City of Newton

City of Somerville

City of Woburn

Town of Arlington

Town of Bedford

Town of Braintree

Town of Framingham

Town of Lexington

Town of Medway

Town of Norwood

Federal Highway Administration  
(nonvoting)

Federal Transit Administration  
(nonvoting)

## MEMORANDUM

**DATE** November 17, 2011  
**TO** Boston Region Metropolitan Planning Organization  
**FROM** Karl H. Quackenbush  
CTPS Executive Director  
**RE** Work Program for: Safety and Operations Analyses at Selected  
Intersections, FFY 2012

### ACTION REQUIRED

Review and approval

### PROPOSED MOTION

That the Boston Region Metropolitan Planning Organization vote to approve the work program for Safety and Operations Analyses at Selected Intersections in the form of the draft dated November 17, 2011.

### PROJECT IDENTIFICATION

#### Unified Planning Work Program Classification

Planning Studies

#### CTPS Project Number

13246

#### Client

Boston Region Metropolitan Planning Organization

#### CTPS Project Supervisors

*Principal:* Efi Pagitsas

*Manager:* Chen-Yuan Wang

#### Funding

MPO 3C Planning Contract #69965

MPO §5303 Contract #70172

## **IMPACT ON MPO WORK**

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

## **BACKGROUND**

This study builds on recommendations generated by the MPO's Congestion Management Process (CMP) to address safety and congestion problems at intersections in the MPO region. Four similar studies in previous funding years are completed or underway and have received favorable responses from municipal administrators and department of public works directors. Municipalities in the region are receptive to this type of study, as it gives them potential low-cost solutions or a head start on conceptual design for intersections in need of attention for safety improvements and congestion mitigation.

Intersections dictate the quality of flow along an arterial, and therefore when improvements are made to their operations and safety, the safe processing capacity of that arterial can increase as a result. This can prevent the addition of traffic lanes from becoming necessary, result in fewer vehicle-miles of travel, reduce use of neighborhood streets as "cut-throughs," and enhance the reliability of any transit vehicles traversing the intersection. Most importantly, when intersections are managed and operated efficiently, safety improves as well.

The previous studies in the series of which the present study is a part focused mainly on individual intersections, or at most two adjacent intersections, where traffic congestion or safety problem does not extend to other locations. This study will focus on major intersections on the region's arterial roadways where both (1) according to the MPO's crash database, many crashes occur and (2) there is congestion during peak periods. The selected locations may be either large single intersections or several adjacent intersections. The intersections may also serve multiple transportation modes, including buses, bicyclists, and pedestrians.

This study will select up to three high-crash bottleneck locations from 20 potential locations to analyze for potential for safety and operations improvements.<sup>1</sup> The potential locations will be identified based on review of the MPO's crash database and the CMP's travel time and delay information. Intersections anywhere in the region will be eligible to be selected for study. The improvement recommendations will be intended to enhance the intersections' operations for all transportation modes, including transit, bicycling, and walking, and to enhance the safety of drivers, bicyclists, and pedestrians. The selected intersections may or may not call for improvements requiring right-of-way acquisition. Locations will be selected only if

---

<sup>1</sup> The number of locations selected for study will depend on the complexity of the analysis required by the selected locations. That is, if one or more of the intersections that are given highest priority for inclusion in the study require particularly time-consuming analysis, the number of locations studied may be fewer than three.

they are not currently under study by MPO staff or by others, or under design. One important basis for the selection will be staff interaction with municipal officials and the officials' interest in project implementation. Other criteria are described below under Task 1.

## **OBJECTIVE**

This study will identify improvements that address operational and safety problems at up to three locations in the Boston Region MPO area.

## **WORK DESCRIPTION**

### **Task 1 Select Locations**

This task will initially identify approximately 20 bottleneck locations throughout the region that have low levels of service and high vehicle crash levels. Staff will generate this group of intersections by employing a variety of strategies:

- Reviewing the most recent Massachusetts Department of Transportation (MassDOT) Registry Division crash data
- Reviewing CMP travel time and delay data for consecutive intersections with spill-over queues
- Reviewing transit travel time data for buses going through the locations identified via the CMP data
- Reviewing TIP projects from the conceptual and pre-TIP categories
- Reviewing public feedback received in the MPO's CMP intersection survey through the MPO website
- In coordination with MAPC, soliciting selection recommendations from MAPC Subregions and individual cities and towns that will declare their commitment to shepherding the recommended improvements to design and implementation

Up to three locations will be selected for consideration from the initial 20 based on criteria in the following categories:

- Safety concerns
- Potential for improvement and technical ease of potential implementation
- Strong indication from the community that it will follow up with implementation

The potential locations will be first screened through safety measures including their Equivalent Property Damage Only (EPDO) crash-severity ratings, their numbers of crashes involving pedestrians or bicyclists, and their intersection crash rates. The locations will also be examined based on need for improvements (safety needs, delays in processing of buses, intersection delays, queue length), ease of implementation (possibility of increasing capacity through signal retiming or

upgrading; availability of right-of-way for minor geometry modifications), and cost considerations. Locations potentially requiring major geometry redesigns, such as grade separation or adding travel lane(s) on an arterial, will not be selected. However, both short- and long-term improvements will be considered for the selected intersections. Finally, with regard to the third criterion bulleted above, staff will discuss with communities their level of interest in following up with implementation of eventual recommendations. This is in addition to having solicited communities' input during the selection of the 20 candidate locations.

### ***Product of Task 1***

A table listing up to 20 potential locations throughout the region, with three of them selected for detailed study.<sup>2</sup>

## **Task 2 Perform Field Reconnaissance and Collect Data**

Once the three locations have been selected, staff will collect detailed data pertaining to each location. This will involve visiting each site and inventorying all relevant geometric, land use, and signal features. Data will include:

- Manual turning movement counts
- Bicycle counts
- Pedestrian counts
- Transit vehicle counts
- Signal timing data (phases, timing lengths)
- Queue lengths
- Geometric data (lanes, curb cuts, sidewalks, crosswalks, pedestrian buttons, transit amenities)
- Land use/zoning information
- Jurisdictional/administrative system responsibilities

### ***Products of Task 2***

Summaries of count, signal, queue, and geometric data, as well as land use and jurisdictional information, for the selected locations.

## **Task 3 Evaluate Selected Locations**

Staff will evaluate each intersection using various types of analysis. First, the crash data for each intersection will be analyzed with regard to crash type and severity and whether bicycles or pedestrians were involved in the crashes. Crash diagrams will also be constructed for the intersections with a crash rate exceeding the MassDOT Highway District average. Second, capacity analyses will be performed in order to determine the operational level of service at each

---

<sup>2</sup> The table will include information explaining why the three locations were chosen using safety concerns, potential for improvement, and municipal interest in implementation as criteria. If the TPPC so desires, staff will make a presentation on the selection process and results to the committee.

intersection. Particular attention will be given to the evaluation of existing pedestrian signal phases, if any, or the need for them. Third, field observations will yield a full understanding of safety levels and of the operations of vehicles, bicycles, and pedestrians at each location. One application of these observations will be in evaluating each location in terms of the “complete street” design concepts.

***Products of Task 3***

Summaries giving each of the selected locations’ incidence and types of crashes, its operational level of service, and an overall assessment of how safe or unsafe it is and how well or how poorly traffic is processed through it.

**Task 4 Develop Improvement Alternatives and Receive Input from MassDOT Office of Transportation Planning and Highway Division and from Local Officials**

Based on the evaluation, staff will develop potential improvement alternatives with a preliminary estimation of construction costs. Staff will contact MassDOT Office of Transportation Planning and Highway Division District Office staff and local officials in each community involved in order to discuss the intersection summaries, receive input on analysis and findings, and discuss potential improvements, including potential actions to promote implementation. The combined comments of local and state officials will steer the development of all final recommended improvements.

***Product of Task 4***

A summary of discussions and other interactions with MassDOT Highway Division District Office staff and local officials with respect to the preliminary findings.

**Task 5 Recommend Improvements**

Based on the evaluation performed in Task 3 and on the feedback given by local and MassDOT Highway Division officials, staff will consider the complete-street design concepts and recommend short- and long-term measures to improve operations and safety levels at the selected locations. Recommendations will include improvements for transit, specifically buses, which may pass through the intersection; these could include curb extensions, bus stop relocations, and transit signal priority options. The cost of the measures will be estimated and the jurisdictional entity or entities responsible for implementation identified.

***Product of Task 5***

A summary of recommended operational and safety improvements for the selected locations.

**Task 6 Document All Findings and Recommendations**

Staff will document all study tasks in a technical memorandum. Each of the communities involved will also receive a technical memorandum providing the analysis and recommendations pertaining to its particular location(s).

***Product of Task 6***

A technical memorandum summarizing the study as a whole; a technical memorandum documenting Tasks 1 through 5, including documentation of the correspondence with municipal officials, for each of the selected intersections.

**ESTIMATED SCHEDULE**

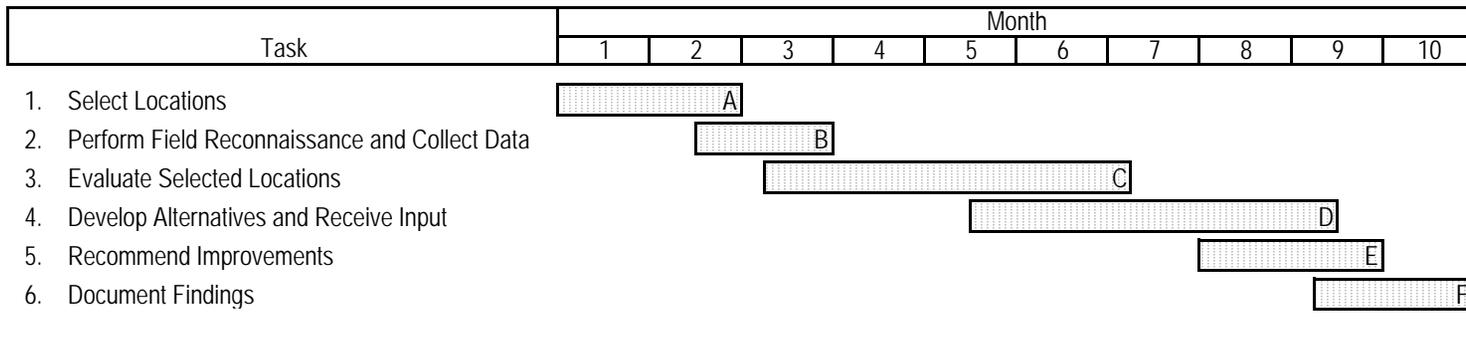
It is estimated that this project will be completed 10 months after the notice to proceed is received. The proposed schedule, by task, is shown in Exhibit 1.

**ESTIMATED COST**

The total cost of this project is estimated to be \$76,430, and will be made up of \$54,130 in PL funds and \$22,300 in Section 5303 funds. The total cost includes the cost of 29 person-weeks of staff time, overhead at the rate of 94.57 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/EP&CW/cw

**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**Safety and Operations Analyses at Selection Intersections, FFY 2012**



**Products/Milestones**

- A: A table of the selected locations with information on basis for selection
- B: Summaries of count, traffic control, geometric, and land use data
- C: Summaries of crash data and intersection capacity analyses; overall assessment of the locations
- D: Summary of discussions and interactions with communities and MassDOT Highway Division District Offices
- E: Summaries of recommended operational and safety improvements
- F: Final technical memoranda

Exhibit 2

ESTIMATED COST

Safety and Operations Analyses at Selection Intersections, FFY 2012

<b>Direct Salary and Overhead</b>	<b>\$75,980</b>
-----------------------------------	-----------------

Task	Person-Weeks					Total	Direct Salary	Overhead (@ 94.57%)	Total Cost
	M-1	P-5	P-2	SP-3	Temp				
1. Select Locations	1.0	2.0	0.0	0.0	0.0	3.0	\$4,919	\$4,652	\$9,570
2. Perform Field Reconnaissance and Collect Data	0.0	1.5	1.5	2.0	3.0	8.0	\$6,836	\$6,464	\$13,300
3. Evaluate Selected Locations	0.0	2.5	1.5	0.0	0.0	4.0	\$5,444	\$5,149	\$10,593
4. Develop Alternatives and Receive Input	0.5	4.0	1.5	0.0	0.0	6.0	\$8,721	\$8,247	\$16,968
5. Recommend Improvements	1.5	1.5	0.0	0.0	0.0	3.0	\$4,927	\$4,660	\$9,587
6. Document Findings	2.0	3.0	0.0	0.0	0.0	5.0	\$8,204	\$7,758	\$15,962
<b>Total</b>	<b>5.0</b>	<b>14.5</b>	<b>4.5</b>	<b>2.0</b>	<b>3.0</b>	<b>29.0</b>	<b>\$39,050</b>	<b>\$36,929</b>	<b>\$75,980</b>

<b>Other Direct Costs</b>	<b>\$450</b>
---------------------------	--------------

Travel \$450

<b>TOTAL COST</b>	<b>\$76,430</b>
-------------------	-----------------

*Funding*

*MPO 3C PL Contract #69965 (\$54,130) and MPO Section 5303 Contract #70172 (\$22,300)*