



## BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Richard A. Davey, MassDOT Secretary and CEO and MPO Chairman  
Karl H. Quackenbush, Executive Director, MPO Staff

### MEMORANDUM

**DATE** September 12, 2013  
**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 2014

#### 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 – FFY 2014, in the form of the draft dated September 12, 2013.

#### Project Identification

##### Unified Planning Work Program Classification

Planning Studies

##### CTPS Project Number

13261

##### Client

Boston Region Metropolitan Planning Organization

##### CTPS Project Supervisors

*Principal:* Efi Pagitsas

*Manager:* Seth Asante

##### Funding

MPO Planning Contract #78890

MPO §5303 Contract #78922

## 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. Five similar studies in previous funding years have been completed or underway and have received favorable responses from municipal administrators and directors of departments of public works. 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 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 eliminate the need for the addition of traffic lanes, result in fewer vehicle-miles of travel, reduce the 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 selected locations will be individual intersections or sets of two intersections. The intersections will also serve users of multiple transportation modes, including buses, bicyclists, and pedestrians.

For this study, up to four isolated high-crash bottleneck locations or two sets of two interrelated intersections will be selected. The selection will be made from 20 potential locations to analyze for safety and operations improvements.<sup>1</sup> The potential locations will be identified based on a review of the MPO's crash database and the CMP's travel-time and delay information. Intersections anywhere in the MPO 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 that require right-of-way acquisition. Locations will be selected only if they are not currently under study by MPO staff or by others, or under design. One important basis for the selection will be input to staff from MassDOT and municipal

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<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 the highest priority for inclusion in the study require particularly time-consuming analysis, the number of locations studied may be fewer than four.

officials, and the officials' level of interest in project implementation. Other criteria are described below under Task 1.

## Objectives

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

## Work Description

### Task 1 Select Locations

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

- Reviewing the most recent crash data from MassDOT's Registry of Motor Vehicles Division
- Reviewing CMP travel-time and delay data for consecutive intersections that have spillover queues
- Reviewing transit travel- time CMP data for buses going through the locations identified via the CMP
- 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 the Metropolitan Area Planning Council (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 four intersections 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 first be screened through safety measures, including Equivalent Property Damage Only (EPDO) crash-severity ratings, the numbers of

crashes involving pedestrians or bicyclists, and the intersection crash rates. The locations will also be examined based on the need for improvements (safety needs, delays in processing buses, intersection delays, and queue length), ease of implementation (the possibility of increasing capacity through signal retiming or upgrading, and the 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 lanes on an arterial, will not be selected. However, both short- and long-term improvements will be considered for the selected intersections. Finally 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 four intersections selected for detailed study.<sup>2</sup>

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

Once the 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 and zoning information
- Jurisdictional and administrative system responsibilities

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<sup>2</sup> The table will include information explaining why the locations were chosen, based on safety concerns, the potential for improvement, and municipal interest in implementation. Staff will make a presentation to the MPO on the selection process and results.

*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 that exceeds the MassDOT highway district average. Second, capacity analyses will be performed in order to determine the operational level of service at each 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 evaluating each location in terms of “complete street” design concepts.

*Products of Task 3*

Summaries providing 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 the Highway Division district office staff and local officials in each of the communities involved in order to discuss the intersection summaries, receive input on the 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.

*Products 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 vehicles, especially buses, that 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. In addition, each of the communities involved will also receive a technical memorandum providing the analysis and recommendations pertaining to its particular locations.

*Products of Task 6*

Technical memoranda, one for each intersection, including documentation of the correspondence with municipal officials

**Estimated Schedule**

It is estimated that this project will be completed 12 months after work commences. The proposed schedule, by task, is shown in Exhibit 1.

**Estimated Cost**

The total cost of this project is estimated to be \$67,057. The total cost includes the cost of 21.9 person-weeks of staff time, overhead at the rate of 97.42 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/EP/ep

**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**Safety and Operations Analyses at Selected Intersections – FFY 2014**

Task	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Select Locations	A											
2. Perform Field Reconnaissance and Collect Data		B										
3. Evaluate Selected Locations						C						
4. Develop Alternatives and Receive Input							D					
5. Recommend Improvements									E			
6. Document Findings and Recommendations	F											

**Products/Milestones**

- A: A table of the selected locations with information on basis for selection
- B: Summaries of intersection data and information
- C: Summaries of crash characteristics, level of service, safety assessment, and traffic flow
- D: Summary of discussions and interactions with communities and MassDOT Highway Division districts
- E: Summary of recommended operations and safety improvements
- F: Technical memoranda

**Exhibit 2**  
**ESTIMATED COST**  
**Safety and Operations Analyses at Selected Intersections – FFY 2014**

<b>Direct Salary and Overhead</b>	<b>\$66,707</b>
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Task	Person-Weeks							Direct Salary	Overhead (97.42%)	Total Cost
	M-1	P-5	P-4	P-2	SP-1	Temp	Total			
1. Select Locations	0.5	1.8	0.0	0.0	0.0	0.0	2.3	\$3,897	\$3,797	\$7,694
2. Perform Field Reconnaissance and Collect Data	0.0	1.5	0.0	0.6	1.0	1.1	4.2	\$4,303	\$4,192	\$8,494
3. Evaluate Selected Locations	0.0	2.0	0.6	0.0	0.0	0.0	2.6	\$4,144	\$4,037	\$8,180
4. Develop Alternatives and Receive Input	0.5	4.0	0.6	0.0	0.0	0.0	5.1	\$8,379	\$8,163	\$16,542
5. Recommend Improvements	0.5	1.5	0.0	0.0	0.0	0.0	2.0	\$3,390	\$3,302	\$6,692
6. Document Findings and Recommendations	3.2	2.5	0.0	0.0	0.0	0.0	5.7	\$9,678	\$9,428	\$19,105
<b>Total</b>	<b>4.7</b>	<b>13.3</b>	<b>1.2</b>	<b>0.6</b>	<b>1.0</b>	<b>1.1</b>	<b>21.9</b>	<b>\$33,790</b>	<b>\$32,918</b>	<b>\$66,707</b>

<b>Other Direct Costs</b>	<b>\$350</b>
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Travel	\$350
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<b>TOTAL COST</b>	<b>\$67,057</b>
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**Funding**

MPO Planning Contract #78890  
MPO §5303 Contract #78922