



## BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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Stephanie Pollack, MassDOT Secretary and CEO and MPO Chair  
Karl H. Quackenbush, Executive Director, MPO Staff

### *MEMORANDUM*

**DATE** October 15, 2015  
**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 2016

#### 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 2016, presented in this memorandum.

#### Project Identification

##### Unified Planning Work Program Classification

Planning Studies

##### CTPS Project Number

13272

##### Client

Boston Region Metropolitan Planning Organization

##### CTPS Project Supervisors

*Principal:* Mark Abbott

*Manager:* Seth Asante

##### Funding

MPO Planning Contract #89787

MPO §5303 Contract #84080 and subsequent MPO §5303 Contract

## 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 will build upon recommendations generated by the MPO's Congestion Management Process (CMP), evaluation of crash data, and input from the MPO's outreach process to address safety and operations problems at intersections in the MPO region. Six similar studies from previous funding years, have been completed, and 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; 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 additional traffic lanes, result in fewer vehicle-hours of travel, reduce the use of neighborhood streets as "cut-throughs," and enhance the reliability of 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 that serve users of multiple transportation modes, including buses, bicyclists, and pedestrians. For this study, up to three high-crash or congested locations will be selected from a list of potential locations that will be identified by reviewing the MPO's crash database, the CMP's travel-time information, and a list of problem intersections submitted through the MPO's outreach process.<sup>1</sup>

The improvement recommendations will be intended to enhance the intersections' operations and safety for all transportation modes, including motor vehicles, transit, bicycles, 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. Two important bases for selection will be input to staff from the Massachusetts Department of Transportation (MassDOT) Highway Division and municipal officials, including the level of interest in project implementation of other stakeholders. Other criteria are described below, under Task 1.

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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 would require particularly time-consuming analysis, the number of locations studied may be fewer than three.

## Objectives

This study will identify improvements that address operational and safety problems at as many as three intersections in the Boston Region MPO area.

## Work Description

### Task 1 Select Locations

This task will initially identify as many as 20 bottleneck locations throughout the MPO region that have low levels of service and high vehicle crash rates. MPO staff will generate a list of these 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 outreach program
- 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

The intersections selected for consideration will be based on criteria in the following categories:

- Safety and operations concerns
- Potential for improvement
- Ease of potential implementation
- Strong indication from the municipality and stakeholders that they will follow up with implementation
- Regional equity (the study locations are distributed throughout the MAPC subregions over time)

The potential locations will first be screened by safety measures, including Equivalent Property Damage Only (EPDO) crash-severity ratings,<sup>2</sup> the number of crashes involving pedestrians or bicyclists, the intersection crash rates, and all conflicts at the intersection involving vehicles, pedestrians, and bicyclists. The

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<sup>2</sup> "Equivalent property damage only" is a method of combining the number of crashes with the severity of crashes based on a weighted scale where a fatal crash is worth 10, an injury crash is worth 5, and a property damage only crash is worth 1.

locations also will be evaluated 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 small-scale projects, such as signal retiming or upgrading; and the availability of right-of-way for minor geometry modifications), and cost considerations.

Locations that would potentially require major geometry redesigns, such as grade separation or adding travel lanes on an arterial roadway, will not be selected. However, both short- and long-term improvements will be considered for the selected intersections.

Finally, staff will discuss with municipal officials their level of interest in following up with implementation of the study recommendations. This input will be in addition to that solicited from municipalities during the process of selecting candidate locations.

Staff will then select as many as three intersections for detailed study. Both the list of intersections considered and the staff recommendations of which intersections to study will be presented to the MPO for discussion.

#### *Product of Task 1*

A summary of the selection process, including a table listing selected locations<sup>3</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:

- Turning-movement counts
- Bicycle counts
- Pedestrian counts
- Transit vehicle counts
- Signal equipment and timing information
- Geometric data (lanes, curb cuts, sidewalks, crosswalks, transit amenities)
- Land use and zoning information
- Jurisdictional and administrative information

#### *Product of Task 2*

A summary of count, signal, and geometric data, as well as land use and jurisdictional information, for the selected locations

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<sup>3</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.

### 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 that have 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 evaluating existing pedestrian signal phases, if any, or the need for them. Third, field observations will be performed to yield a more complete understanding of safety levels and the operations of vehicles, bicycles, and pedestrians at each location. These observations will include evaluating each location in terms of “Complete Streets” design concepts.

#### *Product of Task 3*

A summary of 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’s Office of Transportation Planning and Highway Division and from Municipal Officials

Based on the evaluation performed in Task 3, staff will develop potential improvement alternatives, with a preliminary estimation of construction costs. Staff will contact MassDOT’s Office of Transportation Planning, its Highway Division’s district office staff, and municipal 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 for promoting implementation. The combined comments of municipal and state officials will steer the development of all of the final recommended improvements.

#### *Product of Task 4*

A summary of discussions and other interactions with MassDOT Highway Division district office staff and municipal officials about the potential improvement alternatives

### Task 5 Recommend Improvements

Based on the evaluation performed in Task 3 and the feedback given by municipal and MassDOT Highway Division officials in Task 4, staff will recommend short- and long-term strategies for improving operations and safety levels at the selected locations. The recommendations will include improvements for pedestrians, bicyclists, motorists, and transit service, especially for buses that

pass through the intersection. The recommended improvements could include curb extensions, bus stop relocations, transit signal-priority options, shorter crosswalks, accessible<sup>4</sup> pedestrian signals, bicycle-detection equipment and signs, signal retiming and coordination, and additional turn lanes. The cost of the measures will be estimated and the jurisdictional entity or entities responsible for implementation will be identified.

*Product of Task 5*

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

**Task 6 Document Findings and Recommendations**

Staff will produce, for each of the municipalities involved in the study, a technical memorandum on the analysis and recommendations pertaining to the intersection locations in that municipality.

*Products of Task 6*

Technical memoranda, one for each municipality involved in the study, 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 \$65,000. The total cost includes the cost of 22.8 person-weeks of staff time, overhead at the rate of 98.88 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

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<sup>4</sup> Accessible pedestrian signals are devices that communicate the Walk and Don't Walk intervals at signalized intersections to pedestrians who are blind or who have low vision in nonvisual formats (for example, using audible tones and/or vibrotactile surfaces).

**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**Safety and Operations Analyses at Selected Intersections: FFY 2016**

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 Improvement Alternatives and Receive Input							D						
5. Recommend Improvements										E			
6. Document Findings and Recommendations													F

Products/Milestones

- A: A table of selected locations
- B: Summary of intersection data and information
- C: Summary of crash characteristics, level of service, safety assessment, and traffic operations
- D: Summary of discussions and interactions with municipalities and MassDOT Highway Division district offices
- E: Summary of recommended safety and operations improvements
- F: Technical memoranda

**Exhibit 2**  
**ESTIMATED COST**  
**Safety and Operations Analyses at Selected Intersections: FFY 2016**

<b>Direct Salary and Overhead</b>	<b>\$64,451</b>
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Task	Person-Weeks						Direct Salary	Overhead (98.88%)	Total Cost
	M-1	P-5	P-4	P-2	Temp	Total			
1. Select Locations	0.2	1.0	0.5	1.0	0.0	2.7	\$3,814	\$3,771	\$7,585
2. Perform Field Reconnaissance and Collect Data	0.0	0.5	0.0	0.5	2.0	3.0	\$2,412	\$2,385	\$4,798
3. Evaluate Selected Locations	0.0	2.0	0.5	2.0	0.0	4.5	\$6,279	\$6,209	\$12,487
4. Develop Improvement Alternatives and Receive Input	0.2	3.0	0.5	1.0	0.0	4.7	\$7,468	\$7,384	\$14,852
5. Recommend Improvements	0.2	1.2	0.0	0.0	0.0	1.4	\$2,535	\$2,507	\$5,042
6. Document Findings and Recommendations	2.5	2.0	0.0	2.0	0.0	6.5	\$9,899	\$9,788	\$19,687
Total	3.1	9.7	1.5	6.5	2.0	22.8	\$32,407	\$32,044	\$64,451

<b>Other Direct Costs</b>	<b>\$549</b>
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Travel	\$549
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<b>TOTAL COST</b>	<b>\$65,000</b>
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**Funding**

MPO Planning Contract #89787  
MPO §5303 Contract #84080 and subsequent MPO §5303 contract