



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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

MEMORANDUM

DATE November 16, 2017
TO Boston Region Metropolitan Planning Organization
FROM Karl H. Quackenbush, Executive Director
RE Work Program for Safety and Operations Analysis at Selected Intersections

Action Required

Review and approval

Proposed Motion

That the Boston Region Metropolitan Planning Organization (MPO) votes to approve the work program for *Safety and Operations Analysis at Selected Intersections* presented in this memorandum

Project Identification

Unified Planning Work Program Classification

Planning Studies and Technical Analyses

CTPS Project Number

13283

Client

Boston Region MPO

CTPS Project Supervisors

Principal: Mark Abbott

Manager: Seth Asante

Funding

MPO Planning Contract #101725

MPO §5303 Contract #98873 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. Seven similar studies from previous funding years have been completed¹, 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 designs for intersections that need 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, overall safety improves.

The selected locations will be individual intersections or sets of two intersections that serve users of multiple transportation modes, including bus riders, bicyclists, and pedestrians. For this study, as many as three high-crash or congested locations will be selected 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.²

The improvement recommendations would enhance the intersections' operations and safety for all transportation modes, including motor vehicles, transit service, 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, the Massachusetts Department of Transportation (MassDOT), cities, and towns, or under design. Two important bases for selection will be input from the MassDOT Highway Division and municipal

¹ Completed studies in Chelsea, Peabody, Weymouth, Milford, Westwood, etc.

² The number of locations selected for study will depend on the complexity of the analysis required for the selected locations. For example, if one or more of the intersections that have the highest priority for inclusion in the study would require particularly time-consuming analysis, the number of locations studied could be fewer than three.

officials, including other stakeholders' level of interest in implementing the project. Other criteria are described below, under Task 1.

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 Intersection Locations

This task will initially identify as many as 10 intersection locations throughout the MPO region that experience poor traffic operations and high vehicle crash rates. MPO staff will generate a list of these intersections by:

- 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 Transportation Improvement Program (TIP) projects from the conceptual and pre-TIP categories
- Reviewing public feedback received via the MPO's outreach program
- Soliciting selection recommendations—in coordination with the Metropolitan Area Planning Council (MAPC)—from MAPC subregions and individual cities and towns that will declare their commitment to shepherding the recommended improvements through 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
- Supported by the municipality and stakeholders who will follow up with implementation
- Regional equity (that the study locations would be 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,³ the number of crashes involving pedestrians or bicyclists, the intersection crash rates, and all conflicts at the intersection involving vehicles, pedestrians, and bicyclists. The 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 locations⁴

Task 2 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 and performance
- Signal equipment and timing information

³ "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.

⁴ 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 present the selection process and results to the MPO.

- 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

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 selected location's frequency and type of crashes, its operational level of service, and an overall assessment of how safe or unsafe it is and how well or poorly traffic proceeds through it

Task 4 Develop Improvement Alternatives

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. The combined comments of municipal 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 municipal officials about potential improvement alternatives

Task 5 Recommend Improvements

Based on the evaluation performed in Task 3, and the feedback of 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 pedestrian signals⁵, 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 Methodology, Findings, and Recommendations

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

Products of Task 6

Technical memoranda, one for each municipality involved in the study, including documentation of correspondence with municipal officials

Estimated Schedule

It is estimated that this project will be completed 10 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 \$70,000, which includes the cost of 19.7 person-weeks of staff time, overhead at the rate of 105.66 percent, and travel. A detailed breakdown of estimated costs is presented in Exhibit 2.

KQ/MSA/msa

⁵ 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 at Selected Intersections

Task	Month									
	1	2	3	4	5	6	7	8	9	
1. Select Intersection Locations	█									
2. Collect Data		█								
3. Evaluate Selected Locations			█							
4. Develop Improvement Alternatives				█	█	█	█			
5. Recommend Improvements						█	█	█		
6. Document Methodology, Findings, and Recommendations								█	█	█

Exhibit 2
ESTIMATED COST
Safety and Operations at Selected Intersections

Direct Salary and Overhead	\$69,489
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Task	Person-Weeks						Direct Salary	Overhead (105.66%)	Total Cost
	M-1	P-5	P-4	P-3	Temp	Total			
1. Select Intersection Locations	0.4	1.2	0.2	0.0	0.0	1.8	\$3,306	\$3,493	\$6,799
2. Collect Data	0.0	0.8	0.0	0.0	1.0	1.8	\$2,033	\$2,148	\$4,180
3. Evaluate Selected Locations	0.2	2.0	0.0	0.0	1.0	3.2	\$4,689	\$4,954	\$9,643
4. Develop Improvement Alternatives	0.2	3.0	0.0	0.0	0.0	3.2	\$6,083	\$6,427	\$12,510
5. Recommend Improvements	0.2	2.3	0.0	0.0	0.0	2.5	\$4,750	\$5,019	\$9,770
6. Document Methodology, Findings, and Recommendations	2.2	4.0	0.0	1.0	0.0	7.2	\$12,927	\$13,659	\$26,586
Total	3.2	13.3	0.2	1.0	2.0	19.7	\$33,788	\$35,701	\$69,489

Other Direct Costs	\$511
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Travel	\$511
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TOTAL COST	\$70,000
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Funding

MPO Planning Contract #101725
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