



BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Jamey Tesler, MassDOT Secretary and CEO and MPO Chair
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WORK PROGRAM

SAFETY AND OPERATIONS AT SELECTED INTERSECTIONS

OCTOBER 21, 2021

Proposed Motion

The Boston Region Metropolitan Planning Organization (MPO) votes to approve this work program.

Project Identification

Unified Planning Work Program (UPWP) Classification

Boston Region MPO Planning Studies and Technical Analyses

Project Number 13722

Client

Boston Region MPO

Project Supervisors

Principal: Mark Abbott

Manager: Seth Asante

Funding Source

MPO Combined PL and 5303 #114674

Schedule and Budget

Schedule: 10 months after work commences

Budget: \$82,000

Schedule and budget details are shown in Exhibits 1 and 2, respectively.

Relationship to MPO Goals

The Boston Region MPO elected to fund this study with its federally allocated metropolitan planning funds during federal fiscal year (FFY) 2022. The work completed through this study will address the following goal areas established in the MPO's Long-Range Transportation Plan: safety, system preservation, and capacity management, and mobility.

Background

This study will build on 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 Boston region. Several similar studies from previous funding years have been completed and have received favorable responses from municipal administrators and directors of departments of public works.¹ Municipalities in the region are receptive to this type of study, as it gives them potential low-cost solutions and a head start on conceptual designs for intersections that need safety improvements and congestion mitigation.

Intersections affect the safety and quality of flow along an arterial for people driving, walking, biking, taking the bus, or using assistive mobile devices; therefore, when improvements are made to safety and operations at these locations, users can traverse the intersections safely. Improvements can also reduce congestion and "cut-through" traffic on neighborhood streets and enhance the reliability of transit service. Most importantly, when intersections are managed and operated efficiently, overall safety improves.

The selected locations for this study will be individual intersections or sets of two closely spaced intersections that serve multiple transportation modes, providing options for people who walk, bike, take transit, or use assistive mobility devices. There are a number of factors that are considered when selecting the intersections to study, including crash history, travel times, public concerns, input from the Massachusetts Department of Transportation (MassDOT) Highway District and municipal officials, and other stakeholders' level of interest in implementing the recommendations from the study.

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 Locations will be selected only if they are not currently under study by MPO staff, MassDOT, cities, or towns, or under design.

The recommendations for improvement would enhance the intersections' safety and operations for multiple transportation modes. The recommended improvements will mostly fall within the existing roadway's right-of-way width and the study will aim to

¹ Recently completed studies focused on intersections in Bellingham, Wenham, Chelsea, Peabody, Weymouth, Milford, Westwood, and other municipalities.

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 with the highest priority for inclusion in the study requires particularly time-consuming analysis, the number of locations studied could be fewer than three.

minimize the impact of right-of-way acquisition and consider the needs of abutters and roadway users.

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 Boston region that experience poor safety (based on a high number of crashes) and poor operations. MPO staff will generate a list of these intersections by the following means:

- Reviewing the most recent crash data from MassDOT's Registry of Motor Vehicles Division and IMPACT portal³
- Reviewing CMP travel-time and delay data for consecutive intersections that have spillover queues
- Reviewing transit travel-time 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
- Asking for selection recommendations—in coordination with the Metropolitan Area Planning Council (MAPC)—from MAPC subregions and individual cities and towns that 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 concerns
- Operations concerns
- Multimodal significance (supporting people who walk, bike, take transit, or use assistive mobility devices, and heavy vehicle activities)

³ The IMPACT portal is designed to encourage public-safety initiatives and awareness specific to crash information. Within IMPACT a user can engage with crash-related data through easy-to-understand pre-built reports or conduct a self-driven analysis. The IMPACT portal allows the user to filter by MassDOT's Strategic Highway Safety Plan emphasis areas, which include bike and pedestrian transportation. Also, the tool includes data on high-risk areas and estimates which areas are at the highest risk for future crashes based on a variety of variables.

<https://apps.impact.dot.state.ma.us/cdp/home>

- Implementation potential and support by the municipality and stakeholders for following up with implementation
- Transportation equity (fostering an equitable transportation system that prioritizes the needs of marginalized communities)
- Regional equity (ensuring that the study locations would be distributed throughout the MAPC subregions over time)

The potential locations will be screened by safety measures, including equivalent property damage only (EPDO) crash-severity ratings, the number of crashes involving pedestrians or bicyclists, and the intersection crash rates.⁴ Also, the locations will be evaluated based on the need for improvements (safety needs, delays in processing buses, intersection delays, and queue length); the potential for 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 additional 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 talk with municipal officials about their level of interest in following up with implementation of the study recommendations. This input will be in addition to the input obtained from municipalities during the process of selecting candidate locations.

Staff will then select as many as three intersections for detailed study. Both the full list of intersections considered and the intersections staff recommends for study will be presented to the MPO board.

Products of Task 1

A summary of the selection process, including a table listing selected locations⁵

⁴ EPDO is a method of combining the number of crashes with the severity of crashes based on a weighted scale. Since 2018, MassDOT applied a new EPDO method (where actual crash costs are factored in) to rank high-crash locations in the state. All of the fatal and injury crashes were weighted together (about 30 percent of all crashes in Massachusetts), which resulted in any crash resulting in an injury (including fatal, incapacitating, non-incapacitating, and possible injuries) having a weighting factor of 21 compared to a crash that resulted in property damage only, which would have a weighting factor of one.

⁵ 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 board.

Task 2 Collect Data

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

- Turning movement volumes
- Walking and biking volumes
- Walking and biking networks and their connectivity to the study sites (MassDOT's data on potential everyday walking and biking, MAPC Local Access Scores, and MPO Bicycle Network Gap Evaluation)⁶
- Crash data and police crash reports
- Transit data (service and ridership)
- Signal equipment and timing information
- Geometric data (lanes, curb cuts, sidewalks, crosswalks, and transit amenities)
- Land use and zoning information
- Jurisdictional and administrative information
- Roadway speed and origin-destination data from INRIX/RITIS⁷

Products of Task 2

A summary of the traffic volumes, signal, geometric, and land use data 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, severity, and whether bicycles or pedestrians were involved in the crashes. Crash diagrams will be constructed for the intersections that are classified as Highway Safety Improvement Program (HSIP) eligible. Second, capacity analyses will be performed

⁶ The Local Access Score is calculated using travel demand software that uses input data on population and destinations to estimate the number of trips households are likely to make in a given day, the likely destinations of those trips, and the most direct routes connecting households to their destinations. The dataset contains a separate score for four different types of destinations (schools, shops and restaurants, transit stations, and parks) and two different modes (walking and biking), for a total of eight basic scores. These scores are combined and weighted to produce walking and biking scores as well as an overall composite score. <https://localaccess.mapc.org/>

Beth Isler, Bicycle Network Evaluation (Boston Region Metropolitan Planning Organization, May 2014). www.ctps.org/data/pdf/programs/livability/MPO_0515_Bicycle_Network.pdf.

⁷ INRIX is a private company that collects roadway travel times and origin-destination data for most roadways that are collectors, arterials, limited-access roadways, or freeways. Regional Integrated Transportation Information System (RITIS) provides INRIX data to the Boston Region MPO through its web portal. The data is archived and provided to transportation planning organizations that use the data to monitor congestion through performance measures.

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 complete understanding of safety levels and the operations of vehicles, bicycles, and pedestrians at each location, considering factors such as pedestrian wait times, crossing distances, congestion, and queuing. In addition to the analyses on safety and operations, this evaluation will be based on goals and principles of the statewide pedestrian and bicycle plans, and guidelines from the municipal resource guides for walkability and bikeability.⁸

Products of Task 3

A summary of the frequency and type of crashes at each location and the intersections' operational level of service, an overall safety assessment, and an assessment of how well or poorly traffic proceeds through the intersections

Task 4 Develop Improvement Concepts

Based on the evaluation performed in Task 3, staff will develop potential improvement concepts with a preliminary estimation of construction costs. Staff will contact the MassDOT Office of Transportation Planning, the Highway Division's district office staff, and municipal officials in each of the communities involved 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.

Products of Task 4

A summary of discussions and other interactions with MassDOT Office of Transportation Planning staff, Highway Division district office staff, and municipal officials about potential improvement concepts

Task 5 Recommend Improvements

Based on the feedback received in Task 4, staff will revise the preferred alternatives, if necessary, and recommend short- and long-term strategies for improving safety and operations at the selected locations. The recommendations could include improvements to walking and biking infrastructure, curb extensions, bus stop relocations, transit-signal-priority options, shorter crosswalks, accessible pedestrian signals, bicycle-detection equipment and signs, signal retiming and coordination,

⁸ Massachusetts Department of Transportation, "Massachusetts Pedestrian Transportation Plan," May 2019; Massachusetts Department of Transportation, "Massachusetts Bicycle Transportation Plan," May 2019; Massachusetts Department of Transportation, "Municipal Resource Guide for Walkability," May 2019; Massachusetts Department of Transportation, "Municipal Resource Guide for Bikeability," May 2019.

and turn lanes.⁹ The cost of the measures will be estimated, right-of-way and potential environmental consideration will be noted, and the jurisdictional entity or entities responsible for implementation will be identified.

Products of Task 5

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

Task 6 Document Study

Staff will produce a technical memorandum for each of the municipalities involved in the study, describing the analysis and recommendations for the intersection locations in that municipality along with graphics and visual elements. The draft memoranda will be made available for review by municipal officials, the MassDOT Highway Division, and the MassDOT Office of Transportation Planning.

Products of Task 6

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

Task 7 Finalize Study and Present to MPO

After receiving comments on the draft memoranda from municipal officials, MPO staff will address these comments and finalize the study. The final study results will be presented to the MPO board at a scheduled MPO meeting.

Products of Task 7

Final technical memoranda and MPO presentation

⁹ 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).

The Boston Region Metropolitan Planning Organization (MPO) operates its programs, services, and activities in compliance with federal nondiscrimination laws including Title VI of the Civil Rights Act of 1964 (Title VI), the Civil Rights Restoration Act of 1987, and related statutes and regulations. Title VI prohibits discrimination in federally assisted programs and requires that no person in the United States of America shall, on the grounds of race, color, or national origin (including limited English proficiency), be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination under any program or activity that receives federal assistance. Related federal nondiscrimination laws administered by the Federal Highway Administration, Federal Transit Administration, or both, prohibit discrimination on the basis of age, sex, and disability. The Boston Region MPO considers these protected populations in its Title VI Programs, consistent with federal interpretation and administration. In addition, the Boston Region MPO provides meaningful access to its programs, services, and activities to individuals with limited English proficiency, in compliance with U.S. Department of Transportation policy and guidance on federal Executive Order 13166.

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A complaint form and additional information can be obtained by contacting the MPO or at http://www.bostonmpo.org/mpo_non_discrimination. To request this information in a different language or in an accessible format, please contact

Title VI Specialist
Boston Region MPO
10 Park Plaza, Suite 2150
Boston, MA 02116
civilrights@ctps.org

By Telephone:

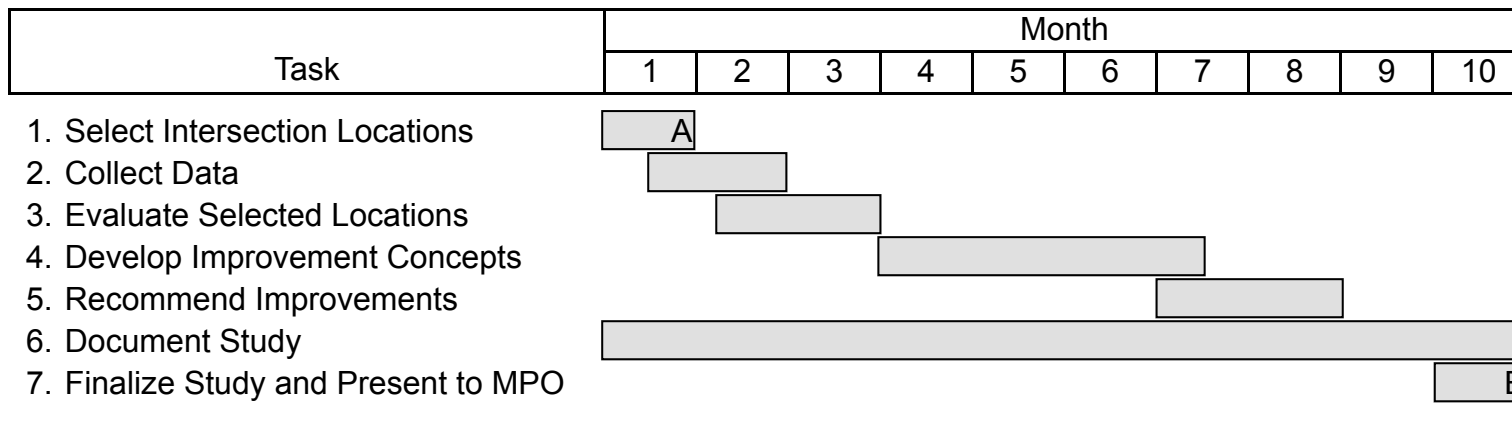
857.702.3702 (voice)

For people with hearing or speaking difficulties, connect through the state MassRelay service:

- **Relay Using TTY or Hearing Carry-over:** 800.439.2370
- **Relay Using Voice Carry-over:** 866.887.6619
- **Relay Using Text to Speech:** 866.645.9870

For more information, including numbers for Spanish speakers, visit <https://www.mass.gov/massrelay>.

Exhibit 1
ESTIMATED SCHEDULE
Safety and Operations at Selected Intersections



Products/Milestones

A: Technical memorandum about the selection process

B: Final report

Exhibit 2
ESTIMATED COST
Safety and Operations at Selected Intersections

Direct Salary and Overhead **\$81,648**

Task	Person-Weeks					Direct Salary	Overhead (109.09%)	Total Cost
	M-1	P-5	P-4	P-2	Total			
1. Select Intersection Locations	0.2	1.0	0.0	1.2	2.4	\$3,847	\$4,197	\$8,044
2. Collect Data	0.0	1.0	1.0	1.0	3.0	\$4,774	\$5,208	\$9,982
3. Evaluate Selected Locations	0.2	0.5	0.0	1.0	1.7	\$2,562	\$2,795	\$5,357
4. Develop Improvement Concepts	0.4	3.0	1.0	1.5	5.9	\$9,475	\$10,336	\$19,811
5. Recommend Improvements	0.4	1.0	0.0	1.6	3.0	\$4,674	\$5,099	\$9,773
6. Document Study	2.5	1.5	0.0	1.5	5.5	\$9,385	\$10,238	\$19,622
7. Finalize Study and Present to MPO	1.2	0.5	0.4	0.5	2.6	\$4,333	\$4,727	\$9,059
Total	4.9	8.5	2.4	8.3	24.1	\$39,050	\$42,599	\$81,648

Other Direct Costs **\$352**

Travel \$352

TOTAL COST **\$82,000**

Funding

MPO Combined PL and 5303 #114674