



## BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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Stephanie Pollack, MassDOT Secretary and CEO and MPO Chair  
Tegin L. Teich, Executive Director, MPO Staff

### *WORK PROGRAM*

## EXPLORING RESILIENCE IN MPO-FUNDED CORRIDOR AND INTERSECTION STUDIES

NOVEMBER 7, 2019

### 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 13299

Client

Boston Region MPO

Project Supervisors

*Principal:* Mark Abbott

*Manager:* Seth Asante

Funding Source

MPO 3C Planning and §5303 Contract #108217

### Schedule and Budget

Schedule: Twelve months after work commences

Budget: \$90,000

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) 2020. The work completed through this study will address the following goal areas established in the MPO's Long-Range Transportation Plan: safety, system preservation, capacity management and mobility, and economic vitality.

## Background

As climate change progresses, the Boston region is likely to experience extreme weather effects, such as extreme heat and heat waves; intense nor'easters, tornadoes, and hurricanes; sea level rise and powerful tidal waves; and intense precipitation and flooding. These climate hazards will likely affect transportation systems:

- Sea level rise and coastal and riverine flooding from intense nor'easters and hurricanes
- Flooding and washouts on roads and bridges, rail tracks and stations, airports and port facilities, and other transportation infrastructure due to intense precipitation
- Fallen trees and utility wires on roads and rails during storms
- Flooding of roadway and rail tunnels and train and subway stations from intense precipitation and storm surges
- Shorted signals resulting from flooding and damage to electrical components (due to corrosion) from exposure to salt water
- Increased failure of electrical equipment due to more intense, longer lasting heat waves
- Service disruptions due to power outages and rolling blackouts
- Passenger safety and discomfort on public transit due to extreme heat
- Wear and stress on equipment and infrastructure, leading to additional service disruptions for emergency repairs

In Massachusetts, there are several ongoing programs currently in place to address climate change resilience and adaptation. Several state agencies and municipalities are directly involved in these efforts. Massachusetts Executive Order #569 called for establishing an integrated climate change strategy for the Commonwealth.<sup>1</sup> Because of the order, state agencies and authorities, as well as cities and towns are preparing for the impacts of climate change by assessing vulnerability and adopting strategies to increase the adaptive capacity and resiliency of transportation infrastructure and other assets. The Municipal Vulnerability Preparedness grant program (MVP) has supported and provided grants for cities and towns in Massachusetts to plan for climate change resiliency and implement priority projects.<sup>2</sup> Many municipalities in the Boston region have participated in the MVP program, completed vulnerability assessments, and developed action-oriented resiliency plans—many of which include protecting vulnerable transportation infrastructure assets in their communities.

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<sup>1</sup> Executive Order No. 569: Establishing an Integrated Climate Change Strategy for the Commonwealth, issued by Governor Charlie Baker on September 16, 2016.

<sup>2</sup> The MVP Planning Grant offers funding to municipalities that wish to assess their vulnerability to climate change impacts, prepare for those impacts, build community resilience, and receive designation from the Executive Office of Energy and Environmental Affairs as a Climate Change MVP program municipality.

Also because of the executive order, the Massachusetts State Hazard Mitigation and Climate Adaptation Plan was developed.<sup>3</sup> The plan provides a framework for linking mitigation measures with long-term climate adaptation, resiliency planning, and implementation. The plan provides information about activities at state agencies that are addressing risks and vulnerabilities from natural hazards and climate change and about how they are coordinating to ensure success. MassDOT and the MBTA are taking the following steps:

- The MBTA's Strategic Plan and Focus 40 goals explicitly address resiliency as a key priority for capital-planning projects.
- The MBTA is performing a complete system-wide vulnerability assessment.
- MassDOT developed the Boston Harbor Flood Risk Model for vulnerability and adaptation assessments of the Central Artery Tunnel. The data were made available to local and state agencies for identifying future high-risk areas and strengthening emergency management.
- MassDOT is developing the Mapping Our Vulnerable Infrastructure Tool (MOVIT), which contains data gathered from the institutional knowledge of maintenance engineers and others, to provide data on vulnerable assets for project review and prioritization.
- MassDOT is incorporating climate change resilience and adaptation into its asset management planning by creating an early environmental coordination checklist and conducting a complete evaluation of all vulnerability, environmental, transportation, and social datasets in the earliest project planning phases.

The MPO recognized the issue of climate change in its long-range transportation plan, *Destination 2040*, and emphasized the need to plan for resiliency in the transportation system to protect transportation investments. The MPO's goal is to incorporate regular consideration of climate change vulnerability and risk and adaptation strategies in transportation decision-making at system and project levels. Many elements of the transportation infrastructure designed to function under historical climate conditions are vulnerable to future weather extremes and climate change, and making them resilient could lead to lower maintenance and other costs, fewer service disruptions, increased safety, system preservation, and economic vitality.

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<sup>3</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan, September 2018

## Objectives

1. Increase MPO staff's familiarity with resiliency planning for transportation system infrastructure
2. Provide assistance to municipalities seeking to combat climate-related challenges
3. Incorporate resilience into MPO-funded discrete and recurring studies

## Work Description

The MPO staff will perform the following tasks in FFY 2020:

- Research previous work on climate change impacts and resilience
- Research and inventory data availability
- Conduct interviews and release a survey to identify climate change problems facing municipalities and best practices
- Select a vulnerable corridor and incorporate resilience planning
- Recommend ways for incorporating resilience into MPO-funded studies
- Document findings

### **Task 1 Research Previous Work on Climate Change Impacts and Resilience**

MPO staff will conduct an extensive literature review to research climate change impacts and adaptation options to protect vulnerable transportation infrastructure. Previous work completed by federal and state departments of transportation, educational and research institutions, MPOs, and municipalities will be synthesized to determine potential climate hazards, available data sources, vulnerable transportation assets, approaches used to identify vulnerabilities and adaptation options, and best practices. In addition, staff will ensure that the summary of the literature review provides information on state and municipal programs and plans and ongoing efforts so as to align this MPO work to support the goals and objectives of the Commonwealth.

#### *Products of Task 1*

- A summary of the literature review that will be included in the final report describing current and ongoing state and municipal efforts on climate change, resilience, and adaptation

- A summary of potential climate hazards and impacts on transportation assets, vulnerability assessments and adaptations options, and best practices regarding resilience and implementation

### **Task 2 Research and Inventory Data Availability**

Vulnerability assessments require a variety of data sources on transportation assets and climate change and extreme weather effects. MPO staff will identify data already available at Central Transportation Planning Staff and MassDOT and those that would be obtained from state and municipal entities. In addition, MPO staff will explore useful sources of information on climate data from other organizations that have experience developing or using climate projections, as these projections, models, and data sources are constantly evolving. Such data include projected climate data for extreme temperatures and precipitation, sea level rise, and coastal and riverine floods. MPO staff will also identify gaps in data sources to determine what necessary information is unavailable.

#### *Product of Task 2*

A summary of available data sources useful for vulnerability and adaptation assessments, climate change and extreme weather projections, and gaps in datasets

### **Task 3 Conduct Interviews and Survey**

Tasks 1 and 2 will increase the MPO staff's familiarity with climate change and resiliency and provide staff with knowledge and experience to develop a survey and interview municipalities in the Boston region.

The survey and interviews will enable the MPO staff to do the following:

- Identify climate change-related problems facing municipalities
- Compile a list of projects and initiatives already in action in the municipalities
- Identify areas of support, assistance, and funding
- Identify policies and regulations that need to be enhanced to advance climate resiliency and adaptation efforts
- Determine the best practices for vulnerability and adaptation assessments, and generate ideas for adapting to climate change impacts
- Gather information about critical transportation assets in the Boston region

#### *Product of Task 3*

A summary of the survey and interview process, including climate change-related problems in the Boston region communities, critical assets, policies and regulation issues, data sources, and analysis tools

#### **Task 4 Select a Vulnerable Corridor and Incorporate Resilience Planning**

MPO staff will select a corridor vulnerable to extreme weather effects, conduct a general vulnerability assessment, and identify adaptation options. The selected corridor will have multimodal transportation options and be critical to the transportation system in the Boston region. There must be sufficient data on the transportation assets and projected climate and extreme weather effects to conduct the assessments and develop adaptation options. This task will provide MPO staff with ideas of how to use available resources effectively to incorporate resilience into MPO-funded intersection and corridor studies and support the cities and towns in transportation resilience projects.

##### *Products of Task 4*

- List of criteria used to select the corridor
- Results of the vulnerability and adaption assessments, and lessons learned about incorporating resiliency into intersection and corridor studies

#### **Task 5 Recommend Ways for Incorporating Resilience into MPO-funded Studies**

Based on the literature review, information gathered from the survey and interviews, data availability, and analyses, MPO staff will recommend approaches for incorporating resilience into MPO-funded discrete and recurring studies and provide technical assistance to communities. The recommendations would outline steps that the MPO could follow to support transportation resiliency projects in the Boston region.

##### *Products of Task 5*

- Recommendations and framework for incorporating resiliency into MPO-funded studies
- Outline steps that the MPO could follow to support or fund transportation resiliency projects in the Boston region

#### **Task 6 Document Findings**

Staff will submit a report on the background of the study, research on previous work, agency and municipal input, data collection and sources, analyses of vulnerability and adaptation options, best practices, and recommendations to support municipalities seeking to combat climate-related challenges on transportation assets. The final document will be presented to the MPO board.

##### *Products of Task 6*

A final report documenting all of the project's tasks and products, including recommendations and steps that the MPO could take to support transportation resiliency projects in the Boston region

**Exhibit 1**  
**ESTIMATED SCHEDULE**  
**Exploring Resilience in MPO-Funded Corridor and Intersection Studies**

Task	Month												
	1	2	3	4	5	6	7	8	9	10	11	12	
1. Research Previous Work on Climate Change Impacts and Resilience	█												
2. Research and Inventory Data Availability		█											
3. Conduct Interviews and Survey			█										
4. Select a Vulnerable Corridor and Incorporate Resilience Planning					█								
5. Recommend Ways for Incorporating Resilience into MPO-funded Studies							█						
6. Document Findings	█ A												

Products/Milestones  
 A: Final report

**Exhibit 2****ESTIMATED COST****Exploring Resilience in MPO-Funded Corridor and Intersection Studies**

<b>Direct Salary and Overhead</b>	<b>\$89,578</b>
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Task	Person-Weeks					Direct Salary	Overhead (102.11%)	Total Cost
	M-1	P-5	P-4	Temp	Total			
1. Research Previous Work on Climate Change Impacts and Resilience	0.5	1.5	0.0	2.0	4.0	\$4,967	\$5,072	\$10,039
2. Research and Inventory Data Availability	0.5	1.5	1.0	2.0	5.0	\$6,413	\$6,549	\$12,962
3. Conduct Interviews and Survey	0.5	2.0	0.0	2.0	4.5	\$5,961	\$6,086	\$12,047
4. Select a Vulnerable Corridor and Incorporate Resilience Planning	0.5	3.0	1.0	1.5	6.0	\$9,129	\$9,321	\$18,450
5. Recommend Ways for Incorporating Resilience into MPO-funded Studies	0.5	2.0	0.5	1.3	4.3	\$6,313	\$6,447	\$12,760
6. Document Findings	3.0	3.0	0.0	0.0	6.0	\$11,538	\$11,782	\$23,320
Total	5.5	13.0	2.5	8.8	29.8	\$44,322	\$45,257	\$89,578

<b>Other Direct Costs</b>	<b>\$422</b>
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Travel	\$422
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<b>TOTAL COST</b>	<b>\$90,000</b>
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**Funding**

MPO 3C Planning and §5303 Contract #108217