

# 5

## Initiatives Recommended for Implementation

The breakout sessions conducted during the Climate Change Summit and discussion at the Summit Leadership Session generated numerous ideas to enhance MassDOT's climate preparedness and mitigation efforts. Of the several initiatives identified, MassDOT selected nine initiatives for implementation. MassDOT will work in conjunction with many partner agencies to further develop and implement the selected initiatives.

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### Initiatives: Opportunities, Challenges, and Policy

This chapter discusses the initiatives identified for implementation and their consistencies with goals included in the *GreenDOT Implementation Plan*<sup>1</sup>. This section also includes a discussion on potential opportunities and challenges for each initiative. **Table 5-1** includes a list of the initiatives and identifies responsible parties and timeframes.

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Initiative ID L-1/SI-4 Capture and document institutional knowledge on vulnerabilities from staff through exit interviews and the Mapping Our Vulnerable Infrastructure Tool (MOVIT)

MassDOT employees possess detailed knowledge of historical weather events and critical infrastructure vulnerabilities. It is important to obtain and record this institutional knowledge to avoid and minimize the impacts of extreme weather events.

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<sup>1</sup> MassDOT. 2012. *GreenDOT Implementation Plan*.  
<https://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/finalImplementation/FinalImplementationPlan12.12.12.pdf>.  
Accessed October 12, 2015.



MassDOT will capture geospatial data on existing vulnerabilities through its new Mapping Our Vulnerable Infrastructure Tool (MOVIT). MOVIT is a web-based application that will capture this information from staff on an on-going basis and prior to leaving the agency. MassDOT will develop an effective vulnerability and adaptation data collection process as part of the Statewide Vulnerability Assessment Project (see Appendix B, *Climate Change Project Fact Sheets*) and will use the MOVIT application to capture and store spatial data.

Following the Statewide Vulnerability Assessment, MassDOT will continue to collect institutional knowledge from personnel on an on-going basis and prior to leaving the organization. MassDOT Environmental Services has developed exit interview questions, provided in Appendix A, *Proposed Exit Interview Questions*, to facilitate the data collection process. This will result in mapped vulnerability data that will be used in the Massachusetts Project Planning System (MaPPS) and Early Environmental Coordination Checklist review processes.

This initiative will provide the opportunity to identify existing infrastructure vulnerabilities, ensure that adaptation actions are taken, and communicate needs to responsible staff. Identification of vulnerabilities and adaptation strategies will augment the State's asset database, strengthen infrastructure, and better ensure the ability to respond to extreme weather events. This initiative supports GreenDOT's goal to improve ecological function of water systems to adapt to climate change resilience.

This initiative includes:

- Developing a system to obtain institutional knowledge from MassDOT employees as part of the Statewide Vulnerability Assessment, on an on-going basis, and prior to leaving the agency;
- Collecting and compiling data through the use of MOVIT; and
- Routinely processing and analyzing the data for utilization in asset management and planning efforts.

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Initiative ID L-2/SIII-5 Incorporate climate change adaptation into MassDOT Highway Division asset management system and process and coordinate asset management across divisions and partner agencies

Asset management is an essential framework and tool that evaluates and manages current system conditions to make informed decisions about allocating resources and balancing critical infrastructure needs. The MassDOT Highway Division asset management system currently consists of five working groups (policy, clearinghouse, data, location of assets, and collection methodology) that evaluate and address many risks facing MassDOT infrastructure. The MassDOT Highway Division developed a Transportation Asset Management Program (TAMP), which was recently submitted



to legislature for review. The Transportation Asset Management Report outlined the inventory and condition analysis efforts of the Highway Division for state owned bridges and pavement in order to improve and preserve the National Highway System.

This initiative calls to incorporate climate change considerations into the MassDOT Highway Division's asset management system and process, with a focus on assets that serve multiple agencies and support operations, safety, emergency service, and economic priorities. Data generated from the on-going vulnerability assessments and existing data collection methods such as LIDAR mapping, culvert mapping, and operations and maintenance records will help flag and prioritize vulnerable infrastructure. As a result, this initiative will support the GreenDOT Implementation Plan goal to improve the ecological function of water systems under the task, "adapt facilities for climate change resilience."

At the Climate Change Summit Leadership Session, it was recognized that more crossover is needed among MassDOT divisions and partner agencies to discuss asset management best practices, identify opportunities to consolidate similar efforts, and leverage contracts to achieve similar goals. As part of this initiative, MassDOT should establish a mechanism for regular communication among the asset management groups within MassDOT and partner agencies. A description of the asset management systems employed by the MBTA, MassDOT Aeronautics and Massport is provided below to facilitate this effort:

**MBTA:** The MBTA procured a core Enterprise Asset Management (EAM) System, Trapeze EAM, to manage all infrastructure assets. The MBTA has made several strategic investments in procuring professional services and additional software to create accurate revenue and non-revenue, GIS based track maps to ensure data population, integrity, validation, and database support for the linear track inventory part of the system. The GIS-based track maps identify all assets along its rights of way with the help of LIDAR. These data, when transposed upon a topographical weather critical map, will aid MassDOT's wider efforts to model state critical assets for climate change and vulnerability. The MBTA Asset Management Program manages multiple categories of assets across the network that have a direct correlation to climate resiliency. For example, it will use risk to evaluate the impact of climate change and resiliency on operational and safety critical assets. The MBTA staff will be trained to conduct such assessments as part of the Asset Management Programs Subject Matter Expert Training curriculum.

**Aeronautics:** The Aeronautics Division coordinates aviation policy in the Commonwealth and oversees the state's public-use general aviation airports, private-use landing areas, and seaplane bases. The Aeronautics Division does not own or operate any of these airports and does not have an established Asset Management program. However, the Aeronautics Division has worked with agencies



such as the State Police Fusion Center in the past to identify critical assets (such as fuel depots) that exist at municipally-owned airports.

**Massport:** At Massport, the EAM program is used to manage asset and infrastructure. The EAM is designed to deliver a program for preventative and corrective maintenance procedures including preventative maintenance forecasting, labor management and scheduling, and inventory management. At its core are the applications Maximo, by IBM, and the Extend7000 mobile solution, by Schad. As the EAM program matures, it will be used to establish reliability centered on maintenance programs for major assets and systems and provide vital asset information using life-cycle analysis to maximize asset replacement scheduling

This initiative includes:

- Developing methods to identify and prioritize essential Highway Division infrastructure;
- Incorporating climate change adaptation into Highway Division asset management working group responsibilities; and
- Coordinating asset management across MassDOT Divisions and partner agencies.

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Initiative ID L-3 Utilize the Boston Harbor Flood Risk Model and data from the vulnerability assessments to identify current and future high risk areas and strengthen emergency management with local, state, and federal agencies

As climate change impacts worsen in the future, transportation infrastructure will become more vulnerable. Assets that were degraded by past storm events will become increasingly susceptible to failure. Preemptive vulnerability identification and emergency response coordination are critical steps in preparing for extreme storm events.

Many agencies are currently involved in emergency coordination and meet on a regular basis. These agencies include MEMA, FEMA, MassDOT, DCR, USGS, and the National Weather Service (NWS). USGS and DCR operate river and tide gauges and collect water elevation data. The NWS monitors precipitation and water elevations. The Northeast River Forecast Center provides 3- and 5-day flood forecasts, and alerts a network of agencies when water elevations are forecast to reach dangerous levels.

During extreme weather events, the state Emergency Operations Center (EOC) located in Framingham serves as the center for operations control. MassDOT personnel are present in the EOC, serving as members of MEMA's Emergency Support Function (ESF) team prior to, during, and after storms to assist in emergency management and recovery as it relates to transportation. MassDOT responds to assistance requests received by MEMA from municipalities during and following



emergency events, providing equipment (and operators) such as plows, sandbags, jersey barriers, and front-end loaders. This effort is often done in coordination with the Massachusetts National Guard.

In the metro Boston area, DCR's Engineering Division operates flood control dams on the Charles and Mystic Rivers and coordinates with the MBTA for flood warnings on the Muddy River in the Brookline Longwood area. When the USGS Muddy River stream gauge approaches flood levels, the Kendall Green Line Station is prepared for closure and a temporary dam is constructed at the tunnel to prevent flood damage. MassDOT also participates in emergency response at the Boston EOC. The Army Corps of Engineers is currently constructing a flood relief system in this area.

Following storms that cause river erosion and landslides, the Office of the State Geologists assists MassDOT in characterizing the geomorphologic causes of these impacts. FEMA often retains the USGS to mark high water levels and subsequently re-delineate flood zones.

Following the Climate Change Summit, coordination with DCR indicated that gaps in instrumentation and data exist in flood prediction and emergency management. For example, USGS and DCR operate a network of stream and tide gauges throughout Massachusetts. However, a significant number of these gauges do not have corresponding flood stage values associated with the water body. This essentially renders the gauge information unusable in the effort of flood forecasting and urban flash flood warning.

This initiative calls to engage local, state, and federal agencies to strengthen storm event and post storm event emergency management. The Boston Harbor Flood Risk Model and data generated by the various vulnerability assessments will be utilized to identify current and future high-risk areas, plan hazard response tasks and identify impacts to evacuation routes. As part of this initiative, MassDOT will coordinate with DCR, USGS, and other agencies to help fill existing gaps in instrumentation and data where possible.

This initiative includes:

- Coordinating with cooperating agencies such as MEMA, FEMA, DCR, USGS, and NWS to strengthen emergency management;
- Using the Boston Harbor Flood Risk Model and data generated from the vulnerability assessments to identify emergency situation vulnerabilities and identify evacuation routes;
- Working with DCR, USGS, and other cooperating agencies to identify and address water elevation instrumentation, data, and other needs; and
- Inter-agency coordination on climate change data including a process for requesting data and streamlining data transmittal.



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### Initiative ID L-4/SII-22 Leverage permit granting authority and ability to influence Section 61 findings to promote mitigation

In 2009, the Massachusetts legislature signed the Healthy Transportation Compact (HTC) into law as part of transportation reform. The Compact aims to adopt best practices that increase efficiency and improve health by coordinating land use, transportation and public health policy efforts. MassDOT also promotes Complete Streets, a design approach that seeks to increase the safety and comfort of all roadway users. MassDOT includes accommodations in line with HTC and Complete Streets where feasible, but many private development projects do not include bicycle and pedestrian facilities and limit transit options.

This initiative promotes the goals outlined in the HTC and Complete Streets by seeking to ensure that MassDOT bicycle and pedestrian requirements are met on private development projects. Land use agencies and MassDOT can influence private development plans during the permitting processes to incorporate multi-modal/alternative transit options into projects. This initiative is consistent with the GreenDOT Implementation Plan goals to design a multi-modal transportation system, promote healthy transportation and livable communities and triple bicycling, transit, and walking mode share.

This initiative includes:

- Reviewing private development plan submittals through the Massachusetts Environmental Policy Act (MEPA) review or other regulatory processes to determine if proposals include multi-modal facilities in line with the HTC and Complete Streets; and
- Working with developers and providing comments on proposals requiring the inclusion of multi-modal facilities.

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### Initiative ID L-6/SIII-2 Evaluate environmental regulation and permitting processes to address major challenges to climate change adaptation and mitigation projects, and identify opportunities to streamline permitting

Adaptation and mitigation projects can sometimes trigger lengthy and problematic regulatory reviews and permitting processes, depending on the environmental resources present at the site. As a result, design alternatives that feature climate change adaptation components and some types of mitigation projects may be dismissed. The number of environmental regulations involved during project permitting, particularly for climate change adaptation and mitigation projects, are numerous and often regulate many of the same resources.

This initiative seeks to coordinate with state and federal agencies to address current regulatory road blocks involved in climate change adaptation and mitigation projects



and identify opportunities to streamline permitting processes. As part of this initiative, working group(s) representing state and federal agencies will be developed and past examples of streamlining processes will be evaluated to adopt best practices. This effort will facilitate the delivery of climate change adaptation and mitigation projects in a cost effective and timely manner.

This initiative is consistent with the GreenDOT Implementation Plan goals to enhance ecological performance of MassDOT impacted land and to improve the ecological function of water systems.

This initiative includes:

- Developing working group(s) representing state and federal agencies;
- Examining environmental regulation and permitting processes to identify and address major challenges to climate change adaptation and mitigation projects;
- Evaluating current permitting processes to identify streamlining opportunities; and
- Analyzing past examples of streamlining mechanisms to determine best practices.

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#### Initiative ID L-7- Pilot Deerfield Watershed Stream Crossing Resilience Program

Stream crossing and culvert maintenance are critical components in the development of resilient infrastructure. However, replacing undersized culverts with adequately sized ones can be cost prohibitive. During the Climate Change Summit Leadership Session, participants discussed the development of a statewide culvert purchasing program to promote climate change adaptation. This program would involve state agencies and municipalities submitting an application and accompanying studies to an interagency panel demonstrating how the upgraded culvert would improve resiliency in that area. The applicant would then be awarded prefabricated culverts free of cost.

Prior to the publication of the 2015 Climate Change Summit Report, EEA informed MassDOT of a grant competition organized by the Department of Housing and Urban Development (HUD). The HUD National Disaster Resiliency Competition made available \$1 billion in funding to increase resiliency in areas that were damaged by federally declared disasters between 2011 and 2013.

In light of this potential funding opportunity, MassDOT Highway Division Environmental Services coordinated with the Chief Engineer's Office regarding the proposed culvert purchasing program to determine if this idea was feasible and practical to pursue. It was determined that because the cost of the culvert itself is



only a small portion of the overall cost of culvert replacements (the majority of the cost being permitting, delivery, and installation), this initiative was not practical.

During the coordination process, the concept of this initiative was changed to the development of a resiliency pilot program consisting of packaged culvert adaptation projects that would be designed and permitted by MassDOT in conjunction with the Department of Ecological Restoration (DER). This pilot program will leverage the data and decision support matrix resulting from the in-process Deerfield Watershed Vulnerability Assessment to identify and prioritize vulnerable road-stream crossings. The adaptation projects will integrate grey and green infrastructure to increase the structural integrity of MassDOT assets while providing streambed/bank restoration and habitat connectivity. This initiative will support the GreenDOT Implementation Plan goal to improve ecological function of water systems to adapt facilities to climate change.

This new initiative was included as part of the Commonwealth's application to the National Disaster Resiliency Competition. The application was submitted to HUD in October of 2015. Unfortunately, MassDOT was recently informed that the Commonwealth was not awarded funding under this grant opportunity. As such, MassDOT will seek an alternative funding source(s) to implement this initiative during its development process.

This initiative includes:

- Analyzing the Deerfield Watershed Vulnerability Assessment decision support matrix to identify priority adaption sites;
- Coordinating with DER, EEA, and other partner agencies to design and permit culvert adaptation projects integrating green and grey infrastructure; and
- Identify funding source(s).

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Initiative ID SI-3 Develop adaptation design guidance and other resources and provide training for project managers and design teams

MassDOT is currently conducting multiple studies, such as the Statewide Vulnerability Assessment, to identify vulnerable infrastructure. Once vulnerabilities are established, MassDOT will modify design guidance and accepted methodologies to increase infrastructure resilience. MassDOT will provide training to project managers and design teams to incorporate adaptation into project design. This initiative will support the GreenDOT Implementation Plan goal to improve ecological function of water systems under the task adapt facilities for climate change resilience.





This initiative includes:

- Identifying vulnerable infrastructure through completion of on-going studies;
- Developing resources, design guidance and accepted methodologies for designers to apply to projects in vulnerable areas; and
- Developing training and educating designers on new design guidance.

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Initiative ID SIII-1 Require a holistic evaluation of all vulnerability, environmental, transportation, and social data sets in the earliest project planning phases

Understanding a broad range of constraints and sensitive resources early in project planning ensures resilient infrastructure and helps avoid permitting issues later in the project development process. This initiative will also reduce the need to retrofit infrastructure for adaptation measures post-construction. MassDOT will vet and compile data sources including vulnerability data and leverage project planning tools such as MaPPS. MaPPS is a web-based GIS and project development tool that will bring together transportation, safety, environmental, and vulnerability data to help arrive at the most context sensitive design (see Chapter 2, *Overview of Climate Change Summit Presentations and Breakout Sessions*).

The holistic evaluation of a diverse range of data sets during project planning will support GreenDOT's goals to enhance ecological performance of MassDOT impacted land and improve ecological function of water systems.

This initiative includes:

- Identifying and developing data sources for project planning; and
- Providing guidance to planning and design teams on acceptable data and best use of data.

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Initiative ID SIII-1a Incorporate sustainability and resiliency review items into the Early Environmental Coordination Checklist

This initiative closely relates to and complements Initiative ID SIII-1. MassDOT Highway Division requires that designers complete and submit an Early Environmental Coordination Checklist (EECC) with backup information and explanations regarding public involvement, regulatory requirements, and project context. This is a key step in the project planning process described previously. Completion of this checklist and its requirements is necessary for the project to obtain approval from MassDOT Highway Division Environmental Services and proceed with a 25 percent Design Public Hearing. Modifications to the EECC will



prompt designers to consider sustainability and climate change adaptation in their design and result in more sustainable and resilient infrastructure.

By incorporating resiliency into the EECC, this initiative will support GreenDOT's goal to improve ecological function of water systems under the task adapt facilities for climate change resilience.

This initiative includes:

- Establishing sustainability (climate change mitigation) and climate change adaptation questions for incorporation into the EECC;
- Developing instructions and guidance for design teams on best available data and established methodologies;
- Educating designers on modifications to the EECC and best practices.

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## Implementation Timelines

MassDOT has categorized initiatives for implementation by timeframe. The implementation timeframes (**Table 5-1**) include:

- Short-term, 0 to 2 years;
- Medium-term, 2 to 5 years; and
- Long-term, 5+ years.



**Table 5-1 Initiatives Selected for Implementation**

ID	Initiative	Responsible Party and Timeframe
L-1/SI-4	Capture and document institutional knowledge on vulnerabilities from staff through exit interviews and the Mapping Our Vulnerable Infrastructure Tool (MOVIT)	<ul style="list-style-type: none"> <li>▪ MassDOT Office of Transportation Planning</li> <li>▪ MassDOT Highway Division Environmental Services</li> <li>▪ Environmental Compliance Coordinators (conducted June 2015 ERIP interviews)</li> </ul> <p><b>Short-term, 0 to 2 years</b></p>
L-2/SIII-5	Incorporate climate change adaptation into MassDOT Highway Division asset management system and process and coordinate asset management across divisions and partner agencies	<ul style="list-style-type: none"> <li>▪ MassDOT Highway Division Asset Management Steering Committee</li> <li>▪ MBTA Commissioner</li> <li>▪ MassDOT Highway Division Assistant Chief Engineer’s Office</li> </ul> <p><b>Medium-term, 2 to 5 years</b></p>
L-3	Utilize the Boston Harbor Flood Risk Model and data from the vulnerability assessments to identify current and future high risk areas and strengthen emergency management with local, state, and federal agencies	<ul style="list-style-type: none"> <li>▪ MassDOT Highway Division Environmental Services</li> <li>▪ MassDOT Operations and Maintenance</li> <li>▪ FEMA/MEMA</li> <li>▪ USGS</li> <li>▪ DCR</li> <li>▪ NWS</li> <li>▪ Municipalities</li> <li>▪ U.S. Coast Guard</li> </ul> <p><b>Medium-term, 2 to 5 years</b></p>
L-4/SII-22	Leverage permit granting authority and ability to influence Section 61 findings to promote mitigation	<ul style="list-style-type: none"> <li>▪ MassDOT Office of Transportation Planning</li> </ul> <p><b>Medium-term, 2 to 5 years</b></p>



**Table 5-1 Initiatives Selected for Implementation**

L-6/SIII-2	Evaluate environmental regulation and permitting processes to address major challenges to climate change adaptation and mitigation projects, and identify opportunities to streamline permitting	<ul style="list-style-type: none"> <li>▪ MassDOT Highway Division Environmental Services</li> <li>▪ USACE</li> <li>▪ FEMA</li> <li>▪ U.S. Coast Guard</li> <li>▪ EEA-MassDEP and MEPA</li> <li>▪ Municipalities</li> <li>▪ CZM</li> </ul> <p><b>Long-term, 5+ years</b></p>
L-7	Pilot Deerfield Watershed Stream Crossing Resilience Program	<ul style="list-style-type: none"> <li>▪ MassDOT Highway Division Environmental Services</li> <li>▪ DER</li> </ul> <p><b>Medium-term, 2 to 5 years</b></p>
SI-3	Develop adaptation design guidance and other resources and provide training for project managers and design teams	<ul style="list-style-type: none"> <li>▪ MassDOT Highway Division Environmental Services</li> <li>▪ MassDOT Highway Division Assistant Chief Engineer</li> <li>▪ MassDOT Chief Engineer’s Office</li> </ul> <p><b>Long-term, 5+ years</b></p>
SIII-1	Require a holistic evaluation of all vulnerability, environmental, transportation, and social data sets in the earliest project planning phases	<ul style="list-style-type: none"> <li>▪ MassDOT Office of Transportation Planning</li> <li>▪ MassDOT Highway Division Environmental Services</li> </ul> <p><b>Medium-term, 2 to 5</b></p>
SIII-1a	Incorporate sustainability and resiliency review items into the Early Environmental Coordination Checklist	<ul style="list-style-type: none"> <li>▪ MassDOT Highway Division Environmental Services</li> </ul> <p><b>Short-term, 0 to 2 years</b></p>