massDOT
Massachusetts Department of Transportation

Research and Technology Transfer

ANNUAL REPORT

FFY2020

Massachusetts Department of Transportation
Office of Transportation Planning

Report contains information as of July 2021

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Executive Summary

The Massachusetts Department of Transportation (MassDOT) is committed to addressing, maintaining and evolving the transportation needs of the Commonwealth through a wide range of research and training programs. This commitment relies on development and fulfillment of established and creative solutions that address critical transportation factors such as data management, implementation and innovation. The COVID-19 pandemic during most of Federal Fiscal Year 2020 (FFY20) led MassDOT to rethink how the agency should continue to conduct business in an effective and efficient manner. This provided MassDOT with an opportunity to not only take an alternative approach with their programs and projects, but to also look through a different lens regarding the current and future landscape of the transportation industry. Through the virtual nature of hosting outreach meetings and training sessions, MassDOT was able to quickly evolve and maintain a steady route of communication, both internally as well as in public and private partnerships. The shift included the methods in which research, trainings, and the transfer of knowledge were conducted throughout the statewide transportation industry.

With this shift in the delivery of relevant and instructive information, trainings and conferences were conducted in a virtual manner. Research Roundtables, designed to connect MassDOT personnel with researchers in order to develop potential research problem statements, also took a virtual form. Business as usual continued, even though the delivery methods quickly shifted to accommodate a telework workforce.

Regardless of a need to shift how research was conducted, FFY20 saw an increase in research projects with 11 new projects taking form. The new transportation research topics ranged from how to best extend the life of concrete sidewalks and 3D printing of transportation infrastructure, to the effectiveness of bike boxes in the Commonwealth. These new projects, coupled with the continuation of training programs, highlighted MassDOT's commitment to formalizing innovative transportation concepts in order to better the Commonwealth's transportation infrastructure for years to come.

A look back at FFY20 showcases many milestones including:

- Initiating 11 new research projects
- Implementing research results from the three projects completed during FFY20 at MassDOT
- Presenting one annual statewide conference and one virtual, abridged statewide webinar series
- Delivering 96 Baystate Roads Program sessions to 3,515 municipal employees, and
- Providing 28 MassDOT Training Service classes to 739 MassDOT participants

This report not only highlights research and training milestones, it showcases the collaborative techniques used to create and share transportation research and trainings throughout Massachusetts. The report also illustrates MassDOT's continuing commitment to the improvement of the Commonwealth's highway transportation infrastructure and transit mobility services.

Activities documented in this report are predominantly funded with State Planning and Research Funds (SP&R) Part II funds from the Federal Highway Administration (FHWA). Each year MassDOT develops its SP&R Work Program to plan out planning and research activities funded through the Federal Highway Administration SP&R funds as authorized by Title 23, U.S. Code, Section 505, and regulated by Title 23, Code of Federal Regulations (CFR), Part 420. The contents do not necessarily reflect the official view or policies of the Massachusetts Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation

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Mission & Vision

MassDOT provides research, training, and technology transfer services to a broad audience of municipal, state, and academic partners in order to support various statewide needs and initiatives. Research activities, mostly driven by internal needs, address key problems and issues in the areas of policy, management, safety, environment, planning, engineering, construction, operations, and maintenance as those areas relate to the Commonwealth's responsibilities for the state highway, public transportation, and inter-modal transportation systems. Activities can range from support services for technology transfer to large-scale, multi-year research projects on complex problems that require technical assistance from outside resources.

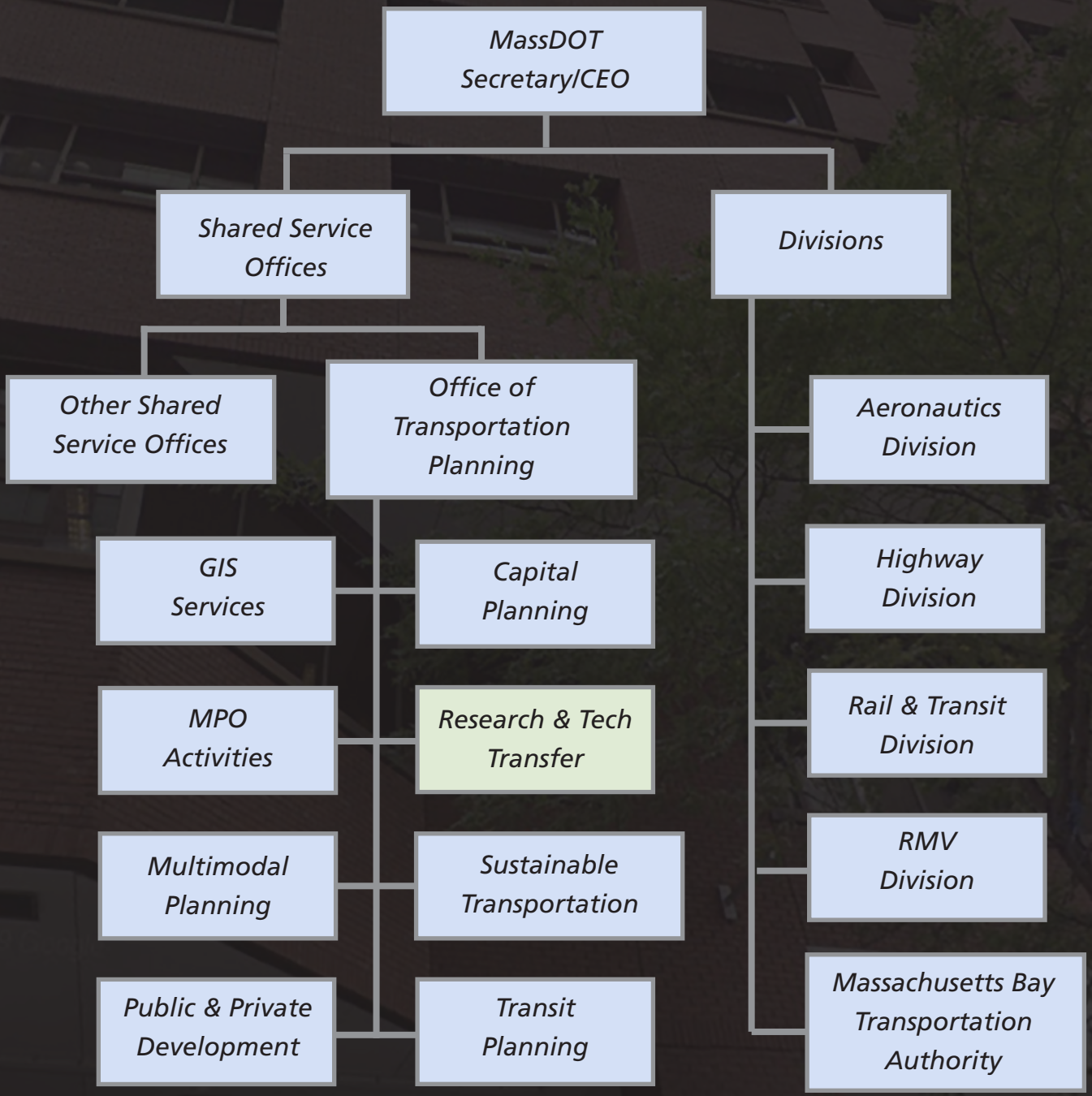
As transportation in Massachusetts is constantly evolving, the development of solutions through applied research, and the dissemination of best practices and knowledge through training helps shape and respond to the changing transportation landscape. Collaborative efforts within these two platforms help the Commonwealth economize resources and funding as we look towards influencing the transportation systems for years to come.

Through an Interdepartmental Service Agreement (ISA), MassDOT partners with the University of Massachusetts Transportation Center (UMTC) to provide services in three areas:

- Massachusetts Cooperative Research Program (MCRP)
- Baystate Roads (the Massachusetts Local Technical Assistance Program)
- MassDOT Training Services (MTS, technical trainings for Highway Division staff)

Our Team

MassDOT's Transportation Research and Technology Transfer Section is in the Office of Transportation Planning. Collaborating with Divisions and other Share-Service Offices, the Research Section organizes its core activities relating to highway, public transportation, and intermodal transportation systems in accordance with the provisions of 23 U.S.C. 505(b).



10 Park Plaza, Suite 4160, Boston, MA 02116
mass.gov/orgs/massachusetts-department-of-transportation

Program Components and Funding

Research

The purpose of the research program is to organize and manage the SPRII research program, conduct internal and external outreach activities and administer associated contracts. The Research Section carries out its initiatives by soliciting and prioritizing MassDOT's research needs in collaboration with MassDOT Divisions and Shared Service Offices, facilitating principal investigator identification, conducting research contracts, and tracking project performance and implementation efforts and impacts.

Research activities address key problems and issues in the areas of policy, management, safety, environment, planning, engineering, construction, operations, and maintenance as those areas relate to the Commonwealth's responsibilities for the state highway, public transportation, and inter-modal transportation systems. Activities can range from support services for quick literature searches and state-of-practice syntheses to large scale, multi-year research projects on complex problems requiring technical assistance from outside resources.

Through the MCRP component, MassDOT directs, coordinates, and oversees the UMTC research staff, which provide request research support services such as: research project solicitation; principal investigator searches; research task management and administration assistance; support in national and regional collaboration; literature searches and reviews; and on-demand access to experts in transportation engineering, planning, policy, etc.).

Short-, Medium- and Long-term Research Projects

- Separate ISA/Contract
- Generated through annual research solicitation process
- State universities or other research entities

Synthesis & Quick Turn-around Projects

- UMass ISA
- MassDOT research staff
- Can be outside of the solicitation process

National & Regional Cooperation

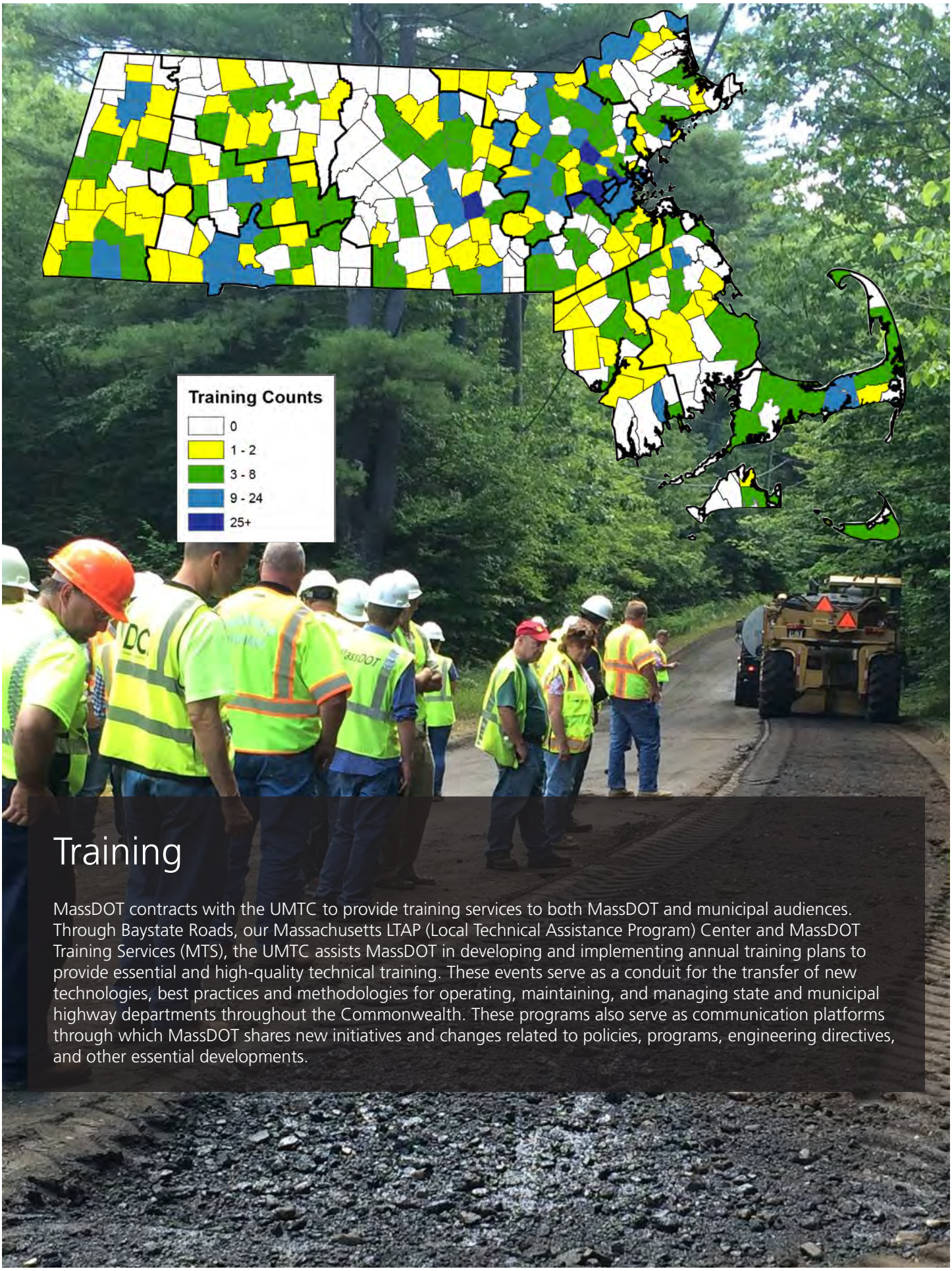
- NCHRP
- NETC
- Other TPFs

Additional Research Services

- Literature search through UMTC
- RAC survey

NYTimes.com

Interdepartmental Service Agreement (ISA); National Cooperative Highway Research Program (NCHRP); New England Transportation Consortium (NETC); Transportation Pooled Funds (TPF); Research Advisory Committee (RAC).



Training

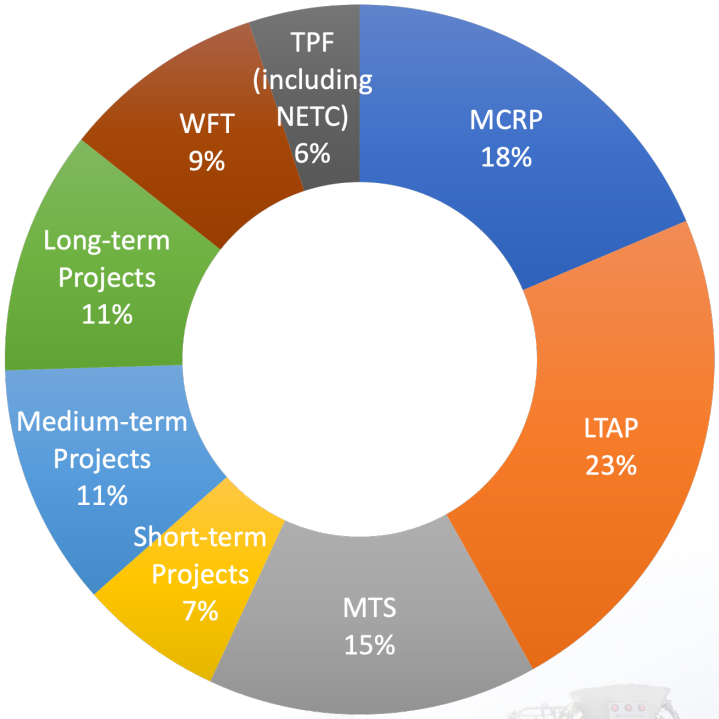
MassDOT contracts with the UMTC to provide training services to both MassDOT and municipal audiences. Through Baystate Roads, our Massachusetts LTAP (Local Technical Assistance Program) Center and MassDOT Training Services (MTS), the UMTC assists MassDOT in developing and implementing annual training plans to provide essential and high-quality technical training. These events serve as a conduit for the transfer of new technologies, best practices and methodologies for operating, maintaining, and managing state and municipal highway departments throughout the Commonwealth. These programs also serve as communication platforms through which MassDOT shares new initiatives and changes related to policies, programs, engineering directives, and other essential developments.

FFY2020 Program Funding

Each year MassDOT develops its State Planning and Research (SP&R) Work Program to coordinate planning and research activities funded through the Federal Highway Administration as authorized by Title 23, U.S. Code, Section 505, and regulated by Title 23, Code of Federal Regulations (CFR), Part 420. Part II of this work program details how MassDOT will use these funds to conduct research and technology transfer activities in the next federal fiscal year.

Research projects that come out of the MassDOT annual research solicitation process and the off-cycle special request process are assigned to one of the five categories: quick turn-around (<12 months), short-term (<15 months), medium-term (15-21 months) long-term (>21 months), and transportation pooled fund studies (TPF) with FHWA and other state DOTs. Through these innovative research projects, MassDOT's transportation research program continues to support a safe, equitable, and efficient transportation network in the Commonwealth.

FFY20 State Planning and Research Program II



- MA Cooperative Research Program (MCRP)
- Local Technical Assistance Program (LTAP)
- MassDOT Training Services (MTS)
- Short-term Research Projects
- Medium-term Research Projects
- Long-term Research Projects
- Work Force Training (WFT)
- Transportation Pooled Funds (TPF) including New England Transportation Consortium (NETC)

Research Highlights

MassDOT Annual Research Project Solicitation Process and Research Roundtables

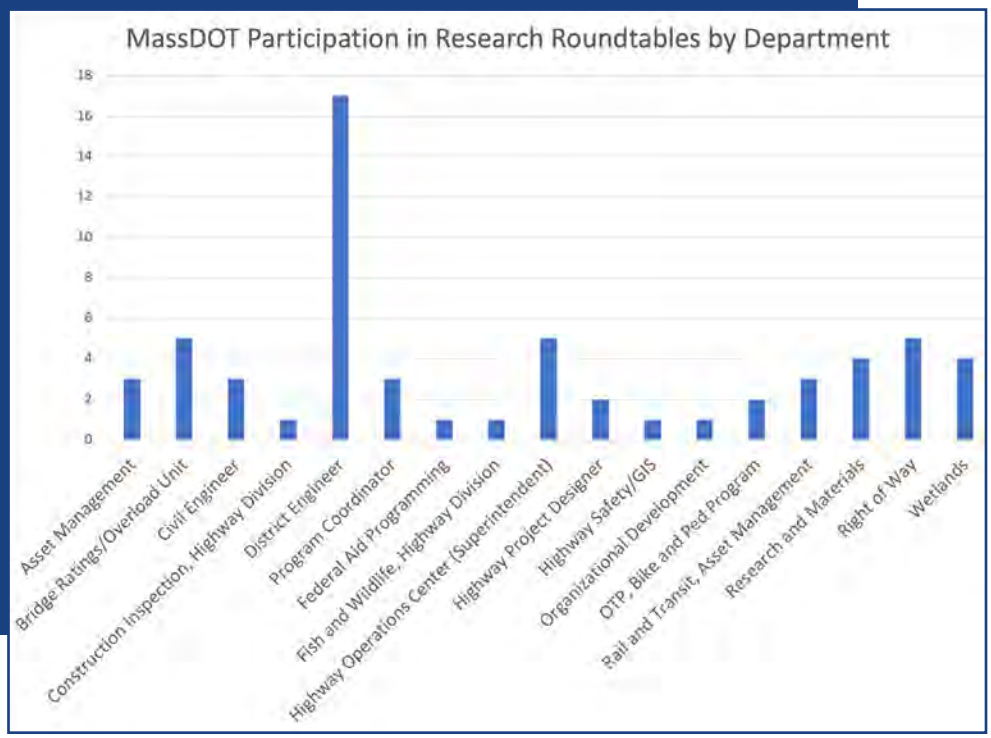
MassDOT's annual process of soliciting and selecting research projects for the coming fiscal year starts with a solicitation period to gather Research Problem Statements for potential future projects in surface transportation infrastructure or intermodal transportation, based on current internal needs and challenges. Each Research Problem Statement is submitted for consideration by a MassDOT or MBTA staff member who, if the project advances to receive funding, then serves as Project Champion (PC). The annual process includes outreach to state transportation practitioners and academic researchers.

MassDOT began holding Research Roundtables during the solicitation period in 2019. Research Roundtables provide a platform to connect state transportation practitioners with academic researchers, and to foster future collaborations between the two groups. The Research Roundtables also provide the participants with a baseline understanding of statewide transportation research needs.

The format of research outreach in 2020 was restructured due to COVID-19. With the pandemic forcing a change in group collaborative efforts and communication methods, MassDOT adapted and conducted its outreach virtually. Working with UMTC, MassDOT hosted five Research Roundtables online during the Spring 2020 solicitation period for FFY2021 Research Projects. The first Roundtable was a kickoff meeting where MassDOT presented an overview of the research project solicitation and selection process. The following four Roundtables provided a presentation of potential ideas, needs, and challenges that MassDOT staff members thought could be suitable for future research projects. In addition, academic researchers from around the Commonwealth briefly presented their areas of expertise, as well as their past and current transportation research. Each of these four Roundtables were centered around varying transportation themes, including:

- Covid-19 Impacts and Resilience (discussed at 3 sessions)
- Roadway Engineering, Safety, and Maintenance (1 session)
- Engineering, Design, and Asset Management (1 session)
- Construction, Materials, and Maintenance (1 session)
- Active Transportation, Mobility, Health, Safety, and Policy (1 session)

Combined, the sessions had a total of 140 attendees, and some researchers and MassDOT staff came to multiple sessions. The attendees included 33 individual MassDOT staff, 24 researchers from 5 universities, and 4 UMTC staff.



Research Recognition, Presentations, Publications

A MassDOT research project (completed in 2019) on Improving Pedestrian Infrastructure Inventory in Massachusetts Using Mobile LiDAR, was honored by the American Association of State and Highway and Transportation Officials (AASHTO) as one of the "Sweet Sixteen" high-value research projects for 2020 and featured in AASHTO's annual publication, "Research Makes a Difference." Headed by Dr. Chengbo Ai of UMass Amherst, this project demonstrated that mobile LiDAR data collection, combined with computer-aided algorithms, is a viable, cost-effective approach for updating sidewalk and curb ramp inventories and assessments. As a "Sweet Sixteen" project, this research was presented as a poster session for the 2021 Annual Meeting of the Transportation Research Board (TRB).

Dr. Chengbo Ai
UMass Amherst

At the 2020 Annual Meeting of the TRB, eight other MassDOT research projects were presented, including a 2019 AASHTO "Sweet Sixteen" project on the Performance of Adhesive and Cementitious Anchorage Systems.

Other MassDOT research presentations at the TRB meeting explored the following topics: Assessing the Impact of Transportation on Health: A Review of Performance Measures (study completed in 2020); Variability of Reclaimed Asphalt Pavement (RAP) Properties Within a State and Its Effects on RAP Specifications (2020); Transitioning to Zero-Emission Bus Fleets (2017); A New Methodology to Optimize Paratransit Services and Transportation Network Companies (TNCs) (2018); and Development of New Load Rating Procedures for Deteriorated Steel Beam Ends (study still in progress). There were also two TRB presentations based on MassDOT's research project on Application of Unmanned Aerial Systems (UAS) in Surface Transportation (completed in 2019), one presentation discussed the Development of a Drone Network for Traffic-Incident Response, and the other a Deep Neural Networks Approach for Runway Pavement Crack Segmentation Using Drone-Captured Images. This year, a research paper from the 2019 UAS study was published in the IET Intelligent Transport Systems journal. The paper focused on the Evaluation of Small UAS highway volume and speed-sensing applications. Also published in a peer-viewed research journal this year was a paper on the 2018 Left Behind Subway Passenger study.

Research Projects

Ongoing Research Projects

During Federal Fiscal Year 2020, each MassDOT research project followed the MassDOT research statement solicitation, review, and selection project process in an earlier year. As shown in the table below and in the brief project descriptions later in this section, together they cover a broad range of topics of interest to MassDOT. Each was selected because they were viewed as helping advance MassDOT's strategic goals and mission of "delivering excellent customer service to people traveling in the Commonwealth by providing transportation infrastructure that is safe, reliable, robust, and resilient" (https://www.mass.gov/orgs/massachusetts-department-of-transportation).

Active MassDOT Research Projects, FFY 2020

Short-Term Research Projects
1. Effectiveness of Bicycle Boxes in Massachusetts (In Progress)
2. Exploring Short-Sea Shipping as an Alternative to Non-Bulk Freight Trucking in Southeastern Massachusetts (In Progress)
3. Future of the Commonwealth's Curb (Completed)
4. Improved Load Rating Procedures for Deteriorated Steel Beam Ends with Deteriorated Stiffeners (Completed)
5. Energy Consumption, Cost, and Emissions of MBTA Rapid Transit Vehicles (In Progress)
6. Compost Blankets for Erosion Control and Vegetation Establishment (Completed)
Medium-Term Research Projects
1. Public Health Assessment for Transportation Projects (Completed)
2. Post-Fire Damage Inspection of Concrete Structures (Completed)
3. Implementing the AASHTO Mechanistic-Empirical Pavement Design Guide (Phase I) (Completed)
4. Feasibility of 3D Printing Applications for Highway Infrastructure Construction and Maintenance (In Progress)
5. Impact of Advanced Driver Assistance Systems (ADAS) on Road Safety and Implications for Education, Licensing, Registration, and Enforcement (In Progress)
6. A Pavement Marking Inventory and Retroreflectivity Condition Assessment Method Using Mobile LiDAR (In Progress)
7. Detecting Subsurface Void in Roadways Using UAS with Infrared Thermal Imaging (In Progress)
8. Use of UAS in Surface Transportation Emergency Incident Response (In Progress)
Long-Term Research Projects
1. Characterization of Reclaimed Asphalt Pavement (RAP) for HMA Surface Courses in Massachusetts (Completed)
2. Translating Data Generated by the Transit App into Insights on Transportation Use in Greater Boston (Completed)
3. Flexible Transit Services in Rural Areas (Completed)
4. Development of Comprehensive Inspection Protocols for Deteriorated Steel Beam Ends (Completed)
5. Understanding Asset Management Systems Utilized by Municipalities in Massachusetts (In Progress)
Cooperative Research Program Projects
1. Evaluating the Safety Impacts of Flashing Yellow Permissive Left-Turn Indications in Massachusetts (Completed)
2. Construction and Materials Best Practices for Concrete Sidewalks (Completed)

Short-Term Research Projects

Boston.gov

1. Effectiveness of Bicycle Boxes in Massachusetts

Principal Investigators:
Dr. Eleni Christofa
and Dr. Chengbo Ai,
UMass Amherst
MassDOT Project Champion:
Andrew Wilkins
Allocated Funding Amount:
$100,000

▶ Project Overview:

Bike boxes have been installed at several intersections in Massachusetts, but they have not yet been evaluated fully. This project conducted a comprehensive assessment of bike boxes, including how they are utilized by bicyclists, their impact on bicyclist and motorist safety, and which design characteristics of bike boxes are most effective.

▶ Main Research Objectives:

- Collect data on bicyclist behavior from various intersections, some with bike boxes and some without (for control), to assess whether bike boxes are being used as intended
- Perform a crash analysis using data from before and after the implementation of bike boxes to study their impact on bicyclist and motorist safety, including with regards to right-hook crashes
- Investigate how specific bike box design elements, such as pavement markings, impact bicyclist behaviors, and then develop guidelines on bike box designs which most effectively improve bicyclist and motorist safety

Timeframe: Expected Completion in September 2021

2. Exploring Short-Sea Shipping as an Alternative to Non-Bulk Freight Trucking in Southeastern Massachusetts

Principal Investigators: Kristin Uiterwyk, Jack Wiggin, Kim Starbuck, Allison Novelly, UMass Boston
MassDOT Project Champion: Benjamin Muller
Allocated Funding Amount: $100,000

▶ **Project Overview:**

Currently, freight shipping for the coastal areas of southeastern Massachusetts relies heavily on trucking, which has a relatively large environmental footprint in terms of roadway congestion and vehicle emissions. This project explored whether short-sea shipping, such as via coastal waterways, could be a viable alternative for some of the current truck shipping, especially for non-bulk freight transport destined to Martha's Vineyard.

▶ **Main Research Objectives:**

- Review existing waterborne freight practices and capacity in Massachusetts
- Analyze the feasibility of shifting some non-bulk freight shipping from trucking to waterborne modes, and of using additional harbors for freight shipping
- Estimate the traffic congestion and emissions impacts associated with a shift to more short-sea freight shipping in southeastern Massachusetts
- Assess the potential resulting economic and environmental impacts of such a shift

Timeframe: Expected Completion in August 2021

portstrategy.com

3. Future of the Commonwealth's Curb

Principal Investigators: Dr. Eric J. Gonzales and Dr. Shannon Roberts, UMass Amherst
MassDOT Project Champion: Derek Shooster
Allocated Funding Amount: $100,000

▶ **Project Overview:**

There are diverse, competing, evolving demands for the use of curb space in municipalities throughout Massachusetts. These demands come from transit, transportation network companies, pedestrians, delivery vehicles, and more. This project investigated current curb management practices, curb use patterns, needs, and concerns. It proposed a framework for communities to identifying appropriate curbside lane designs and management strategies based on different municipal contexts.

▶ **Main Research Objectives:**

- Explore current and projected demands on the curbside lane in municipalities across Massachusetts
- Identify strategies for re-purposing and managing the curbside lane to accommodate these demands,
- Develop recommendations for different strategies and curbside lane designs in different municipal contexts, based on factors such as population density, traffic volumes, and curb space demand patterns.
- Web link to Final Report: https://www.mass.gov/doc/improving-future-of-the-commonwealths-curb-final-report/download

Timeframe: Completed July 2021

4. Improved Load Rating Procedures for Deteriorated Steel Beam Ends with Deteriorated Stiffeners

Principal Investigators:
Dr. Simos Gerasimidis and
Dr. Sergio Breña, UMass Amherst
MassDOT Project Champion:
Alexander Bardow
Allocated Funding Amount: $100,000

▶ **Project Overview:**

This study builds upon earlier research by the same Principal Investigators regarding the inspection and evaluation of corroded steel beam ends on bridges. The purposes of this study were to experimentally test corroded deteriorated beams, analyze the stiffened beam-end corrosion topologies utilizing high-fidelity Finite Element Models (FEM), and then introduce updates for the MassDOT Bridge Manual's load rating procedures accordingly.

▶ **Main Research Objectives:**

- Identify the common shapes for and locations of stiffened steel beam end deterioration using data from inspection reports of bridges in Massachusetts
- Experimentally test real corroded stiffened beams from bridge replacement or rehabilitation projects
- Conduct computational work using FEM to validate the experimental findings
- Update the Bridge Manual guidelines with new load rating procedures for deteriorated steel beam ends

Timeframe: Completed July 2021

5. Energy Consumption, Cost, and Emissions of MBTA Rapid Transit Vehicle

Principal Investigators: Dr. Jimi Oke, Dr. Eleni Christofa, and Dr. Eric J. Gonzales, UMass Amherst
MassDOT Project Champion: Sean Donaghy, MBTA
Allocated Funding Amount: $123,000

▶ **Project Overview:**

This project aims to enhance the environmental sustainability of the MBTA's rapid transit network. The project utilized train position and energy consumption data first to develop and calibrate a predictive energy use model, and then created strategies for reducing the network's energy consumption, costs, and environmental impacts.

▶ **Main Research Objectives:**

- Analyze real-time train position, acceleration, and electric consumption data to quantify the energy use, costs, and subsequent emissions of an electric rail vehicle
- Develop metrics for energy use per vehicle mile to assist with planning for future energy demand and MBTA Operations & Maintenance budgets
- Demonstrate the potential of optimal drive cycle changes to reduce energy consumption, costs, and emissions

Timeframe: Expected Completion in August 2021

6. Compost Blankets for Erosion Control and Vegetation Establishment

Principal Investigator: Dr. Jack Ahern, UMass Amherst
MassDOT Project Champions: Stephanie Smoot and George Bachelor
Allocated Funding Amount: $100,000

▶ **Project Overview:**

This project focused on learning about the current use of compost blankets by state DOTs and others, and best practices for applying compost blankets to stabilize slopes and aid in native grass establishment on roadside slopes. This project reviewed the state of knowledge and existing best practices regarding the use of compost blankets for these purposes.

▶ **Key Findings:**

- Compost blanket particle size distribution is important for erosion control effectiveness.
- Compost blanket application is best performed with pneumatic blowers to assure even coverage Native grass/forb seed is best applied as a separate layer mixed with a compost layer.
- The timing of native species seeding is key to successful vegetation establishment on slopes.
- Web link to Final Report: www.mass.gov/doc/compost-blankets-for-erosion-control-and-vegetation-establishment-final-report/download

Timeframe: Completed April 2020

Medium-Term Research Projects

1. Public Health Assessment of Transportation Projects

Principal Investigators: Dr. Eleni Christofa, UMass Amherst; Dr. Krystal Pollitt, Yale University; Karin Valentine Goins and Dr. Stephenie Lemon, UMass Medical School
MassDOT Project Champions: Elliot Sperling and Michael Bolduc
Allocated Funding Amount: $166,000

▶ Project Overview:

Performance-based assessment of transportation projects related to public health factors is often missing from project evaluations. Health impact assessments require additional resources that are not always available. To address health more systematically, this project focused on identifying health metrics, tools, and data, and on developing a framework for assessing the health-related impacts of individual transportation projects and programs.

▶ Key Findings:

- The information gathered in this study led to the creation of eight new project evaluation criteria in the areas of air quality, accessibility, equity, physical activity, and safety.
- These criteria are recommended for incorporation into the MassDOT highway project scoring process.
- The research identified and documented existing collaborations between state departments of transportation and public health.
- The research identified remaining research needs and challenges related to incorporating public health factors into transportation decision making, including limited data sets and availability.
- Web link to Final Report: www.mass.gov/doc/public-health-assessment-for-transportation-projects/download

Timeframe: Completed February 2020

2. Post-Fire Damage Inspection of Concrete Structures

Principal Investigators:
Dr. Simos Gerasimidis and
Dr. Scott Civjan, UMass Amherst
MassDOT Project Champion:
John Czach
Allocated Funding Amount:
$100,000

▶ Project Overview:

Post-fire inspections of tunnels and decisions on subsequent tunnel closures can involve some uncertainty. Visual inspections to assess fire damage can be difficult as the extent of the damage may not easily be observable. This project seeks to improve the understanding of tunnel conditions post-fire. The study's results will be incorporated into the fire section of the MassDOT tunnel inspection guidelines.

▶ Main Research Objectives:

- Conduct an extensive literature review on fire impacts on concrete structures, with a focus on tunnels, and the residual capacity of fire-damaged concrete components
- Develop a flow chart/checklist that can be used as part of post-fire inspection protocols specific to MassDOT tunnel materials and components
- Create a preliminary experimental program to test sample materials at high temperatures, and assess testing feasibility
- Based on this preliminary testing, develop recommendations for a physical testing program, and future experimental research.
- Web link to Final Report: https://www.mass.gov/doc/post-fire-damage-inspection-of-concrete-structures-final-report/download

Timeframe: Completed June 2021

3. Implementing the AASHTO Mechanistic-Empirical Pavement Design Guide (Phase I)

Principal Investigator: Dr. Walaa Mogawer, UMass Dartmouth
MassDOT Project Champion: Edmund Naras
Allocated Funding Amount: $200,000

▶ Project Overview:

AASHTO's new Mechanistic-Empirical pavement design method (M-E design) has not yet been implemented at MassDOT. Once implemented, M-E design could enhance pavement design, performance, and resiliency. This research project to assist with implementation is proposed in four phases. This first phase (Phase I) focuses on re-calibrating the AASHTO M-E design models for predicting pavement distresses, to Massachusetts conditions. The original models were developed and calibrated nationally. Adjusting them for Massachusetts conditions will improve their accuracy in predicting pavement performance.

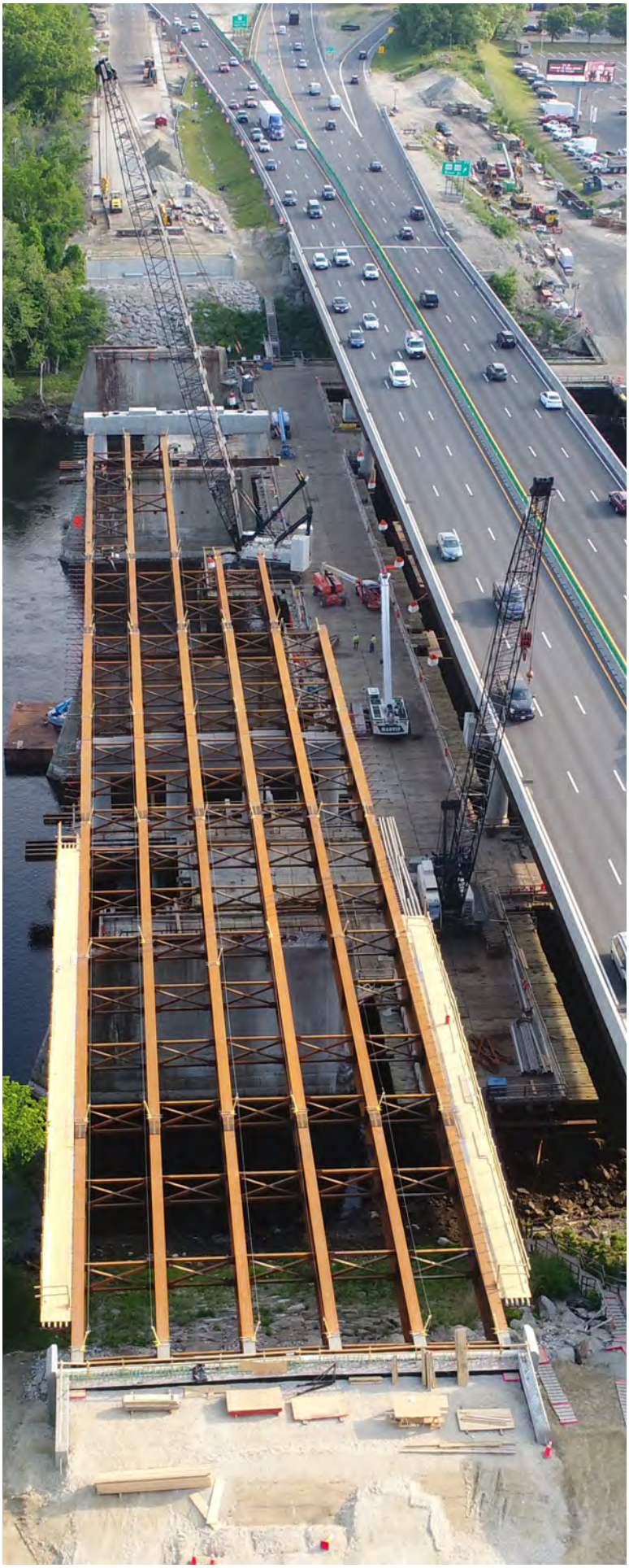
▶ Main Research Objectives for Phase I:

- Determine the overall state-of-practice of AASHTO M-E design and implementation, through a literature review and information gathering from state agencies that have successfully completed local calibration of the AASTHO M-E design models for predicting pavement distresses
- Conduct initial testing of already sampled mixtures to assist with future phases of this research
- Web link to the Final Report: https://www.mass.gov/doc/improving-the-long-term-condition of pavements-in massachusetts-and-determining-return-on-investment-implementing-the-aashto-mechanistic-empirical-pavement-design-guide-phase-1-final-report/download

Timeframe: Completed June 2021

Transportation.org

4. Feasibility of 3D Printing Applications for Highway Infrastructure Construction and Maintenance



Principal Investigators:
Dr. Simos Gerasimidis and
Dr. Wen Chen, UMass Amherst;
Dr. John Hart, Massachusetts Institute of Technology
MassDOT Project Champions:
Paul Tykodi and Catherine H. Chen
Allocated Funding Amount: $175,000

▶ **Project Overview:**

In recent years, there has been a significant increase in additive manufacturing (AM), though AM is still largely unexplored for infrastructure projects. The study will explore AM innovations and capabilities related to transportation infrastructure and as a potential future resource to assist MassDOT with construction and maintenance activities for highways, bridges, and tunnels.

▶ **Main Research Objectives:**

- Survey transportation colleagues to learn about their experiences using AM for construction and maintenance of highway infrastructure
- Explore additive repair techniques and individual component manufacturing for highway infrastructure projects
- Engage with MassDOT Highway's maintenance and engineering departments to create a list of potential candidate objects for test printing with AM
- Develop draft business process recommendations for MassDOT on AM technologies

Timeframe: Expected Completion in May 2022

5. Impact of Advanced Driver Assistance Systems (ADAS) on Road Safety and Implications for Education, Licensing, Registration, and Enforcement

Principal Investigator: Dr. Anuj K. Pradhan, UMass Amherst
MassDOT Project Champion: Daniel A. Sullivan
Allocated Funding Amount: $120,000

▶ Project Overview:

Drivers often do not fully understand the capabilities and limitations of ADAS technologies, which can then lead to their misuse of these systems and potential transportation safety issues, especially as ADAS become more common. The study gathered information to investigate this topic, and then proposed strategies to address current driver knowledge gaps and safety concerns.

▶ Main Research Objectives:

- Conduct a literature and market review of the current state of commercially available ADAS technologies, and the deployment of ADAS-equipped vehicles in Massachusetts
- Assess drivers' knowledge, perceptions, and attitudes towards ADAS
- Study the impact of drivers' knowledge of ADAS on ADAS use and misuse
- Develop and evaluate training and other strategies to improve drivers' understanding of ADAS

Timeframe: Expected Completion in November 2021

6. A Pavement Marking Inventory and Retroreflectivity Condition Assessment Method Using Mobile LiDAR

Principal Investigators: Dr. Chengo Ai, UMass Amherst
MassDOT Project Champion: Neil Boudreau
Allocated Funding Amount: $200,000

▶ Project Overview:

The FHWA is proposing regulations to guide minimum pavement marking retroreflectivity levels. This study seeks to help MassDOT prepare for these regulations by developing an automated method for locating pavement markings and assessing their retroreflectivity, and testing it on a discrete sample of road segments. This method utilizes mobile LiDAR and automated LiDAR processing algorithms. If successful, approach could be extended to additional roadways in a future phase of research.

▶ Main Research Objectives:

- Generate a complete inventory of pavement markings and their retroreflectivity for the selected road segments
- Compare historic and current data to inform the deterioration trends of specific marking materials
- Define the benefits-to-cost ratio for each of the marking materials, to help inform MassDOT's pavement marking standards

Timeframe: Expected Completion in March 2022

7. Detecting Subsurface Voids in Roadways Using UAS with Infrared Thermal Imaging

Principal Investigators: Dr. Alessandro Sabato, UMass Lowell
MassDOT Project Champions: Dr. Jeffrey DeCarlo and Jason L. Benoit
Allocated Funding Amount: $60,000

▶ Project Overview:

Soil voids beneath roadways can create a safety hazard. These voids can result from the failure of culverts and drainage piping. This project seeks to reduce such failures through better inspections. The project will explore the use of UAS and rapid aerial infrared thermography to detect soil voids and assess the conditions of culverts and drainage piping beneath public roadways.

▶ Main Research Objectives:

- Determine the accuracy of infrared (IR) imaging for field inspections to detect underground structures and to detect soil voids as a function of depth
- Characterize the smallest size and severity of defects that can be detected with IR thermography
- Compare the performance of aerial IR thermography to current inspection techniques
- Define operational challenges with deploying IR thermography in the field, and suggest operating procedures to optimize the use of IR imaging on UAS platforms

Timeframe: Expected Completion in February 2022

8. Use of UAS in Surface Transportation Emergency Incident Response

Principal Investigators:
Dr. Danjue Chen and
Dr. Yuanchang Xie, UMass Lowell
MassDOT Project Champions: Dr. Jeffrey DeCarlo and
Chester Osborne
Allocated Funding Amount:
$ 60,000

▶ **Project Overview:**

This study builds on research conducted by the same Principal Investigators in an earlier project. That project developed a conceptual UAS emergency response network for emergency highway incident and natural disasters. This new project investigates details regarding the deployment of the UAS emergency response network and how UAS can best be integrated into existing highway emergency response practices.

▶ **Main Research Objectives:**

- Conduct pilot flights to test the feasibility of applying UAS for highway incident response
- Analyze UAS operational parameters based on literature review and pilot flight data
- Based on these analyses, update operational parameters and the initial UAS network for emergency response defined in the earlier study
- Develop recommendations for effectively integrating UAS into current highway emergency response practices

Timeframe: Expected Completion in April 2022


https://www.fhwa.dot.gov/

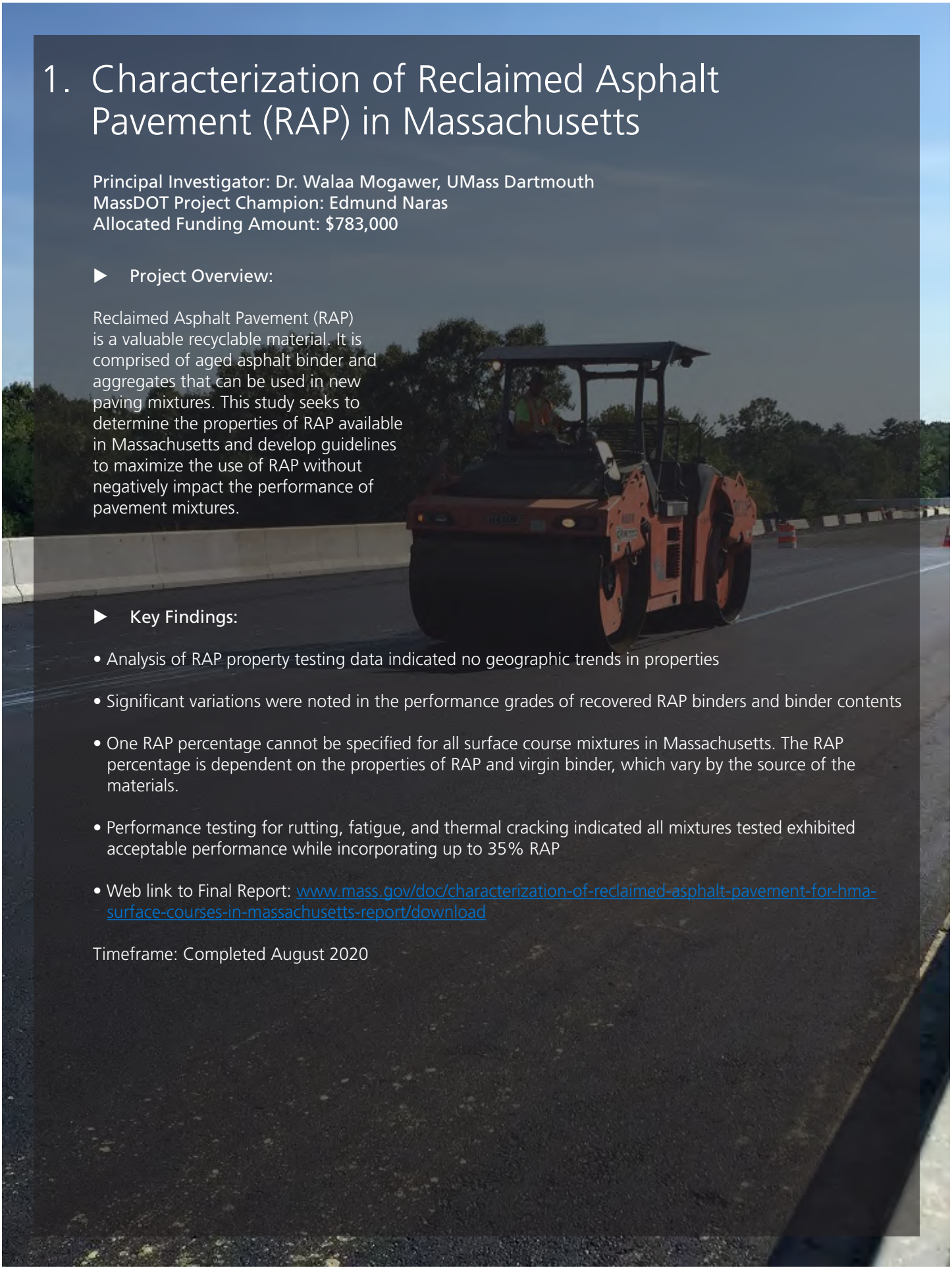
Long-Term Research Projects

1. Characterization of Reclaimed Asphalt Pavement (RAP) in Massachusetts

Principal Investigator: Dr. Walaa Mogawer, UMass Dartmouth
MassDOT Project Champion: Edmund Naras
Allocated Funding Amount: $783,000

▶ Project Overview:

Reclaimed Asphalt Pavement (RAP) is a valuable recyclable material. It is comprised of aged asphalt binder and aggregates that can be used in new paving mixtures. This study seeks to determine the properties of RAP available in Massachusetts and develop guidelines to maximize the use of RAP without negatively impact the performance of pavement mixtures.



▶ Key Findings:

- Analysis of RAP property testing data indicated no geographic trends in properties
- Significant variations were noted in the performance grades of recovered RAP binders and binder contents
- One RAP percentage cannot be specified for all surface course mixtures in Massachusetts. The RAP percentage is dependent on the properties of RAP and virgin binder, which vary by the source of the materials.
- Performance testing for rutting, fatigue, and thermal cracking indicated all mixtures tested exhibited acceptable performance while incorporating up to 35% RAP
- Web link to Final Report: www.mass.gov/doc/characterization-of-reclaimed-asphalt-pavement-for-hma-surface-courses-in-massachusetts-report/download

Timeframe: Completed August 2020

2. Translating Data Generated by the Transit App into Insights on Transportation Use in Greater Boston

Principal Investigators:
Dr. Daniel O'Brien, Dr. Ryan Wang and Dr. Justin de Benedictis-Kessner, Northeastern University
MassDOT Project Champion:
David Barker, MBTA
Allocated Funding Amount:
$300,000

▶ **Project Overview:**

The third-party Transit app can now provide the MBTA with transit rider data that goes beyond that which the MBTA has previously had access to. This project seeks to combine data from the Transit app and other sources to obtain a better understanding of transit riders' travel patterns, and then use that understanding to improve transit planning and services for customers.

▶ **Main Research Objectives:**

- Develop and document a process for making Transit app data available to the MBTA for real-time tracking and historical analysis
- Combine the app data with transit usage data from other sources for greater Boston
- Conduct initial studies regarding mobility, transit experiences and resiliency, to demonstrate the benefits of having the Transit app data
- Web link to Final Report: https://www.mass.gov/doc/translating-data-generated-by-the-transit-app-into-insights-on-transportation-use-in-greater-boston-final-report/download

Timeframe: Completed May 2021

3. Flexible Transit Services in Rural Areas

Principal Investigators: Dr. Eric J. Gonzales and Dr. Eleni Christofa, UMass Amherst
MassDOT Project Champion: Abril Novoa Camino
Allocated Funding Amount: $165,000

▶ Project Overview:

Outside of larger cities, the density of demand for transit is low, which makes the provision of transit services costly. This project identified flexible transit services that could be operated more cost-effectively in low-density rural and suburban communities, and developed methods for more systematically collecting, tracking and reporting data for flexible transit services.

▶ Main Research Objectives:

- Develop methods for identifying potential markets for flexible transit services and the types of service that would most cost-effectively serve the demand
- Identify the opportunities and data requirements associated with the General Transit Feed Specification (GTFS0-flex), particularly focusing on the requirements for implementing an automated reservation system for flexible transit services
- Compare data from flexible transit pilot programs in Massachusetts with pre-service and theoretical analyses to develop guidelines for future service implementations.

Timeframe: Completed in July 2021

berkshireeagle.com

4. Development of Comprehensive Inspection Protocols for Deteriorated Steel Beam Ends

Principal Investigators: Dr. Simos Gerasimidis and Dr. Sergio Breña, UMass Amherst
MassDOT Project Champion: Alexander Bardow
Allocated Funding Amount: $150,000

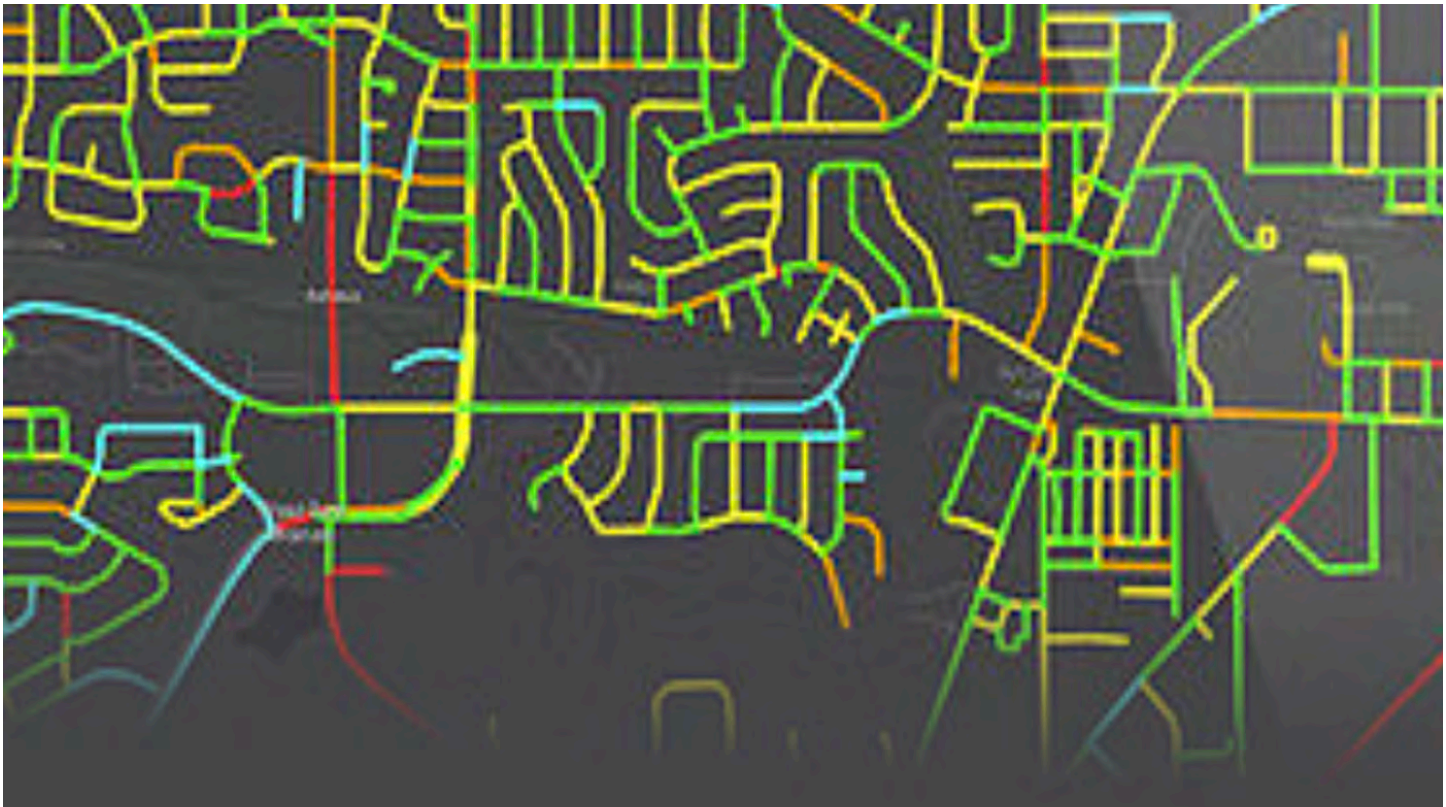
▶ **Project Overview:**

This study builds upon earlier research by the same Principal Investigators which assessed the capacity of bridges with deteriorated steel beam ends, and accordingly suggested updates to the MassDOT Bridge Manual's load rating procedures. This research explores data collection procedures and inspection techniques which could be used in conjunction with the new load rating procedures.

▶ **Main Research Objectives:**

- Develop a comprehensive inspection and documentation protocol to be used with the new load rating procedures for steel bridge beam ends.
- Develop and document effective procedures for collecting important data from deteriorated steel beam ends.
- Explore new practical inspection techniques, including ones which utilize technologies such as UAS and LiDAR, to obtain critical measurements.
- Identify unique cases requiring further research or modeling beyond the new load rating procedures

Timeframe: Expected Completion in March 2022



5. Understanding Asset Management Systems Utilized by Municipalities in Massachusetts

Principal Investigator: Dr. Walaa Mogawer
MassDOT Project Champion: Bryan Pounds, Edmund Naras, and John Moran
Allocated Funding Amount: $200,000

▶ Project Overview:

Many municipalities in Massachusetts have implemented their own asset management systems. MassDOT has limited information on these systems, which often use different approaches, and their data on pavement conditions. As a result, conditions on roadway miles in Massachusetts beyond MassDOT and federal highway roadways remain under-monitored and under-reported at a state level. The focus of this study is to investigate and catalog the different pavement asset management systems used by the municipalities and their data.

▶ Main Research Objectives:

- Catalog the different pavement asset management systems being used by cities, towns, Metropolitan Planning Organizations, and Regional Planning Agencies in Massachusetts
- Prepare a report describing the different asset management systems used, type of data collected, and how those data are utilized in decision making.

Timeframe: Expected Completion in April 2022

cartegraph.com

Cooperative Research Program Projects

1. Evaluating the Safety Impacts of Flashing Yellow Permissive Left-Turn Indications in Massachusetts

Principal Investigator: Dr. Cole Fitzpatrick, UMass Amherst
MassDOT Project Champion: Jim Danila
Allocated Funding Amount: $100,000

▶ Project Overview:

MassDOT has been working to retrofit over 350 traditional protected-permissive left-turn (PPLT) traffic signals to include the flashing yellow arrow (FYA) permissive signal indication. This purpose of this project is to investigate the safety impacts of the FYA signal indication and the retrofit installations.

▶ Main Research Objectives:

- Conduct a crash analysis using data from before and after the implementation of FYA for permissive left-turns, and specifically investigating the impact of signal sequencing on crashes
- Complete a safety assessment and provide MassDOT with recommendations for developing a dedicated safety performance function for FYA in Massachusetts
- Prepare a prioritization plan for moving forward with FYA retrofitting procedures
- Conduct a cost-benefit analysis for the implementation of FYA at protected/ permissive left-turn signals statewide.
- Web link to Final Report: https://www.mass.gov/doc/evaluating-the-safety-impacts-of-flashing-yellow-permissive-left-turn-indications-in-massachusetts-final-report/download

Timeframe: Completed April 2021

2. Construction and Materials Best Practices for Concrete Sidewalks

Principal Investigators: Dr. Sergio Breña and Dr. Kara Peterman, UMass Amherst
MassDOT Project Champions: Richard Mulcahy and Amy Bisbee
Allocated Funding Amount: $285,000

▶ **Project Overview:**

This project explored the potential factors that are thought to contribute to the deterioration of concrete sidewalks over winter freezing and thawing cycles, and identified materials and construction practices for reducing this deterioration.

▶ **Main Research Objectives:**

- Identify the factors that contribute to the decreased durability of concrete sidewalks through a combination of laboratory test of hardened concrete, air void structure analysis, and photographic documentation at installation sites
- Identify the best performing sidewalk materials for durability and the best deicing sidewalk treatments
- Determine best construction practices that result in durable concrete sidewalks, including aspects of construction such as concrete placement activities, finishing procedures, and curing method.
- Web link to Final Report: https://www.mass.gov/doc/construction-and-materials-best-practice-for-concrete-sidewalks-final-report/download

Timeframe: Completed May 2021

Research Impacts and Outcomes

MassDOT is committed to tracking the implementation and impacts of research. To help with this goal, MassDOT Research Section conducted semi-structured interviews with MassDOT Project Champions (PC) for recently completed research projects to understand how research results are utilized by the agency and what are the implementation impacts on the agency's processes and procedures, as well as on related industry practices. Surveys are also distributed to the Principal Investigators (PIs) through UMTC to gather information on the knowledge transfer efforts taken by the researchers to disseminate research findings, and the future workforce development impacts that the funded projects have by engaging students in research investigation.

Implementing Research Results at MassDOT

The research projects completed this year ranged from understanding the properties of reclaimed asphalt to incorporating public health in transportation decision making to examining how erosion blankets stabilize sloping roadside conditions. After the projects were completed, each of the Project Champions at MassDOT discussed the relevancy and value of each project. Here are some excerpts from each discussion:

- Characterization of Reclaimed Asphalt Pavement (RAP) for HMA Surface Courses in MA

The project demonstrated that the allowable percentage of RAP could be increased dramatically by both taking into account the composition of the RAP, and more carefully controlling binder grades to accommodate the composition of recycled material and the combined blend.

MassDOT currently allows up to 15% RAP but, by increasing monitoring of binder properties, could comfortably and safely increase that to 25-30% in theory. This will be tested in a pilot project in Somerville and Chelmsford. Ideally this will prove that in the real world, the increased RAP content suffers no degradation in quality or durability and can realize substantial cost and environmental savings for future MassDOT projects.

Results of the research project are being submitted to AASHTO Materials and Pavement Committee for review and potential modification of standards. The research has received positive feedback from other DOTs and industry members nationwide.

- Public Health Assessment for Transportation Projects

There were two primary forms of implementation: the modification of the project scoring criteria by the Highway Division to more heavily weight the public impacts of projects, and the addition of public health scoring to other Division project scoring formulae. The updated scoring criteria now include improved air quality data, public health 'hotspots," and geographic representation through the Massachusetts Project Intake Tool (MaPIT) where previously they included only greenhouse gas emissions which, while important, have little bearing on local environmental health.

This project led directly to the creation of the FFY2021 project "Measuring Accessibility to Improve Public Health" which aims to address the problem of accessibility gaps in social determinants of health (parks, education, food, etc.) by providing additional public health criteria and a "playbook" for decision makers to address these inequalities."

- Compost Blankets for Erosion Control and Vegetation Establishment

Both directly and indirectly this project led to many changes in the construction and post-construction erosion control process. Direct results of the project include a more defined process for site control during construction, a follow-up procedure for seeding and compost spreading, and alterations to "standard" seed mixes. Seeding plans have now been tied to the construction schedule, not the season, to ensure plants are capable of surviving the establishment period.

Indirectly, the project pointed to a number of areas for improvement. MassDOT is now taking a harder look at compost blends with greater longevity. MassDOT aims to include a wider range of native plants that take longer to become fully established as well as site-specific planting schemes to preferentially plant species in areas with more appropriate conditions (such as water-loving species planted in areas where runoff will be directed).

The study also highlighted the need for greater quality control in seed mixes and compost blends to ensure correct distribution. This has led to a decoupling of the erosion control, seeding, and composting elements in project budgets so that the individual elements can be more discretely controlled for. MassDOT is in the process of creating an approved vendor list for seed and compost mixes.

PCs suggested it would be beneficial if the research process included a mechanism to establish longer-term monitoring of implementation, specifically for things such as vegetation establishment that may take several years to become fully realized and/or change over time.

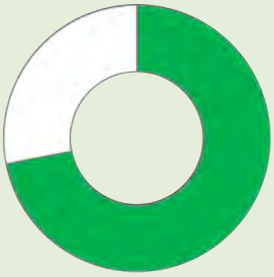
Disseminating Research Findings

To gather information on how researchers disseminate research findings, PIs with projects that were completed during the FFY2017-2020 period were contacted, and survey responses were received from PIs regarding 23 out of the 24 studies. Key findings from the survey:

FOR STUDIES COMPLETED IN 2017 to 2020:

70% of these studies have been presented at a conference

41% of studies have been published in peer-reviewed research journals



72% of the PIs who teach classes have incorporated the research into their academic curricula

Sharing Research at Professional Conferences

Eleven studies have been presented at the Transportation Research Board (TRB) Annual Meetings, and the 2020 TRB conference included 8 presentations on MassDOT research, including two from the same study which examined potential applications for UAS in surface transportation.

The research studies have also been showcased at conferences for the American Public Health Association, the Association of Collegiate Schools of Planning, and the Northeast Asphalt User Producer Group (NEAUPG), as well as at MassDOT's Annual Innovation and Moving Together conferences, among others.

Incorporating Research Findings into Training Materials for Municipalities

Findings from a research study on street trees have now been incorporated into a Baystate Roads training class on Street Tree Essentials. Similarly findings from a project regarding measures to induce greater demand for transit have been incorporated into a Baystate Roads class on Transit Street Design.

Training Future Transportation Workforce

As the future research workforce continues to be involved with current research projects (data collection, developing algorithms, conducting trials etc…), constant exposure to other research is occurring. Past and current Principal Investigators (PIs) share their research and results not only with their research colleagues, practitioners, and the public, but with also with students. For the PIs of MassDOT research studies completed during 2017-2020 who teach classes, 72% indicated that they have incorporated their research into their course curricula. PIs also engage students to help with their research while it is underway. Of the MassDOT research projects that were either completed or in progress this year, there were 16 graduate students and 10 undergraduate students involved.

An example of incorporating research into the classroom is exemplified in the recently completed Characterization of Reclaimed Asphalt Pavement (RAP) in Massachusetts project. The Principal Investigator exemplified pavement sustainability through the use of reclaimed asphalt pavement on the surface layer. There were a number of graduate and undergraduate students who worked on this project that investigated improving the sustainability of pavement which includes the use of reclaimed asphalt pavement on the surface layer. The pavement sustainability concept was shared with students not only through the research project itself, but also in the PI's classes. This cross-sharing approach of research encourages more research sharing and future research ideas.

Research Studies Leading to Further Research

Over 40% of the PIs for the research studies completed in 2017-2020 reported that those projects then led to additional funded research that built on the results of the earlier studies. Relatedly, of the 22 current (FFY2020) MassDOT research projects presented in this report, at least six are directly connected to earlier completed MassDOT studies, often with the same PIs and Project Champions. One example is the Pavement Marking Inventory and Retroreflectivity Condition Assessment using Mobile LiDAR, which derived from the success of the previous mobile LiDAR study described earlier (page 10).


Technology Transfer
& Training Services
16:07

Training Courses

Through the Massachusetts Local Technical Assistance Program (LTAP), training and technical resources are provided to municipal personnel, MassDOT personnel and private sector contractors through the Baystate Roads LTAP and MassDOT Training Services (MTS). Classes, including virtual, online, blended, face-to-face, and webinar-based, are offered to municipal personnel based on local needs and MassDOT priorities.

Overview

During Federal Fiscal Year 2020 (FFY20), Baystate Roads (BSR) conducted training sessions on over half a dozen class topics. In addition to BSR's municipal training focus, the technical training needs of Massachusetts Department of Transportation personnel were addressed by MTS. Many of the outreach and trainings were directly impacted by COVID. Adapting a new format for trainings was essential.

New Formats and Resources – Adapting to COVID

Midway through the FFY2020 year, a number of new services were launched to better meet the needs of municipal partners and the changing state health recommendations and mandates. Additional training tasks during this period were significant, including a transition from face-to-face training to virtual, self-paced, blended, training and/or webinars. Which of these training options were implemented depended on a variety of factors including: instructor's ability to provide virtual instructions, what was needed to transition the training from face-to-face to a virtual format, or the requirements to turn-around some trainings to be blended based on the topic. Although there was an existing plan toward the expansion of various program approaches, the pandemic resulted in a much quicker and extensive pivot.

Although more than twice as many face-to-face classes were conducted pre-COVID, participation was greatest via the webinars provided, most of which were presented after the virus shut down in-person training options. This indicates that BSR was addressing the need to connect to an expanded audience, in addition to providing a platform enabling greater audience participation. Class topics included a broad variety of subjects, with most pre-pandemic topics incorporating a hands-on component for skills development.

The training opportunities presented during FFY2020 included:

Training Approach	# Provided	Participants
Face-to-Face	55	1,225
Webinar	28	2,063
Virtual Class	8	118
Online	2	87
Blended Learning	3	22
Total	96	3,515

During this period, training options were developed or under development for a variety of remote formats, allowing BSR to continue assisting Massachusetts professionals in local roadway safety, construction, maintenance and operations, and personnel development. Topics addressed both the changing needs of our core audience and ongoing needs that required a remote presentation format, allowing training topics to remain current for both returning and new participants. BSR expanded its training topics by 36% with new or redeveloped training in 10 subject areas, including: Sign Installation & Maintenance, Asphalt Inspection, Stormwater System Maintenance and Green Infrastructure Retrofitting in Massachusetts, and You're a Supervisor, Now What?

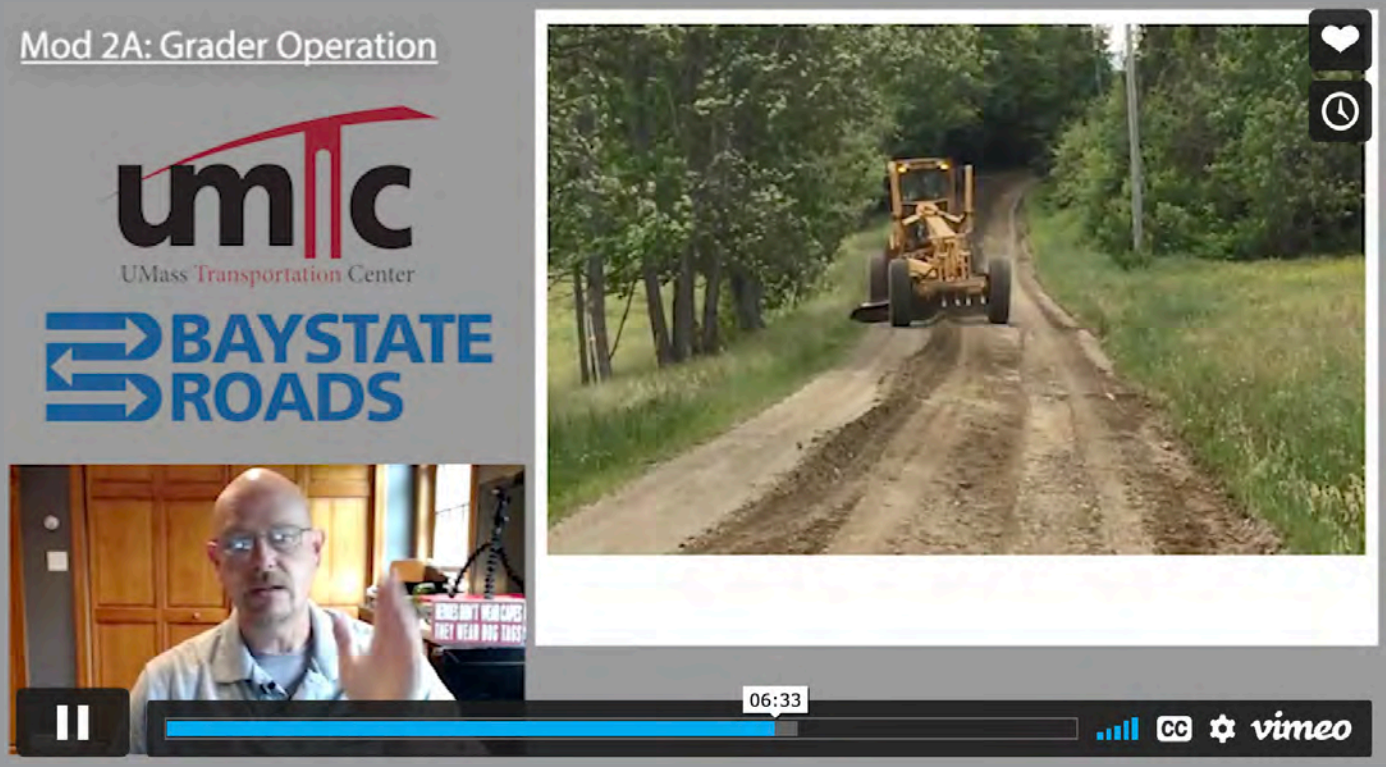
Webinars

During FFY2020, BSR presented a number of webinars, the majority of which were viewed via a new 1-hour Stump the Instructor (STI) series. Responding to the sudden COVID-19 crisis and inability to train as usual, this interactive webinar series kicked off in March 2020.

Initially developed to provide connections for the public works audience –with each other and the BSR team - STI provided a supportive opportunity for the public works community to share strategies, while providing a training topic to educate. The series also allowed straightforward and insightful audience interaction with MassDOT participants, and included segments on:

- Construction during COVID-19 with MassDOT Highway Administrator Jonathan Gulliver
- Gravel Road Maintenance
- Basic Chainsaw Maintenance
- Traffic Signal Basics
- Trench & Excavation Safety; Pavement Preservation; and many more.

By the end of FFY2020, 1,731 people had attended Stump the Instructor webinars.



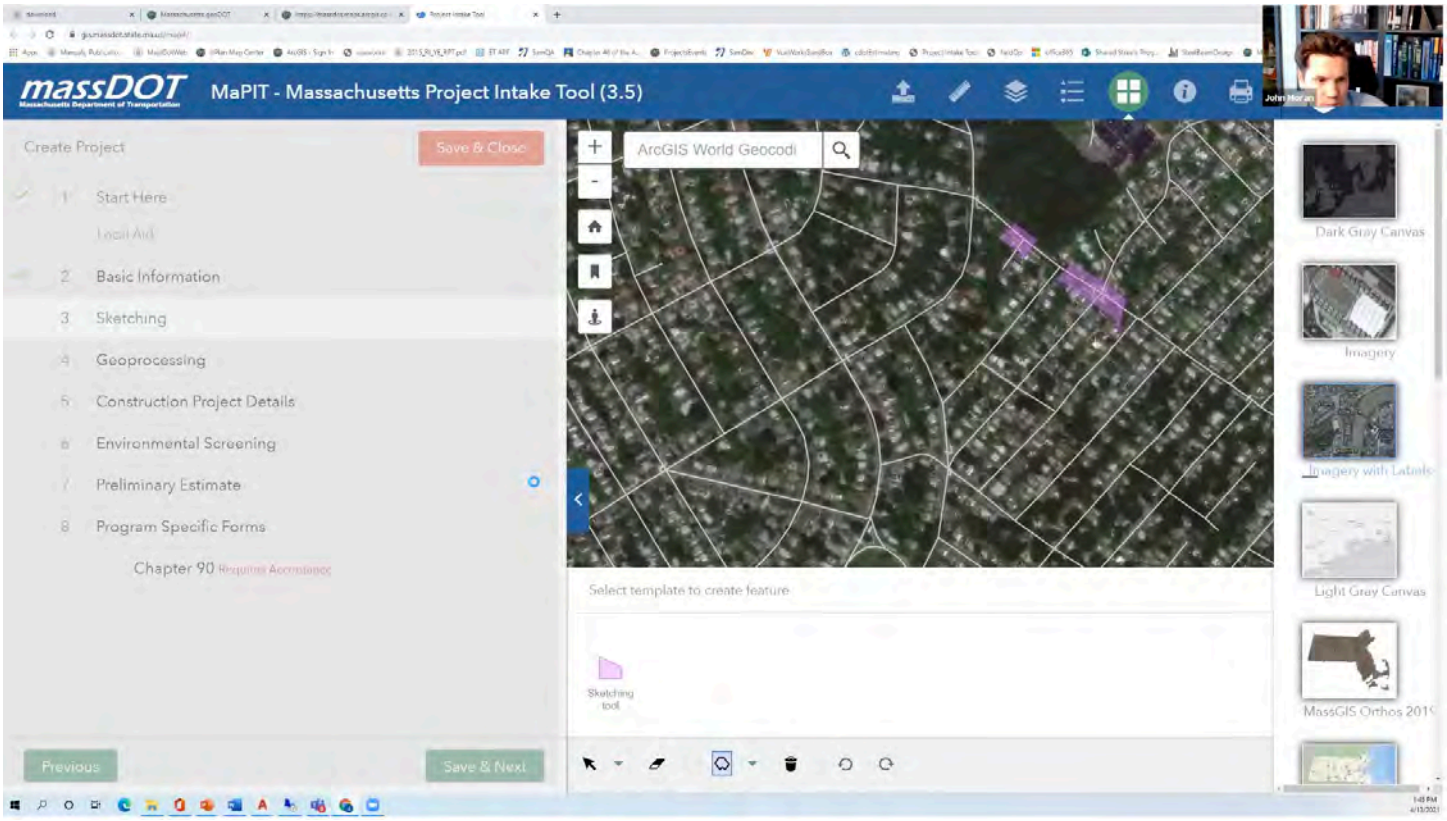
Virtual Classroom

Hosted on the Zoom Meeting platform, the virtual classroom approach was primarily developed as an alternative means to provide training during pandemic. Topics included virtual re-designs of: Asphalt Inspection, Complete Streets (201, 301, 302), Design of ADA Curb Ramps & Pedestrian Access Routes, Hoisting CEU/Test Prep, You're a Supervisor, Now What?, MaPIT 3.0, two Snow and Ice Operations classes, OSHA-10, and drainage classes, among others. This effort to redesign existing face-to-face classes with virtual formats was significant and reflects a team-wide commitment to providing for our municipal audience.

Online & Blended Training

Prior to statewide COVID-19 health mandates, Baystate Roads (BSR) had begun incorporating online training to provide options, attractive to a broader audience. Additional promotion of the new self-paced course on Traffic Signal Warrants: How to Perform, Assess, and Satisfy the Requirements of Each generated a strong response, with 85 registered participants in FFY2020.

Blended learning options this year included 5 courses completed or under development, including Sign Installation & Maintenance, Pavement Preservation, and Confined Space training classes. This blended approach included participant completion of several online modules, followed by a virtual class.



Expanded Resources

Responding to additional training needs within the context of social distancing, provided a creative challenge that resulted in additional information sharing methods. These included the development of Resource Sheets, job aids, and on-demand videos.

This latter training option allowed Baystate Roads to share transportation safety and operations information as needed through brief instruction on topics including:

- Best Practices for Pothole Patching
- Calibration Done Right
- Flashing Yellow Arrow Left Turn Signal
- Gravel Roads
- MaPIT
- Pavement Management: Why Are They Working on That Road?
- Rigging & Load Securement Safety
- Silica Dust Tailgate Talk
- Supervisor Leadership
- Traffic Signal Priority
- Winter Operations: Pretreating Roads & Sidewalks
- Winter Operations: Sand is for Beaches
- Workforce Development

Combined, these new resources and training approaches mark a major transition in standard operating procedures for the Massachusetts LTAP center. Face-to-face classroom training will return, but the addition and variety of additional training and support options has permanently expanded the Baystate Roads toolbox.

MassDOT Training Services (MTS)

MassDOT Training Services (MTS)

In addition to Baystate Roads' municipal training focus, the technical training needs of Massachusetts Department of Transportation personnel were addressed by MassDOT Training Services (MTS). A total of 28 classes were conducted this year, providing services for 739 course participants.

MassDOT Training Services (MTS) also shifted approaches this year, in response to pandemic operating restrictions. New topics and once classroom-based sessions were identified, developed, or redesigned for remote presentation including virtual classes, webinars, and online training.

Topics also varied significantly, from safety training and design courses to invasive plant management. Training topics by presentation approach include:

Remote training represented 21% of the classes presented and 28% of the FFY2020 audience.

Training Approach	# Provided	Participants
Face-to-Face	22	534
Webinar	2	52
Virtual Class	3	150
Online	1	3

Virtual Training

- OSHA-10
- Designing Culverts for Geomorphic Compatibility

Online

- Traffic Signal Warrants: How to Perform, Assess, and Satisfy the Requirements of Each

Classroom F2F Training

- Confined Space
- Trenching & Excavation Safety
- Chainsaw Maintenance
- Bridge Maintenance
- How to Read Construction Drawings
- Utility Coordination for Highway Projects
- Trenching & Excavation Safety
- OSHA-10
- Countermeasure Design for Bridge Scour and Stream Stability
- Design and Implementation of Erosion and Sediment Control
- Pedestrian Facility Design
- Principles and Fundamentals of Weed Science
- Woodchipper Operation & Safety

Webinar

- Buzz Time with Brenda: Pavementology Today
- State Regulations Pertaining to Invasive Plant Management, Part A2 of the Invasive Plant Management Certificate Program

Gauging Impacts

Online Training Evaluation

Assessing the success and impacts of these new approaches is an important part of the training development process. Participant evaluation assists not only with identifying the effectiveness of a single class or series, but with gauging the effectiveness of the remote modes being employed. Efforts to complete higher level evaluations were limited this year due to ongoing pandemic conditions, related staffing protocols, and workload; however, Level 1 evaluations of online, virtual, and blended classes indicates that well designed training – in all formats – remains useful and effective. Although there were some minor hiccups in moving to a virtual format, the evaluation results remained predominantly positive. This also speaks to audience flexibility and appreciation of Baystate Roads team efforts. Incorporating evaluation results and comments in class updates can assist in long-term efforts to maintain or increase participation in these new approaches.

Public Outreach: Providing Assistance & Identifying Needs

Baystate Roads act not only as a training and resource clearinghouse, but also provides our municipal partners with a community forum, an opportunity to connect with peers across the state via the weekly Stump the Instructor webinars and the Baystate Roads Listserv. This year, 91 topics were posted for discussion on the listserv, ranging from COVID-19 procedures to job postings, public information meetings, to the new hands-free law.

Baystate Roads fosters connections with municipal peers and organizations, allowing opportunities for public input and training needs identification. Several approaches provided these opportunities in FFY2020, including the Baystate Roads Advisory meetings, attendance at state and regional meetings and events, and individual community technical assistance requests.

Baystate Roads' participation in broader National Local Technical Assistance Program Association events continues to open a world of potential resource sharing, ultimately reducing training development time. FFY2020 events hosted and/or attended included the NLTAPA Winter Business Meeting, Northeast Regional Meeting (hosted), Annual Conference (attended virtually). Baystate Roads also assisted MassDOT with a 2020 TRB Annual Meeting Strategic War Games event attended by 130 people including Massachusetts Secretary of Transportation Stephanie Pollack.

The M3 newsletter provides another opportunity to connect with and engage the municipalities. Content includes information on municipal success stories, MassDOT initiatives, Baystate Roads classes and resources, upcoming conferences and events, new Baystate Roads Scholars, transportation research, and other specific topics of interest to the DPW community.

Conferences

MassDOT hosted one of two annual transportation conferences, Moving Together. Due to COVID-19, the Innovation Conference was postponed and instead presented virtually as the Transportation Innovation Webinar Series in the fall of 2020.

Moving Together, October 24, 2019

MassDOT held its 19th annual Moving Together Conference at the Boston Park Plaza Hotel on October 24th, 2019. Over 970 people attended the conference across the private, public, and academic sectors. The conference included 57 sponsors and exhibitors, 16 panel sessions, 2 site visit sessions, a keynote address by MassDOT Secretary of Transportation Stephanie Pollack, and a showing of the winning videos in the MassDOT Safe Streets, Smart Trips video contest for high school students.

Session Attendance

Complete Streets 2.0 – Progress of the Complete Streets Funding Program and Discussion of What Comes Next - 121
MassDOT Data Overview – What We're Using - 110
Quick Builds and Pilots to Advance Multimodal Mobility - 87
MassTrails - Investments in Trails Across the Commonwealth - 82
Latest Design Guidance - 105
Improving Biking and Walking - Project Spotlight - 211
Increasing Mobility through Technology - 130
Measuring Equity at a Statewide Level - 76
New Approaches to Crossing Treatments - 94
Central MA Regional Connectivity - 28
Building Bridges: Enhancing Coordination Between MassDOT and our Municipal Partners - 118
Best Practices and Lessons Learned for Suburban and Rural Mobility - 70
Placemaking – A Firsthand Look at Ongoing Projects - 70
Emerging Popular Mobility - 80
Improving South Shore Transportation - 67
SITE VISIT: Phillips Square Tactical Plaza - 15
SITE VISIT: Walking tour of New Separated Bike Lanes on Charles River Dam Road - 25
Implementing MassDOT's Bicycle and Pedestrian Plans - 204

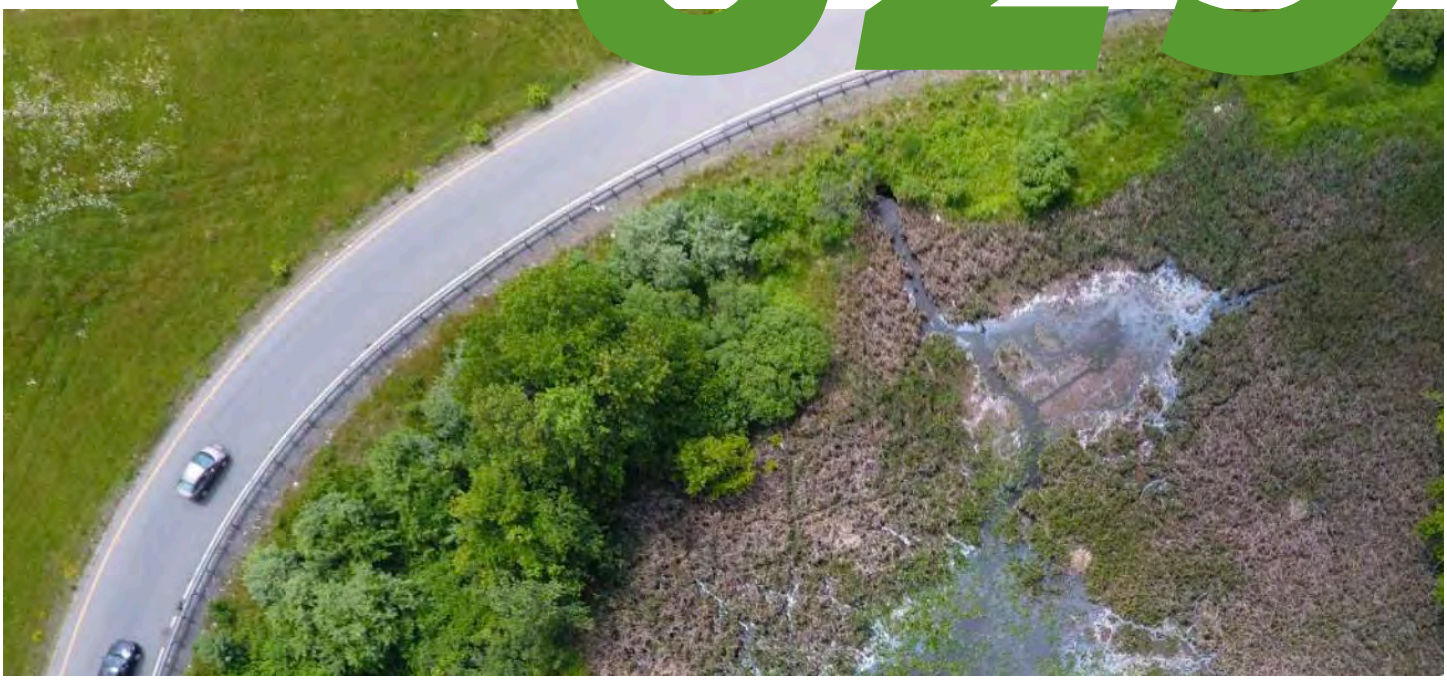
Transportation Innovation Webinar Series, September – October 2020

The Spring 2020 Transportation Innovation Conference was put on hold due to COVID-19. In its place, the Transportation Innovation Webinar Series was held during September and October 2020. Relevant and innovative abstracts submitted for the in-person conference were used to create a virtual eight-webinar series program with these topics:

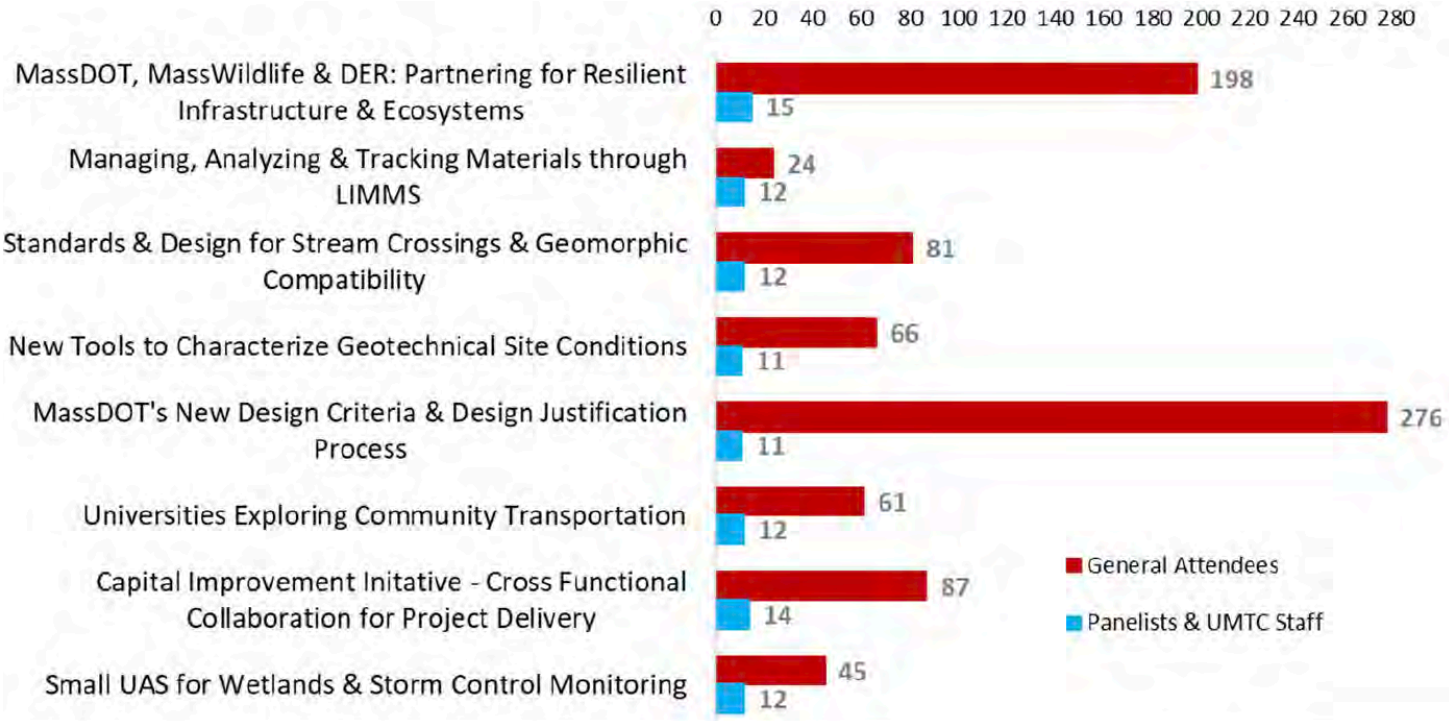
- MassDOT, MassWildlife, & MassDER: Partnering for Resilient Infrastructure & Ecosystems
- Managing, Analyzing, & Tracking Materials through LIMMS (Laboratory Information Materials Management System)
- Standards & Design for Stream Crossings & Geomorphic Compatibility
- New Tools to Characterize Geotechnical Site Conditions
- MassDOT's New Design Criteria & Design Justification Process
- Universities Exploring Community Transportation
- Capital Improvement Initiative - Cross Functional Collaboration for Project Delivery
- Small Unmanned Aerial Systems (sUAS) for Wetlands & Storm Control Monitoring

More than 830 participants attended across the eight webinars. The webinar series proved successful, and plans are underway to make this series a recurring event in the future. Another series is being scheduled for Fall 2021.

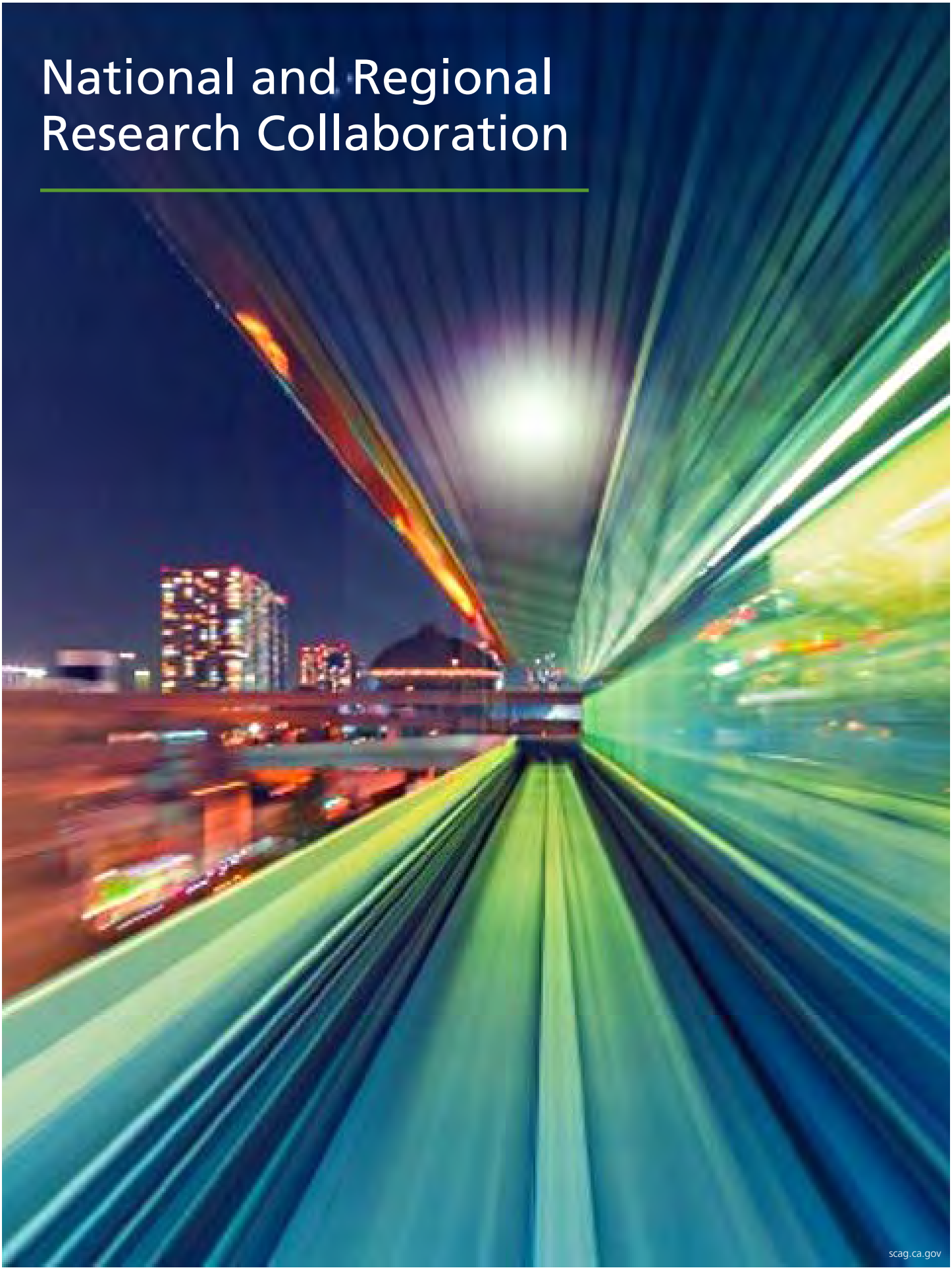
Total Attendance **829**



Session Attendance



National and Regional Research Collaboration



Transportation Research Board (TRB)

MassDOT members participate in a number of the TRB Committees to share knowledge of best practices and keep abreast of research advancements in their fields. Many MassDOT employees also serve on the TRB administered research project technical panels, such as for National Cooperative Highway Research Program (NCHRP) projects. These panels are made up of experienced practitioners and research specialists from across the country, providing technical guidance on transportation research projects selected annually by the American Association State Highway and Transportation Officials (AASHTO) Research & Innovation (R&I) Committee. The following two tables list the TRB committees and NCHRP project panels with MassDOT members.

TRB Committees
Standing Committee on Quality Assurance Management
Standing Committee on Asphalt Materials Selection and Mix Design
Standing Committee on Contract Law
Honorary Committee
Section - Executive Management Issues
Standing Committee on Strategic Management
Standing Committee on Workforce Development and Organizational Excellence
Standing Committee on Performance Effects of Geometric Design
Standing Committee on Aviation Administration and Policy
Standing Committee on Transportation and Public Health
Standing Committee on Data for Decision Making
Standing Committee on Economic Development and Land Use
Standing Committee on Access Management
Standing Committee on Economics, Revenue, and Finance
Standing Committee on Rural, Intercity Bus, and Specialized Transportation
Standing Committee on Alternative Fuels and Technologies
Standing Committee on Safety Performance and Analysis
Standing Committee on Transportation Safety Management Systems
Standing Committee on Transportation Planning Policy and Processes
Standing Committee on Airport Terminals and Ground Access
Standing Committee on Economic Development and Land Use
Standing Committee on Community Resources and Impacts
Standing Committee on Strategic Management

NCHRP Project Representation

NCHRP Project Panel on Development of Guidance for Non-Standard Roadside Hardware Installations
NCHRP Project Panel on Roadwide Design for Conflicts in Proximity to Bridge Ends and Intersection Roadways
NCHRP Project Panel on Evaluation of Bridge Rail Systems to Confirm AASHTO MASH Compliance
NCHRP Project Panel on Synthesis of the Performance of Portable Concrete Barrier Systems
NCHRP Project Panel on Improvement and Reorganization of Section 13 of the AASHTO LRFD Bridge Design Specifications to Address MASH Loading
NCHRP Project Panel on Bridge Deck Overhangs with MASH-Compliant Railings
NCHRP Project Panel on Catastrophic Transportation Emergency Management Guidebook
NCHRP Project Panel on Temporary Pavement Markings Placement and Removal Practices in Work Zones
NCHRP Project Panel on Operational Standards for Highway Infrastructure
NCHRP Project Panel on Essential Communications
NCHRP Project Panel on Deploying Transportation Security Practices in State DOTs
NCHRP Project Panel on Organizational and Operational Models used by State DOTs for Emergency Response
NCHRP Project Panel on Mechanical Properties of Laboratory Produced Recycled Plastic Modified (RPM) Asphalt Binders and Mixtures
NCHRP Project Panel on Indentifying Influences on and Minimizing the Variability of Ignition Furnace Correction Factors
NCHRP Project Panel on Proposed AASHTO Guidelines for Use of Stainless Steel in Bridge Girders
NCHRP Project Panel on A Guidebook for Emergency Contracting Procedures for Administration
TCRP Project Panel on Mobility Inclusion for Un(der)served Population with the Emerging Technologies
NCHRP Project Panel on Alternative Technologies for Mitigating the Risk of Injuries and Deaths in the Work Zone
NCHRP Project Panel on Incorporating Driver Behavior Considerations in Safety Performance Estimates on Infrastructure Improvements
NCHRP Project Panel on Enhancing Pedestrian Volume Estimation and Developing HCM Pedestrian Methodologies for Safe and Sustainable Communities
TCRP Project Panel on An Update on Public Transportation's Impacts on Greenhouse Gas Emissions
NCHRP Project Panel on Assessing the Impacts of Connected, Automated and Autonomous Vehicles on the Future of Transportation Safety
NCHRP Topic Panel on Micromobility Policies, Permits, and Practices
NCHRP Project Panel on Reducing Risks to Worker Safety in Work Zones Due to Distracted Drivers
NCHRP Project Panel on Methods of Short-Term Crash Prediction
NCHRP Project Panel for the Protection of Transportation Infrastructure from Cyber Attacks
NCHRP Project Panel on Use of Vehicle Probe and Cellular GPS Data by State Departments of Transportation
NCHRP Project Panel on Development of Business Case and Communication Strategies for a State DOT Resilience Program
TCRP Synthesis Panel on Assessing Equity and Identifying Impacts Associated with Bus Network Redesigns

NCHRP Project Panel on Mitigation of Weldment Cracking of Highway Steel Structures due to the Galvanizing Process
NCHRP Project Panel on Effective Use of Duplex Coating Systems to improve Steel Bridge Structure Durability
NCHRP Project Panel on Application of Federal Funding Flexibility at the State DOTs
NCHRP Project Panel on Updating Safety Performance Functions for Data-Driven Safety Analysis
NCHRP Project Panel on Transit, Freight, and Emergency Services Integration in Integrated Corridor Management Using SHRP2 Business Process Tools
BTSCRP Project Panel on The Influence of Infrastructure Design on Distracted Driving
NCHRP Project Panel on FloodCast: A Framework for Enhanced Flood Event Decision Making for Transportation Resilience – Phase IV
NCHRP Project Panel on Access to Jobs, Economic Opportunities, and Education in Rural Areas
NCHRP Project Panel on IDEA (Innovations Deserving Exploratory Analysis)
NCHRP Project Panel on Emerging Challenges to Priced Managed Lanes
NCHRP Project Panel on Recommended Guidelines for Prefabricated Bridge Elements and Systems Tolerances and Dynamic Effects of Bridge Moves
Standing Committee on Critical Transportation Infrastructure Protection
NCHRP Project Panel of Synthesis of Leveraging Private Capital for Infrastructure Renewal
NCHRP Project Panel on Integrating Effective Transportation Performance, Risk, and Asset Management Practices
NCHRP Project Panel on Integrating Freight Movement into 21st Century Communities' Land Use Design, and Transportation Systems
TCRP Project Panel on Guidebook for Deploying Zero Emissions Transit Vehicle Fleets
NCHRP Project Panel on Research Roadmap for Knowledge Management
NCHRP Project Panel on State DOT Contributions to the Study, Investigation, and Interdiction of Human Trafficking
NCHRP Project Panel on Update of Security 101: A Physical Security Primer for Transportation Agencies
NCHRP Project Panel on Support for State DOT Transportation Systems Resilience and All-Hazards Programs
NCHRP Project Panel on Surface Transportation Security Research
TCRP Project Panel on Command-Level Decision Making for Transit Emergency Managers
NCHRP Project Panel on Guidelines for Selecting Ramp Design Speeds
NCHRP Project Panel on Safety Performance of Part-Time Shoulder Use on Freeways
NCHRP Project Panel on Proposed AASHTO Highway Safety Manual, Second Edition
NCHRP Project Panel on Developing Crash Modification Factors for Corridor Access Management
NCHRP Project Panel on Estimating Effectiveness of Safety Treatments in the Absence of Crash Data
NCHRP Project Panel on Collaborative Practices for Performance-Based Asset Management between State Transportation Agencies and Metropolitan Planning Organizations
NCHRP Project Panel on Emerging LED Technologies, and their spectrum of use within Tunnels
NCHRP Project Panel on Implementation and Training Materials for the Highway Safety Manual, Second Edition

Transportation Pooled Fund Projects (TPFs)

The Transportation Pooled Fund (TPF) Program is a popular means for State Department of Transportation (DOT), Federal Highway Administration (FHWA) program offices and commercial entities to combine resources and achieve common research goals. Pooling resources reduces marginal costs and provides efficient use of taxpayer dollars. It also provides greater benefits to participating interests as compared to individual entities conducting or contracting for research on their own. MassDOT continues to collaborate and contribute, with FHWA and other DOTs, to a certain number of transportation related studies pertinent to the Commonwealth now and in years to come.

Over the years, one of the consistent project highlights of the TPF has been the continued involvement and success of the New England Transportation Consortium (NETC). NETC is a cooperative research effort that includes state DOTs from Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. The NETC is a valuable regional partnership for the identification and dissemination of shared transportation research initiatives.

FFY 20 TPFs projects MassDOT Participated In

Project number	Title	Lead Agency	MassDOT annual contribution ($)
TPF-5(313)	Technology Transfer Concrete Consortium	Iowa DOT	$12,000
TPF-5(315)	National Accessibility Evaluation	Minnesota DOT	$42,500
TPF-5(373)	New England Transportation Consortium VII	Maine DOT	$100,000
TPF-5(370)	Fostering Innovation in Pedestrian and Bicycle Transportation Pooled Fund Study	FHWA	$25,000
TPF-5(353)	Clear Roads Phase II	Minnesota DOT	$25,000
TPF-5(343)	Roadside Safety Research for MASH Implementation	Washington State DOT	$50,000
TPF-5(316)	Traffic Control Device (TCD) Consortium	FHWA	$10,000
TPF-5(419)	National Cooperative Highway Research Program	TRB	$710,000

NETC Advisory Committee

The NETC Advisory Committee includes representatives from the state DOTs, FHWA, and New England state universities (including the University of Massachusetts, represented by the UMTC). MassDOT's involvement in NETC includes an annual financial contribution for research projects, collaboration on annual project solicitation and prioritization, and participation on project technical committees, and in monthly meetings and annual events.

New NETC research projects FFY20 include:

- Curved Integral Abutment Bridge Design
- Multi-Scale Multi- Season Land-Based Erosion Modeling and Monitoring for Infrastructure Management
- Experimental Validation of New Improved Load Rating Procedures for Deteriorated Unstiffened Steel Beam Ends

The following NETC research projects were completed during FFY20:

- Development of MASH Computer Simulated Steel Bridge Rail and Transition Details
- Quick Response Project: 2019 ICNet Workshop

Appendix

massDOT Innovation Series

INNOVATION SERIES WEBINARS - Fall 2020

MassDOT, MassWildlife, & MassDER: Partnering for Resilient Infrastructure & Ecosystems
September 10, 2020
This session highlighted MassDOT's partnerships with the Division of Fisheries & Wildlife (MassWildlife) and the Division of Ecological Restroration (DER) and showcased recent innovative examples of how disparate agencies can work together towards common goals and the furthering of each other's missions.
Panelists: Tim Dexter, MassDOT Highway Division; David Paulson, MA Dept of Fish & Game, Division of Fisheries & Wildlife (MassWildlife); Carrie Banks, MA Dept of Fish & Game; Division of Ecological Restoration (DER)

Managing, Analyzing, & Tracking Materials through LIMMS
September 17, 2020
The Laboratory Information Materials Management System (LIMMS) is a highly efficient software ecosystem, which uses a system of computers, electronic identification tags, and cloud servers to track, manage, analyze materials. LIMMS allows MassDOT to perform data analysis on its construction materials like never before, for the purpose of discovering and modeling useful test data, making informed conclusions, and supporting decision-making. The presentation provided an overview of the LIMMS project timeline from conception to implementation. Global and project functionality were also reviewed including how materials inspection, sampling, and testing is performed in the system. Finally, the LIMMS data analytics capabilities were also discussed.
Panelists: Richard Mulcahy, Megi Martini, & Alana Geary from the MassDOT Research & Materials Laboratory

Standards & Design for Stream Crossings & Geomorphic Compatibility
September 24, 2020
This session focused on the latest technical developments in the MassDOT Highway Division's approach to stream crossings and resilient design using the principles of fluvial geomorphology. It also shared experiences that are expected to guide future innovations for providing resilient, cost-effective, habitat-friendly stream crossings in Massachusetts.
Panelists: Tim Dexter & John Pierce, MassDOT Highway Division; Roy Schiff, Milone & MacBroom; Matthew Lundsted, Comprehensive Environmental Inc.

New Tools to Characterize Geotechnical Site Conditions
October 1, 2020
This session discussed the FHWA's Every Day Counts (EDC)-5 effort known as the "A-GaME", which is establishing a new standard for enhanced site characterization. Site characterization plans are required for all MassDOT construction projects, regardless of design status, project type, or project scope. Effective site characterization is critical for recognizing potential problems that may affect design and construction and for ensuring safe, well-performing and cost effective projects.
Panelists: Jennifer Rauch & Pete Connors, MassDOT Highway Division; Mary Nodine, GEI Consultants

MassDOT's New Design Criteria & Design Justification Process
October 6, 2020
This session will review the new Engineering Directive E-20-001 - Controlling Criteria and Design Justification Process – released in January 2020 that applies to all projects led and reviewed by MassDOT. Criteria for Pedestrian and Bicycle Facilities expand on MassDOT's previous guidance to help build a network of high quality, high comfort facilities for users of all ages and abilities.
Panelists, from MassDOT: Jackie deWolfe, Office of the Secretary; Andy Paul & Andrew Wilkins, Highway Division

Universities Exploring Community Transportation
October 8, 2020
This session highlighted three recent collaborative efforts between academia and transportation that focus on how access to transportation affects the health and quality of life of older adults, people with disabilities, and low-income individuals.
*Panelists: Aniko Laszlo, MBTA; Dr. Nina Silverstein, UMass Boston; Cheryl Kiser, Babson College; Dr. Sarah McAdoo & Nathan Taber, UMass Medical Schoo*l

Capital Improvement Initiative - Cross Functional Collaboration for Project Delivery
October 14, 2020
This webinar discussed the steps MassDOT has taken to streamline project delivery from Procurement to Contractor Notice to Proceed (NTP), with the creation of four workstreams in partnership with MassDOT shared services divisions. The presentations and discussion focused on the Agile process, workstream operational structure, findings and accomplishments to date.
Panelists, from MassDOT: Patricia Leavenworth, Chief Engineer; Joseph Foti, Deputy Administrator & Chief of Operations; Michael McGrath, Assistant Administrator of Construction Engineering; Bryan Pounds, Manager, MPO Activities; Esther Nganga, Data Analytics and Process Improvement Analyst – OPMI; Meghan Haggerty, Highway Chief of Staff; & Tracy Osimboni, Highway Process Improvement Engineer

Small Unmanned Aerial Systems (sUAS) for Wetlands & Storm Control Monitoring

October 15, 2020

This session included presentations on two pilot studies that were conducted by the MassDOT Highway Division in collaboration with the MassDOT Aeronautics Division, on the use of sUAS for environmental monitoring. The first study investigated the use of sUAS with multi-spectral sensors to assist with wetland construction compliance and long-term monitoring. The second study evaluated the effectiveness of using sUAS for inspecting Stormwater Control Measures (SCMs). The presentations discussed the type of data collected in these studies, the data collection processes and protocols, and the integration of these data with information from other sources for documenting current conditions and changes over time. The session will also cover the benefits and strengths of these new technologies, as well as potential challenges.

Panelists: Dr. Scott Uebelhart & Robin Grace, MassDOT Aeronautics Division, Drone Program; Melissa Riley, MassDOT Highway Division, Environmental Compliance; Henry Barbaro, MassDOT Highway Division, Stormwater Management; & Matt Lundsted, Comprehensive Environmental Inc.

SCHEDULE AT A GLANCE

PROGRAM TRACKS: PI (PROJECT IMPLEMENTATION) PD (PLACEMAKING DESIGN) M (MUNICIPAL)

REGISTRATION/EXHIBITS: 7:45 am - 8:45 am

WELCOME SESSION: 8:45 am - 9:15 am

Grand Ballroom A

Pete Sutton, MassDOT
Jonathan Gulliver, Highway Administrator, MassDOT

BREAK/EXHIBITS: 9:15 am - 9:30 am

CONCURRENT SESSION #1: 9:30 am - 10:45 am

Session 1A – Complete Streets 2.0 – Progress of the Complete Streets Funding Program and Discussion of What Comes Next

Georgian Room - M

Over two-thirds of the Commonwealth's municipalities have committed to the Complete Streets design concept. This session will take a look at the accomplishments of the first four years of MassDOT's Complete Streets Funding Program. What has the program accomplished? What are the impacts in our communities of passing policies and developing Prioritization Plans? You will hear about current evaluation efforts, and about municipal efforts to institutionalize this concept. We also want to hear from you on what should come next as the program continues.

Panelists:
Eileen Gunn, MassDOT
Walter Ramsey, Town of Montague
Chris Cassani, City of Quincy
Moderator:
Michelle Danila, MassDOT

Session 1B – MassDOT Data Overview – What We're Using

Berkeley/Clarendon Rooms

Data continue to inform all MassDOT projects and initiatives large and small. Updates to safety and crash data are highlighted within a new and improved crash portal. Findings from the Better Bus Project study will develop a list of options to improve travel opportunities. Challenges to equity in access to transportation services and destinations, as well as agency-wide performance measures will round out the panel.

Panelists:
Bonnie Polin, MassDOT
Liz Williams, MassDOT
Caroline Vanasse, MassDOT
Laura Riegel, MassDOT
Moderator:
Rachel Bain, MassDOT

Session 1C – Quick Builds and Pilots to Advance Multimodal Mobility

First Floor Studio 1 - PI

Making roadway modifications or building trails typically takes years to implement. However, MassDOT and municipalities are implementing projects – within weeks or months – that address current safety concerns especially for people walking and biking. Low cost modifications, such as adjustments to pavement markings and using flexible delineator posts and signs, will all be presented within this panel. This session will feature the following projects: the Route 3A Road Diet pilot program in Hingham; the Charles River Basin Bridges, and Day Boulevard in South Boston.

Panelists:
Amy Getchell, MassDOT
Koby Lemrise, MassDOT
Corey O'Connor, MasssDOT
Moderator:
Laura Hanson, MassDOT

Session 1D – MassTrails - Investments in Trails Across the Commonwealth

First Floor Studio 2

The MassTrails Team helps to develop a unified vision for a trails network across the Commonwealth. Since its official launch in 2018, the team completed its first round of five million dollars in MassTrails grants to 71 projects throughout the Commonwealth. Learn how the team is investing in trails through project review and scoring, partnerships, funding strategies, and about the long-term network vision of the program.

Panelists:
Kurt Gaertner, Executive Office of Energy and Environmental Affairs
Paul Jahnige, Department of Conservation and Recreation
Michael Trepanier, MassDOT
Moderator:
Andy Paul, MassDOT

Session 1E – Latest Design Guidance

Arlington Room - PD

This session aims to highlight recent cutting-edge designs at the municipal, state, and national levels.The panel will address: the new NACTO guidance details on intersection design treatments that save lives and make biking and walking more comfortable for people of all ages and abilities; an update of MassDOT's 2006 Project Development and Design Guide; and the City of Cambridge's first-of-its-kind cycling safety ordinance requirement to install permanent protected bike lanes whenever a roadway within the city's bicycle plan is reconstructed.

Panelists:
Andrew Wilkins, MassDOT
Susanne Rasmussen, City of Cambridge
Matthew Roe, National Association of City Transportation Officials
Moderator:
Derek Shooster, MassDOT

BREAK/EXHIBITS: 10:45 am - 11:15 am

CONCURRENT SESSION #2: 11:15 am - 12:30 pm

Session 2A – Improving Biking and Walking - Project Spotlight

Georgian Room - PI

MassDOT's Complete Streets approach to project delivery continues to take into consideration all modes of transportation, providing improved pedestrian, cycling, vehicle, and transit facilities. Three high-profile works-in-progress will be featured in this presentation: current replacement of the Storrow Drive Charlesgate bridge, full modernization of Worcester's Kelley Square, and the extension of the Mass Central Rail Trail.

Panelists:
Steve McLaughlin, MassDOT
Dan Driscoll, Department of Conservation and Recreation
Tom Emerick, MassDOT
Moderator:
Pete Sutton, MassDOT

Session 2B – Increasing Mobility through Technology

Berkeley/Clarendon Rooms

Innovative multimodal approaches are necessary to serve our growing population. This session will discuss three featured cutting-edge improvements that offer more attractive conditions for transit riders, bicyclists and pedestrians alike. Join the session to hear about light detection and ranging (LIDAR) technology being implemented to update MassDOT's sidewalk inventory data, the new Massachusetts Municipal Transportation Dashboard GIS application and smart curb management that equitably serves all modes of travel.

Panelists:
Chengbo Ai, UMass Amherst
Andrew Clark, Central Transportation Planning Staff
Heather Bhowmick, MassDOT
Moderator:
Makaela Niles, MassDOT

Session 2C – Measuring Equity at a Statewide Level

First Floor Studio 1

Achieving equity throughout the project delivery process is a top priority at the local and statewide levels. Attendees will learn about the latest progress made by the MBTA on developing its Public Participation Plan, how MassDOT's recently released Bicycle and Pedestrian Transportation Plans incorporate equity checks within performance measures and how the City of Boston's Sidewalk Repair Equity Metric measures walking conditions on a block-by-block level.

Panelists:
Arthur Prokosch, MassDOT
Katie Choe, City of Boston
Laurel Paget-Seekins, MBTA
Moderator:
Ben Muller, MassDOT

Session 2D – New Approaches to Crossing Treatments

First Floor Studio 2 - PD

Crossing treatments will be addressed at this year's conference as this hot topic gets the treatment from three different perspectives. The MBTA provides insight about some of the experiences/lessons learned from making bus improvements and considering the impacts of pedestrians/riders. New approaches to trail crossing maintenance and safety at the regional and statewide levels reveal two unique methodologies for cataloging inventory and prioritizing improvements.

Panelists:
Eric Burkman, MBTA
Jeff McCollough, Pioneer Valley Planning Commission
Skye Levin and Kayla Cabral, VHB
Moderator:
Brendan Kearney, WalkBoston

Session 2E – Central MA Regional Connectivity

Arlington Room - M

Learn about the growing active transportation networks in the central part of the state. The Montachusett Regional Trails Coalition continues to advance walking and biking across a wide array of stakeholders. Discussions will include the overlapping efforts by local advocacy trail builders and an extensive volunteer network focused on the completion of the Mass Central Rail Trail. Finally, hear about one municipality's unique vision to connect urban and rural trails within its city limits.

Panelists:
Colleen Abrams, Wachusett Greenways
Sheri Bean, Montachusett Regional Planning Commission
Ralph Baker, Fitchburg Trail Vision Plan
Moderator:
Derek Krevat, MassDOT

LUNCHEON/SECRETARY'S KEYNOTE ADDRESS/VIDEO AWARDS: 12:30 pm - 1:45 pm

Grand Ballroom A

Stephanie Pollack, Secretary of Transportation & Chief Executive Officer, MassDOT
Awards: Safe Streets Smart Trips High School Video Contest

CONCURRENT SESSION #3: 1:45 pm - 3:00 pm

Session 3A - Building Bridges: Enhancing Coordination Between MassDOT and our Municipal Partners - M

Georgian Room

Highway Administrator Jonathan Gulliver and Deputy Administrator and Chief Engineer Patricia Leavenworth will detail some of the new initiatives and emphasis areas at the Highway Division and hold a dialogue on how these efforts can support our municipal partners in DPWs across the Commonwealth. Topics will include new tools that will help municipal staff in their everyday work, best practices in use by the Highway Division, and the various forms of trainings that MassDOT can provide to further bolster staff capacities in towns and cities. Please bring your questions and ideas to this roundtable session.

Panelists:
Jonathan Gulliver, Highway Administrator, MassDOT
Patricia Leavenworth, Deputy Administrator & Chief Engineer, MassDOT
Moderator:
Chris Ahmadjian, UMass Transportation Center

Session 3B – Best Practices and Lessons Learned for Suburban and Rural Mobility

Berkeley/Clarendon Rooms

The relationship between health, aging and transportation will be the focus of this panel - to bring attention to suburban and rural multimodal options for older adults seeking to travel for everyday purposes and improved health outcomes. Representatives from a rural municipality, a regional planning agency, and a recent microtransit project will offer best practices and discuss lessons learned.

Panelists:
Andy Hogeland, Town of Williamstown
Nicole Freedman, City of Newton
Maureen Mullaney, Franklin Regional Council of Governments
Moderator:
Aniko Laszlo, MassDOT

Session 3C – Placemaking – A Firsthand Look at Ongoing Projects

First Floor Studio 1 - PD

Municipalities across the Commonwealth are increasingly turning to crowdfunding sources for funding and guidance for creating great new public spaces. Attendees will see a firsthand account of the transformations taking place in downtown Lynn from both the creative local vision and the state agency responsible for the Commonwealth Places program. The MassDOT perspective on redefining infrastructure, improving mobility and the public realm will round out this session.

Panelists:
Al Wilson, Beyond Walls Lynn
Laura Christopher, MassDevelopment
George Batchelor, MassDOT
Moderator:
Alexandra Markiewicz, MassDOT

Session 3D – Emerging Popular Mobility

First Floor Studio 2

Building on last year's successful panel on new mobility services, three separate entities will offer their perspectives on these growing transportation options. The MBTA will provide an overview on a licensing pilot for mobility device companies seeking to place bikes and scooters on MBTA property. Updates from a motorized scooter pilot program at the municipal level will provide guidance to other communities. The role of e-bikes from the state's largest bike advocacy group will also be discussed.

Panelists:
Galen Mook, MassBike
Yanni Poulakos, MBTA
Heather Hamilton, Town of Brookline
Moderator:
Elizabeth van der Els, MassDOT

Session 3E – Improving South Shore Transportation

Arlington Room

The area directly south of Boston along the Route 3 corridor continues to face increasing transportation challenges. Various regional approaches to improving mobility among buses, trains, walking, bicycling and rideshare modes will be described at the regional planning agency level, through the region's largest transit provider, and by one of the area's community health network area coalitions that has identified transportation as a priority issue.

Panelists:
Paul Chenard, Old Colony Planning Council
Ashley Stockwell, Blue Hills Community Health Alliance
Alison Felix, Metropolitan Area Planning Council
Mike Lambert, Brockton Area Transit
Moderator:
Travis Pollack, Metropolitan Area Planning Council

SITE VISIT: Phillips Square Tactical Plaza

Meet in the Hotel Lobby

Tour is limited to the first 25 attendees to sign up at the registration table the morning of the conference. Come see Chinatown's re-imagined Harrison Avenue, between Essex and Beach Streets, in Boston's latest signature public space. Attendees will visit the site and see tactical urbanism at its best on this full city block: the addition of a designated seating area, separated bike lanes and pedestrian safety upgrades as well as the return of public art in the form of two guardian lion statues that had been removed from the neighborhood during the Big Dig.

Guides:
Jacob Wessel and **Charlotte Fleetwood**, City of Boston

SITE VISIT: Walking tour of New Separated Bike Lanes on Charles River Dam Road

Meet at the Registration Table

Tour is limited to the first 25 attendees to sign up at the registration table the morning of the conference. MassDOT's recently completed reconstruction to this major arterial (Route 28) includes separated bike lanes between Land Boulevard and Leverett Circle, while maintaining two travel lanes in each direction, and a dedicated turn lane onto Land Boulevard. This work is the result of close collaboration with the community, advocates, elected officials, and key stakeholders to update and refine these long-planned roadway changes so that they increase safety for this important corridor.

Guide:
Andy Paul, MassDOT

BREAK/EXHIBITS: 3:00 pm - 3:15 pm

SESSION #4: 3:15 pm - 4:30 pm

Session 4 – Implementing MassDOT's Bicycle and Pedestrian Plans

First Floor Studios 1 & 2 - PI, PD, M

MassDOT's 5-year Capital Investment Plan includes $60 million in state funding programmed for high-priority projects identified in the recently released Statewide Pedestrian and Bicycle Transportation Plans. One of the core elements of both plans is the rollout and implementation of new projects that scored highly for biking and walking upgrades along MassDOT-owned roadways. The Potential for Everyday Biking and the Potential for Walkable Trips were the two resultant scorecards from which MassDOT then prioritized corridors and locations most in need of bike and pedestrian upgrades. This final session will highlight select projects from each of the six MassDOT districts.

Panelists:
Michelle Danila, MassDOT
Mark Moore, MassDOT District 1
Richard Masse, MassDOT District 2
Arthur Frost, MassDOT District 3
Brian Fallon, MassDOT District 4
Pam Haznar, MassDOT District 5
Courtney Worhunsky, MassDOT District 6
Moderator:
Jonathan Gulliver, Highway Administrator, MassDOT

VISIT THE STATLER ROOM AND ENJOY THE OPEN SQUARE!

Visit with exhibitors, sit, relax, play games, and enjoy a latte or cappuccino while networking with colleagues.

****YOUNG PROFESSIONALS IN TRANSPORTATION (YPT) SOCIAL HOUR: 4:30 pm**
M.J. O'Connor's

The Young Professionals in Transportation group will host a social hour immediately following the Moving Together Conference at M.J. O'Connor's, located next door to the conference. YPT will provide light appetizers (while supplies last). Everyone is welcome! Young Professionals in Transportation provides networking, professional development, and fellowship opportunities for young professionals in the transportation field. YPT does not provide an age definition for young; its membership and events are open to all.

massDOT Massachusetts Department of Transportation
U.S. Department of Transportation Federal Highway Administration

MORNING KEYNOTE SPEAKER

Jonathan Gulliver

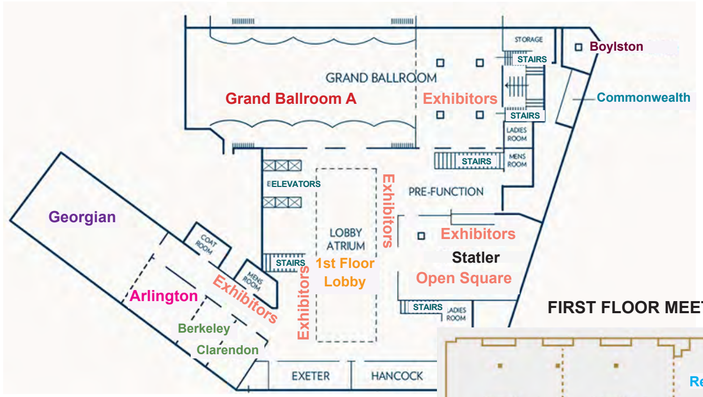
Jonathan Gulliver is the Highway Administrator at MassDOT, having served in this role since May 2017. Jonathan has been with MassDOT since 2009, and prior to becoming Highway Administrator, he served as the District 3 Highway Director, responsible for the management and oversight of the state highway and bridge system of Central Massachusetts. Jonathan has over two decades of experience in managing complex state and municipal projects, and holds a degree in Civil Engineering from Worcester Polytechnic Institute.

LUNCHEON KEYNOTE SPEAKER

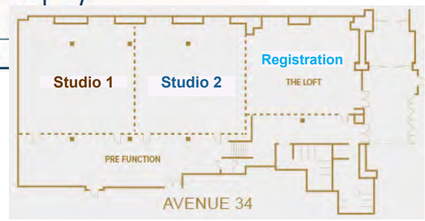
Stephanie Pollack

As Secretary of Transportation and MassDOT CEO, Stephanie Pollack has led efforts to establish project selection criteria, set priorities, and deliver a $18.3 billion five-year capital investment plan that is focused on improving safety and reliability for the traveling public by modernizing Massachusetts' transportation assets. She has focused MassDOT on better serving all its customers with initiatives such as All-Electronic Tolling, Municipal Complete Streets and Small Bridge, and improving construction coordination and customer communications. Since July 2015, the leadership of the Massachusetts Bay Transportation Authority (MBTA) has also reported to Secretary Pollack, giving her a critical role in steering the ongoing turnaround of the transit system serving Eastern Massachusetts. Secretary Pollack leads the Department in its mission "to find better ways to meet the State's transportation needs, serve customers, spur the Commonwealth's economy, and reducing the State's carbon footprint.

MEZZANINE MEETING ROOMS



FIRST FLOOR MEETING ROOMS



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