

Transportation Research Quarterly

Providing highlights of MassDOT's transportation research activities and other helpful information

2024 Q2

Focus on Research

"Since time is the one immaterial object which we cannot influence - neither speed up nor slow down, add to nor diminish - it is an imponderably valuable gift."

Maya Angelou

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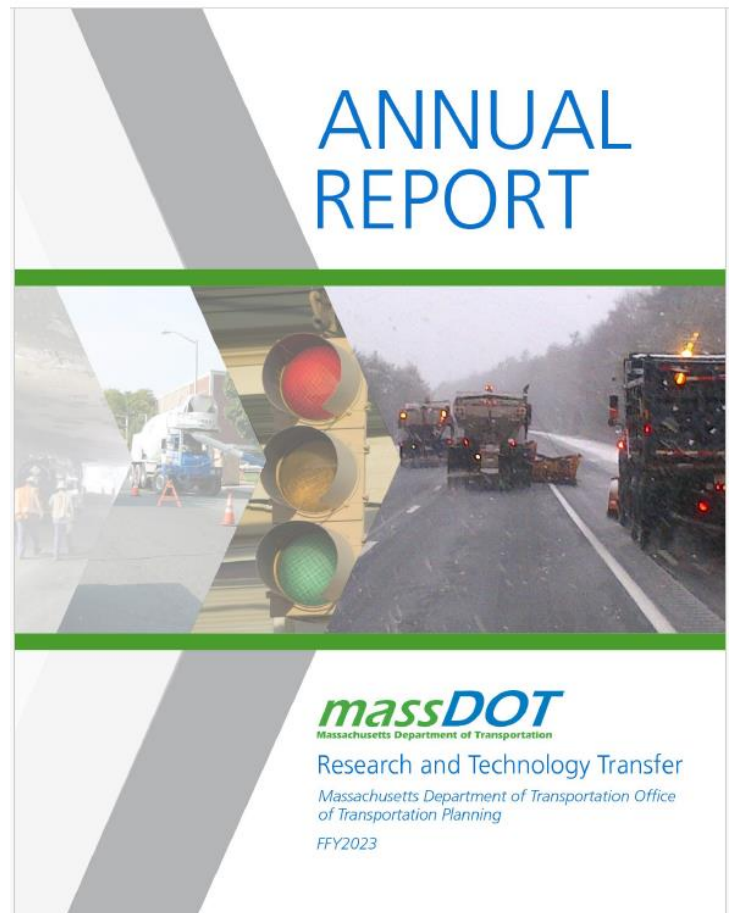
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MassDOT Research Annual Report

The Massachusetts Department of Transportation (MassDOT) remains at the forefront of addressing and advancing the Commonwealth's transportation system's multifaceted challenges. In Federal Fiscal Year 2023 (FFY2023), underpinned by the latest legislative advancements, including the Act to Reduce Traffic Fatalities, MassDOT underscored its commitment to roadway safety, with a pronounced focus on protecting Vulnerable Road Users (VRUs). This focus not only informed the strategic agenda but was pivotal in shaping MassDOT's research and technology transfer efforts, aligned with our overarching goal of creating safer, more inclusive roadways for all. Click [here](#) to reach the full report.



Annual MassDOT Innovation Conference

Annual MassDOT Innovation Conference Report

MassDOT's annual Transportation Innovation Conference provides a forum for sharing knowledge and ideas on innovative transportation initiatives, technologies, and systems. The Innovation Conference is supported by the MassDOT Research and Technology Transfer Program. This year's Innovation Conference took place on April 30th and May 1st at the DCU Center in Worcester. A total of 1,765 people registered for the conference: 1,592 signed up to attend in-person, and 173 to attend only remotely. Remote attendees had access to keynote and plenary talks, and to five of the podium presentation sessions. People registered for the conference from 30 states, the District of Columbia, Ontario and Quebec.

The conference included 30 podium sessions, a poster session, a hands-on GIS learning lab, and 91 exhibitors/sponsors. By organization type, one-third (33%) of registrants were from MassDOT/MBTA, 44% from the private sector, 8% from local/regional government, 7% from academia, 2% from other state DOTs, and 6% from other organizations or registered as individuals.



BY THE NUMBERS

1765
TOTAL
REGISTRATIONS

**HIGHEST IN-PERSON
SESSION ATTENDANCE**

300 DIGGING DEEPER:
LESSONS FROM THE
CENTRAL ARTERY
TUNNEL PROJECT
(HYBRID)

75%
ATTENDED
BOTH DAYS

197 ESTABLISHING
TARGET SPEED
GUIDANCE (HYBRID)

44%
PRIVATE SECTOR MADE
UP THE LARGEST GROUP
IN ATTENDANCE -
UP FROM 37% IN 2023

**HIGHEST VIRTUAL
SESSION ATTENDANCE**

107 DRIVING THE
FUTURE: NAVIGATING
THE INTERSECTION
OF AI, ML, AND
TRANSPORTATION
INNOVATION
(HYBRID)

48%
HAD AN
EXCELLENT
EXPERIENCE

105 BIKE, WALK, RIDE...
ACCOMMODATING
THE VULNERABLE
ROAD USERS IN
EVERYDAY LIFE
(HYBRID)



MassDOT Bicycle and Pedestrian Program Coordinator Pete Sutton served as the conference's Master of Ceremonies, additionally, Sutton and Highway Administrator Jonathan Gulliver gave the opening plenary. Highlights of the conference included the keynote talks by Victoria Sheehan, Executive Director of the Transportation Research Board of the National Academies of Sciences, Engineering, and Medicine, and by Monica Tibbits-Nutt, Secretary and CEO of MassDOT. According to the post-conference survey, 75 percent of respondents indicated that they attended both days, and 90 percent said that overall, they had a favorable—either “Good” or “Excellent”—experience at the conference.

Ongoing Research Project Highlights



Speed Management and Emergency Response – A Synthesis Study

The impact of speed on roadways throughout the Commonwealth of Massachusetts continues to be a critical concern in the effort of achieving zero fatalities and reducing serious injuries. Speed management solutions are numerous and their ability to reduce vehicle speeds well documented; what's missing is the lack of use - municipal officials may be apprehensive in implementation. The apprehension stems from concerns historically related to first responders and concerns regarding the impact on emergency response times and other metrics. In New England, public works officials are frequently hesitant to implement speed management solutions due to anecdotal challenges related to snow removal.

This research project was designed to enhance the understanding of the impact of speed management strategies on vehicular speeds, as well as the concerns of emergency and public works' personnel. Given the latest MassDOT ongoing efforts to evaluate and implement new strategies statewide, this research will stem from the development of the new Safe Speeds repository. The deliverables will include a set of recommendations for roadway treatments that successfully reduce roadway speeds, improve implementable design standards, and address municipal personnel concerns.

The four main project objectives include:

- Conduct a survey of current speed management techniques, their effectiveness, and municipal implementation challenges;
- Host regional speed management forums to engage with local stakeholders, based on existing municipality feedback;
- Create an inventory of regional speed management case studies and municipal partnerships;
- Assist MassDOT in their ongoing efforts to promote sustainable speed management treatment strategies.

Completed Research Project Highlights

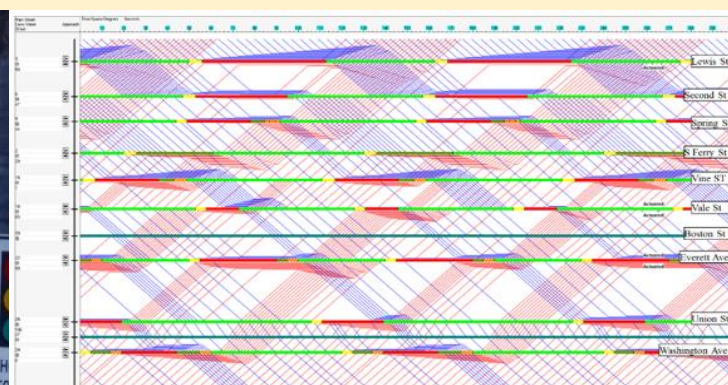
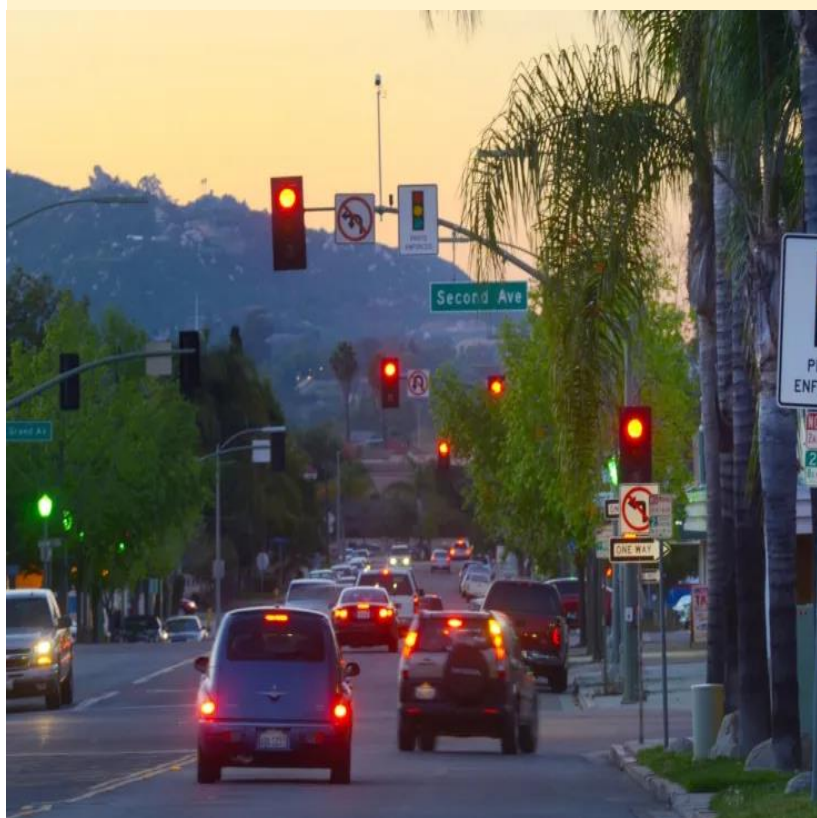
Safe Waves: Signal Timing Guide, Analysis Tool, And Case Studies

As more cities adopt Vision Zero principles, they feel a stronger need to reduce speeding on arterial roads. Unfortunately, physical traffic calming techniques involving horizontal and vertical deflection, while highly effective for speed control on local streets and streets with one directional lane, cannot generally be applied on multilane arterials. This raises the question; can traffic signals be used effectively to manage vehicular speeds on multi-lane arterials? This study examines an approach to speed management based on timing traffic signals in a way that minimizes opportunities for speeding.

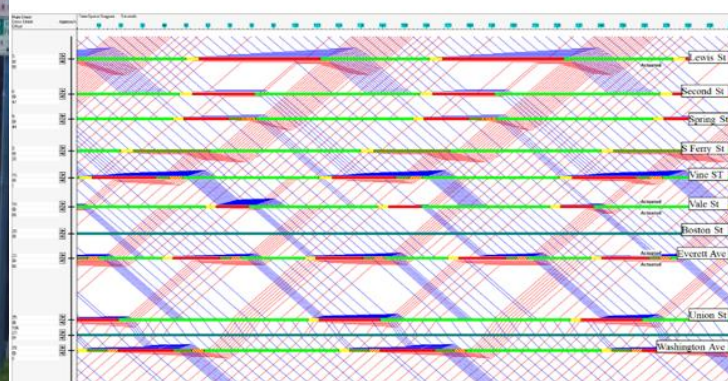
The present study was initiated with three objectives that aim at advancing arterial speed management using signal timing. The first objective was to develop a guideline for Safe Waves traffic signal timing. A second objective was to develop software that could evaluate the number of speeding opportunities afforded by a proposed arterial traffic signal timing plan. A new app, the Safe Waves Analysis Tool (SWAT), was developed and has been implemented as a web-app. The study's third objective was to conduct field test case studies in two corridors.

At the end of the field tests, Safe Waves signal timing was found to be effective at managing speed at little "cost" in terms of added vehicle delay, and with substantial reductions in pedestrian delay. In the field test, the number of speeding vehicles fell by about 75%, while average arterial delay per intersection increased by only 2 s, and average pedestrian delay fell by 18.5 s. The Safe Waves timing plan induced this reduction in speeding behavior by reducing the number of speeding opportunities by more than 50% in the a.m. and midday periods, and by 29% in the more congested p.m. peak period.

As a result of this research, an app was successfully developed for counting and visualizing the speeding opportunities associated with any proposed arterial signal timing plan. Additionally, a guidance document was created to help designers create signal timing plans following the Safe Waves approach. Together with the SWAT app, MassDOT expects that more signal timing plans that effectively manage arterial speeds and thereby improve safety will be developed and implemented.



100 % volume



75% volume

A Look at Who We are – Transportation Research Team Highlights

Each MassDOT research project team is comprised of a Project Champion(s), a Principal Investigator(s) and a Project Manager. The Project Champion serves as the MassDOT technical representative, the Principal Investigator conducts research investigation and produces deliverables per project scope and schedule, and the Project Manager takes charge of the overall project administrative management and coordination. Highlighted below are the key members of “SAFE WAVES: SIGNAL TIMING GUIDE, ANALYSIS TOOL, AND CASE STUDIES” project team.

Principal Investigator – Peter Furth, PhD

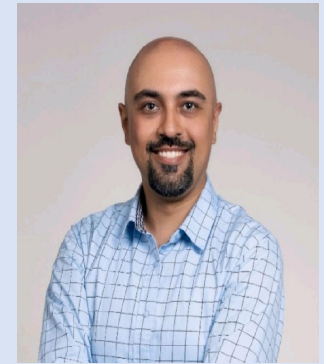
Dr. Furth is a leading researcher on bicycle network analysis, having invented the “Level of Traffic Stress” criteria and methods for evaluating low-stress bike accessibility. He continues to develop new frontiers in bike network analysis.

He is also a leading thinker in traffic signal control, developing new techniques and algorithms for transit priority, for better serving pedestrians and bicyclists, and for improving transportation safety. He pioneered the concept of “speeding opportunities,” showing how traditional signal timing methods create many opportunities and incentives for drivers to speed on urban and suburban arterial roads, and showing how a different signal timing approach can drastically lower speeding opportunities while still providing good service.



Researcher – Milad Tahmasebi, PhD Candidate

Milad Tahmasebi is a PhD Candidate at Northeastern University. Before starting his Ph.D. program, Milad had six years of industry work experience, working on various transportation projects. During his PhD, he had the privilege of working on several geometry and signal timing plan design projects under the supervision of Prof. Furth, focusing on providing a safer transportation network for all road users.



Project Champion – James Danila

James M. Danila, P.E. & PTOE, became the State Traffic Engineer at the MassDOT Highway Division in 2021 and had served as the assistant State Traffic Engineer prior to that. Before joining MassDOT, Jim worked as a Transportation Engineer at several private engineering design firms, including Howard Stein Hudson. He received his B.S. in Civil Engineering with a Minor in Environmental Science from Lafayette College in Easton, Pennsylvania. Jim is an active member of the AASHTO Standing Committee on Highway Traffic Safety and a member of the Institute of Transportation Engineers.



Research manager – Michael Flanary

Mike Flanary is a transportation planner and Research Project Manager with the Research Section at the Office of Transportation Planning. He joined MassDOT in September 2019 after graduating from Tufts University with a Master’s in Urban and Environmental Policy and Planning. Prior to working at MassDOT, Mike worked at Tufts University and completed internships with Conservation Law Foundation, the Martha’s Vineyard Commission, and the City of Cambridge, MA. He is an avid cyclist and greatly enjoys riding his e-bike around Boston. Mike also just welcomed a new addition to his family, baby boy Andy.



News and Events

The MassDOT Moving Together Conference

This conference provides a unique platform for meaningful discussions, knowledge sharing, and collaborative strategy development to enhance our transportation systems and ensure safety for all.

- Learn from industry leaders and experts who will share their invaluable insights and experiences
- Participate in workshops and sessions offering practical insights and innovative solutions. Workshops and panels that highlight current pedestrian, bicyclist and public transportation topics
- Network with colleagues representing diverse interests from the public, academic and private sectors
- All new site visits and mobile workshops led by engineers and bicyclist/pedestrian advocates

October 23, 2024

Sheraton Boston Hotel

39 Dalton Street

Boston, MA • 7:45 am - 4:30 pm

Visit the [2024 Moving Together Conference](#) website to view the complete conference program.



— massDOT — Innovation Webinar Series

Effectiveness of Two-stage Turn Queue Boxes in Massachusetts: A Comparison with Bike Boxes - July 18, 2024

This project studied the effectiveness of two-stage turn queue boxes (TSTQB) in Massachusetts by investigating left-turning bicyclist behavior at TSTQB and correlating it with design elements. Click [here](#) for the webinar

Data-Driven Approaches for Transit Capital Planning - June 20, 2024

This research report presents a review of the existing RTA capital planning process in Massachusetts, current practices for transit asset management nationwide, and potential changes to the processes and software tools that would make capital planning more data-driven. Click [here](#) for the webinar

Development of a Salt-Spreader Control Program Using Machine-Sensed Roadway Weather Parameters -May 30, 2024

This study aimed to develop and validate an automated system that can automatically adjust the spreader controller based on the acquired mobile RWIS sensor data, such as road temperature, grip level, and surface state. Click [here](#) for the webinar

Artificial Intelligence Framework for Crosswalk Detection Across Massachusetts - April 25, 2024

This webinar discussed the development of an Artificial Intelligence (AI) framework to detect crosswalk locations across the state of Massachusetts, as well as their type classification (continental, parallel lines, or solid) and location category (intersection, midblock, or driveway). Click [here](#) for the webinar

Research Resources

In Progress MassDOT Research

	Start Date
• Development of Improved Inspection Techniques Using LIDAR for Deteriorated Steel Beam Ends	March 2022
• Smart Work Zone Safety Control and Performance Evaluation	April 2022
• Tree Preservation and Planting for Complete Streets Development	April 2022
• Development of a Salt Spreader Controller Program	April 2022
• Post-Fire Inspection of Concrete Structure Phase III- In-Situ Experiments	April 2022
• Methods to Identify Problematic Carriers and Prevent Infrastructure Damage	June 2022
• 3D Printing Applications for Bridge Element Repair	June 2022
• Evaluating Safety Impacts of Two-stage Bike Boxes	August 2022
• Field Study to Determine Salt Usage Efficiency on Two Pavement Types	August 2022
• Implementing AASHTO Mechanistic-Empirical Pavement Design Guide Phase III	November 2022
• Effect of Asphalt Binder Source on Asphalt Mixture Performance	February 2023
• Accessible Bus Stop Design in the Presence of Bike Lanes	March 2023
• Cross-Modal Assessment of Sustainable Transportation Networks	March 2023
• A Pavement marking Inventory and Retroreflectivity Condition Assessment Method Phase II	March 2023
• Speed Management and Emergency Response – A Synthesis Study	April 2023
• Evaluating the Effectiveness of Drivers' Education Modules on Safety	April 2023
• Fare Payment Compliance on MBTA Buses and Light Rail	May 2023
• Measuring Food Access to Improve Public Health Phase II	September 2023
• Data-Driven Approaches for Transit Capital Planning	September 2023

Recently Completed MassDOT Research

	Completion Date
• Uncovering the Root Causes for Truck Rollover at Highway Ramps	March 2023
• Safety Impacts of Yellow Flashing Permissive Left-Turn Indications – Approach Analysis	March 2023
• Using Mycofiltration Treatment for Stormwater Management	March 2023
• Construction and Material Best Practices for Concrete Sidewalk Phase II – Hot Placement	March 2023
• Optimizing MassDOT's High Performance Asphalt Overlay Mixtures	May 2023
• Massachusetts Depth to Bedrock	May 2023
• Multisource Data Fusion for Traffic Incident Detection	May 2023
• Measuring Food Access To Improve Public Health Phase I	July 2023
• Post-Fire Damage Inspection of Concrete Structures (Phase II) – Experimental Phase	February 2023
• Building Information Model for Transit Infrastructure: Feasibility and Gap Analysis	August 2023
• Implementing AASHTO Mechanist-Empirical Pavement Design Guide Phase II	September 2023
• Developing Massachusetts-Specific Trip Generation Models for Land Use Projects	September 2023
• Revised Load Rating Procedures for Prestressed Concrete Beams	November 2023
• Ultra-High Performance Concrete Reinforced with Multi-scale Hybrid Fibers	December 2023
• Artificial Intelligence Framework for Midblock Crosswalk Detection Across Massachusetts	February 2024
• Using Traffic Signals to Reduce Speeding Opportunities	February 2024
• LIMMS Development Planning	July 2024

Additional Resources

[Transportation Research and Information Database \(TRID\)](#) is a comprehensive bibliographic database containing more than 1.2 million records of transportation research.

[Research in Progress \(RiP\) Database](#) contains information on more than 13,000 current or recently completed federally-funded transportation research projects.

[AASHTO Publications](#) include the most accepted technical guides, specifications, and manuals of the industry.

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