

# INTEGRATED SMART WORK ZONE INITIATIVE

By Pennsylvania Department of Transportation (PennDOT)

## IN THIS CASE STUDY YOU WILL LEARN:

- 1 How PennDOT evaluated and built upon already established permanent ITS devices logic and functionality through its Advanced Traffic Management System (ATMS) for Smart Work Zone initiatives.
- 2 How the Smart Work Zone systems included speed management, ramp metering and traveler information applications.
- 3 How PennDOT developed a process that provides both industry business partners and PennDOT staff with the opportunity to understand procedures for requesting Smart Work Zone applications within their work zones.

## BACKGROUND

Pennsylvania, like many other states, has been looking to implement strategies to improve the safety, mobility, and situational awareness for road users traveling through work zones. PennDOT's Integrated Smart Work Zone Initiative utilizes already available equipment, technology, and logic to bring together those concepts to provide a mod-

ernized, scalable, and expanded approach to deploying Smart Work Zone applications in Pennsylvania.

While PennDOT has deployed various Smart Work Zone applications over the years, the department, like many other states, has experienced challenges with the deployment due to the high initial costs, lack of understanding about what is needed to deploy the application, and the lack of interoperability between the equipment and systems. These challenges made PennDOT rethink its deployment approach to future Smart Work Zone applications. The department evaluated and built upon already established permanent ITS devices logic and functionality through its Advanced Traffic Management System (ATMS). Standard work zone equipment is now integrated with the ATMS system through several efforts:



- Speed Management – PennDOT sometimes lowers the speed limits when workers are present and activity is occurring, but in the past would utilize “static” signs which needed to be uncovered during the activity and recovered at the end of the shift. With advancements

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to variable speed limits (VSL), the department has now incorporated this functionality allowing for both dynamic and static displays of speed limit based on the project needs. This approach not only improves worker safety by limiting exposure but allows technology to help slow down road users to acceptable speeds within the work zones.



- Ramp Metering – PennDOT currently utilizes permanent ramp meters in its ATMS and recently completed a pilot deployment within a work zone that can deploy both static and dynamic ramp metering regardless of the time frame needed.



- Traveler Information – PennDOT has identified the following applications to better provide accurate, timely, and relevant traffic information:
  - *Travel Time Messaging* – With recent advances to 3rd party probe data that improves the granularity for reporting speeds, the department has been successful in utilizing that same ATMS Travel Time Messaging module to establish and provide work zone travel time information.
  - *Queue Warning Systems* – This application can be configured to utilize Changeable Message Signs (CMS) that are connected to PennDOT's ATMS system. By incorporating this logic into a work zone, automated slow down and queue messaging can be communicated in real-time using probe data. In the past, similar types of systems could be deployed with a lot of effort put into placement of physical detection. Based on quality control testing

of the data, these deployments produced minimal performance improvements. Therefore, a new application was implemented that could both have field detectors and/or utilize probe data to provide important queue related messaging.

- *Integrated Corridor Management* – PennDOT developed an approach where multiple routes can be evaluated, and relevant traveler information be displayed. This allows road users the ability to make informed decisions when navigating between two similar parallel corridors.

## TSMO PLANNING, STRATEGIES AND DEPLOYMENT

PennDOT's integrated approach better reflects a more consistent and reliable application to the road users. With the applications built within the ATMS and many of the work zone devices integrated into the system, most of the planning and deployment now involves typical project design characteristics. Projects that want to utilize Pennsylvania's Smart Work Zone applications would submit the locations of work zone devices that will be integrated into the application. While some of the applications do require minimum devices to be effective, this approach allows for project scalability along with the ability to add additional devices while in construction with very little disruption. Once the applications and devices have been identified, PennDOT's Statewide Traffic Management Center (STMC) would develop the necessary applications that have already been built into the ATMS system.

Once the project strategies are developed, it can be reviewed and tested prior to making the application active in the field. Additionally, any additions or adjustments can be easily adjusted from the STMC and evaluated prior to activation. These technology advancements have been achievable due to PennDOT's understanding of the available data sources and incorporating where practical TSMO strategies that can be utilized for both permanent and temporary situations. As this data continues to improve and as other data becomes more available, PennDOT will continue to look at opportunities to identify, plan, and implement effective Smart Work Zone applications that provide an overall safety and mobility benefit to road users and workers on each project.

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## COMMUNICATIONS PLANNING AND EXECUTION

PennDOT has begun to deploy the TSMO strategies identified above on long term work zones this winter season and will continue to refine the process so that many projects next construction season can be considered for implementation. This process will provide both industry business partners and PennDOT staff with the opportunity to understand the process and procedures moving forward for requesting these applications within their work zones.

PennDOT's ATMS system has been built with various strategies and applications from a dynamic Travel Time Module, Changeable Message Sign Module (allowing dynamic prioritization and messaging), Corridors Modules (allowing queue protection and automated altering), and Variable Speed Limit Module. While this only displays a few of the modules developed within PennDOT's ATMS system, this system was initially developed by Q-Free Open roads and now is being maintained and enhanced by Southwest Research Institute.

PennDOT is an active member of the Eastern Transportation Coalition (formally I-95 Corridor Coalition) and participates in the coalition's Vehicle Probe Marketplace to obtain third party speed data. Currently, PennDOT purchases statewide INRIX data that is used for real-time notification, reporting, automated messaging, and performance reporting.

PennDOT's work zone devices go through a statewide review and product review process to ensure they meet the department's standards. Recently the department has incorporated specific requirements regarding connectivity into its specifications. Many of the approved field devices utilized for work zones have already been integrated into the ATMS system since they have been utilized for previous permanent or semi-permanent traffic management purposes.

PennDOT will continue to evaluate the most effective Smart Work Zone applications and will continue to update its guidelines on implementation to designers, maintenance, and construction staff so that this technology can be utilized to complement conventional work zone protection strategies.

## OUTCOME, LEARNINGS AND PUBLIC BENEFIT

PennDOT's approach to addressing work zone safety and mobility through this more holistic approach to deployment helps provides clarity to road users, industry partners, designers, and internal staff. The approach also helps stakeholders understand future planning, design, and deployment of these technologies. The use of the ATMS software and effective management by Traffic Management Centers and construction field staff allows for more focus on automated messaging which will provide road users with more accurate, timely, and relevant information to make appropriate decisions while traveling through PennDOT's Work Zones.

As the department continues preparing to move towards compliance with the Work Zone Data Exchange Standard and to prepare for some of the more advanced connected and automated vehicle applications, this work zone approach has prepared PennDOT to provide road users with appropriate information to make actionable and informed decisions.