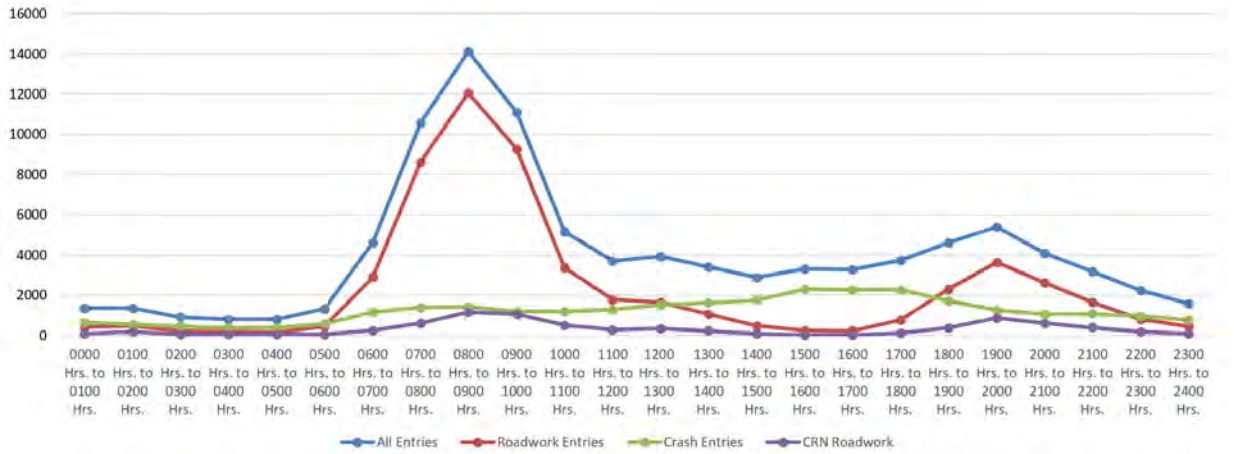
PennDOT Lane Reservation System Update

AGENDA

- Lane Reservation System Review
- Work Completed Since November ‘22
- Peer Exchanges and Lessons Learned
- Publication/Policy Next Steps
- Deployment Timeline Update

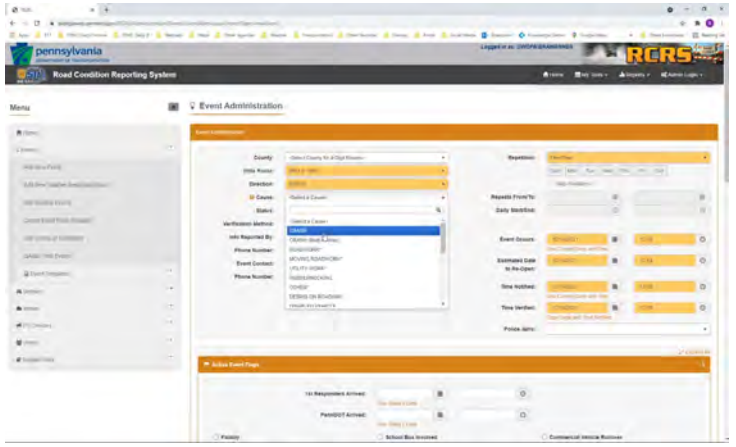
OVERVIEW – PROJECT GOALS

- Reduce work zone conflicts
- Reduce work zone congestion
- Improve work zone/general traffic safety
- Share work zone/incident data effectively
- Improve TMC Operations
- Standardize work zone scheduling and tracking on our roadways

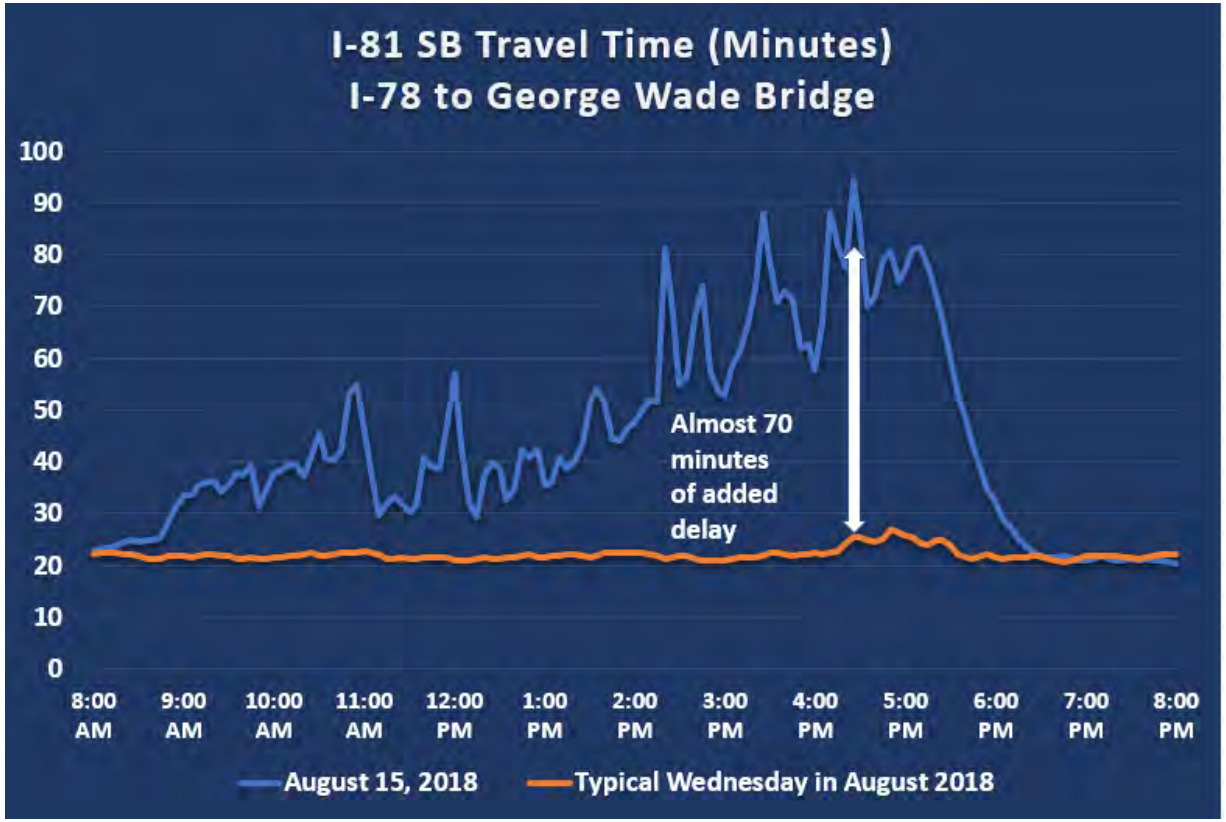


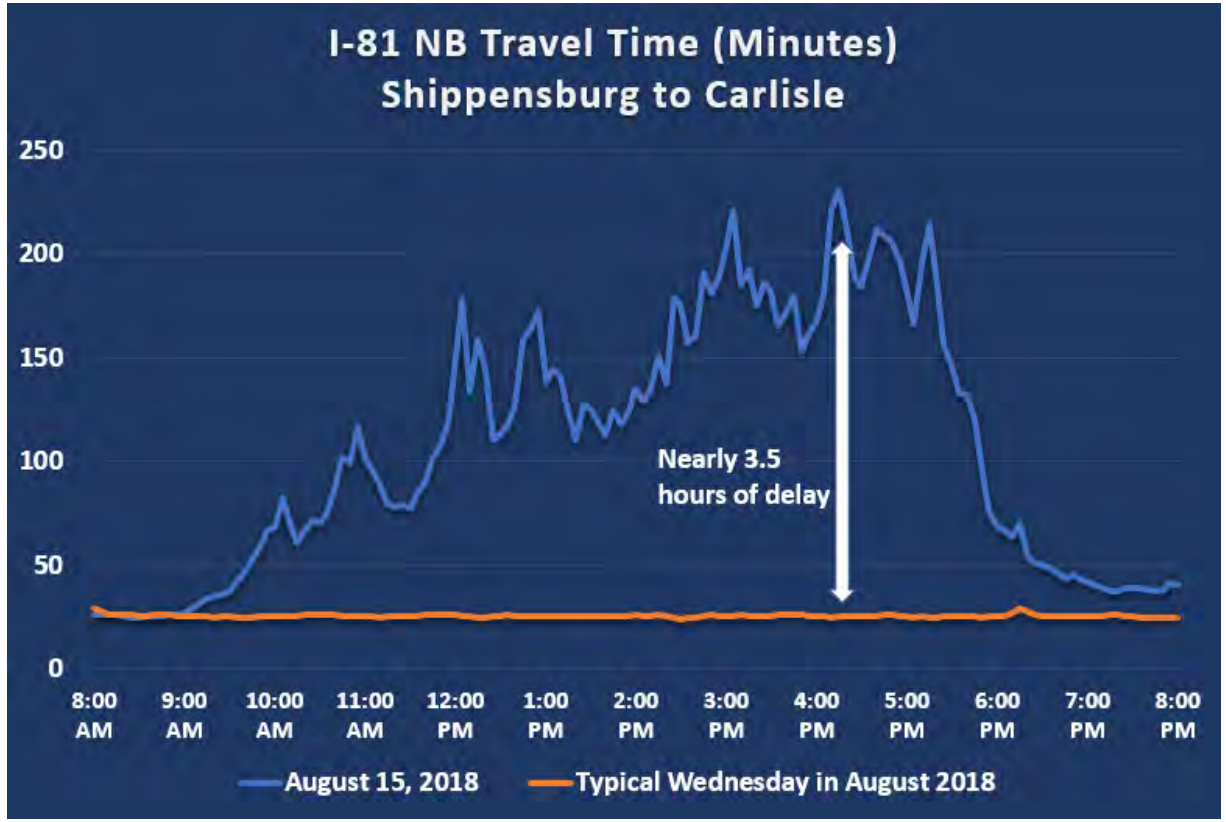
Yearly Work Zone Entries

CAUSE	ALL ROUTES	CORE NETWORK ONLY
ROADWORK	27,635	11,866
MOVING ROADWORK	6,239	4,325
UTILITY WORK	5,114	590
TOTAL	38,988	16,781

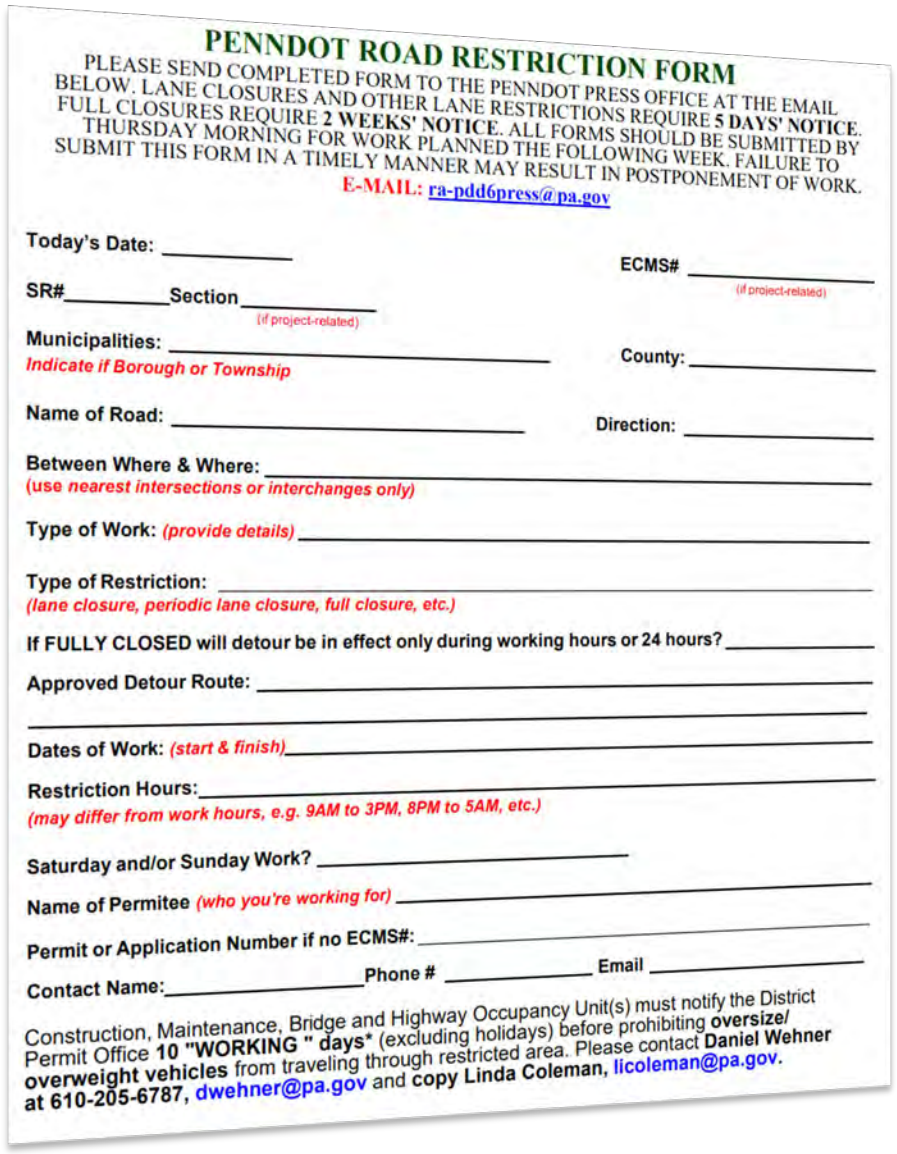


NEED FOR A SYSTEM





CURRENT PROCESS FOR TRACKING WORK ZONES



PENNDOT ROAD RESTRICTION FORM

PLEASE SEND COMPLETED FORM TO THE PENNDOT PRESS OFFICE AT THE EMAIL BELOW. LANE CLOSURES AND OTHER LANE RESTRICTIONS REQUIRE **5 DAYS' NOTICE**. FULL CLOSURES REQUIRE **2 WEEKS' NOTICE**. ALL FORMS SHOULD BE SUBMITTED BY THURSDAY MORNING FOR WORK PLANNED THE FOLLOWING WEEK. FAILURE TO SUBMIT THIS FORM IN A TIMELY MANNER MAY RESULT IN POSTPONEMENT OF WORK.

E-MAIL: ra-pdd6press@pa.gov

Today's Date: _____ **ECMS#** _____ (if project-related)

SR#_____ **Section** _____ (if project-related)

Municipalities: _____ **County:** _____

Indicate if Borough or Township

Name of Road: _____ **Direction:** _____

Between Where & Where: _____

(use nearest intersections or interchanges only)

Type of Work: *(provide details)* _____

Type of Restriction: _____

(lane closure, periodic lane closure, full closure, etc.)

If FULLY CLOSED will detour be in effect only during working hours or 24 hours? _____

Approved Detour Route: _____

_____

Dates of Work: *(start & finish)* _____

Restriction Hours: _____

(may differ from work hours, e.g. 9AM to 3PM, 8PM to 5AM, etc.)

Saturday and/or Sunday Work? _____

Name of Permitee *(who you're working for)* _____

Permit or Application Number if no ECMS#: _____

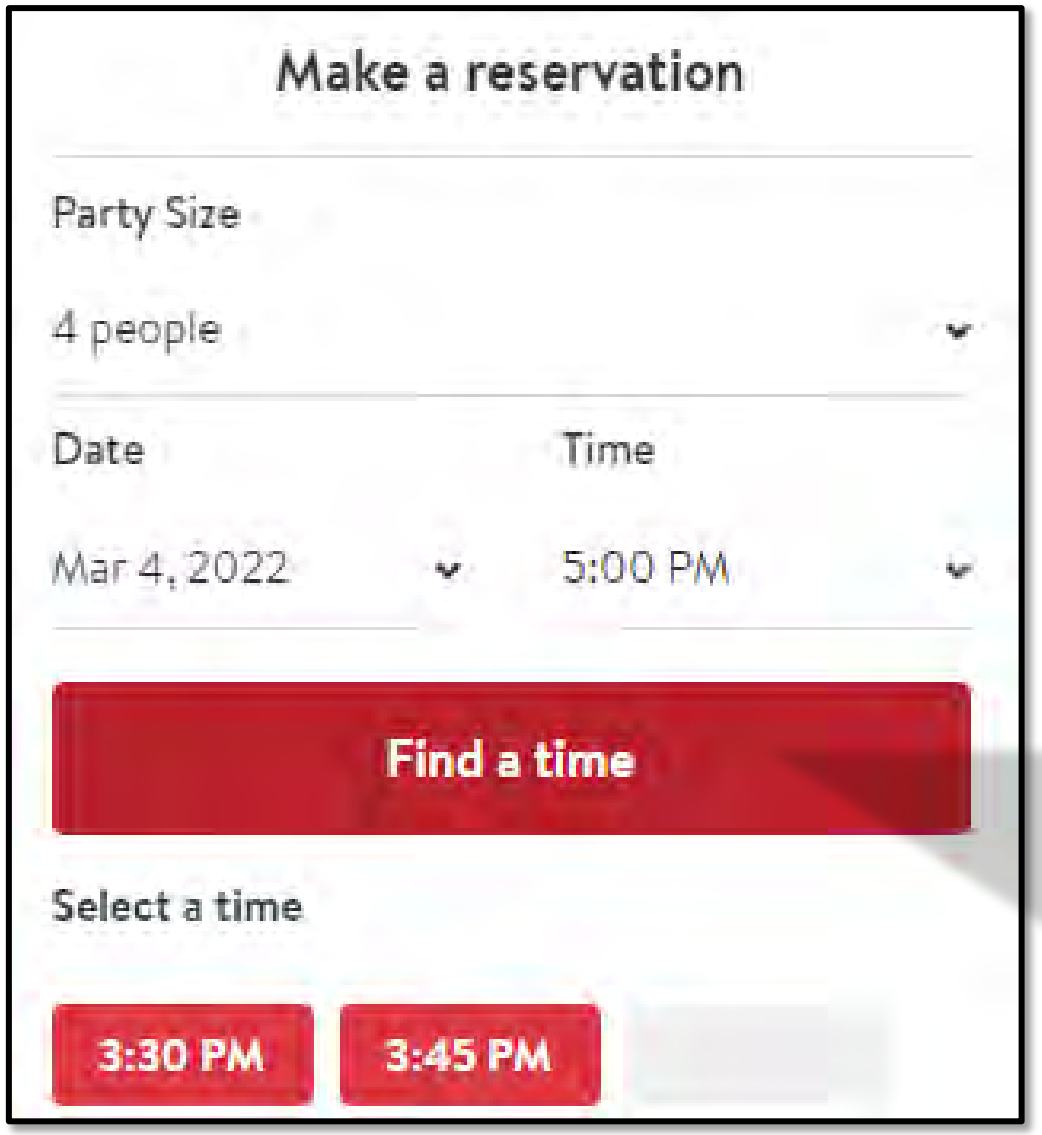
Contact Name:_____ **Phone #** _____ **Email** _____

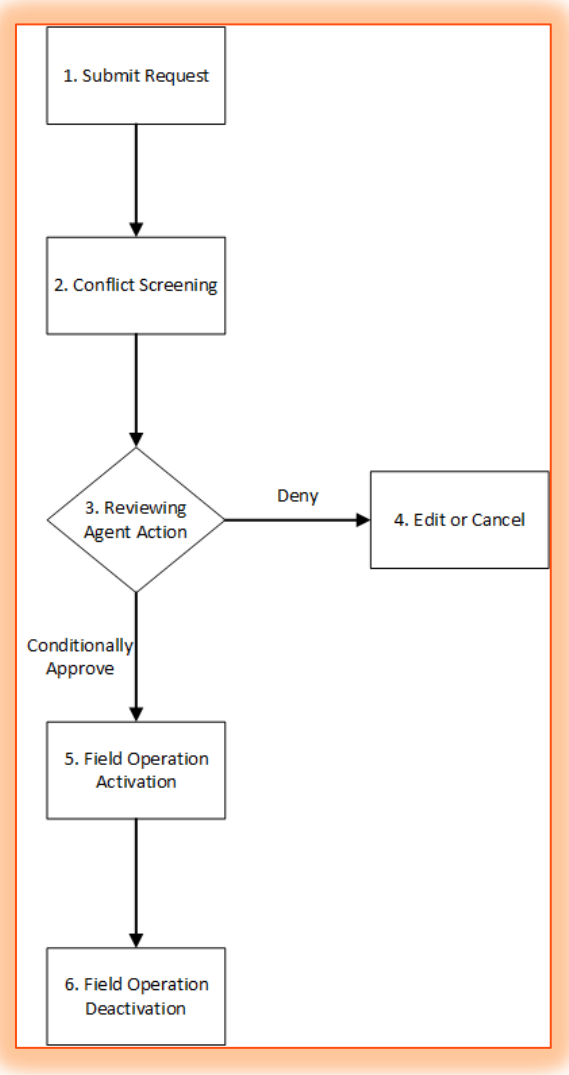
Construction, Maintenance, Bridge and Highway Occupancy Unit(s) must notify the District Permit Office **10 "WORKING " days*** (excluding holidays) before prohibiting **oversize/ overweight vehicles** from traveling through restricted area. Please contact **Daniel Wehner at 610-205-6787, dwehner@pa.gov** and **copy Linda Coleman, licoleman@pa.gov.**

Gaps/justification for changes:

- Separate, non-standard processes
- Duplication of efforts
- No automated conflict identification
- Work zones not captured
- Communication issues
- Lack of timely and accurate traveler information

LANE RESERVATION CONCEPT





DEPLOYMENT TIMELINE UPDATE

ConOps and Requirements
Sept 22

LRS Event Mgmt. "Initial Phase"
~~Summer 23~~
Winter 23

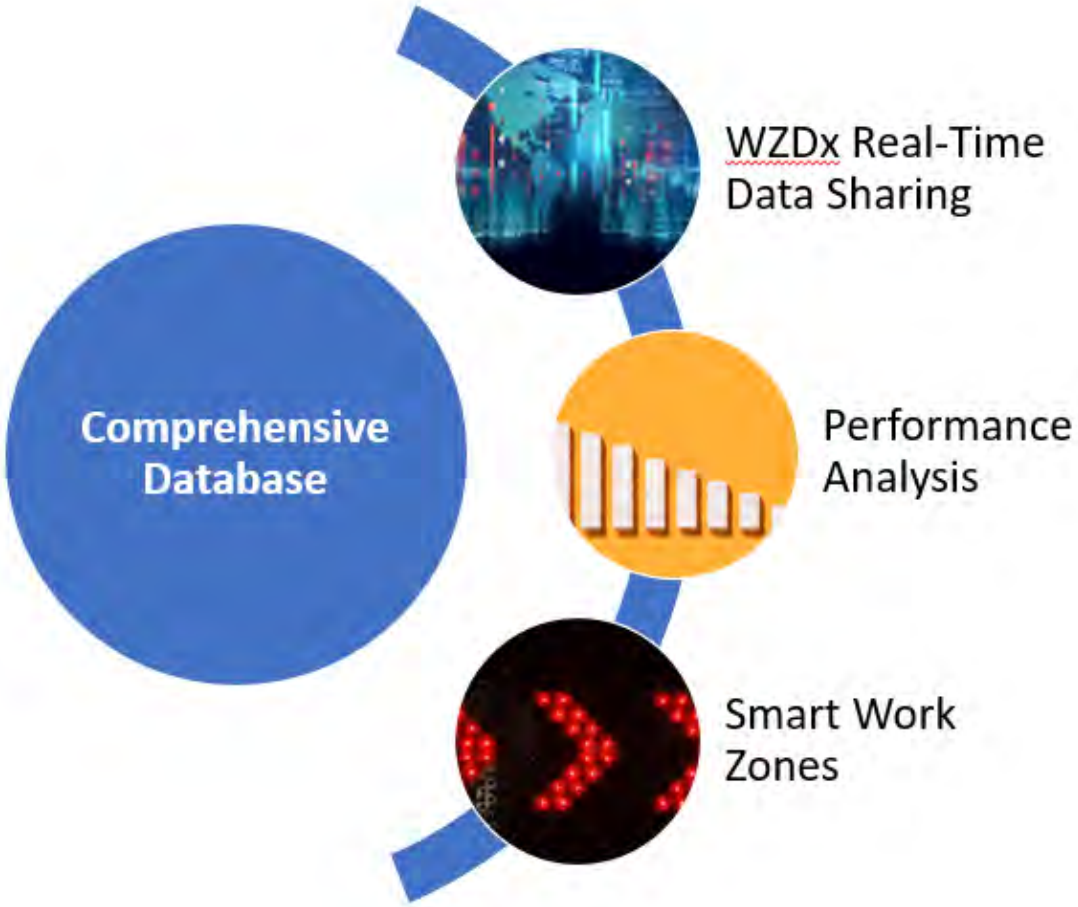
LRS Power User Testing
Spring 24

Design, Development, and Testing
Winter 22/23

Policy Finalized and Training
Winter 23/24

Construction & Maintenance Testing
Spring/Summer 24

FIRST STATEWIDE DATABASE



CONCEPT OF OPERATIONS

More than four (4) working group meetings held.

- Over 50 PennDOT personnel across the state
- Design/Construction
- Maintenance
- Traffic Engineering

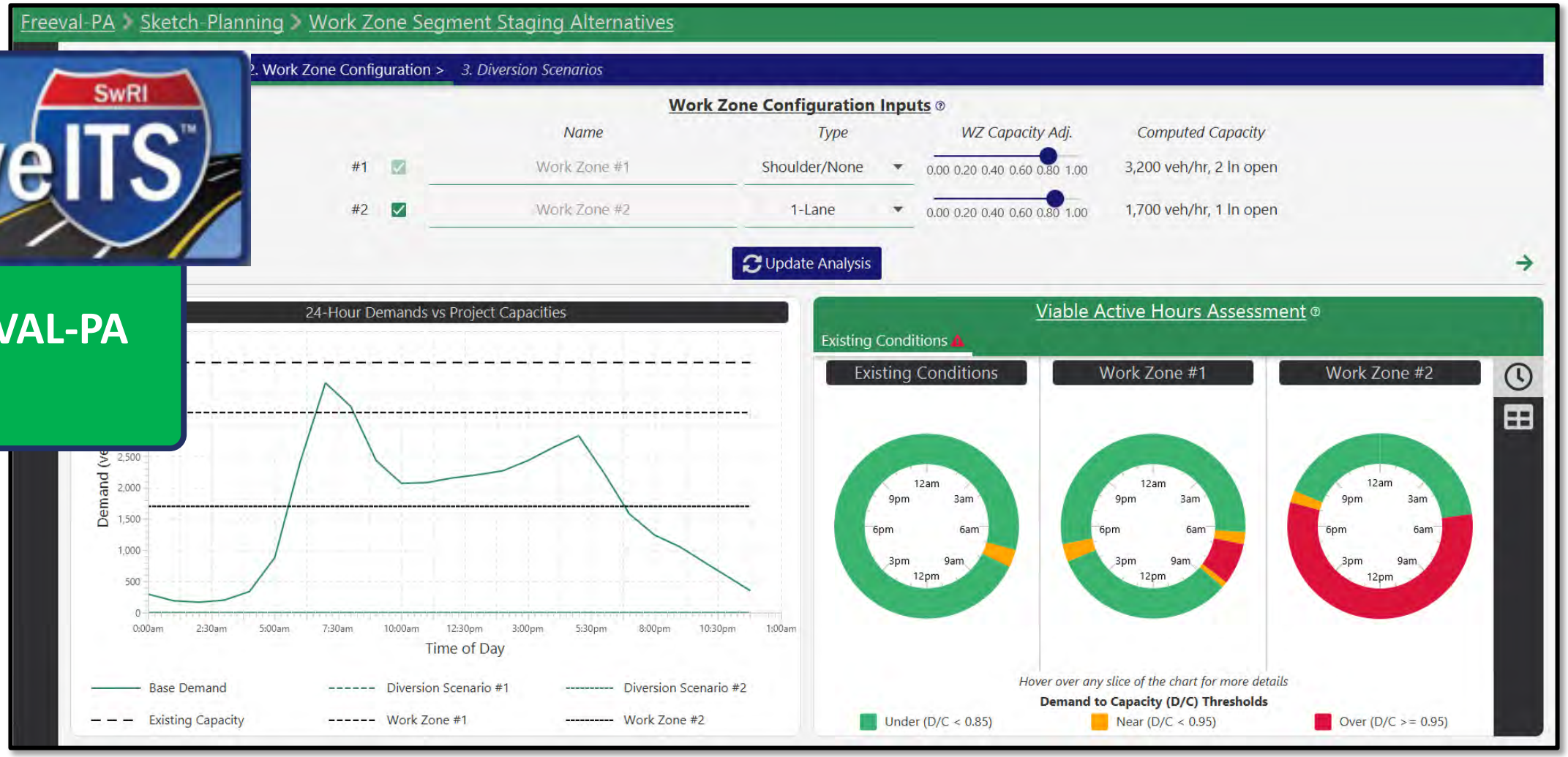
LRS INTEGRATION NOTES

- System business rules should be intelligent enough to grant a majority pre-approval/approval without interaction
  - Escalation for emergency or edge case scenario will exist
- Adding individual-based assignment in the system
  - I.e., Reviewer, in-field ownership (workers on scene), communication between parties during review/adjustment process
- User-specific project calendar
- Mobile App/Website able to activate or deactivate work zones with a click of a button
  - Phone calls to the TMCs to eventually be phased out

FREEVAL INTEGRATION

SwRI ActiveITS™

FREEVAL-PA



PEER EXCHANGES

VDOT

WISCONSIN DEPARTMENT OF TRANSPORTATION

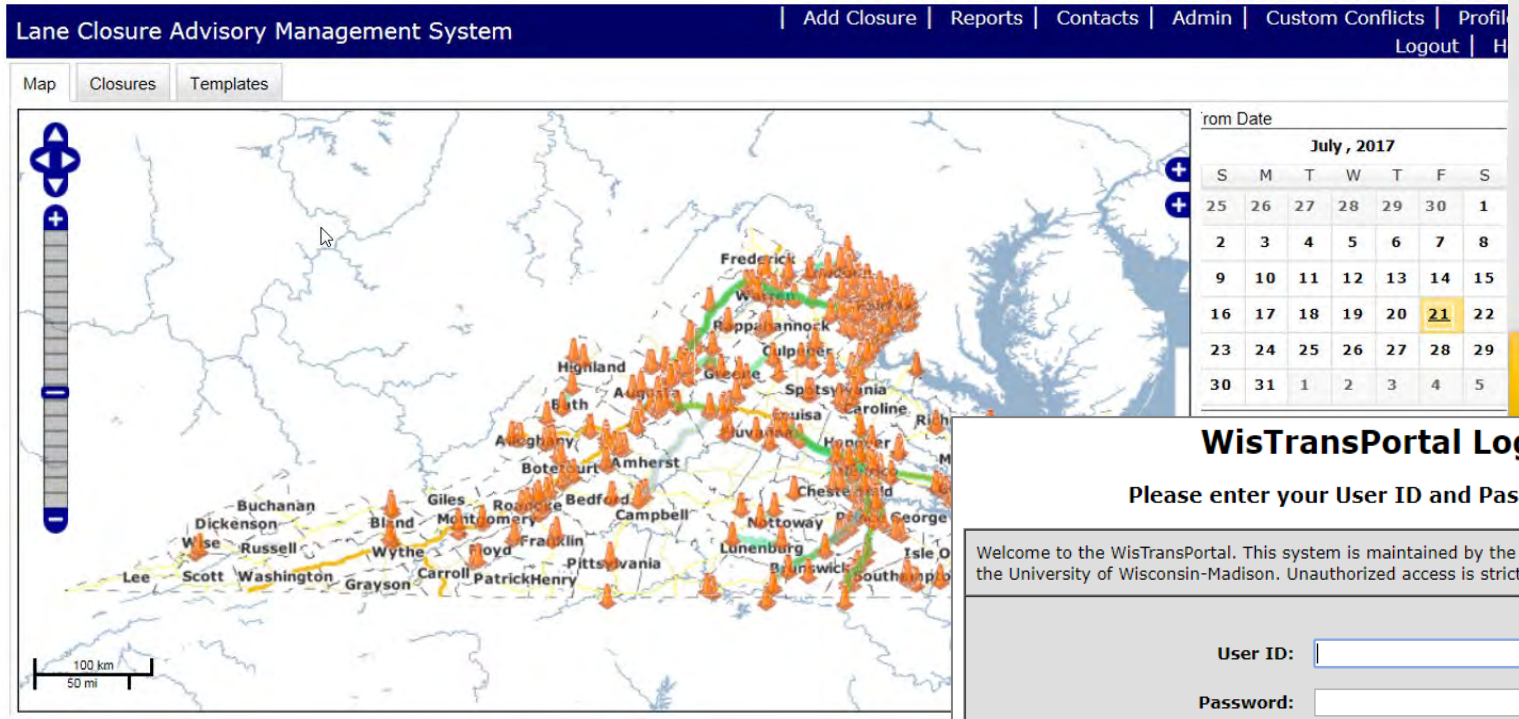
PennDOT Site Visit

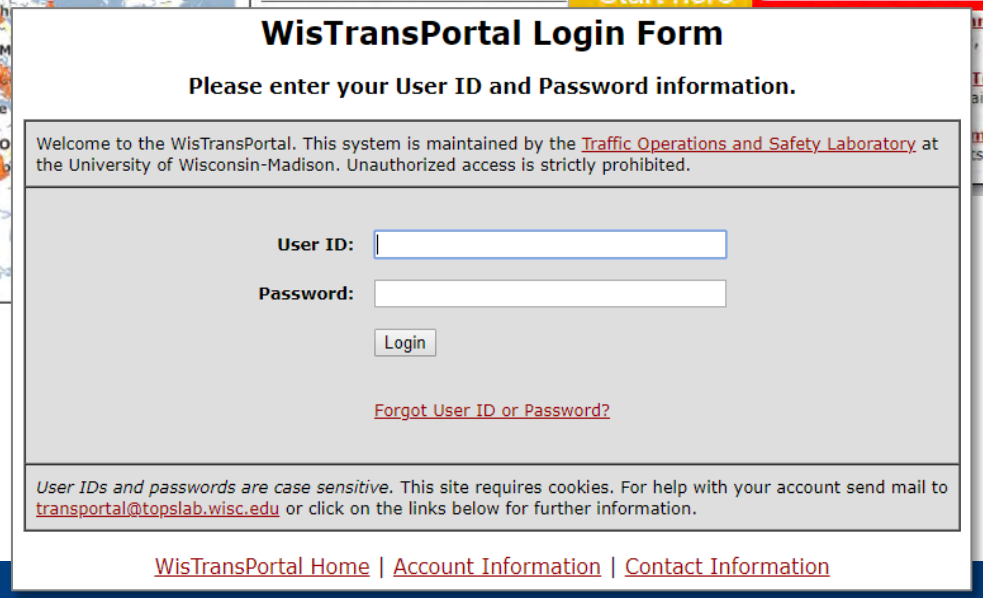
August 24, 2023

Traffic Management Center

PEER EXCHANGES – LESSONS LEARNED

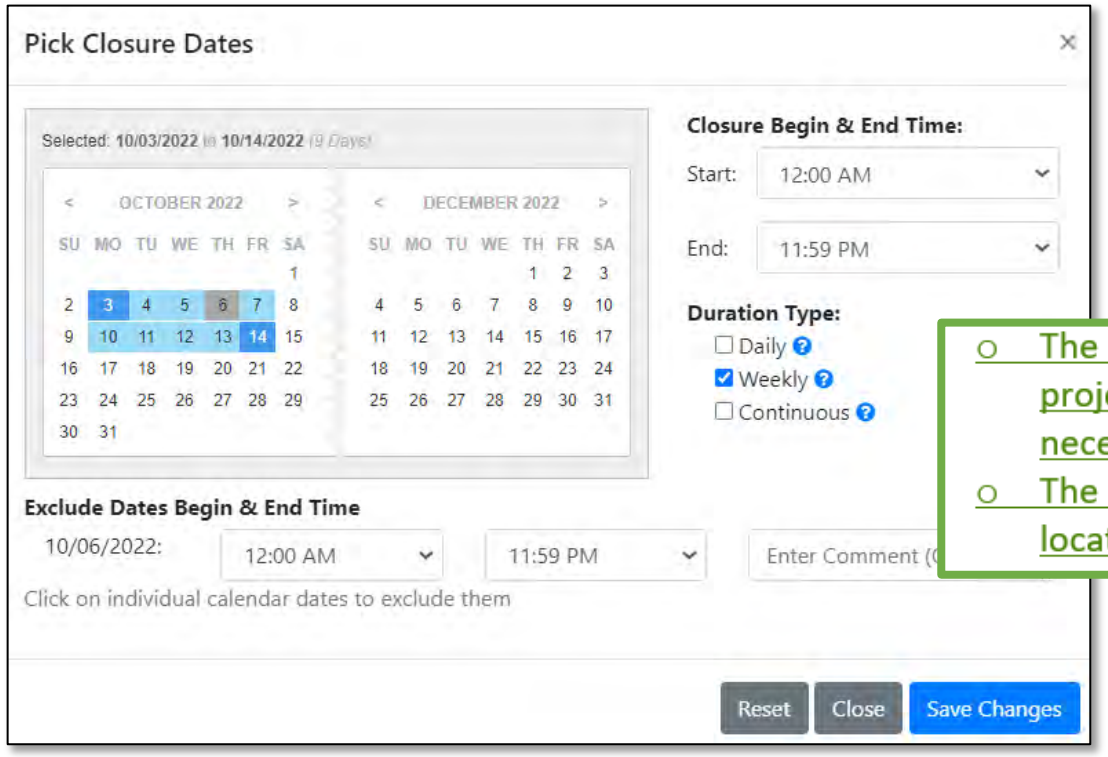
VDOT





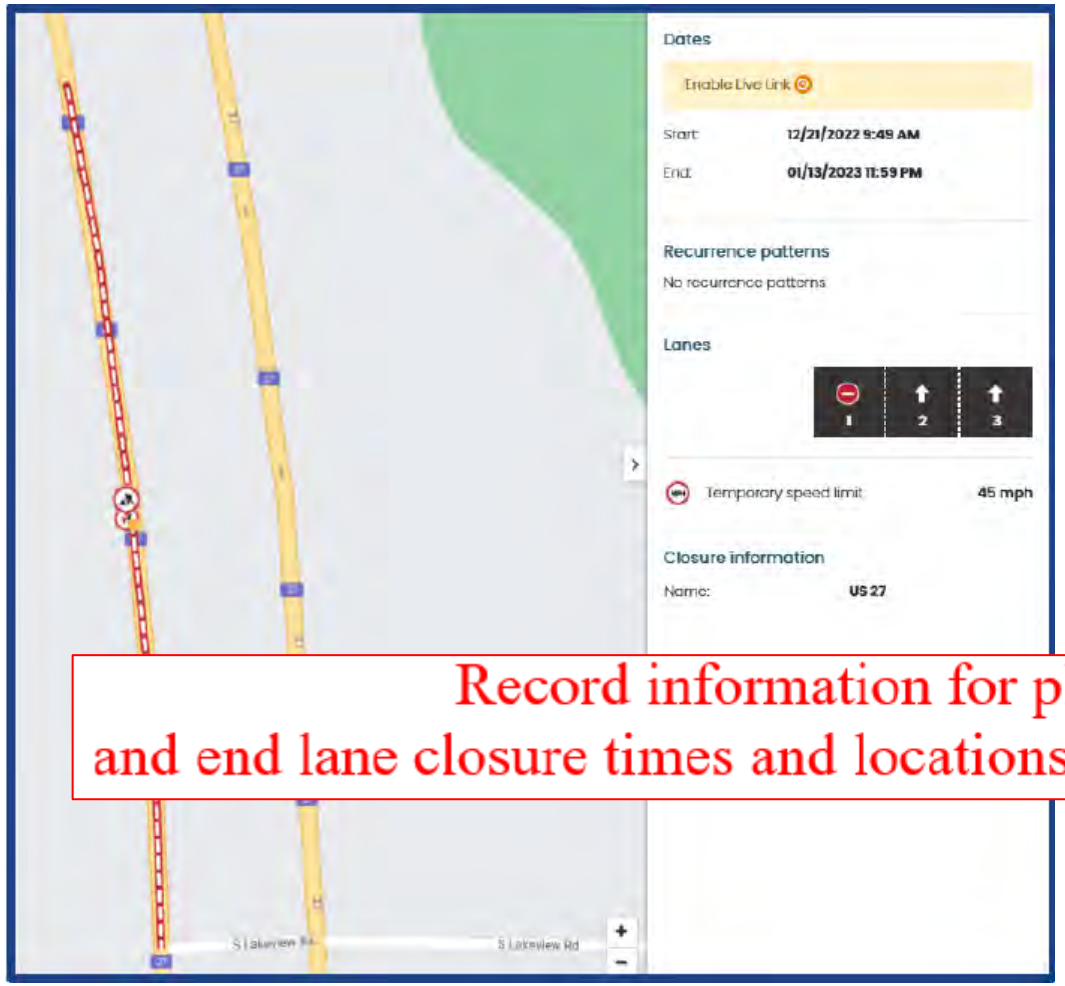
PEER EXCHANGES – PARENT/CHILD

- **Weekly** Closure Duration Example
  - A Monday - Friday closure for 4 weeks, from 8am Monday to 3pm Friday.
  - The cones would be dropped every Monday at 8am, and picked up every Friday at 3pm, each week the closure is active.



- The user will be able to enter the roadway(s), start and end points, and directions of the project. Note that these locations are to define the scope of the project and not necessarily the location of the lane/should closure request.
- The user may enter several different limits of work for open end projects with multiple locations (e.g., mowing, weed control, line striping).

PEER EXCHANGES – LESSONS LEARNED



FDOT

Florida Department of Transportation

Record information for planned lane closures, including but not limited to begin and end lane closure times and locations, into the Department's lane closure notification system.

CON-OP UPDATES

Chapter 5. Operational Policies and Procedures

~~**Distance between Work Zones for Location Conflicts**~~

~~**As stated in Chapter 4, requests within a certain distance of each other from the ending point of the upstream taper to the starting point of the downstream taper will be flagged. The distance will be configurable by each PennDOT District until an official statewide policy is finalized. In addition, when future phases of LRS are rolled out to conventional roadways, each District will determine the distance between work zones on the conventional roadways that will trigger location conflicts.**~~**Reservation Request Priority**

The following priority order is established for conflicts where there are multiple requests for the same area at the same time. Multiple requests within the same category will be considered "first come, first serve."

1. **Emergency Work** – Unplanned work to address an event that causes an immediate safety or mobility issue, such as a traffic incident, trees down across a roadway, or utility repairs in accordance with Title 67 PA Code, Chapter 212.414.
2. **Contractor Project Work** – Planned ECMS project number.
3. **PennDOT Work** – Planned maintena personnel, contracted crews, or mu Agility Agreement.
4. **Municipality Work** – Planned work that includes roadway, bridge, or ro maintenance.
5. **Permit/Utility Work** – Planned work with Publication 282: Highway Occu

The District has the discretion to prioritize lowe previously approved request that was reschedu

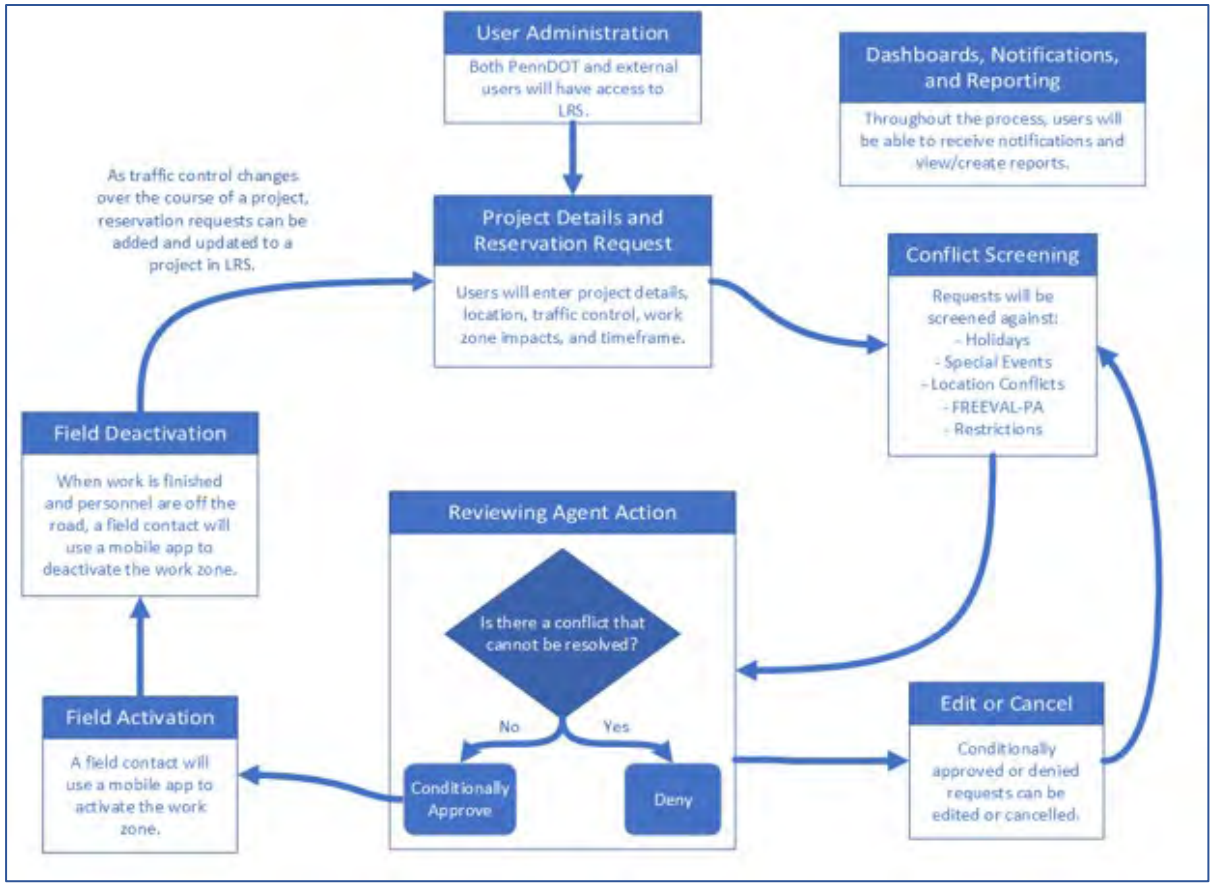
High-Level Functional Requirements

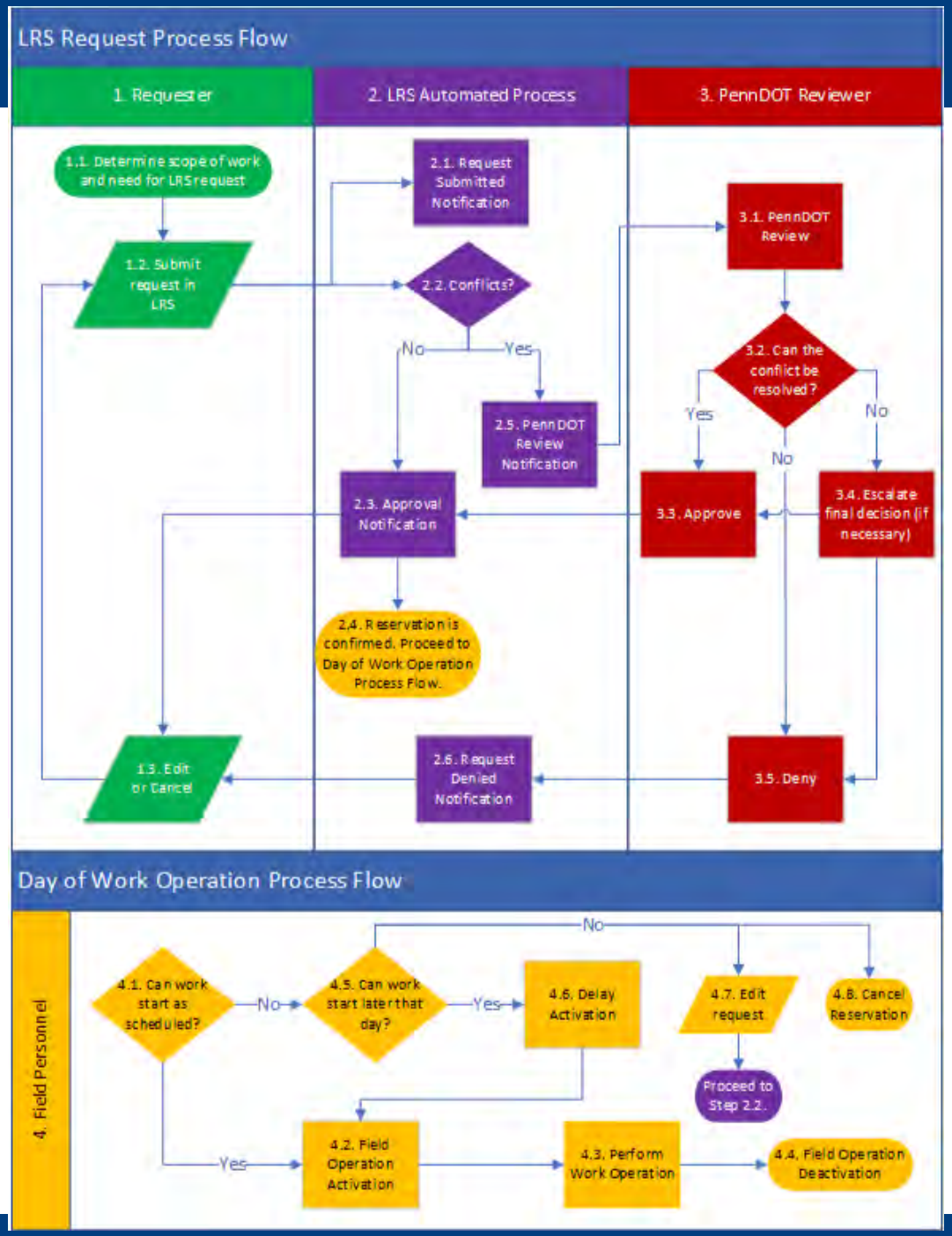
The high-level functional requirements of LRS associated with field activation are shown in Table 6. Use cases (see Chapter 6) that demonstrate a requirement are also noted.

TABLE 6. REQUIREMENTS FOR FIELD ACTIVATION AND DEACTIVATION

ID	Functional Requirement	Use Case
ACT-1	LRS shall include a mobile app that is compliant with Apple and Android devices.	
ACT-2	The LRS mobile app shall allow a team member to activate ~~conditionally~~ approved requests, delay activation of ~~conditionally~~ approved requests, cancel ~~conditionally~~ approved requests, edit ~~conditionally~~ approved requests, and deactivate active work zones.	UC 5: Mobile App
~~ACT-3~~	~~The LRS mobile app shall be able to send notifications to users' Apple/Android devices.~~	
ACT-43	If a user delays activation, the LRS mobile app shall allow a user to enter in a new planned start time.	UC 5: Mobile App
ACT-54	The LRS mobile app shall use geolocating to find nearby reservation requests.	
ACT-65	The LRS mobile app shall not solely rely on geolocating. A user must be able to enter a unique ID or scroll through reservation requests where they are a team member to find a request to activate, delay activation, etc.	

LRS Concept Overview





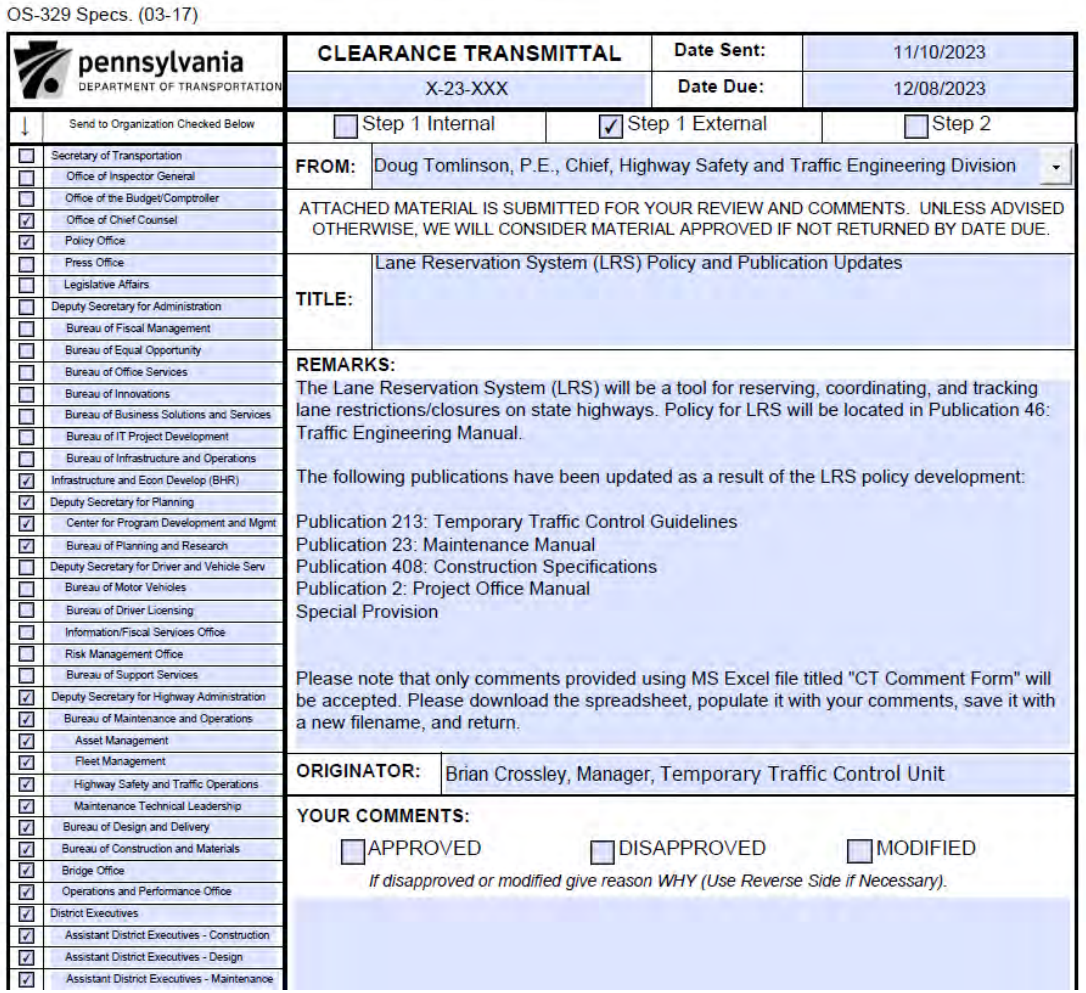
Updated Process Flow

RESERVATION REQUEST PRIORITY

1. **Emergency Work** – Unplanned work to address an event that causes an immediate safety or mobility issue, such as a traffic incident, trees down across a roadway, or utility repairs in accordance with Title 67 PA Code, Chapter 212.414.
2. **Contractor Project Work** – Planned work performed by a contractor associated with an ECMS project number.
3. **PennDOT Work** – Planned maintenance work performed by PennDOT Maintenance personnel, contracted crews, or municipalities performing work for PennDOT under an Agility Agreement.
4. **Municipality Work** – Planned work associated with a municipality owned/led project that includes roadway, bridge, or roadway facility construction, reconstruction, or maintenance.
5. **Permit/Utility Work** – Planned work associated with utilities and permits in accordance with Publication 282: Highway Occupancy Permit Operations Manual.

PUBLICATION POLICY UPDATES

- Pub 213 – Temporary Traffic Control Guidelines
- Pub 46 – Traffic Engineering Manual
- Pub 23 – Maintenance Manual
- Publication 408 – Specifications
- Publication 2 – Project Office Manual
- Special Provisions



OS-329 Specs. (03-17)

pennsylvania DEPARTMENT OF TRANSPORTATION

CLEARANCE TRANSMITTAL	Date Sent:	11/10/2023
X-23-XXX	Date Due:	12/08/2023

Send to Organization Checked Below

- ☐ Secretary of Transportation
- ☐ Office of Inspector General
- ☐ Office of the Budget/Comptroller
- ☑ Office of Chief Counsel
- ☑ Policy Office
- ☐ Press Office
- ☐ Legislative Affairs
- ☐ Deputy Secretary for Administration
- ☐ Bureau of Fiscal Management
- ☐ Bureau of Equal Opportunity
- ☐ Bureau of Office Services
- ☐ Bureau of Innovations
- ☐ Bureau of Business Solutions and Services
- ☐ Bureau of IT Project Development
- ☐ Bureau of Infrastructure and Operations
- ☑ Infrastructure and Econ Develop (BHR)
- ☑ Deputy Secretary for Planning
- ☑ Center for Program Development and Mgmt
- ☑ Bureau of Planning and Research
- ☐ Deputy Secretary for Driver and Vehicle Serv
- ☐ Bureau of Motor Vehicles
- ☐ Bureau of Driver Licensing
- ☐ Information/Fiscal Services Office
- ☐ Risk Management Office
- ☐ Bureau of Support Services
- ☑ Deputy Secretary for Highway Administration
- ☑ Bureau of Maintenance and Operations
- ☑ Asset Management
- ☑ Fleet Management
- ☑ Highway Safety and Traffic Operations
- ☑ Maintenance Technical Leadership
- ☑ Bureau of Design and Delivery
- ☑ Bureau of Construction and Materials
- ☑ Bridge Office
- ☑ Operations and Performance Office
- ☑ District Executives
- ☑ Assistant District Executives - Construction
- ☑ Assistant District Executives - Design
- ☑ Assistant District Executives - Maintenance

☐ Step 1 Internal ☑ Step 1 External ☐ Step 2

FROM: Doug Tomlinson, P.E., Chief, Highway Safety and Traffic Engineering Division

ATTACHED MATERIAL IS SUBMITTED FOR YOUR REVIEW AND COMMENTS. UNLESS ADVISED OTHERWISE, WE WILL CONSIDER MATERIAL APPROVED IF NOT RETURNED BY DATE DUE.

TITLE: Lane Reservation System (LRS) Policy and Publication Updates

REMARKS:

The Lane Reservation System (LRS) will be a tool for reserving, coordinating, and tracking lane restrictions/closures on state highways. Policy for LRS will be located in Publication 46: Traffic Engineering Manual.

The following publications have been updated as a result of the LRS policy development:

Publication 213: Temporary Traffic Control Guidelines
Publication 23: Maintenance Manual
Publication 408: Construction Specifications
Publication 2: Project Office Manual
Special Provision

Please note that only comments provided using MS Excel file titled "CT Comment Form" will be accepted. Please download the spreadsheet, populate it with your comments, save it with a new filename, and return.

ORIGINATOR: Brian Crossley, Manager, Temporary Traffic Control Unit

YOUR COMMENTS:

☐ APPROVED ☐ DISAPPROVED ☐ MODIFIED

If disapproved or modified give reason WHY (Use Reverse Side if Necessary).

PUBLICATION AND POLICY UPDATES

Publication 213 – Temporary Traffic Control Guidelines

Acronyms

Add the following:

LRS – Lane Reservation System

Definitions

Add the following:

Lane Reservation System (LRS) – A tool for reserving, coordinating, and tracking lane restrictions/closures and shoulder closures on state roadways.

PATA 408

Remove Note 4

General Notes, Section A, Worksite Procedures

Replace the current text with the following:

A-1. Reporting and Notification

Planned Work

The Lane Reservation System (LRS) is the primary method for reporting work zone activities to PennDOT. More information on LRS can be found in PennDOT Publication 46: Traffic Engineering Manual, Chapter 6.

In accordance with the chart below, the individuals responsible for TTC on the operation shall enter the data required by LRS and:

- Submit the lane reservation request per the required timeframe before the work operation.
- Activate the lane reservation using LRS at least 15 minutes prior to beginning the work operation.
- Deactivate the lane reservation using LRS after all temporary traffic control devices are covered or removed, all workers are off the road, and travel lanes are open to unrestricted flow.

Roadway Type	LRS Reporting Type	Reporting Timeframe	TTC Condition		
			Full Road Closure	Lane Closure / Lane Restriction	Shoulder Closure
Freeways and Expressways	Request Submission	14 days minimum	REQUIRED		
	Operation Activation	15 minutes			
	Operation Deactivation	Immediately upon conclusion			
Numbered Traffic Routes and Pre-Planned Detour Routes	Request Submission	Two full workdays before work is scheduled	REQUIRED		RECOMMENDED
	Operation Activation	15 minutes			
	Operation Deactivation	Immediately upon conclusion			
Other State Roadways	Request Submission	Two full workdays before work is scheduled	REQUIRED	RECOMMENDED	
	Operation Activation	15 minutes			
	Operation Deactivation	Immediately upon conclusion			

PUBLICATION AND POLICY UPDATES

(b) *Utility work*. Emergency repair for utility work may be initiated under this section or repair to a utility facility undertaken under Chapter 459 (relating to occupancy of highways by utilities) to repair damage resulting from a vehicle crash or collision with the facility, a failed component or storm damage. Utility service connections or disconnections unrelated to a vehicle crash, a failed component, or storm damage must otherwise comply with this subchapter.

(c) *Expediting emergency work*. Emergency work may be completed without installation of work zone traffic-control devices required by this subchapter, if one of the following conditions is met:

(1) Review of the condition indicates that the emergency work can be completed in less time than it would take to install the temporary traffic-control devices, and the work or condition would not create a significant potential hazard.

(2) Temporary traffic control has been set up and it is found that additional traffic-control devices are desirable, but that it would take longer to obtain and install additional traffic-control devices than it would to complete the work."

Examples of emergency work include trees and/or utility lines down across a roadway, a chemical spill, gas line rupture, traffic incidents, obstructions in the roadway, equipment breakdown or any other unexpected and potentially dangerous situation. Emergency situations may also include those events where road users are not required to stop but must be slowed. This is due to an event that occurred close enough to a travel lane to create a potential danger to approaching road users.

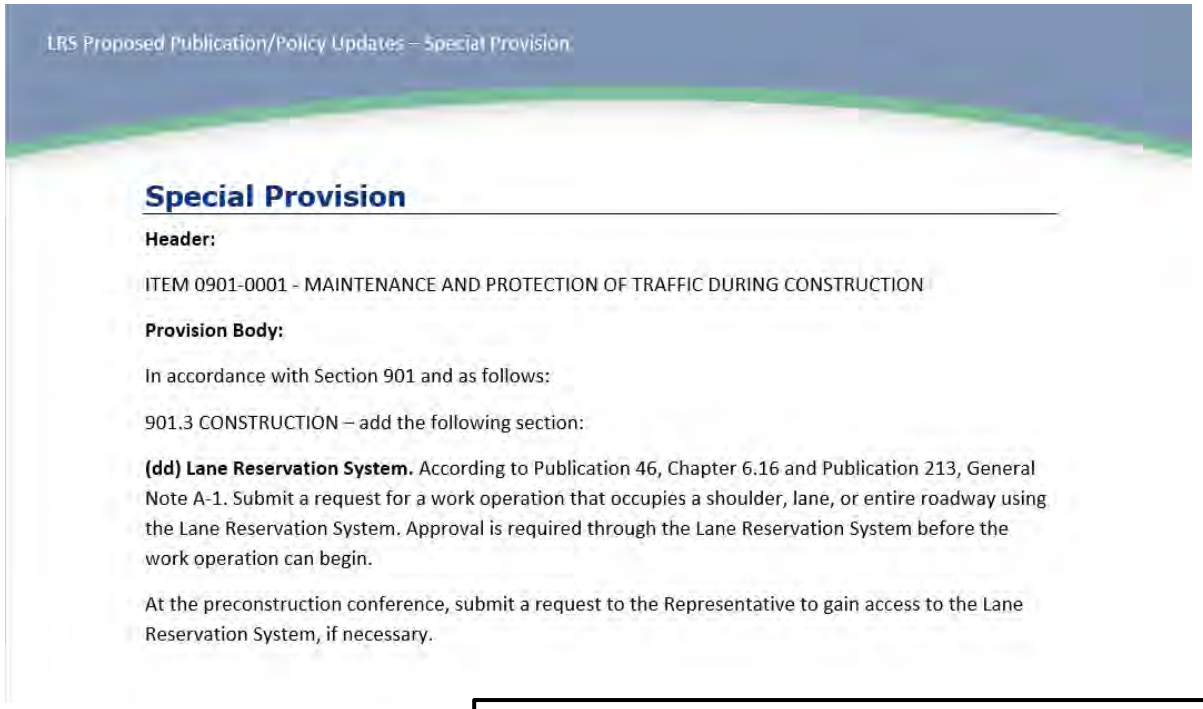
In accordance with the following chart, the individuals responsible for TTC on the operation shall report emergency work by using LRS or contacting the TMC. At a minimum, the following information should be provided:

- Beginning Location
- Ending Location
- Beginning Date/Time
- Estimated Date/Time to Reopen
- Roadway Status – Closed, Lane Restriction, Ramp Closure, Shoulder Closure, etc.
- On-Scene Contact Information
- Description of Work
- Detour Information (if applicable)

Emergency work reported using LRS must adhere to the "Operation Activation" and "Operation Deactivation" timeframes for planned work.

Roadway Type	Emergency Work Timeframe	Reporting Type	TTC Condition		
			Full Road Closure	Lane Closure / Lane Restriction	Shoulder Closure
Freeways and Expressways	Beginning < 24 hours	LRS or TMC Call	REQUIRED		
	Beginning > 24 hours[1]	LRS			
Numbered Traffic Routes and Detour Routes	Beginning < 24 hours	LRS or TMC Call	REQUIRED		RECOMMENDED
	Beginning > 24 hours[1]	LRS			
Other State Roadways	Beginning < 24 hours	LRS or TMC Call	REQUIRED	RECOMMENDED	
	Beginning > 24 hours[1]	LRS			

PUBLICATION AND POLICY UPDATES


LRS Proposed Publication/Policy Updates – Special Provision

Special Provision

Header:

ITEM 0901-0001 - MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION

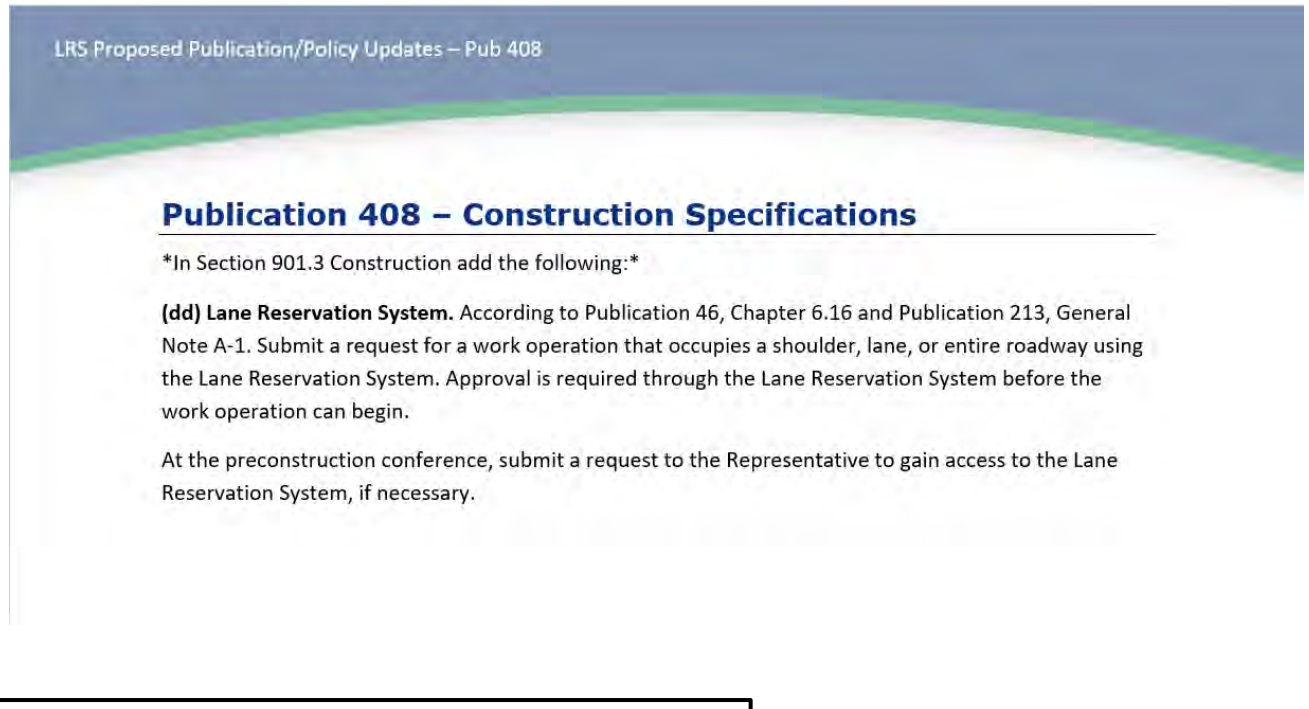
Provision Body:

In accordance with Section 901 and as follows:

901.3 CONSTRUCTION – add the following section:

(dd) Lane Reservation System. According to Publication 46, Chapter 6.16 and Publication 213, General Note A-1. Submit a request for a work operation that occupies a shoulder, lane, or entire roadway using the Lane Reservation System. Approval is required through the Lane Reservation System before the work operation can begin.

At the preconstruction conference, submit a request to the Representative to gain access to the Lane Reservation System, if necessary.


LRS Proposed Publication/Policy Updates – Pub 408

Publication 408 – Construction Specifications

In Section 901.3 Construction add the following:

(dd) Lane Reservation System. According to Publication 46, Chapter 6.16 and Publication 213, General Note A-1. Submit a request for a work operation that occupies a shoulder, lane, or entire roadway using the Lane Reservation System. Approval is required through the Lane Reservation System before the work operation can begin.

At the preconstruction conference, submit a request to the Representative to gain access to the Lane Reservation System, if necessary.

(dd) Lane Reservation System. According to Publication 46, Chapter 6.16 and Publication 213, General Note A-1. Submit a request for a work operation that occupies a shoulder, lane, or entire roadway using the Lane Reservation System. Approval is required through the Lane Reservation System before the work operation can begin.

At the preconstruction conference, submit a request to the Representative to gain access to the Lane Reservation System, if necessary.

PUBLICATION AND POLICY UPDATES

Publication 46 – Traffic Engineering Manual

Update Table of Contents and Table of Exhibits for new material and add the following:

6.1 General

Definitions

Lane Reservation System (LRS) – A tool for reserving, coordinating, and tracking lane restrictions/closures and shoulder closures on state roadways.

6.16 Lane Reservation System (LRS)

Scope

Anyone performing work on the roadway or shoulder shall use LRS in accordance with this Chapter and Publication 213: Temporary Traffic Control Guidelines.

Purpose

The Lane Reservation System (LRS) is a web-based platform to schedule, coordinate, and track work zone activities on state roadways.

- LRS is used to schedule work by submitting a reservation request.
- LRS helps coordinate work zone activities by identifying conflicts with reservation requests. For example, LRS uses FREEVAL-PA to identify any work zone operations that would cause unacceptable levels of congestion.
- Users track work zone status and activities through LRS. Using LRS, users activate the reservation request prior to beginning the work operation and deactivate it immediately upon conclusion of the work operation. LRS can also send automated email notifications and includes reporting features.

LRS standardizes and streamlines work zone planning across the state. It helps coordinate work between contractors, utilities, government agencies, others performing roadwork, and Regional Traffic Management Centers (RTMC) to ensure work can be completed while minimizing delay to the traveling public. LRS also facilitates real-time, accurate work zone information data sharing which helps PennDOT meet the requirements of "Provisions for traffic and travel conditions reporting," 23 C.F.R. §511.309.

Process

Exhibit 6-14 shows a flowchart that outlines the process for using LRS with a short explanation of each step. As each step is completed, LRS can automatically email notifications to users based on their role.

The sections following Exhibit 6-14 describe the policies governing the use of LRS, and a detailed LRS process flowchart is included in the appendix.

Exhibit 6-16 Emergency Work Reporting Timeframes and Requirements

Roadway Type	Emergency Work Timeframe	Reporting Type	TTC Condition		
			Full Road Closure	Lane Closure / Lane Restriction	Shoulder Closure
Freeways and Expressways	Beginning < 24 hours	LRS or TMC Call	REQUIRED		
	Beginning > 24 hours[1]	LRS			
Numbered Traffic Routes and Detour Routes	Beginning < 24 hours	LRS or TMC Call	REQUIRED		RECOMMENDED
	Beginning > 24 hours[1]	LRS			
Other State Roadways	Beginning < 24 hours	LRS or TMC Call	REQUIRED	RECOMMENDED	
	Beginning > 24 hours[1]	LRS			

1) Examples include work that must be completed as soon as crews receive required materials or work that must be completed after a weather event ends.

Conflict Screening

After a request is submitted, it is screened against potential conflicts to ensure work can be accomplished safely, efficiently, and without creating unacceptable congestion. The types of conflicts LRS screens against include, but are not limited to:

- Holidays
- Location conflicts with other work zones
- FREEVAL-PA
- Special Events
- Oversize/Overweight Restrictions

Holidays

The following holidays will be screened against in LRS:

- New Year's Day – day prior through day after
- Memorial Day Weekend – Thursday prior through Tuesday after
- Independence Day – day prior through day after
- Labor Day Weekend – Friday prior through Tuesday after

PUBLICATION AND POLICY UPDATES

- Thanksgiving Day – Wednesday prior through Tuesday after
- Christmas Day – day prior through day after
- Possible Non-Annual Holidays (e.g., Inauguration Day)

Location Conflicts with other Work Zones

Any requests that are within a certain distance of each other at the same time will be flagged for conflict. The distance will be configurable by each PennDOT District but may not be more than three (3) miles.

FREEVAL-PA

FREeway EVALuation-Pennsylvania, or FREEVAL-PA, is a predictive work zone assessment tool for use by PennDOT employees and business partners. FREEVAL-PA is the Pennsylvania-specific version of the FREEVAL analysis software, created to analyze work zones' effect on traffic flow. It guides PennDOT's decision-making process for implementing lane closures, crossovers, or other traffic control methods and helps to minimize congestion and delays during construction or maintenance projects.

FREEVAL-PA will be integrated into LRS such that LRS will create a sketch plan screening of all requests. If the sketch plan screening results in unacceptable conditions, the reservation request will be flagged for a conflict. Unacceptable conditions will be demand to capacity ratio thresholds defined by each District.

While LRS will provide a sketch plan screening of every request, it is encouraged that a FREEVAL-PA detailed screening is performed by the requestor in advance to determine if the request will trigger a conflict. Additionally, it will be assumed that all contractor work zone lane/shoulder closures have been screened through FREEVAL-PA by using the detailed screening process. This screening will occur during the design phase of the project.

Special Events

Requests will be screened against permitted special events with approved TE-300 forms and regional events, such as sporting events, that have the potential to impact mobility on the surrounding transportation network. Each District shall enter permitted special events at least one month in advance of the start date of the event.

Oversize/Overweight Restrictions

A request to restrict oversize vehicles (maximum length, height, width, or gross weight) submitted less than 14 days in advance of the planned start date will be flagged for a conflict. This is to allow coordination with the PennDOT District Permits Section.

Publication 2 – Project Office Manual

Part A – Preconstruction, Section 3 – Preconstruction, Section A.3.1 – Preconstruction Conference

Add the following as #27:

27. **Lane Reservation System** – Discuss the Lane Reservation System and the requirements for submitting requests according to Publication 213 and Publication 46, Chapter 6.16. The Representative should assist the contractor with gaining access to the system, if necessary.

Change "Question and Answer Period" to #28.

Part C – Construction Inspections, Section 9 – Traffic Accommodation and Control (900)

Add the following as C.9.16:

REPLACES	PENNSYLVANIA DEPARTMENT OF TRANSPORTATION	PART	SECTION	PAGE
C.9.16		C	9	16-1
DATED XX/XX/20XX	PROJECT OFFICE MANUAL	DATE XX, 20XX		
SUBJECT	LANE RESERVATION SYSTEM (LRS)			

LRS is the Department's system for scheduling, coordinating, and tracking work zone activities on state roadways. It standardizes and streamlines work zone planning across the state and facilitates real-time, accurate work zone information data sharing.

Publication 213, General Note A-1 and Publication 46, Chapter 6.16 describe the requirements governing the use of LRS. If LRS is required for a work operation due to the temporary traffic control condition and roadway type, the Representative will ensure:

- that the contractor performs their responsibilities related to LRS,
- that no operation begins without an approved LRS request,
- that the reservation is activated in LRS 15 minutes before the start of work, and
- that the reservation is deactivated in LRS immediately after all temporary traffic control devices are covered or removed, all workers are off the road, and travel lanes are open to unrestricted flow.

Questions/Feedback

Ryan McNary
Pennsylvania Department of Transportation

Brian Crossley
Pennsylvania Department of Transportation

Virtual Queue Protection and PennDOT Initiatives for WZ Safety

pennsylvania
DEPARTMENT OF TRANSPORTATION

AGENDA

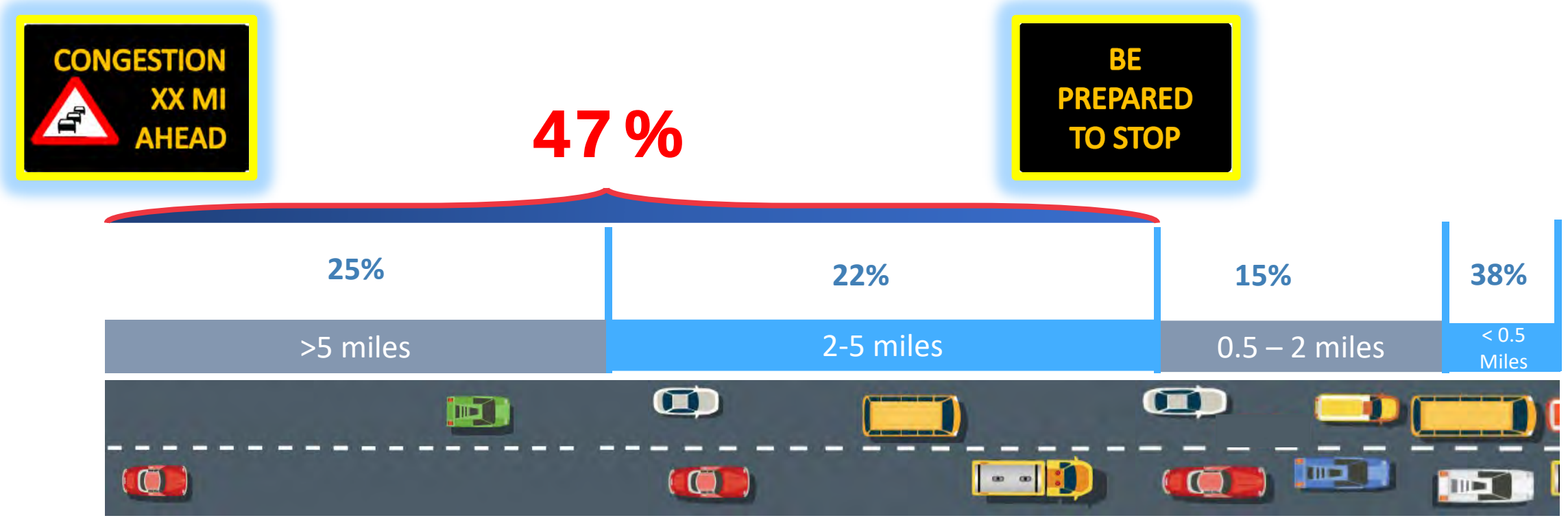
- Vehicle Probe Data-Driven Queue Protection
  - Request Process
  - Safety Facts
  - STIC Initiative
- Utilizing Waze to Help Routing For Projects
- Connected Vehicle Data Exchange Capabilities
- AVL and Mobile Work Zone Protection

Future Considerations:

- AI for Traffic Control Plan Reviews
- VSL Policy for High ADT

ENHANCING SAFETY FOR WORK ZONE OPERATIONS

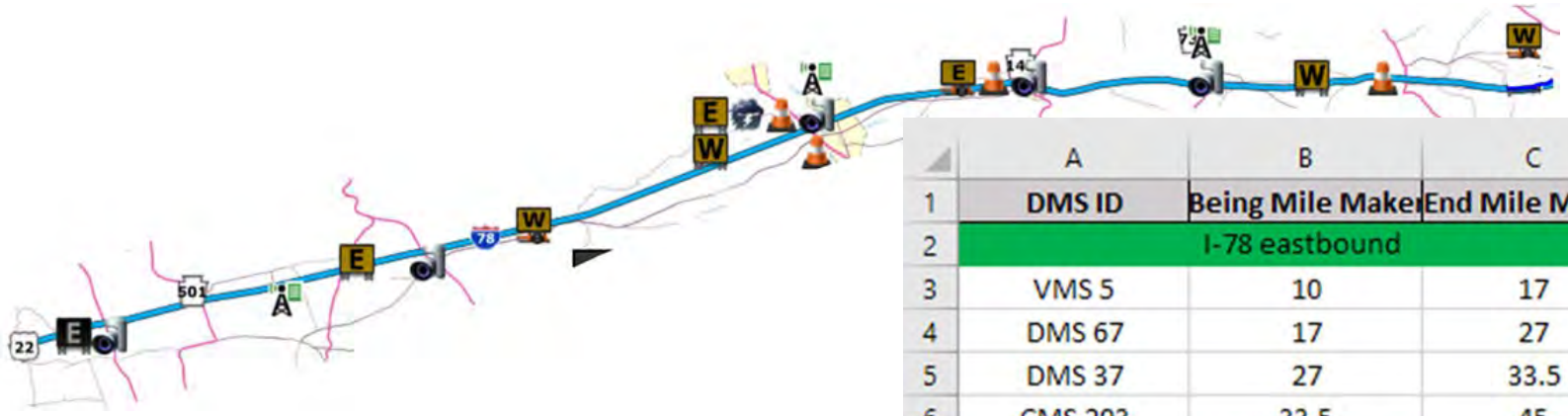
956 Crashes in Work Zone Congestion (Core Network in 2022)



QUEUE PROTECTION REQUIREMENTS AND FAQS

- **Limited Access Route** or **Higher ADT Route Equivalent**
- Duration of Project **6 months** or greater*
  - *Exceptions will be considered on a project-by-project basis
- Message Boards that are **on Commonwealth Network** OR have **Modems to accept Verizon SIM**
  - Permanent and Portable Boards Ready
  - FHWA State Transportation Innovation Council Approved Initiative
- Initial **Request** Should be Facilitated through the **PennDOT District Traffic Unit**
  - Prompt Kick-Off and Requirements Gathering
- Current Turnaround Time is approximately **1-2 Months** Start to Finish

PROBE-DATA QUEUE PROTECTION



INRIX

	A	B	C	D	E	F
1	DMS ID	Being Mile Maker	End Mile Marker		Congestion Message	
2	I-78 eastbound				<45 MPH	
3	VMS 5	10	17		SLOW TRAFFIC XX MILES AHEAD KEEP ALERT	
4	DMS 67	17	27			
5	DMS 37	27	33.5		SLOW TRAFFIC XX MILES	KEEP ALERT
6	CMS 203	33.5	45			
7	I-78 westbound				<25 MPH	
8	CMS 212	48	42.5		STOPPED TRAFFIC XX MILES AHEAD KEEP ALERT	
9	DMS 35	42.5	29			
10					STOPPED TRAFFIC XX MILES	KEEP ALERT
11						
12						
13						

Speed <55

Speed >25 mph

Speed >25 mph

1 Mile Segments

PRELIMINARY SAFETY FACTS AND STATUS

I-78 Construction Project: Same 6 months in 2021 to 2022:

- **12% decrease** in crashes
- **24% decrease** in a possible injury or worse crashes

- **20+** Probe Data-Driven Queue Protection Corridors deployed during 2021 and 2022
- **Costs savings, Flexibility** and **Increased safety** on projects who **couldn't budget** traditional queue protection

WAZE MAP EDITOR COMMUNITY

- **Resource Account Established**

WAZE MAP EDITOR COMMUNITY

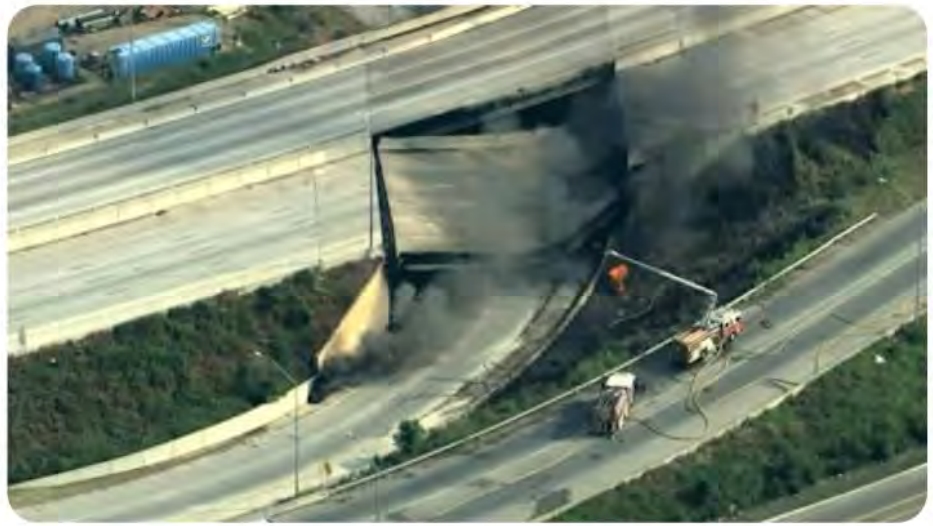
Partner+Community Collaboration

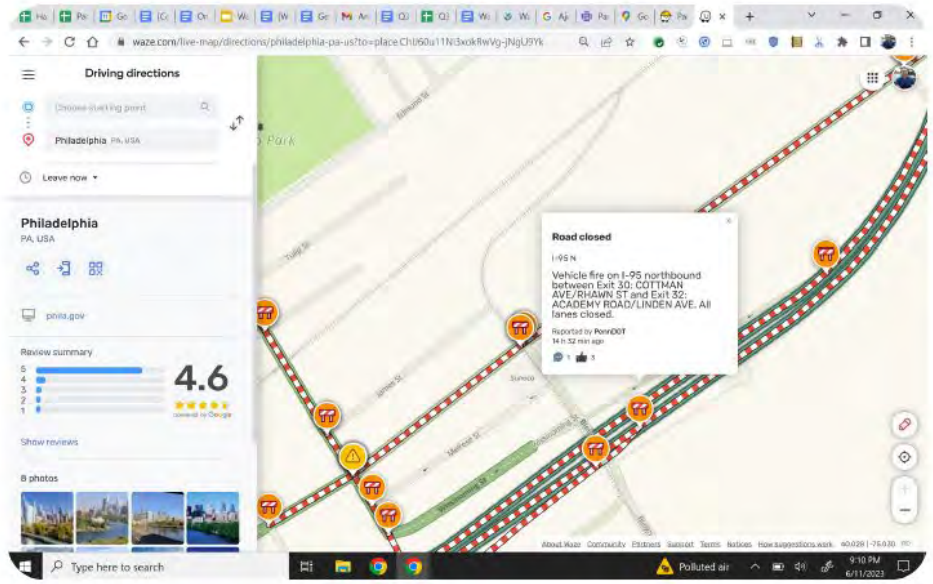
Success Story: I-95 Collapse (Philadelphia, Jun 2023)

- Partners+Community immediately **added closures and managed detours** which were automatically sent to Geo
- **Impacted ~100,000 drivers** per day

Next Steps

- Build in the Partners Hub a messaging platform that will allow sending RT important information to drivers in specific polygons.





WAZE COLLABORATION BEST PRACTICES

- **Start** and **End** of a Project
- **Planned Lane Shifts** or **Turning Restrictions** Effective On Particular Dates
- Complicated **Traffic Control Plans with Detours**
- **Emergency Closures** (i.e., Material Deliveries, Utility)
- Communication with Waze should be facilitated through the **PennDOT District Traffic Unit** or a **PennDOT Project Representative**

Future Considerations for Work Zone Safety

CONNECTED VEHICLE DATA EXCHANGE

Carnegie Mellon University Pittsburgh Pennsylvania 1900

Pitt

aws

Data Exchange

511

waze

RESEARCH

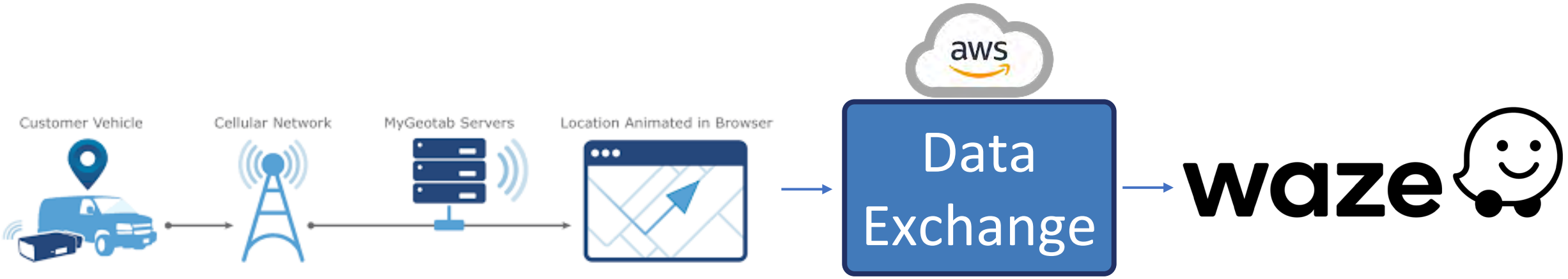
CONNECTED VEHICLES and INFRASTRUCTURE

AVL FLEET EXPANSION

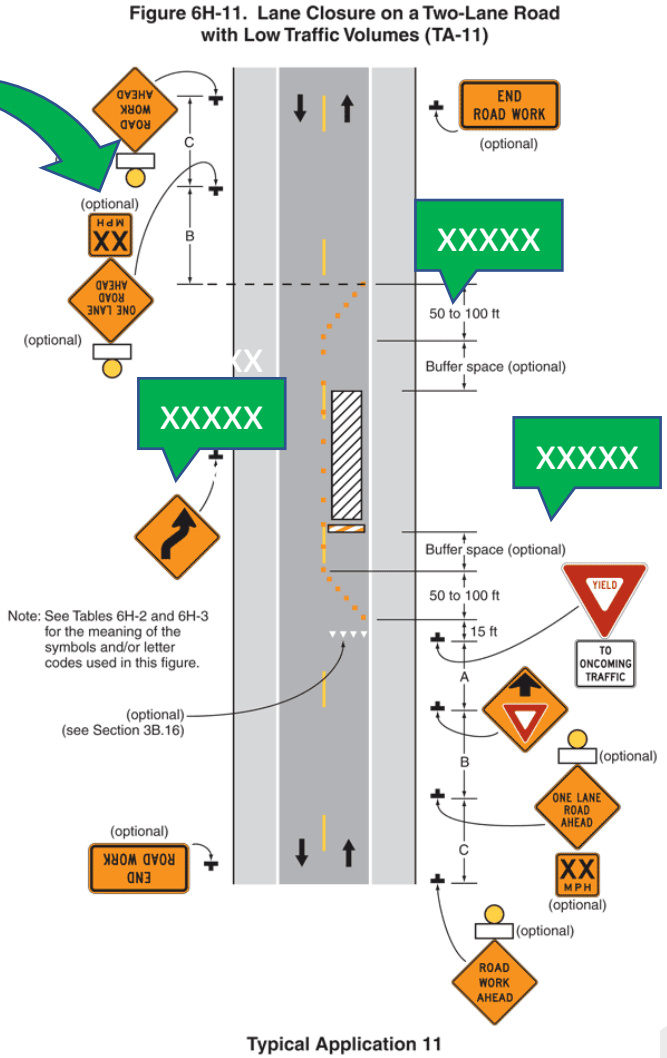
- 5000 PennDOT Trucks will be receiving AVL by Spring/Summer 24’

Developing Mobile Work Zone Protection Solutions

UTILIZING PENNDOT'S VEHICLE TELEMATICS DATA



CONSIDERING AI TO ASSIST TCP REVIEWS

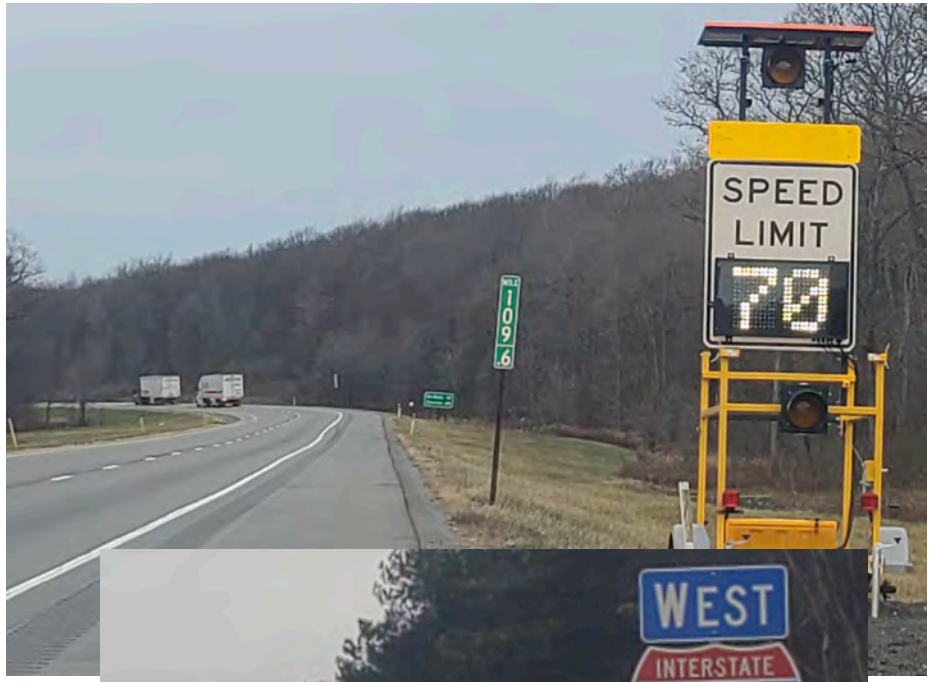


BENEFITS OF AI APPROACH

- Enhanced **Efficiency** of **Time-Consuming Tasks**
- Improving **Accuracy** and **Safety for Motorists** and **Workers**
- Consistent **Adherence to Standards**
- **Real-Time Feedback** and Iterative Learning
- Empowers individuals to use specialized skills for engineering judgement and plan approvals

Variable Speed Limits Applications

CORRIDOR UNITS



VSL STATUS AND SAFETY FACTS

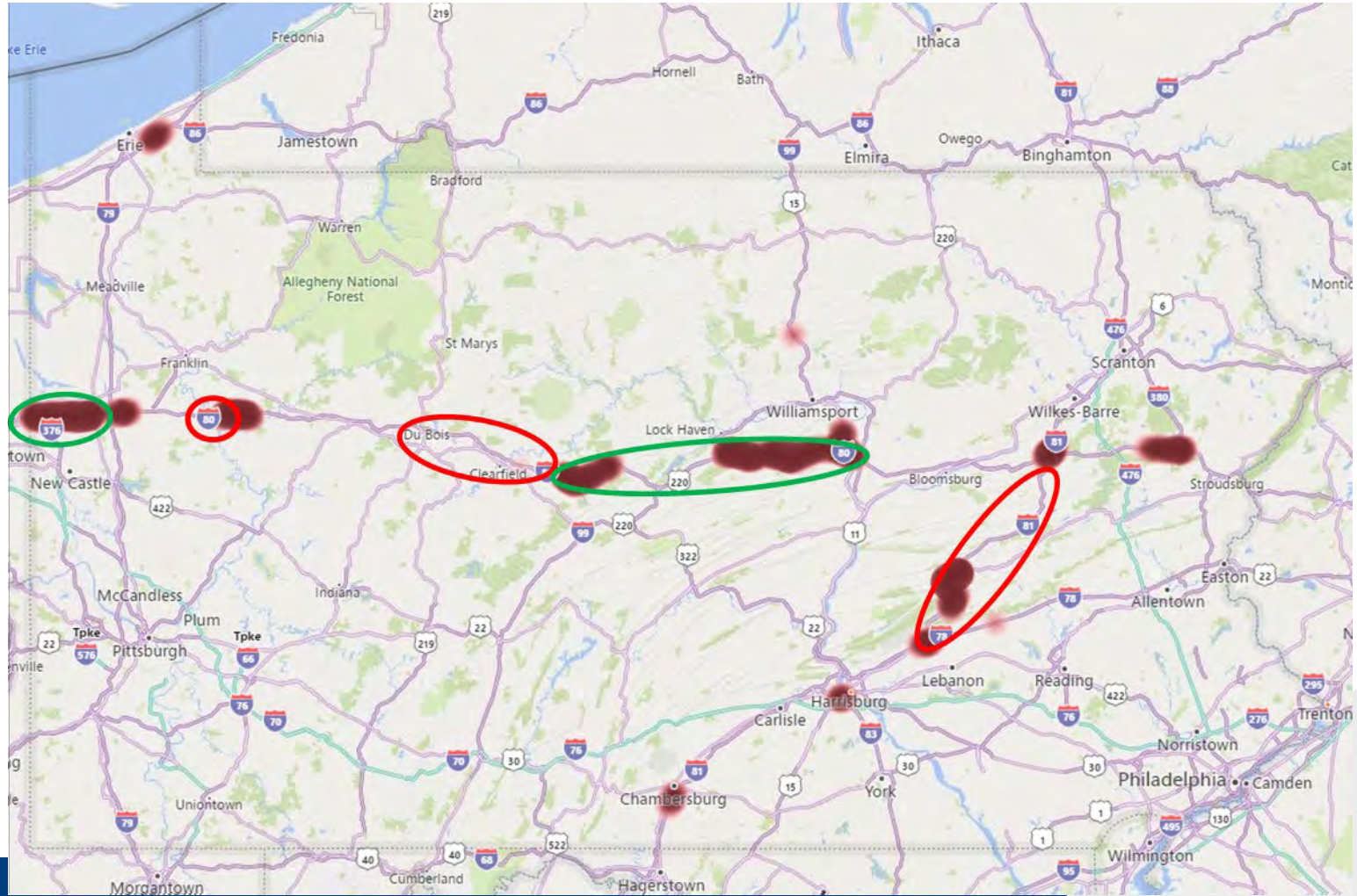
- **55 MPH VSL Restriction shows speed reductions of 4-9 MPH when compared to the same roadway conditions without VSL**

VSL Deployments

Existing

Winter 23/24 Expansion

Closures >3 Hours in Whiteout Conditions



SAFETY FINDINGS - WINTER

CLEARFIELD VSL CORRIDOR CRASH HISTORY (ALL WEATHER CONDITIONS)

- 2016/2017: 31 crashes, 5 Full Closures, 2 fatalities
- 2017/2018: 39 crashes, 1 full Closure, 0 Fatalities
- 2018/2019: 32 crashes, 5 full Closures, 1 Fatality
- 2019/2020: 33 crashes, 5 full closures, 0 fatalities
- 2020/2021: 37 crashes, 4 Full Closures, 1 Fatality
- 2021/2022: 12 crashes (VSL), 1 full closures, 0 Fatalities
- 2022/2023: 27 crashes (VSL), 0 full closures, 0 Fatalities

24% Avg decrease in crashes
75% Avg Decrease in Full Closures
100% Avg Decrease in Fatalities (Avg .8 per year)

CLINTON VSL CORRIDOR CRASH HISTORY (ALL WEATHER CONDITIONS)

- 2016/2017: 22 crashes, 5 Full Closures, 1 Fatality
- 2017/2018: 14 crashes, 3 Full Closures, 1 Fatality
- 2018/2019: 15 crashes, 2 Full Closures, 0 fatalities
- 2019/2020: 19 crashes, 5 Full Closures, 1 fatality
- 2020/2021: 26 crashes, 2 Full Closures, 1 Fatality
- 2021/2022: 23 crashes, 6 Full Closures, 0 Fatalities
- 2022/2023: 14 crashes, 1 Full Closure (VSL added), 0 Fatalities

4% Average decrease in crashes
75% Average Decrease in Full Closures
100% Avg Decrease in Fatalities (Avg .6 per year)

POLICY SUPPORT

pennsylvania
DEPARTMENT OF TRANSPORTATION

494-20-02

DATE: February 20, 2020

SUBJECT: Temporary Traffic Control Zone (Work Zone) Regulatory Speed Limit Policy

TO: District Executives

FROM: T Jay Cunningham, P.E., Acting Director
Bureau of Maintenance and Operations

This Strike-off Letter (SOL) establishes a new Temporary Traffic Control Zone (work zone) Regulatory Speed Limit Policy for evaluating regulatory speed limit reductions within work zones on state roadways. All work zones should be designed to accommodate the existing posted regulatory speed limit whenever possible, and documented justification is required when a regulatory speed limit reduction is being considered.

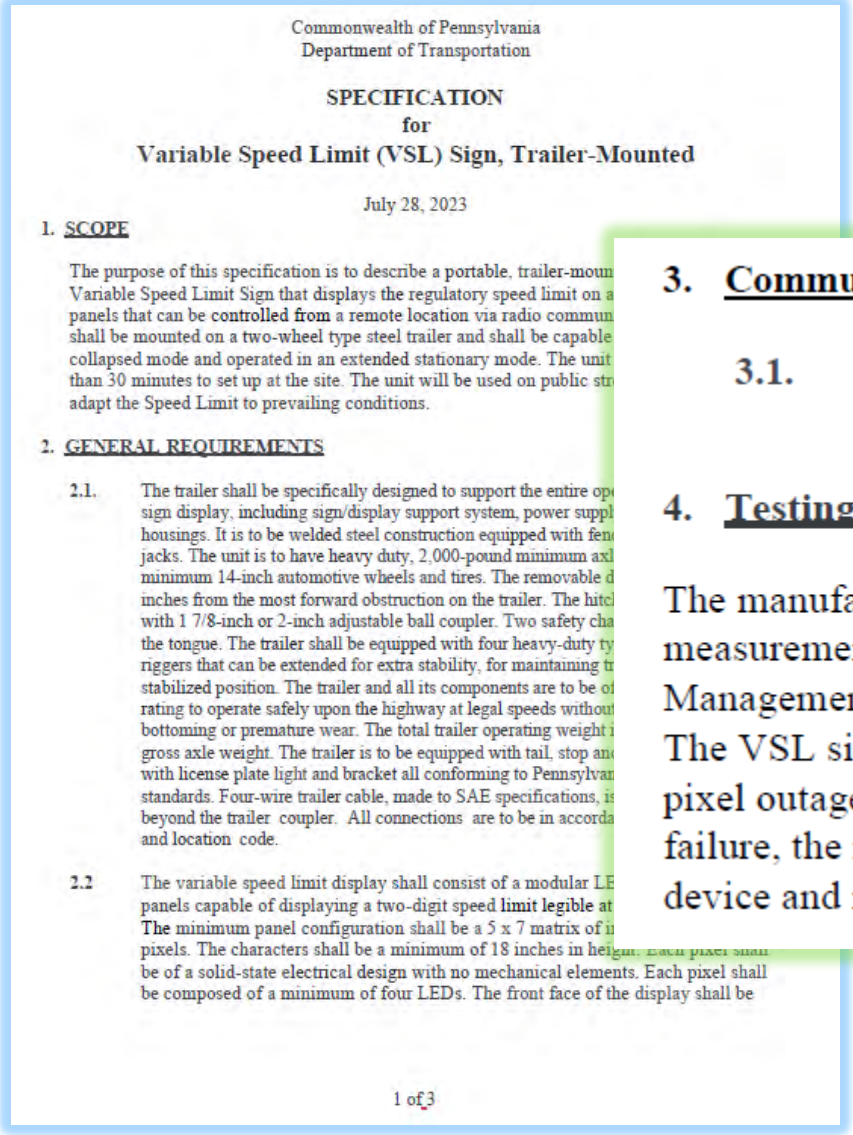
Completion of Traffic Engineering Form 162 - Temporary Traffic Control Zone Regulatory Speed Limit Reduction Evaluation (TE-162) is required for all regulatory speed limit reduction requests on utility projects, highway occupancy permit (HOP) projects, and local jurisdiction construction or maintenance projects impacting a state highway. For this policy, "impacting a state highway" refers to local projects requiring signs to be posted on a state highway.

- TE-162 (Temporary Traffic Control Zone Regulatory Speed Limit Reduction Evaluation) can be found at: http://www.dot.state.pa.us/public/PubsForms/Forms/TE-162.pdf

Regulatory Speed Limit Type	Description	Typical Applications
Variable 	Changeable speed limit used only when an active work zone is in effect or when a mobility degradation justifies a lower operational speed. This type of speed limit is based on actual field conditions, and cannot exceed 24 consecutive hours.	• Occasional lane/shoulder/median closure/ shift when workers are present near active travel lanes with no positive protection • Intermittent flagging operation • Time of day specific recurring congestion or queuing
Continuous 	Speed limit reduction in effect 24 hours a day for the duration of the work zone condition.	• Work zone condition where roadway geometry cannot be designed to accommodate design standards (e.g. taper lengths, travel lane widths, sight distance, temporary alignments) • Unprotected workers adjacent to travel lanes on a daily basis • Congestion or queuing throughout the day

To avoid driver confusion and speed disparities, frequent changes in the work zone regulatory speed limit should be avoided as noted in MUTCD 6C.01, Paragraph 12. Apply the following guidance when considering a continuous work zone regulatory speed limit.

VSL SPECIFICATION UPDATE



Commonwealth of Pennsylvania
Department of Transportation

SPECIFICATION
for
Variable Speed Limit (VSL) Sign, Trailer-Mounted

July 28, 2023

1. SCOPE

The purpose of this specification is to describe a portable, trailer-moun
Variable Speed Limit Sign that displays the regulatory speed limit on a
panels that can be controlled from a remote location via radio commun
shall be mounted on a two-wheel type steel trailer and shall be capable
collapsed mode and operated in an extended stationary mode. The unit
than 30 minutes to set up at the site. The unit will be used on public str
adapt the Speed Limit to prevailing conditions.

2. GENERAL REQUIREMENTS

2.1. The trailer shall be specifically designed to support the entire op
sign display, including sign/display support system, power suppl
housings. It is to be welded steel construction equipped with fen
jacks. The unit is to have heavy duty, 2,000-pound minimum axl
minimum 14-inch automotive wheels and tires. The removable d
inches from the most forward obstruction on the trailer. The hitc
with 1 7/8-inch or 2-inch adjustable ball coupler. Two safety cha
the tongue. The trailer shall be equipped with four heavy-duty ty
riggers that can be extended for extra stability, for maintaining tr
stabilized position. The trailer and all its components are to be of
rating to operate safely upon the highway at legal speeds without
bottoming or premature wear. The total trailer operating weight
gross axle weight. The trailer is to be equipped with tail, stop an
with license plate light and bracket all conforming to Pennsylvan
standards. Four-wire trailer cable, made to SAE specifications, is
beyond the trailer coupler. All connections are to be in accorda
and location code.

2.2 The variable speed limit display shall consist of a modular LE
panels capable of displaying a two-digit speed limit legible at
The minimum panel configuration shall be a 5 x 7 matrix of i
pixels. The characters shall be a minimum of 18 inches in heigh
be of a solid-state electrical design with no mechanical elements. Each pixel shall
be composed of a minimum of four LEDs. The front face of the display shall be

1 of 3

3. Communication

3.1. The VSL sign shall be commonwealth communication network compatible prior to deployment. Integration into PennDOT's ATMS software is required.

4. Testing

The manufacturer shall bring the sign to a location specified by the Department for inspection, measurement and 30-day performance test. The test period will begin when a PennDOT Traffic Management Center remotely assumes control of the VSL sign and posts the desired speed limit. The VSL sign will successfully complete the test if there are no communication failures, LED pixel outages, improper displays, and/or power failures during the test period. In the event of a failure, the manufacturer will be notified and provided a one-time opportunity to correct the device and restart the test. Any type of failure during the second test period is cause for rejection.

WORK ZONE SPEED LIMITS

WORK ZONE SPEED LIMITS

Reliable and consistent speed limits through enhanced management.

Questions/Feedback

Ryan McNary
Pennsylvania Department of Transportation

Brian Crossley
Pennsylvania Department of Transportation

THANK YOU

pennsylvania
DEPARTMENT OF TRANSPORTATION