Smarter Work Zones Webinar Series

Webinar #1: Overview of the Smarter Work Zones Initiative

Jawad Paracha, Martha Kapitanov, Todd Peterson, W.D. Baldwin, and Neil Boudreau

September 9, 2015
1:00-2:30pm EDT
Smarter Work Zones
INTRODUCTION AND TODAY’S SPEAKERS
Today’s Speakers

Jawad Paracha
Work Zone Program Manager
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FHWA Office of Operations

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HDR

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Massachusetts DOT
Smarter Work Zones Webinar Series

• This is the first in a series of Smarter Work Zones webinars
• Topics based on what matters most to you!
• Upcoming webinars will be announced soon!
  – Information will be available on the Work Zone Safety Clearinghouse website, https://www.workzonesafety.org/SWZ
Purpose of Today’s Webinar

Provide a comprehensive overview of the Smarter Work Zones (SWZ) initiative to enable a common understanding of the program, its goals, and implementation

Topics include:

• SWZ initiative and its two strategies
• SWZ implementation plans & funding opportunities
• SWZ resources and technical assistance opportunities
Smarter Work Zones
OVERVIEW
What are Smarter Work Zones (SWZ)?

_Innovative strategies designed to optimize work zone safety and mobility_

- Policies and practices used to incrementally and continuously improve WZ operations
- Tools to reduce WZ crashes and delays
- Tools to enhance WZ management strategies
Two Identified SWZ Initiatives:

**Project Coordination**
Coordination within a single project and/or among multiple projects within a corridor, network, or region, and possibly across agency jurisdictions

**Technology Application**
Deployment of Intelligent Transportation Systems (ITS) for dynamic management of work zone traffic impacts, such as queue and speed management
SWZ Initiative Goals

• Project Coordination Goal #1
  – By December 2016, 25 State DOTs have incorporated work zone project coordination strategies into agency documentation and business processes

  – What does this mean?
    • Review of existing agency project coordination (PC) related policies and practices to identify strengths and weaknesses
    • Review of best practices of other agencies
    • Identification of strategies such as
      - software-based systems to coordinate right of way construction activities and minimize traffic impacts
      - Use of corridor-level transportation management plans (TMPs) to minimize traffic impacts
    • Implement PC strategy
    • Develop agency documentation and business processes
SWZ Initiative Goals

• Project Coordination Goal #2
  - By December 2016, 5 State DOTs have volunteered to pilot the Work Zone Implementation Strategies Estimator (WISE) software

- What does this mean?
  • Use WISE tool to optimize project schedules and analyze mitigation strategies to minimize work zone traffic impacts
  • Pilot, evaluate, suggest enhancements, and demonstrate its value for work zone management

Source: TRB
SWZ Initiative Goals

• Technology Application Goal #1A
  - By December 2016, 35 State DOTs have implemented business processes for work zone ITS technologies as identified in the Work Zone ITS Implementation Guide and/or have utilized at least one work zone ITS technology application for dynamic management of work zone impacts.

• What does this mean?
  – Well-documented agency policies and processes to streamline consideration and use of work zone ITS technologies to minimize traffic impacts.

Source: Battelle
SWZ Initiative Goals

• Technology Application Goal #1B
  – By December 2016, 35 State DOTs have implemented business processes for work zone ITS technologies as identified in the Work Zone ITS Implementation Guide, and/or have utilized at least one work zone ITS technology application for dynamic management of work zone impacts

• What does this mean?
  – Consideration of the six step process explained in work zone ITS implementation guide to plan and implement ITS strategies
  – Identify and use ITS strategy such as speed and/or queue management on at least one project for dynamic management of work zone impacts
Smarter Work Zones
PROJECT COORDINATION
Project Coordination – What is it?

Coordination within a **single project** and/or among multiple **projects** within a **corridor, network, or region**, and possibly across **agency jurisdictions** to minimize work zone traffic impacts.

Source: FHWA
Benefits of Project Coordination (1 of 2)

• Greater ability to reduce and manage traffic disruptions from road work
  – Set a maximum time delay for work zone area
  – Provide alternate routes for drivers
• Earlier identification of project impacts
  – Adjust schedule to stay on track or minimize completion delay
• Fewer number of work zones
• Dynamic adjustments to project schedule
• Improved communications within and across agencies
Benefits of Project Coordination (2 of 2)

- Reduced numbers of street cuts
- Better quality road surfaces
- Cost savings
- Increased customer satisfaction
  - Provide locations in which drivers can select an alternate route to exit work zone road.
Project Coordination Example #1
Software to coordinate right-of-way construction activities

- **Washington, DC: WZ Project Management System**
  - System includes:
    - DDOT, Developer, Utility WZ Projects
    - Work Zone Tracking Tool
    - Traffic Analysis Tool
  - Used to develop annual citywide TMP
  - Tracks performance measurement
  - Assists in transportation demand management strategies

Source: DDOT
Project Coordination Example #2
Corridor-level TMPs to address traffic-related construction impacts

- **Michigan DOT I-94 Corridor**
  - Significant construction
  - Three corridors identified
  - Corridor-Level TMPs
    - Assess corridor traffic impacts
    - Define corridor/segment delay thresholds
    - Suggest traffic mgmt. strategies
    - Discuss implementation plan

Source: Michigan DOT
Project Coordination Example #3
Multi-agency construction traffic management activities

- **Washington State DOT**
  - Collaborative, multi-agency construction traffic planning effort
  - Long-term, mid-term, and short-term information sharing
  - Construction Impact Analysis Tool, Maps, Gantt Charts
  - Hot Spots, Watch Lists

Source: WSDOT
Project Coordination Tool (1 of 2)
Work Zone Implementation Strategies Estimator (WISE)

- Developed under the SHRP2 R11 project
- Proactively reduces WZ impacts:
  - Effective project coordination upfront in planning/programming
  - Carrying coordination through to project planning/design decisions
- Made up of two modules:
  - Planning Module
  - Operation Module
Project Coordination Tool (2 of 2)
Work Zone Implementation Strategies Estimator (WISE)

• A grant to pilot the WISE tool was recently awarded to four states:
  • California – Association of Monterey Bay Area Governments MPO
  • Florida – MetroPlan Orlando MPO
  • Maryland DOT
  • Tennessee DOT
• Tool and documentation available at http://www.trb.org/Main/Blurbs/168143.aspx
Smarter Work Zones

PROJECT COORDINATION:

CORRIDOR-BASED COORDINATION

Lessons from Oregon DOT
OTIA III Statewide Bridge Program
Program Coordination – Corridor-Based Coordination – Overview

- Establish the Vision for the Corridor
- Develop Details of How the Coordination Occurs
- Educate and Inform Personnel and Stakeholders
- Implement
- Refine the Process
OTIA III Repair and Replacement Bridges Locations
Establish the Vision for the Corridor or System

• Top Management Directive to Agency
• Buy-in of Stakeholders

Mission: Keep Traffic Moving During Construction
Oregon’s Key Mobility Corridors

- Identified critical routes
  - N/S, E/W
  - Complete one and save as unencumbered route.
  - Addressed freight movement.

- Work zone delays
  - “Up to 20 minutes” delay standard.
  - Result: Additional three hours from California to Portland on I-5.
  - Solution: Established delay thresholds.
Establish the Vision for the Corridor or System

• Overall Committee made up of decision-makers with authority to speak for those they represent
  – Construction, Maintenance, Design, Operations, Traffic, Contracting, PI
  – May need technical subcommittees to identify and solve issues

• Development of Overall Guide and Associated Memorandums
Developing Details of How the Coordination Occurs (1 of 2)

• Identify what needs to be managed in the Work Zones?
  – Travel Times
  – Traffic Volumes/Capacity
  – Load Sizes/Hole in the Air

• Develop Tools to Plan, Manage and Monitor
Develop Details of How the Coordination Occurs (2 of 2)

• Develop Guidance
  – Corridor-Level or Statewide Transportation Management Plan (TMP)
  – Project-Level TMP Guidance Document
    • Used to develop the individual Project-Level TMPs
Delay Estimation Tool

• Delay Thresholds
• Segment 4-C
  o Length: 55 miles
  o Delay threshold: 7 minutes
Delay Estimation Tool

- Gather volume/count data
  - ODOT data: Multiple, robust sources
    - Automatic traffic recorders
    - Heavy vehicles
    - Seasonal variations
    - Day of week variations
    - Growth rates

- Identify free-flow threshold
  - Compare
    - Lane closure chart

Free Flow Threshold: The maximum sustainable volume that yields average travel speeds at or near free flow conditions.
Physical Restrictions

- Examples of detours of hundreds of miles
- Maintain access to regions of the state
  - E/W and N/S routes
Physical Restrictions

• Mandate covers width, height, length, and weight
• Oversize load examples
  – Manufactured housing
  – Windmill components
Educate and Inform Personnel and Stakeholders

• Important for Agency Staff
  – Know what is expected
  – Know what to do
  – Re-educate for updates and staff turnover

• Stakeholders Participation
  – Understand what to expect
  – Share their perspective

• Train
  – Importance of and how to use of tools
  – Importance of and how to develop Project-Level TMPs
Implement (1 of 3)

• Tools
• TMPs
• Coordination Meetings
  – Sharing information on Process Updates
  – Sharing project information between affected stakeholders (project scope, schedules)
  – Identify conflicts
  – Work to resolve conflicts
• Escalation Process
Implement (2 of 3)

- Coordination Meetings
  - Corridor/Regional Meetings of Affected Stakeholders in the trenches
    - Agency: planning, construction, maintenance, operations, permitting/development, public information
    - Other agencies with impacts/project activities
- Tracking Projects through their lives
  - Long term plans: general traffic impacts and schedule as known
  - Nearer term plans: refined traffic impacts/staging and schedule
  - Short term and current construction
Implement (3 of 3)

- Use and upkeep of tools, especially project tracking tools
Refine the Process

- During Early Development: from overall committee and technical subcommittee
- During Training: Participants spotting challenges
- During Implementation
Project Coordination – Corridor-Based Coordination

For Additional information:

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NW Area Traffic Leader (HDR)
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Smarter Work Zones
TECHNOLOGY APPLICATION
Technology Application – What is it?

Deployment of Intelligent Transportation Systems (ITS) for dynamic management of work zone traffic impacts, such as queue and speed management to provide actionable information to drivers and traffic managers.
Capabilities of Technology Application

• **Improved driver awareness**
  – Changing traffic patterns
  – Downstream congestion
  – Construction vehicle ingress/egress
  – Expected delay / travel time

• **Dynamic and actionable guidance** to drivers
  – “Road work ahead” vs “Traffic Stopped 1 mile ahead”
  – “Road work – expect delays” vs. “Road Work I-95 past Exit 52 Use Alternate Routes”

• **Enhanced tools for on-site traffic management**
  – Speed monitoring
  – Automated speed enforcement
  – Queue formation
Benefits of Technology Application

• **Empowers drivers** to be proactive in responding to work zones
  – Awareness of downstream hazards
  – Facilitates real-time decision-making and trip planning

• **Streamlines traffic management functions** through partial automation
  – Speed enforcement
  – Data collection
  – Performance measurement

• **Information increases customer satisfaction**
  – The More you Know…
Technology Application Example:
Queue Warning System (QWS)

Zone of advanced work zone awareness provided by Queue Warning System

Queue Detection Zone

Warning Signs installed per TCP

Work Zone

Queue Warning Controller

DATA

PCMS

STOPPED TRAFFIC 2 MILES

DYNAMIC WARNING
Technology Application Example: Variable Speed Limits (VSL)

- Multiple speed trailers in & approaching work zone
- Each unit monitors prevailing speed – relays information to upstream units.
- Posted speed limit dynamically adjusted to reduce downstream speed differential

Technology Application Example: Dynamic Lane Merge

• Early Merge
  – In low-volume conditions, it reduces the occurrence of high-speed margining at the point of lane closure.

• Late Merge
  – In high-volume conditions, it reduces the length of the queue.
Work Zone ITS Implementation Guide


STEP 1 – ASSESSMENT OF NEEDS
STEP 2 – CONCEPT OF OPERATIONS
STEP 3 – DETAILED SYSTEM PLANNING
STEP 4 – PROCUREMENT
STEP 5 – SYSTEM DEPLOYMENT
STEP 6 – SYSTEM OPERATION,
MAINTENANCE, and
EVALUATION

Source: FHWA
Smarter Work Zones
TECHNOLOGY APPLICATION
CASE STUDY
Massachusetts's Callahan Tunnel Rehabilitation Project
Callahan Tunnel Rehabilitation Project

December 2013 to March 2014

Source: MassDOT
Assessment of Needs

In developing the Traffic Management Plan for the Callahan Tunnel Project, MassDOT identified a need to provide real-time traffic conditions to the DOT and our stakeholders in order to meet the stated goals:

• **Mobility**: minimize congestion through queue warning, providing travel/delay times and encouraging traffic diversion

• **Safety**: minimize the number and severity of traffic-related incidents, injuries and fatalities in the work zone

• **Planning and Monitoring**: collect operations data to develop performance reports, allocate enforcement patrols, refine allowable working hours, and evaluate throughput capacity
Boston Callahan Tunnel Traffic Management

- Had Early Action item to remove median and realign travel lanes to address expected queues
- Upgrades to traffic signal equipment and timing plans for traffic progression
- SWZ system concept of operations identified a need to monitor and provide Real-Time feedback about alternate routes

Alternate Routes for Callahan Tunnel Closure

Source: MassDOT
Smarter Work Zone System Design

“Real-Time” view of area traffic conditions

Source: MassDOT
**SWZ Traffic/Queue Management**

### PCMS 06-CP 6 on Nashua St

<table>
<thead>
<tr>
<th>FREE FLOW</th>
<th>MODERATE</th>
<th>HEAVY</th>
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<tbody>
<tr>
<td>CALLAHAN TUNNEL CLOSED</td>
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**LOGIC & SENSORS**

- **FREE FLOW** = Travel Time for Route 6 = <13 MIN
- **MODERATE** = Travel Time for Route 6 = 14-20 MIN
- **HEAVY** = Travel Time for Route 6 = 21 MIN or More

**Route 6**

- PCMS 06-CP 6 to PCMS 07-CP 7 via EX18, Haul Rd Ramp A
  - Distance: 5 MILES
  - Time: 8 MINUTES IN FREE FLOW

### PCMS 09-CP 9 (Storrow Dr at Longfellow Bridge)

<table>
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<th>FREE FLOW</th>
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<td>FOR LOGAN AIRPORT</td>
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**LOGIC & SENSORS**

- **FREE FLOW** = Travel Time for Route 9 = <14 MIN
- **MODERATE** = Travel Time for Route 9 = 15-20 MIN
- **HEAVY** = Travel Time for Route 9 = 21 MIN or More

**Route 9**

- PCMS 09-CP 9 to CP 7 via I-93S, Exit 18 to Haul Road
  - Distance: 5 MILES
  - Time: 8 MINUTES IN FREE FLOW

Message Boards driven by “Delay Threshold” logic fed by probe vehicle data.
## SWZ Traffic/Queue Management

### LOGIC & SENSORS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
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<tr>
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**Route 6: PCMS 06-CP 6 to PCMS 07-CP 7 via EX18, Haul Rd Ramp A**

- 5 MILES
- 8 MINUTES IN FREE FLOW

### LOGIC & SENSORS

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**Route 9: PCMS 09-CP 9 to CP 7 via I-93S, Exit 18 to Haul Road**

- 5 MILES
- 8 MINUTES IN FREE FLOW
SWZ Traffic/Queue Management

PCMS 06-CP 6 on Nashua St

- **FREE FLOW**
  - CALLAHAN TUNNEL CLOSED
- **MODERATE**
  - CALLAHAN TUNNEL CLOSED
- **HEAVY**
  - CALLAHAN TUNNEL CLOSED
- **USE I-93 SOUTH TO EXIT 18**
- **EXPECT MODERATE DELAYS**
- **EXPECT MAJOR DELAYS**

PCMS 09-CP 9 (Storrow Dr at Longfellow Bridge)

- **FREE FLOW**
  - CALLAHAN TUNNEL CLOSED
- **MODERATE**
  - FOR LOGAN AIRPORT
- **HEAVY**
  - FOR LOGAN AIRPORT
- **DETOUR USE EXIT 18**
- **CONSIDER USE RTE 1 N TOBIN BR**
- **USE RTE 1 N TOBIN BR**
SWZ System Operations

SWZ message boards provide route choice suggestions based on “real time” traffic conditions
SWZ Monitoring Key Locations

Use SWZ technology to foster an Interagency Partnership through information sharing.

Monitor key alternate route decision points.

Source: MassDOT
Evaluation of SWZ System

- Enhanced messaging helps eliminate motorists frustration with construction delays
- Stopped traffic notification helps alert motorists on back of queue and prevents crashes
- MassDOT construction staff benefit from allowing the SWZ system to manage traffic
- Sharing SWZ system access/data with partner agencies helps improve network mobility
SWZ System Procurement

• Jobs are either bid as a “Lump Sum” or have a deployment cost and a per month rental cost

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Monthly Cost Range</th>
<th>Inclusions</th>
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<tbody>
<tr>
<td>Portable Message Boards</td>
<td>$500 - $750</td>
<td>Solar with Remote Operation</td>
</tr>
<tr>
<td>Queue Sensor Trailer</td>
<td>$400 - $700</td>
<td>Lane-by-Lane Data Capture</td>
</tr>
<tr>
<td>Portable Camera Trailer</td>
<td>$1,000 - $1,300</td>
<td>w/Streaming Video</td>
</tr>
<tr>
<td>System Operation</td>
<td>$2,500 - $3,500</td>
<td>Includes unlimited data plan</td>
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</table>
SWZ Lessons Learned

• Make use of ITS in work zones part of your traffic management mitigation strategies

• Start planning your Concept of Operations early in project development

• Prepare SWZ System Item Specifications that include detailed descriptions of the equipment, system operation and expected deliverables

• Capture traffic data to generate performance measures for SWZ
Callahan Tunnel Rehabilitation Project - Case Study

For Additional information:

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State Traffic Engineer (MassDOT)
neil.boudreau@state.ma.us
Smarter Work Zones
IMPLEMENTATION PLANS and
FUNDING OPPORTUNITIES
SWZ State Implementation Plan

• Individual State Implementation Plans
  – Use as project management tool by listing activities and schedule to ensure successful implementation of SWZ initiative
  – Provides a way to better understand agency initiative, assess any technical assistance needs, and tracking progress

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<tr>
<td><strong>Opt-out:</strong> The State is not interested in pursuing [tool or technology]</td>
<td>☐</td>
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<td><strong>Development Phase:</strong> Collect guidance and best practices, build support with partners and stakeholders, and develop a process necessary for implementation</td>
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<td><strong>Demonstration Phase:</strong> Testing/piloting [tool or technology]</td>
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<td><strong>Assessment Phase:</strong> Assess performance and the process for carrying out [tool or technology]. Make adjustments to prepare for full deployment</td>
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<td><strong>Institutionalized:</strong> [Tool or technology] is adopted by the State’s highway construction industry and used regularly on projects</td>
<td>☐</td>
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<td>☐</td>
<td>✓</td>
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SWZ State Implementation Plan (continued)

• Implementation Plan Activities
  – Provide a list of activities that are planned to progress from current implementation stage to goal implementation stage

<table>
<thead>
<tr>
<th>Activity No.</th>
<th>Description of Activity</th>
<th>Target Completion Date</th>
<th>Schedule/Status</th>
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How can States fund these initiatives?

State Transportation Innovation Councils (STIC) Incentive Program

– Funds activities which turn innovations into standard practices
– All states are eligible
– Up to $100,000 available to each STIC annually
– Can be used to fund multiple initiatives
– Use to pay consultants to develop standards, specifications, design manuals, evaluations, implementation plans, workshops, training, and more!

www.fhwa.dot.gov/stic
How can States fund these initiatives?

Accelerated Innovation Deployment (AID) Demonstration Program

– Projects may be any aspect of highway transportation
– Max of $1,000,000 (up to full cost of project)
– Monitoring, assessment, and technology transfer commitments
– Current grants include ABC, high surface friction treatments, and ATMS/A.

https://www.fhwa.dot.gov/accelerating/grants/
Smarter Work Zones

FHWA Resources and Opportunities
FHWA Resources and Opportunities

• **SWZ Outreach Materials**
  • Case studies
  • Fact Sheets
  • Resource Toolkit (online and via USB drive)
    • Guidelines, presentations, deployment strategies, procurement procedures, and more!

• **Virtual and In-person Training Opportunities**
  • Webinars
  • 1-2 day training workshops

• **Virtual and In-person Peer-to-Peer Exchanges**
  • Meet with agencies who have successfully adopted SWZ strategies
FHWA Resources and Opportunities

- **Regional Peer Exchange Workshops**
  - Four regional workshops to be attended by agency representatives and SMEs to discuss SWZ strategies and implementation

- **Demonstration Site Visits**
  - See SWZ deployments first-hand across the country.

- **Additional Resources**
  - Project Coordination-specific and Technology Application-specific lists of resources available to download.
SWZ Implementation Core Team

- **SWZ Initiative Leads**
  - Paul Pisano, Team Leader, FHWA Office of Operations
  - Jawad Paracha, Work Zone Program Manager, FHWA Office of Operations

- **FHWA Smarter Work Zones Team**
  - Todd Peterson, FHWA Office of Operations
  - Martha Kapitanov, FHWA Office of Operations
  - Eric Ferron, Lakewood, CO FHWA Resource Center
  - Ken Wood, Matteson, IL FHWA Resource Center
  - Karen Gilbertson, FHWA Kansas Division Office

- **SWZ Subject Mater Experts**
  - Jerry Ullman, Texas A&M Transportation Institute
  - W.D. Baldwin, HDR

- **State DOT SWZ Subject Matter Experts**
  - Neil Boudreau, Massachusetts DOT
  - Chris Brookes, Michigan DOT
  - Scott McCanna, Oregon DOT
  - Michael Fontaine, Virginia Center for Transportation Innovation and Research
Thank you for joining us!

• **Upcoming Events**
  – Webinar #2: Implementing Technology Application Solutions
    • Tuesday, September 29, 2015 1:00-2:30pm EDT
  – Regional Peer Exchanges

<table>
<thead>
<tr>
<th>FHWA DFS Region</th>
<th>Location</th>
<th>Dates</th>
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<tbody>
<tr>
<td>North</td>
<td>University of Massachusetts, Springfield</td>
<td>Week of October 26-30 (exact dates TBD)</td>
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<tr>
<td>South</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>Mid-America</td>
<td>TBD</td>
<td>Week of October 19-22 (exact dates TBD)</td>
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<tr>
<td>West</td>
<td>TBD</td>
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– Check The National Work Zone Safety Information Clearinghouse website for updates
  • [https://www.workzonesafety.org/SWZ](https://www.workzonesafety.org/SWZ)

• **Questions or Comments?**
  – Jawad Paracha (FHWA Operations, WZ Team)
    • Jawad.Paracha@dot.gov