Smarter Work Zones

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Efficiency through technology and collaboration

innovation ingenuity imagination invention
Every Day Counts

U.S. Department of Transportation
Federal Highway Administration

Agenda

- **Smarter Work Zones (SWZ) Overview**
  - What is SWZ, why is it relevant, and what are the goals?
  - What funding mechanisms are available?
  - What support will FHWA provide?
- **SWZ's Project Coordination Initiative**
  - Strategies and Examples
- **SWZ's Technology Application Initiative**
  - Strategies and Examples
- **Questions/Discussion**

Why are SWZs Important?

SWZs play major role in reducing WZ-related injuries, fatalities, and travel delays

- Work Zone related injuries:
  - Occur every 14 minutes (96 injuries/day)
  - Over 20,000 workers injured annually
  - 29,000 injuries in 2013
- Work Zone related fatalities:
  - Occur every 15 hours (1.6 fatalities/day)
  - 105 worker fatalities in 2013
  - 579 traffic-related fatalities in 2013
- Work Zone related mobility issues:
  - 24% of non-recurring delay
  - 10% of all congestion
  - NHS capacity loss ~180mil vehicles/day

Source: VDOT

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

Smarter Work Zone Initiatives

- Project Coordination
- Technology Applications

“Smarter Work Zones”

EDC round 3 (January 2015 – December 2016)

Every Day Counts (EDC) – program to accelerate state adoption of innovations for *“shortening project delivery, enhancing the safety of our roadways, and protecting the environment.”*

http://www.fhwa.dot.gov/everydaycounts/edc-3/zones.cfm

What are Smarter Work Zones?

PROJECT COORDINATION

Coordination within and/or between agencies to minimize work zone traffic impacts among multiple projects

TECHNOLOGY APPLICATIONS

Implementation of ITS tools for improved work zone traffic management

Project Coordination Definition and Goals

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

Goal 1 By December 2016, **25 State DOTs** have incorporated work zone project coordination strategies into agency documentation and business processes for improving safety and reducing work zone delays

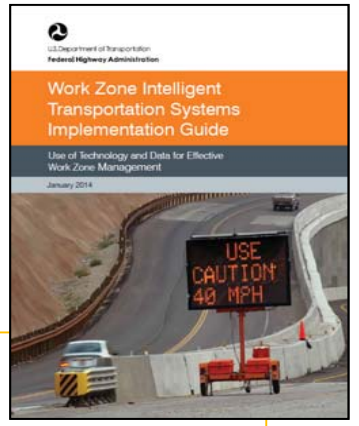
Goal 2 By December 2016, **five State DOTs** have volunteered to pilot the WISE (Work Zone Impact & Strategy Estimator) software application.

WISE

Source: TRB

Technology Applications Definition and Goals

Deployment of **Intelligent Transportation Systems (ITS)** for **dynamic management of work zone traffic impacts,** such as queue and speed management.



Goal

By December 2016, **35 State DOTs** have:

Implemented business processes for planning, design, procurement, operation, and evaluation of 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 such as speed and queue management.

How do States fund these initiatives?

State Transportation Innovation Councils (STIC) Incentive Program

www.fhwa.dot.gov/stic

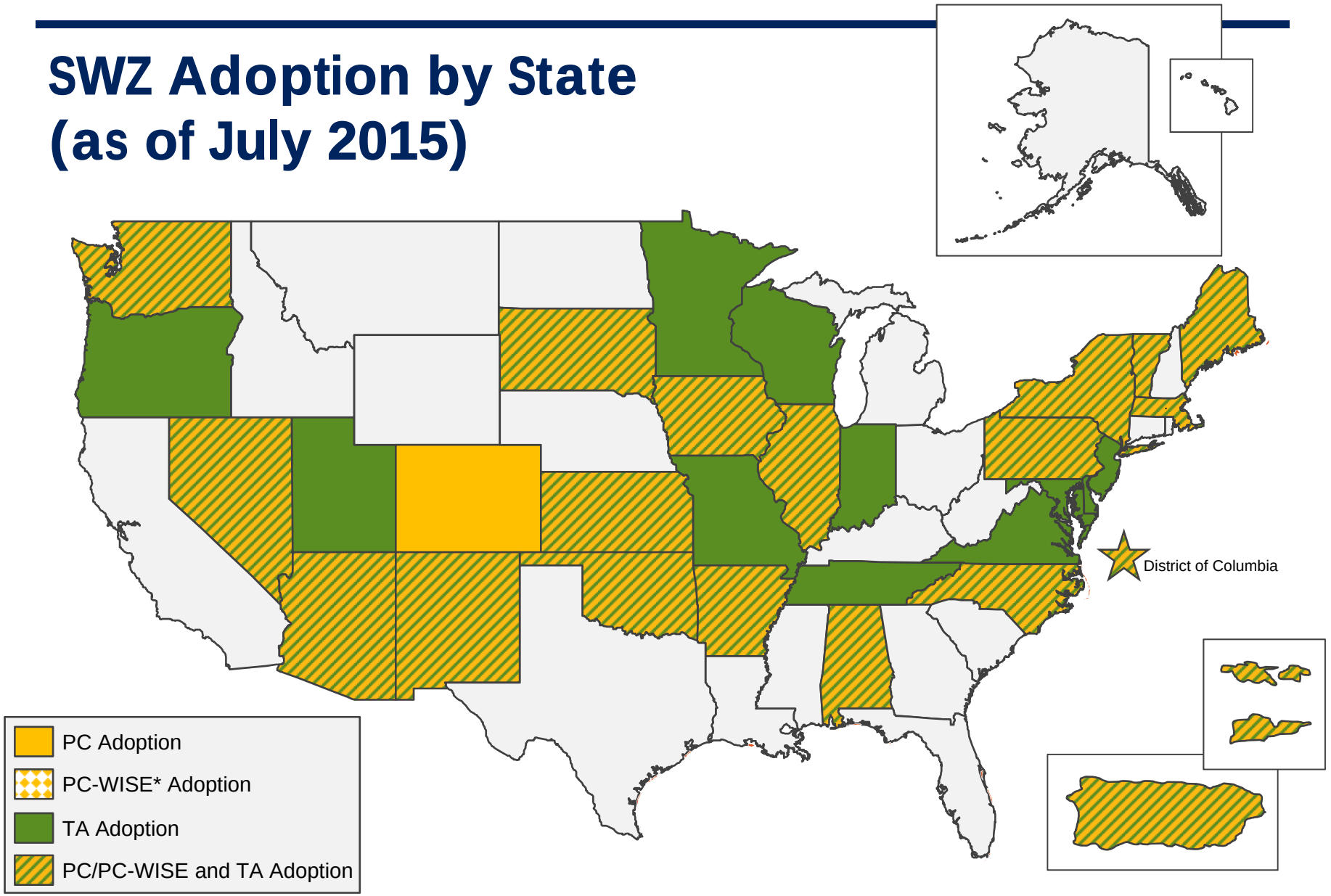
- Funds activities which turn innovations into standard practices
- Up to $100,000 available to each STIC annually

Accelerated Innovation Deployment (AID) Demonstration Program

www.grants.gov

- 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

SWZ Adoption by State (as of July 2015)



**Final WISE Pilot grantee selection by end of Summer 2015*

FHWA is supporting states in implementing SWZ strategies in a variety of ways!

SWZ outreach materials
- Case studies
- Fact sheets
- Toolkit *(online and via thumb-drive)*

Learn more about SWZ strategies and deployments!

Virtual and in-person training opportunities
- Monthly 90-min webinars
- 1-2 day in-person workshops

Learn about SWZ concepts based on YOUR state needs!

Virtual and in-person peer-to-peer exchanges
- Hosting and participant opportunities

Regional Peer Exchange Workshops
- Hosting and participant opportunities

Meet with agencies who have successfully adopted SWZ strategies!

Demonstration Site Visits
- Hosting and participant opportunities

See first-hand SWZ deployments across the country!

PROJECT COORDINATION
Strategies and Examples

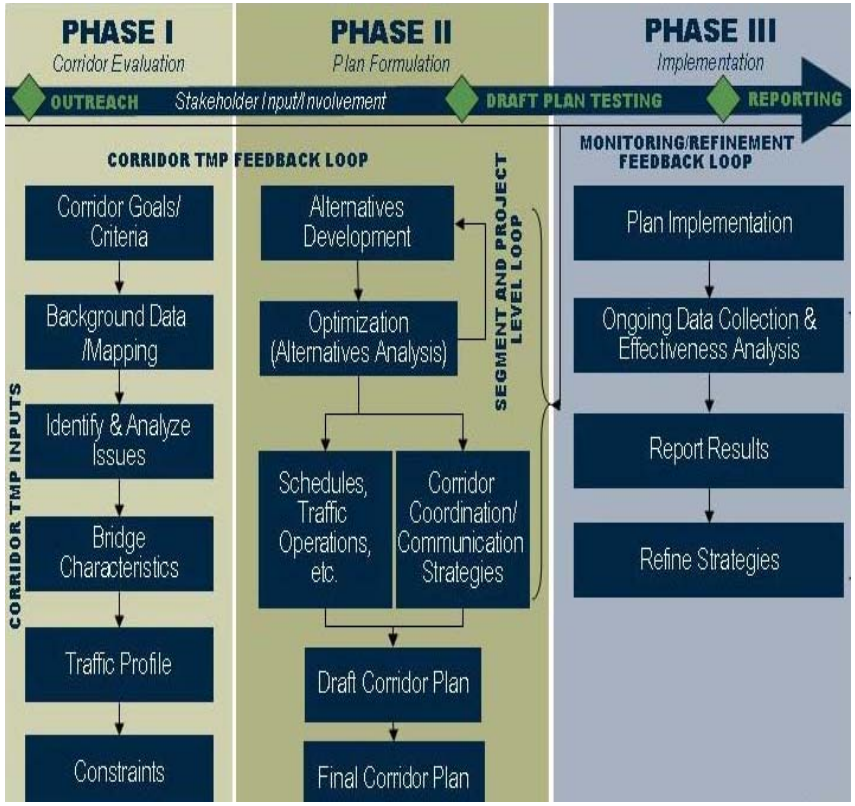
- Some successful coordination strategies deployed in metropolitan areas and interstate corridors
- Strategies are not standard practice among most transportation agencies

Source: FotoSearch.com

Project Coordination Strategy #1

Corridor-level TMPs to address traffic-related construction impacts

- **Oregon Transportation Investment Act**
  - Significant construction
  - Six corridors identified
  - Three levels of TMP
  - Corridor-Level TMPs
    - Assess corridor traffic impacts
    - Define corridor/segment delay thresholds
    - Suggest traffic mgmt. strategies
    - Discuss implementation plan

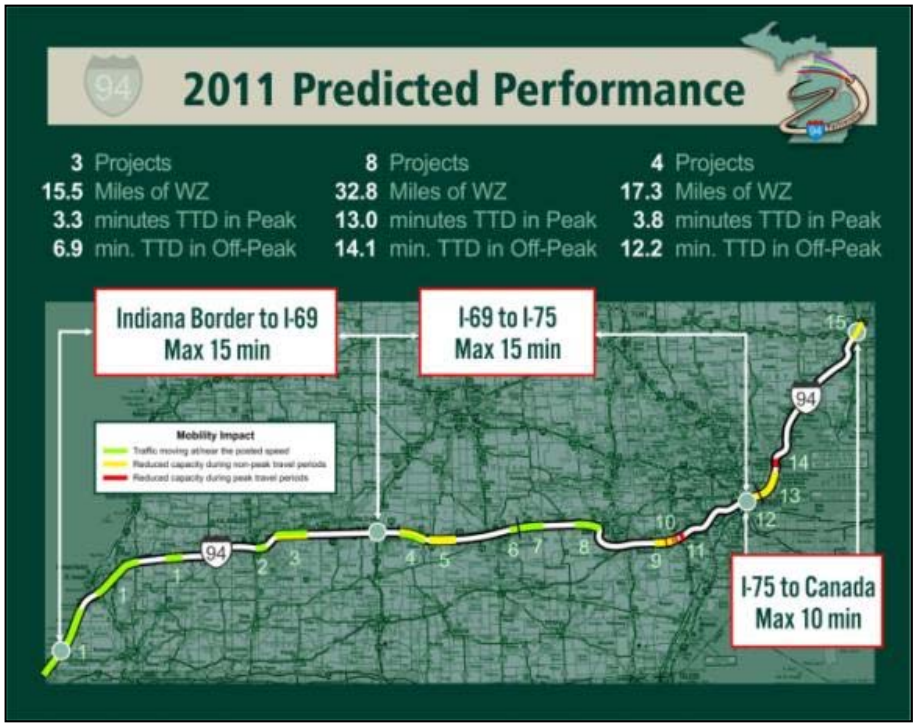


Source: ODOT

Project Coordination Strategy #2

Building partnerships to enhance mobility during construction

- **Michigan's I-94 Corridor**
  - I-94 Corridor Operation Partnership (COP) Mission: "Improve traffic operations and system reliability along the I-94 corridor statewide."
  - I-94 COP Objectives:
    - Unification of I-94 corridor with one focus
    - Travel Reliability: 40 min delay max for entire corridor



Project Coordination Tool

Work Zone Implementation Strategies Estimator (WISE)

- Product of SHRP2 R11 Project
- Proactively reduces WZ impacts:
  - Effective project coordination upfront in planning/programming
  - Carrying coordination through to project planning/design decisions
- Helps bridge the gap between planning/MPOs and design-construction/DOTs
- Has ability to analyze demand and duration based strategies
- Supports better and more complex decision-making

Available at trb.org

WISE modules:

Planning Module

- Optimized sequencing of renewal projects

Operations Module

- DynusT platform evaluates impact of individual strategies at project level

TECHNOLOGY APPLICATIONS
Strategies and Examples

Benefit / Cost
- System cost vs. agency budget constraints
- Lack of understanding of benefits (and how that offsets the cost)

No "one size fits all" approach
- Lack of standard procedures, specifications, etc. for implementing at state level
- Lack of practitioner knowledge (design, construction)
- Procurement challenges

Third-party issues
- Legislative requirements
- Stakeholder resistance to change (law enforcement, public, industry partners)

Source: FotoSearch.com

Technology Applications – Objectives and Criteria

Objectives

Safety

- Improved driver awareness of downstream congestion related to work zones
- Dynamic guidance to improve driver responsiveness to changes in traffic patterns
- Enhanced tools for on-site traffic management

Mobility

- Facilitate real-time decision-making and trip planning so drivers can divert trips to avoid adding to work zone congestion
- Enhanced transportation management facilitated by real-time data flows
- Increased customer satisfaction

Basic Criteria

Are **traffic responsive** – incorporate real-time data collection

- Provide **enhanced information delivery** to drivers
- Functions are **automated** and **dynamic**

System Components

- **Infrastructure:**
  - ✓ Sensors
  - ✓ Connected traffic control devices (e.g., signals, PCMS)
  - ✓ Communications
  - ✓ Data processing / archival
- **Business Processes:**
  - ✓ Assessment of need
  - ✓ Understanding of regulatory requirements (i.e. System Engineering)
  - ✓ Coordination with external stakeholders
  - ✓ System design / specification
  - ✓ Procurement / contracting mechanisms

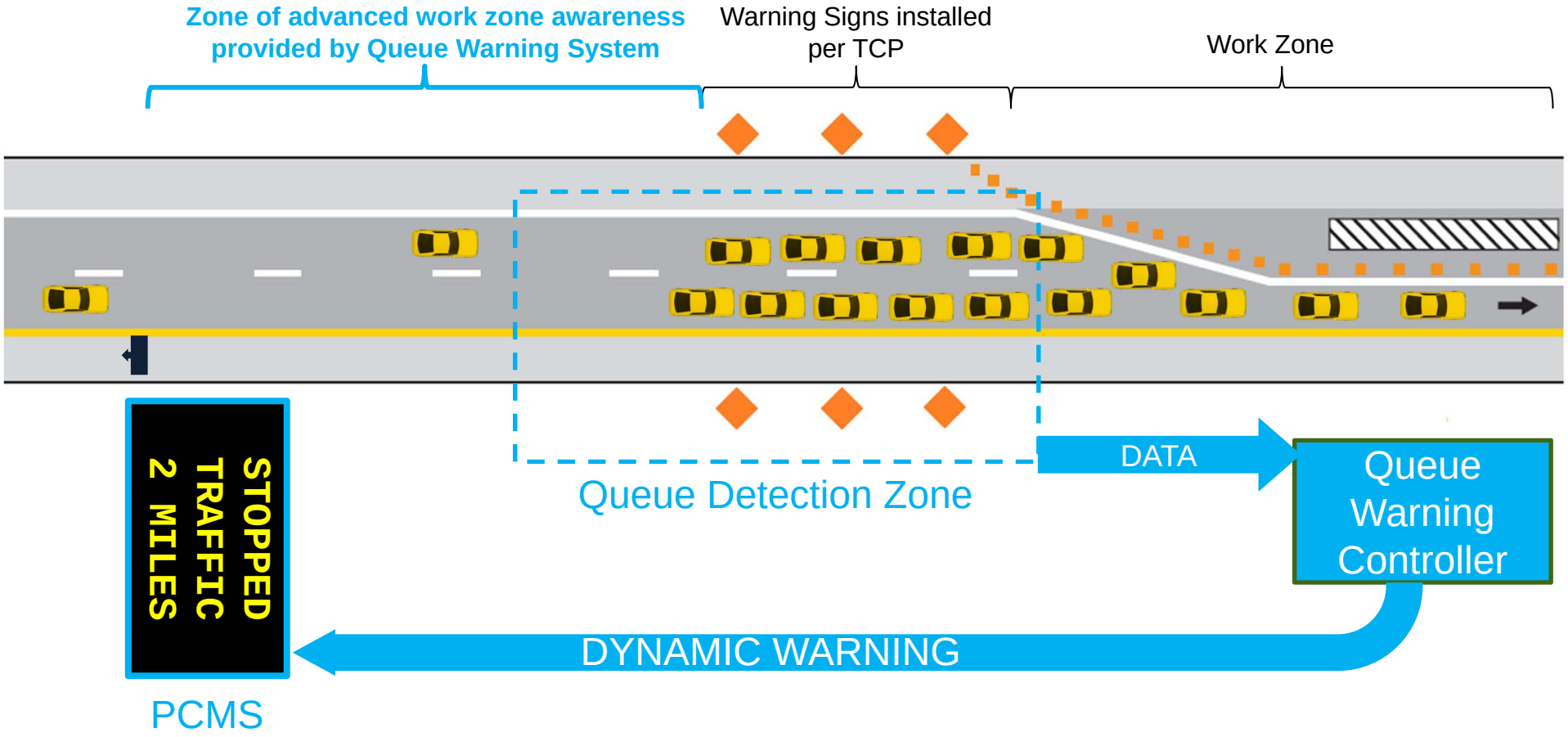
National ITS Architecture
http://www.iteris.com/itsarch/

Work Zone ITS Applications

From the ITS Implementation Guide

- Real-time Traveler Information
- Queue Warning
- Dynamic Lane Merge (early/late)
- Incident Management
- Variable Speed Limits
- Automated Enforcement
- Entering / Exiting Vehicle Notification
- Performance Measurement

Technology Application Strategy #1
Queue Warning System (QWS)



Technology Application Strategy #2
Variable Speed Limits (VSL)

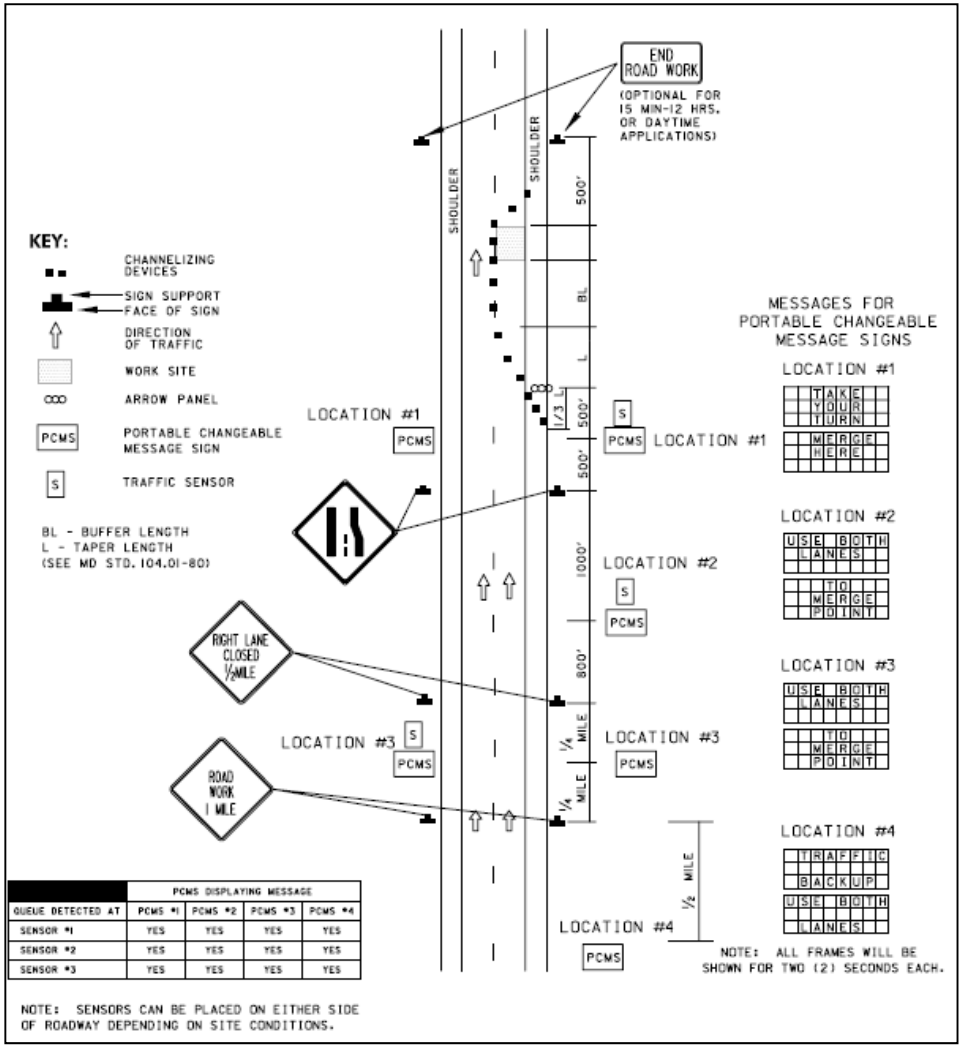
- Multiple speed trailers in & approaching work zone
- Each unit monitors prevailing speed – relays information to upstream units.
- Posted speed limit dynamically adjusted to reduce downstream speed differential

http://www.michigan.gov/documents/mdot/MDOT_Research_Report_RC1467_200924_7.pdf

Technology Application Strategy #3
Dynamic Lane Merge

Early Merge
- In low-volume conditions reduces the occurrence of high-speed merging at the point of lane closure.

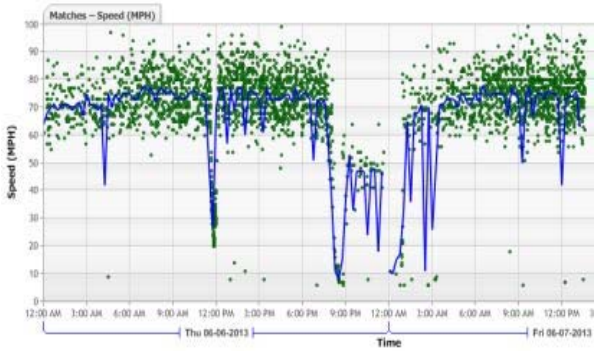
Late Merge
- In high-volume conditions reduces the length of the queue.

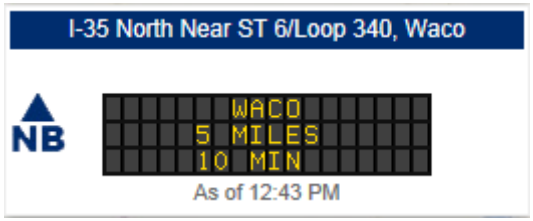


Source: Maryland State Highway Administration

Technology Application Case Study #1
I-35 Traveler Information During Construction

- Provide **advance** notification of planned lane closures and their anticipated impacts
- Provide travelers with **predicted** delays for construction closures (web app http://i35-maps.tti.tamu.edu/)
- Provide **real-time** traveler information





Technology Application Case Study #2
Rural Queue Detection and Warning Systems

Central Illinois reconstruction projects used ITS for WZ rear-end crash concerns

- I-70/I-57 interchange, 6 mi of concurrent routes
- I-57/I-64 Interchange, 4 mi of concurrent routes

Key Concerns

- Unpredictable queues leading to severe rear-end crashes
- Lengthy delays when queues form

Solution Requirements

- Automatic detection of slow/queued traffic
- Ability to warn approaching motorists of slow/queued traffic
- Encourage diversion by informing motorists of current delays

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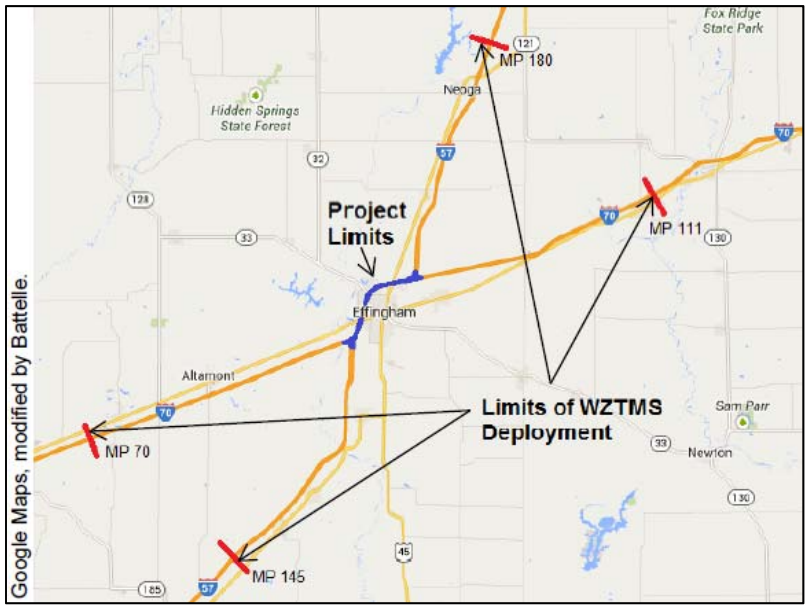
Temporary, solar-powered system

Technology Application Case Study #2 (cont.)
Rural Queue Detection and Warning Systems

I-70/I-57 Interchange

- Portable solar-powered trailers:
  - Radar sensors
  - Traffic sensors
  - Video surveillance cameras
- Traffic volume and speed data across multiple lanes of traffic
- Sensors not degraded by inclement weather conditions:
  - Precipitation, fog, darkness, dust, or road debris
- Cellular communications



Limits of the I-70/I-57 WZTMS
(10-12 miles upstream in each direction)

Technology Application Case Study #2 (cont.)
Rural Queue Detection and Warning Systems

I-57/I-64 Interchange

- Portable traffic monitoring devices
- Self-contained, battery-powered unit with radar detector, GPS, cellular, and backup satellite communication capabilities and processors
- Sensors 3-14 miles upstream of interchange (depending on direction)

I-57/I64 Map layout of sensors

FHWA's Work Zone ITS Implementation Guide

Work Zone ITS Implementation Guide

Publication FHWA-HOP-14-008

Available in print & PDF

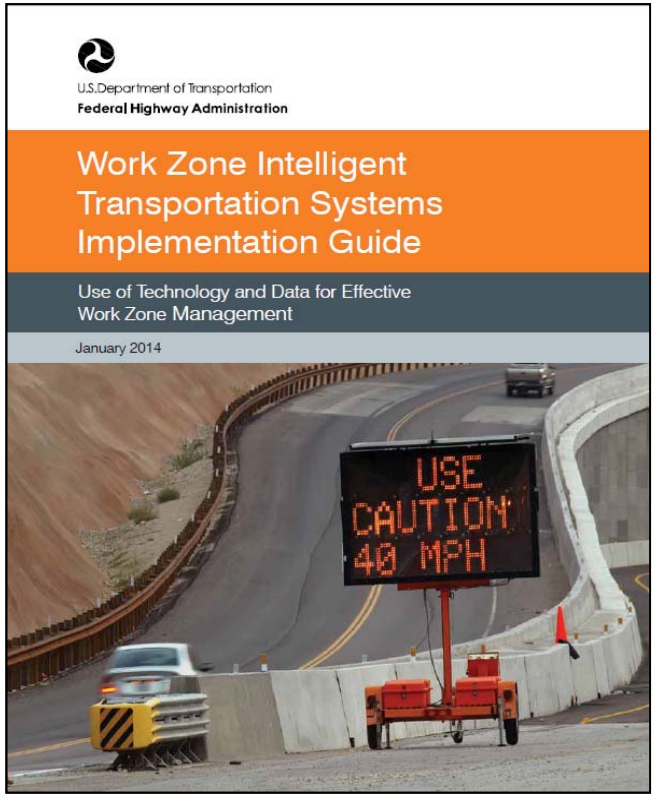
ops.fhwa.dot.gov/publications/fhwahop14008/

Work Zone ITS Case Studies

Publication FHWA-HOP-14-007

Available in PDF only

ops.fhwa.dot.gov/publications/fhwahop14007/



ITS Implementation Guide – The 6-Step Process

- **Step 1:** Assessment of Needs
- **Step 2:** Concept Development and Feasibility
- **Step 3:** Detailed System Planning and Design
- **Step 4:** Procurement
- **Step 5:** System Deployment
- **Step 6:** System Operation, Maintenance and Evaluation

Where can I find out more about FHWA support opportunities?

Support includes:

- SWZ Outreach Materials
- Training Opportunities
- Peer-to-Peer Exchanges
- Regional Peer Exchange Workshops
- Demonstration Site Visits

SWZ initiative co-leads:

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workzonesafety.org

FHWA's Every Day Counts Website:

https://www.fhwa.dot.gov/everydaycounts/edc-3/zones.cfm

Resources

Project Coordination

FHWA	• FHWA Work Zone Mobility and Safety Program – Project Coordination http://www.ops.fhwa.dot.gov/wz/construction/crp/index.htm • FHWA Work Zone Mobility and Safety Program – Peer-to-Peer Program http://www.ops.fhwa.dot.gov/wz/p2p/index.htm
TRB SHRP2	• WISE Software Users Guide http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-R11-RW-2.pdf
NCHRP	• NCHRP Synthesis 413: Techniques for Effective Highway Construction Projects in Congested Urban Areas http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_413.pdf
Others	• Highway Construction Coordination to Minimize Traffic Impacts http://planning.transportation.org/Documents/8-36/NCHRP8-36(56)FinalReport.pdf

Technology Applications

FHWA	• FHWA Every Day Counts Website http://www.fhwa.dot.gov/everydaycounts/ • FHWA Work Zone Mobility and Safety Program – Work Zone ITS & Technology http://www.ops.fhwa.dot.gov/wz/its/index.htm • FHWA Work Zone ITS Implementation Guide http://ops.fhwa.dot.gov/publications/fhwahop14008/fhwahop14008.pdf • FHWA Work Zone ITS Implementation Case Studies http://ops.fhwa.dot.gov/publications/fhwahop14007/fhwahop14007.pdf • Intelligent Transportation Systems Joint Program Office http://www.its.dot.gov/index.htm
NCHRP	• NCHRP Report 560: Guide to Contracting ITS Projects http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_560.pdf
Others	• National Work Zone Safety Information Clearinghouse http://www.workzonesafety.org/search-results?query=its

Questions and Comments