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**RESEARCH PROJECT TITLE**

Guidance on Active Work Zone Data Archival

**SPONSORS**

Smart Work Zone Deployment Initiative  
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Federal Highway Administration  
(InTrans Project 18-646)

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The Smart Work Zone Deployment Initiative (SWZDI) is a transportation pooled fund that supports research investigations into better ways to improve the safety and efficiency of traffic operations and highway work in work zones. The primary objective is to promote and support research and outreach activities that focus on innovative practice-ready policies, processes, tools, and products that enhance the implementation and constructability, safety, and mobility impacts of all types of work zones. The fund is administered by Iowa State University's Institute for Transportation, and the lead agency is the Iowa Department of Transportation.

The sponsors of this research are not responsible for the accuracy of the information presented herein. The conclusions expressed in this publication are not necessarily those of the sponsors.

Although good information about general construction project schedules is usually available, providing transportation agencies, first responders, and the public with accurate information about the specific locations and timing of construction-related lane closures can help mitigate the safety and mobility impacts of work zones.

## Objectives

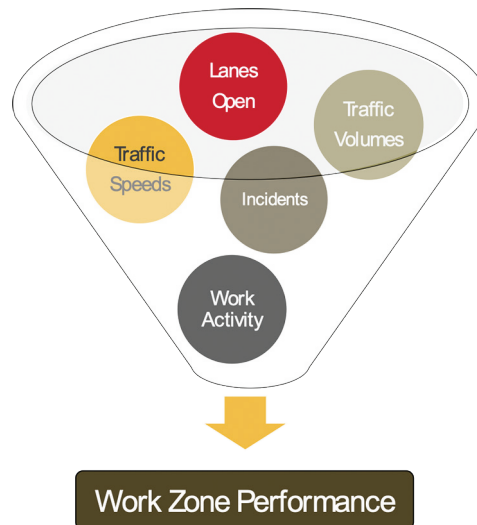
The primary objectives of this project were to review various stakeholders' current needs for pre-construction, real-time, and post-construction work zone information, particularly regarding lane closures; compare those needs to the available work zone data sources; and develop a conceptual solution for addressing gaps between the required and available data.

## Problem Statement

The work zone information disseminated to first responders and the public is often based on incomplete or outdated information about construction-related closures and their impacts. The data necessary for effectively relating work zone characteristics to operational performance measures such as queuing and delay are not consistently available to state departments of transportation (DOTs).

## Background

Highway work zones often have major safety and mobility impacts, particularly when the work requires lane closures. To mitigate these impacts, stakeholders such as transportation agencies, first responders, and the public require accurate information about the location, extent, and timing of construction-related closures. Ideally, this information should be highly specific as to the location of each closure, which lanes are closed, and the actual times when the closure begins and ends.



Elements of work zone performance

To provide such information to road users, state DOTs have invested heavily in disseminating pre-trip closure information through telephone hotlines and websites. Several agencies also provide data feeds that can be used by radio traffic reporters and commercial traffic information services such as Here Traffic, Google Maps, TomTom, and Waze.

In addition, state DOTs endeavor to improve work zone safety and mobility by monitoring traffic conditions and incidents and relating them to the specific characteristics of work zones, such as the location, extent, and timing of lane closures. In the past, this type of analysis has been hampered by a lack of detailed information about the extent and timing of closures. For example, an agency might authorize a contractor to work in a particular corridor for several weeks but not have a way to determine retrospectively whether lanes were closed at a specific time within the authorized time window.

## Research Description

This project included five main activities:

1. Information was gathered about the work zone data sources currently available to state DOTs and the ways these data are used by various stakeholders.
2. Existing US and European protocols for the collection and electronic transmission of work zone data were reviewed, including Datex II, Radio Data System Traffic Message Channel (RDS-TMC), Traffic Protocol Experts Group Generation 2 (TPEG2), the Traffic Management Data Dictionary (TMDD), the International Traveler Information System (ITIS) (SAE standard J2540), and the recommendations currently being developed through the Federal Highway Administration's (FHWA's) Work Zone Data Initiative (WZDI).
3. A nationwide survey of state DOTs and follow-up interviews with selected work zone engineers who responded to the survey were conducted to identify the work zone data use cases and applications most relevant to the near-term needs of state DOTs. The use cases presented in the survey were derived from the WZDI. Twenty six states responded to the survey, and representatives from seven states were interviewed.
4. Synthesizing the information gathered about the available work zone data sources and the needs and priorities of state DOTs, gaps were identified between the data requirements for high-priority use cases and the currently available data sources.
5. To present an option to help gather lane closure data that are not currently available from other sources, a set of conceptual sketches was developed for a mobile or web-based data collection application (app) that could be used by on-site personnel.

## Key Findings

- The survey of state transportation agencies indicated that use cases related to the dissemination of lane closure information, causes of traffic delays, factors affecting work zone safety, pre-construction analysis, and reviews of transportation management plan effectiveness are highly relevant to the needs of most state DOTs.
- Improving interjurisdictional coordination is important in some states, particularly if a major urban area straddles the state line.
- Nearly all of the data currently used for work zone monitoring and analysis are byproducts of data systems developed for other purposes. For example, freeway speeds and video are typically obtained to support permanent traffic incident management systems.
- The four main data gaps identified include traffic speeds for non-freeway facilities, traffic volumes during construction (especially for non-freeway facilities), lane closure details such as location and actual start/stop times, and detailed location and start/stop times for incidents and crashes in or near work zones.

## Conclusions and Recommendations

- Work zone monitoring has traditionally focused mainly on freeway closures, but closures on urban arterials and two-lane rural highways can also significantly impact road user safety and mobility. In such cases, the spatial extent of a closure can affect multiple legs of an intersection in addition to roadway segments.
- A lack of lane closure details significantly impedes more effective work zone monitoring. A few states are experimenting with gathering this information from global positioning system (GPS) devices installed in maintenance vehicles or traffic control equipment.
- A mobile or web-based lane closure data collection app could potentially be developed to collect real-time lane closure information, either through manual data entry or by linking GPS-equipped devices with specific closures or mobile operations. A set of conceptual sketches for an app was developed as part of this research.
- Crash location and severity information is typically available from law enforcement reports but is not always timely and accurate. The lane closure data collection app could be used to record work zone crashes and non-crash incidents affecting work zone traffic flow.

- By combining real-time crash/incident and lane closure information, agencies could more completely understand the factors contributing to work zone delays and the characteristics of well-performing work zones. Such information could support post-incident debriefings and post-construction work zone performance reviews.
- A work zone activity database could provide a central repository of information to help users apply data from multiple systems. Desirable data elements would include lane closure locations and precise start/end times, lane configuration details, road surface condition, work type, and crash/incident location and timing.
- The current lack of a unified global standard for work zone data interchange presents technical challenges. The Datex II standard provides a broad set of work zone data elements that can be extended as needed, and the WZDI is developing a similar set of data interchange standards for the US. A key challenge will be integration with legacy systems.

## Implementation Readiness and Benefits

More detailed and comprehensive work zone data would allow state DOTs to better relate specific work zone characteristics, such as lane closure location and duration, to operational performance measures and the factors contributing to good or poor performance. The quality of lane closure information disseminated to first responders and the public would also improve.

Many of the data gaps identified in this research could be addressed through further development of the proposed lane closure data collection app. Development would likely proceed in phases and use a modular approach so that new features can be added as funding becomes available. To support interoperability, the app should be designed to support a work zone data repository that is compliant with relevant technical standards.

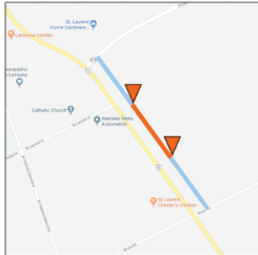
Contractors are likely to view the app more favorably if they see value for their own operations.

### Select Activity

- My Projects
- Enter New Closure
- Begin Saved Closure
- Copy Previous Closure
- Modify Saved Closure
- End of Shift
- Closure All Done
- My User Profile

### Enter New Closure

Road No: **Z99**  
Road Name: **Old Hwy 6**  
South Limit: **Bruce Rd**  
North Limit: **Hwy 415**  
Job Length: **1.21 miles (1.96 km)**  
Approaches: **2**



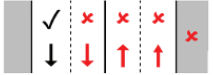
Dist: 0.73 miles (1.18 km)    Appr: 2

BACK
ADD APPROACH
CONFIRM

### Enter Lane Details

**Z99 Old Hwy 6: Bruce Rd – Hwy 415**  
Closing 0.73 of 1.21 job miles  
Closing 2 of 2 approaches

**2 of 2 Northwest-bound Lanes Closed**  
NWB Shoulder Closed



**1 of 2 Southeast-bound Lanes Closed**  
SEB Shoulder Open

Two-Way One Lane Operation

BACK
NEXT APPROACH
CONFIRM

### Enter Closure Timing

**Z99 Old Hwy 6: Bruce Rd – Hwy 415**  
Closing 0.73 of 1.21 job miles  
Closing 2 of 2 job legs

Closure Start Date: TODAY TOMORROW

Closure End Date: TODAY TOMORROW

Expected Start Time: 8:45 AM

Expected Reopening: 3:45 PM


Duration 7 hr 00 min

Status Check Alarm: 3:30 PM  
15 min before reopening

BACK
NEXT

ALERT

End of Scheduled Closure



**Z99 Old Hwy 6: Bruce Rd – Hwy 415**  
Closing 0.73 of 1.21 job miles

End: **Today 3:45 PM** (15m from now)

DELAY END 5 MIN
DONE NOW

MODIFY
DONE IN 5 MIN

### Closure Completion

**Z99 Old Hwy 6: Bruce Rd – Hwy 415**  
Closing 0.73 of 1.21 job miles  
Closing 2 of 2 approaches

Planned Start: Today 8:45 AM  
Actual Start: **Today 8:45 AM**  
**STARTED ON TIME**

Planned End: Today 3:45 PM  
Actual End: **Today 3:37 PM**  
**DONE 8 MIN EARLY**

EXIT TO MAIN MENU
COPY FOR TOMORROW