Development of Work Zone Programmatic Reviews

Final

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16. Abstract An important component of a State's approach to work zone management involves reviewing practices and processes, evaluating mobility and safety performance in work zones, and identifying areas for improvement. In 2024, the Federal Highway Administration updated the Work Zone Safety and Mobility Rule to require State Departments of Transportation (DOTs) to conduct work zone programmatic reviews instead of work zone process reviews. The shift from work zone process reviews to work zone programmatic reviews involves a more systematic approach to assessing all aspects of a State's work zone management practices and a data-driven analysis of work zone safety and mobility impacts. This document presents guidance for conducting work zone programmatic reviews, including detailed steps and a work zone programmatic review template. An overview of existing resources and State DOT practices is also presented, as some of the practices from work zone process reviews may be transferable to work zone programmatic reviews.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act
AFAD	Automated Flagger Assistance Device
AS	Any State
ATSSA	American Traffic Safety Services Association
CFR	Code of Federal Regulations
CV	Connected Vehicle
DOT	Department of Transportation
FHWA	Federal Highway Administration
PDO	Property Damage Only
SSC	Speed Safety Camera
TCR	Traffic Control Review
TMA	Truck-Mounted Attenuator
TMP	Transportation Management Plan
TTC	Temporary Traffic Control
VHT	Vehicle Hours Traveled
VMT	Vehicle-Miles Traveled
WZDx	Work Zone Data Exchange
WZPERFOMAT	Work Zone Performance Metrics Analytical Tool

EXECUTIVE SUMMARY

The Work Zone Safety and Mobility Rule issued by the Federal Highway Administration (FHWA) includes requirements for State Departments of Transportation (DOTs) to periodically assess their practices for work zone management (23 Code of Federal Regulations (CFR) Part 630 (2024)). The original rule, released in 2004 with an effective date of October 12, 2007, specified requirements for work zone process reviews (23 Code of Federal Regulations (CFR) Part 630 (2004)). The rule was updated in 2024 (effective date December 2, 2024) to require work zone programmatic reviews, which are broader and more comprehensive than work zone process reviews.

This document provides guidance along with a template and example to assist State DOTs in developing and conducting work zone programmatic reviews in accordance with the updated Work Zone Safety and Mobility Rule.

The requirements for work zone programmatic reviews from Section 630.1008 of the updated rule are summarized as follows (23 CFR Part 630 (2024)).

- A work zone programmatic review shall be conducted by States every five years and submitted to FHWA.

- A data-driven assessment of work zone safety and mobility performance for a State's work zones shall be conducted as part of the review. The data-driven assessment shall be based upon a representative sample of the State's significant work zones during the five-year period and shall utilize available data (e.g., crash data, safety surrogate data, operational data) and the performance measures identified by the State in their work zone policy. Safety and mobility performance assessment of work zones shall be conducted annually.

- In addition to the data-driven assessment of work zone safety and mobility performance, a systematic evaluation of the State's work zone management processes and procedures shall be conducted.

- Action items for improvement shall be identified along with an estimated timeline and designation of the State divisions responsible for implementation of the action items.

- Review participants shall include the appropriate personnel from various offices within the State and FHWA who are involved with project development and implementation.

There are various general resources available for work zone process / programmatic reviews, including guidance, tools, and case studies. There are also existing resources available for topics related to work zone process / programmatic reviews, such as Work Zone Capability Maturity Framework and performance measures.

Existing State DOT practices for work zone process reviews were synthesized through a review of existing State DOT resources (e.g., guidance and work zone process review reports) and interviews with 10 State DOTs. Thirty-five State DOTs supplied information on their practices

for work zone process reviews in the form of written descriptions, guidance documents, and/or previous reports. The literature search identified 13 State DOTs with DOT-specific guidance for work zone process reviews.

State DOT practices for work zone process reviews can be summarized as follows.

- Approaches to conducting work zone process reviews include field reviews, office reviews, focusing on specific topics, meeting with Districts, transportation management plan (TMP) reviews, scoring projects for performance metrics, and data-driven analyses for work zone safety and mobility. State DOTs include representatives from various groups, divisions, and districts as well as FHWA representatives on the teams that conduct the reviews.

- State DOTs track various performance measures for work zone mobility (e.g., delays, queues, speeds, work zone incidents), safety (e.g., work zone crashes, truck-mounted attenuator (TMA) strikes), and exposure (e.g., Annual Average Daily Traffic (AADT), sum of maintenance of traffic pay items, work zone hour miles, work zone length, work zone duration).

- Example outcomes from work zone process reviews include creating forums or working groups, updating policies or specifications, and generating summaries of action items or recommendations.

- State DOTs are in the early stages of transitioning to work zone programmatic reviews through development or refinement of performance measures for mobility and/or safety, policy updates, and internal coordination (e.g., working towards a team-based multi-disciplinary approach).

- Example challenges noted during the State DOT interviews include finding consistent and reliable datasets, developing performance measures, uncertainty of what will meet the requirements of the new work zone safety and mobility rule (and how to meet those requirements), and the need for multi-disciplinary team and for coordination among different groups within DOTs for work zone programmatic reviews, and getting personnel together do conduct the reviews.

- Example training needs for work zone programmatic reviews described during the State DOT interviews include how to determine performance measures, best practices or examples from other States, more details or clarity on the requirements, and technical assistance (e.g., consultant or researcher support) to help agencies establish performance measure frameworks using existing data.

An example template document for the development of work zone programmatic reviews has been developed. The intent of the template is to provide an example framework and process for the development of work zone programmatic reviews. State DOTs are not required to follow the structure, content, or organization of the template and are encouraged to customize their work zone programmatic reviews based on their own data availability, practices, review objectives, and work zone management goals. The template outlines the steps for conducting a work zone

programmatic review: assemble review team, assess actions since previous review, assess safety and mobility performance, review additional data and trends programmatic assessment, and summarize findings and action items. An example report showing how the template could be applied has also been developed.

Some recommendations and tips for conducting work zone programmatic reviews are provided as follows.

- Determine the processes and procedures that will be used for work zone programmatic reviews in advance (e.g., identify multi-disciplinary team to participate in the review, select work zone safety and mobility performance measures and identify data sources for those performance measures, select a representative sample of significant work zone projects during the 5-year period of the review, identify other data sources (e.g., surveys, social media responses, field observations, training statistics, public feedback, post-project reviews) that will be used for analysis to help identify potential areas for improvement in work zone management practices).

- Ensure that the assessment includes both a data-driven assessment of work zone safety and mobility performance and a systematic evaluation of the State's work zone management processes and procedures.

- Examples of other topics that could be included in work zone programmatic reviews include rolling roadblocks, smart work zone technologies, considerations for non-motorized users in work zones, and the use of other emerging technologies (e.g., artificial intelligence, connected vehicle (CV) data).

- Conduct a safety and mobility performance assessment of work zones annually.

- Generate a list of action items for improvement along with an estimated timeline and designation of the State divisions responsible for the implementation of the action items.

- Develop a system for tracking implementation of action items that are recommended in the work zone programmatic review report.

- Facilitate a continuous improvement approach to work zone programmatic reviews, using an assessment of the impacts of implemented action items from the previous work zone programmatic review to help inform the development of action items for the next review.

- The use of the Work Zone Capability Maturity Framework, which provides an approach for agencies to improve their work zone management program capabilities across six process areas (https://ops.fhwa.dot.gov/publications/fhwahop19030/fhwahop19030.pdf), to focus programmatic review efforts through the prioritization of improvement areas and organizational changes for work zone management, is encouraged but not required.

CHAPTER 1. BACKGROUND

An important component of a State's work zone management program involves reviewing practices and processes, evaluating mobility and safety performance in work zones, and identifying areas for improvement. The Work Zone Safety and Mobility Rule issued by the Federal Highway Administration (FHWA) includes requirements for State Departments of Transportation (DOTs) to periodically assess their practices for work zone management (23 Code of Federal Regulations (CFR) Part 630 (2024)). The original rule, released in 2004, specified requirements for work zone process reviews (23 Code of Federal Regulations (CFR) Part 630 (2004)). The rule was updated in 2024 to require broader work zone programmatic reviews. The transition from work zone process reviews to work zone programmatic reviews reflects FHWA's increased emphasis on data-driven decision-making, performance management, and continuous improvement in work zone safety and mobility using a holistic approach.

This document provides guidance along with a template and example to assist State DOTs in developing and conducting work zone programmatic reviews in accordance with the updated Work Zone Safety and Mobility Rule.

The following sections summarize both versions of the rule.

2004 VERSION (WORK ZONE PROCESS REVIEWS)

Section 630.1008 of the original Work Zone Safety and Mobility Rule, issued in September 2004 with an effective date of October 12, 2007, required State DOTs to conduct a work zone process review at least every two years to evaluate the safety and effectiveness of their procedures for work zone safety and mobility (23 Code of Federal Regulations (CFR) Part 630 (2004)). The results of the review are meant to support the efforts of State DOTs to enhance work zone safety and mobility through suggested changes to work zone processes and procedures. The work zone process review can include an analysis of work zone safety and mobility at the State level and an assessment of randomly selected projects. The rule encouraged State DOTs to form multi-disciplinary teams to conduct the reviews in partnership with FHWA. FHWA's website (FHWA 2025) includes a list of suggested questions that can be answered through a work zone process review, such as how work zones are performing for mobility and safety, whether customer expectations for work zone safety are being met, and what potential improvements can be discerned.

2024 VERSION (WORK ZONE PROGRAMMATIC REVIEWS)

On November 1, 2024, an updated Work Zone Safety and Mobility Rule was released (23 CFR Part 630 (2024)). The updated rule, which took effect on December 2, 2024, includes requirements for work zone programmatic reviews, which are more comprehensive than work zone process reviews. The requirements for work zone programmatic reviews from Section 630.1008 of the updated rule are summarized as follows (23 CFR Part 630 (2024)).

- A work zone programmatic review shall be conducted by States every five years and submitted to FHWA.

- A data-driven assessment of work zone safety and mobility performance for a State's work zones shall be conducted as part of the review.

    - The data-driven assessment shall be based upon a representative sample of the State's significant work zones during the five-year period. The rule defines a significant project as follows: "A significant project is one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts (as defined in § 630.1004) that are greater than what is considered tolerable based on State policy and engineering judgment." (23 CFR Part 630 (2024)) In addition, the rule indicates that significant projects should be identified as soon as possible in collaboration with FHWA (23 CFR Part 630 (2024)). The methodology for selecting the representative sample of significant work zones shall be documented and based on various factors (e.g., land use, roadway type, work zone type, and extent of work zone impacts).

    - The data-driven assessment shall utilize available data (e.g., crash data, safety surrogate data, operational data) and the performance measures identified by the State in their work zone policy. Safety and mobility performance assessments of work zones shall be conducted annually.

- In addition to the data-driven assessment of work zone safety and mobility performance, a systematic evaluation of the State's work zone management processes and procedures shall be conducted. This systematic evaluation shall encompass State divisions or offices involved with work zone safety and mobility management (e.g., planning, design, maintenance, operations, permits, training, and public information and outreach).

- Action items for improvement shall be identified along with an estimated timeline and designation of the State divisions responsible for implementation of the action items.

- Review participants shall include the appropriate personnel from various offices within the State and FHWA who are involved with project development and implementation. Optionally, other non-State stakeholders may also participate in the review.

SUMMARY OF KEY DIFFERENCES BETWEEN WORK ZONE PROGRAMMATIC REVIEWS AND WORK ZONE PROCESS REVIEWS

Based on a review of the 2004 and 2024 versions of the rule, the main changes in the transition from work zone process reviews to work zone programmatic reviews are summarized as follows.

- State DOTs are required to conduct work zone programmatic reviews every five years (work zone process reviews were required every two years). However, under the updated rule, safety and mobility performance of work zones shall be assessed annually.

- Work zone programmatic reviews require the development and tracking of work zone safety and mobility performance measures. A data-driven evaluation of work zone safety and mobility performance is required using these performance measures and based upon

a representative sample of the State's significant work zones during the five-year period. The use of data-driven analyses was encouraged for work zone process reviews.

- The scope is more encompassing for work zone programmatic reviews than for work zone process reviews. Work zone programmatic reviews require a broader assessment of a State's work zone management processes and procedures.

- Along with the more comprehensive scope, work zone programmatic reviews also require broader participation of personnel from various offices within the State and FHWA who are involved with project development and implementation.

- Work zone programmatic reviews require the development of a list of action items for implementation and an estimated timeline and designation of the State divisions responsible for their implementation.

DOCUMENT OVERVIEW

This document presents guidance for State DOTs in conducting work zone programmatic reviews. The document summarizes available resources and DOT practices for work zone process reviews, as some aspects of those resources and practices may be transferable to work zone programmatic reviews. The document also outlines the steps and provides some tips for conducting work zone programmatic reviews. A template and example for a work zone programmatic review report are also provided.

The remainder of this document is organized as follows:

- Chapter 2 presents an overview of existing resources related to work zone process/programmatic reviews.

- Chapter 3 describes existing State DOT practices for work zone process reviews based on a literature review and State DOT interviews.

- Chapter 4 presents the guidelines for work zone programmatic reviews.

- Chapter 5 presents a summary of the guidance.

- Appendices include a work zone programmatic review report template and example work zone programmatic review report.

CHAPTER 2. OVERVIEW OF EXISTING RESOURCES FOR WORK ZONE PROGRAMMATIC REVIEWS

This chapter presents an overview of available resources for and related to work zone programmatic reviews, such as guidance documents, tools, and case studies. Most of the existing resources actually pertain to work zone process reviews. However, these resources are still relevant for work zone programmatic reviews for the most part.

EXISTING RESOURCES FOR WORK ZONE PROCESS / PROGRAMMATIC REVIEWS

This section provides an overview of general resources that are available for work zone process / programmatic reviews, including guidance, tools, and case studies. These resources provide valuable methodologies, tools, and examples that State DOTs can adapt when developing work zone programmatic reviews.

Guidance and Tools for Work Zone Process Reviews

A guidance document on work zone process reviews from FHWA covers various topics, such as tips for success, effective use of data and performance measures, and coordinating process reviews with other agency work zone improvement initiatives (e.g., FHWA Division Office Monitoring Activities, Work Zone Capability Maturity Framework (Ullman and Schroeder 2015)). The guidance encourages the application of a continuous improvement cycle, with reviews required every two years. As shown in Figure 1, this process includes planning for and conducting the review, identifying and implementing recommendations through an action plan, and assessing the effect of the recommendations.

Source: FHWA

Figure 1. Graphic. Overview of continuous improvement cycle for work zone process reviews from FHWA guidance (Ullman and Schroeder 2015).

The guidance document for work zone process reviews suggests the formation of a multi-disciplinary team for work zone process reviews, with representation from various Divisions/Offices, such as Planning, Worker Safety, Construction Administration, Design, Materials, Traffic Operations, Traffic Safety, Permitting, Maintenance, District or Region Staff, Training, Public Information Office, Design Consultants, and FHWA Division Office (Ullman and Schroeder 2015).

The guidance document also provides resources for work zone process reviews, including a checklist and work zone process review template. The template provides an overview of the suggested content for the work zone process review and is organized into these sections: Executive Summary (optional), Introduction/Background, Purpose/Objective, Scope/Methodology, Observations/Findings, Conclusions/Recommendations, Action/Implementation Plan, and Appendices (Optional).

In addition to the guidance document, a toolbox for work zone process reviews is also available from FHWA (FHWA 2025). The toolbox presents an overview of work zone process reviews and the rule requirements, steps for conducting work zone process reviews, review topics (e.g., overall work zone policy implementation, impacts assessment, training, and transportation management plans (TMPs)), and data sources (e.g., work zone self-assessment, crash data, operational data, field observations, customer surveys, performance measures, and work zone traffic control reviews). The suggested steps for conducting a work zone process review are as follows (FHWA 2025).

- Assemble a multi-disciplinary team
- Develop a review plan

- Conduct review
- Analyze and interpret results
- Develop inferences, recommendations, and lessons learned
- Prioritize recommendations and lessons learned
- Present review findings
- Apply recommendations and lessons learned

Case Studies for Work Zone Process Reviews

A series of case studies for data-driven work zone process reviews, conducted for five State DOTs in 2021 and 2022, is available from FHWA. A summary of these case studies is provided in Table 1.

Table 1. Summary of data-driven case studies for work zone process reviews.

State (Ref.)	Performance Areas	Metrics	Notes
Illinois (Sankar et al. 2022)	• Safety • Mobility • Law enforce-ment	• Number and length of work zone projects (exposure) • Number of work zone crashes, crash type, crash contributing factors (safety) • Vehicle miles traveled per work zone, vehicle hours of delay (mobility)	• Collects data for work zone enforcement deployments and citations
Iowa (Sankar et al. 2021a)	• Safety • Mobility • Field reviews	• Traffic Critical Projects (exposure) • Number of work zone crashes, number of work zone crashes per Traffic Critical Project (safety) • Number of work zone traffic congestion events, duration of events, queue length, percent of traffic encountering a queue (mobility)	• Developing dashboard for field reviews • Use of smart arrow boards to track lane closures
Kentucky (Boyapati et al. 2022)	• Safety • Mobility	• Number of work zones, length of work zone activity (exposure) • Number of work zone crashes (safety) • Delay per work zone jam and delay per work zone crash-related jam (mobility)	• Uses maximum queue length for assessing mobility impacts • Collects and publishes work zone activity data
Maryland (Sankar et al. 2021b)	• Safety • Mobility • Field inspections	• Number of work zone construction projects (exposure) • Number of work zone crashes (safety) • Number of work zone traffic congestion events, vehicle miles traveled per project, vehicle hours of delay (mobility)	• Developed list of action items for future reviews (e.g., periodically assess work zone traffic impact metrics for corridors or regions)
Virginia (Sankar et al. 2021c)	• Safety • Mobility • Field reviews	• Number of work zones, work zone miles, work zone hours, lane closure hours (exposure) • Crashes per vehicle miles traveled, number of work zone crashes, crash rates per thousand work zone miles (safety) • Vehicle hours of delay (mobility)	• Selected rear-end crashes as key focus area • Additional exploration of queue warning systems and speed limit trailers

Some of the key lessons learned from these case examples are summarized as follows.

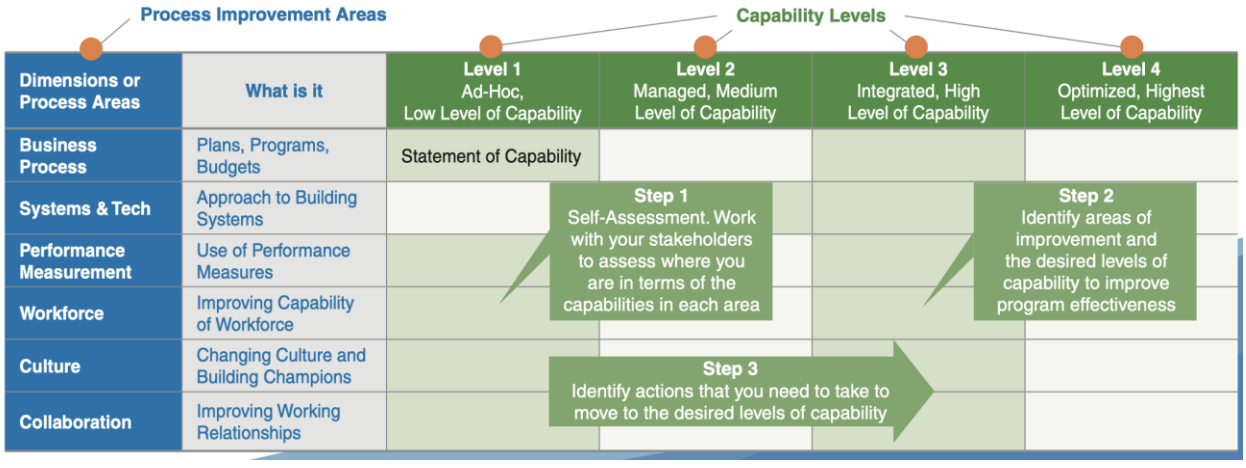
- A thorough inventory of all available data resources can help to facilitate the identification of work zone performance measures.
- The development of quantitative metrics can facilitate the continuous tracking of the performance of processes and procedures for work zones.
- The use of both quantitative data and qualitative contextual information can enhance the identification of root causes and possible solutions. Information sources include, for example, field reviews, traffic control safety reviews, and work zone safety and mobility audits.
- Emerging data sources (e.g., probe data, crowdsourced data) and data analytics and visualization tools) can be utilized to assess work zone safety and mobility performance.

EXISTING RESOURCES FOR TOPICS RELATED TO WORK ZONE PROCESS / PROGRAMMATIC REVIEWS

This section provides an overview of general resources for topics related to work zone process / programmatic reviews, such as Work Zone Capability Maturity Framework and performance measures.

Work Zone Capability Maturity Framework

The Capability Maturity Framework allows agencies to perform self-assessments to identify current strengths and weaknesses across six process improvement areas: business process, systems and technology, performance measurement, workforce, culture, and collaboration (FHWA 2016). As shown in Figure 2, there are four capability levels for these process improvement areas. After the self-assessment, an agency identifies actions for improvement across program areas.



Source: FHWA

Figure 2. Graphic. Overview of Capability Maturity Framework process (FHWA 2016).

A framework and tool for the application of the Capability Maturity Framework to work zone management are available (FHWA 2022). The tool includes options for a detailed assessment or short (one-minute) assessment. A collaborative approach is suggested for the framework (FHWA 2016). A day-long workshop is usually conducted to go through the framework. Stakeholders that could participate in the workshop include work zone traffic managers, maintenance personnel, traffic operations personnel, and construction personnel. The goal of the workshop is to develop an assessment of an agency's capabilities for all of the dimensions and a preliminary list of prioritized actions to enhance work zone management practices.

The Work Zone Capability Maturity Framework can be incorporated into work zone programmatic reviews by helping to identify actions for improvement (FHWA 2019). Additional details on this process are presented in Chapter 4.

Work Zone Performance Measures

As described in Chapter 1, an important component of conducting work zone programmatic reviews involves developing and tracking performance measures for work zone safety and mobility to help identify areas for improvement and action items. A webpage from FHWA provides an overview of work zone performance measures, including examples of performance measures utilized by State DOTs and other organizations (FHWA 2025).

While an updated guidance document on work zone performance measures is under development in 2026, a previously developed primer from FHWA (Ullman et al. 2011) and guidance document (Ullman et al. 2013) are available. The primer provides guidance on work zone performance measures and covers topics such as performance measure needs at both the project and program levels, selection and estimation of work zone performance measures, data sources, and methods and technologies that are available for data collection and monitoring. The primer also provides examples of performance measures for potential use (including measures for exposure, safety, and mobility) (Ullman et al. 2011). The primer also notes the necessary attributes of work zone performance measures, such as correlation with an agency's safety and mobility goals and objectives, compatibility with an agency's other performance measures, and facilitating an assessment of the impacts of alternative strategies to limit work zone impacts.

In addition to the primer, a guidance document on data needs, availability, and opportunities for work zone performance measures is also available from FHWA (Ullman et al. 2013). This document presents information on current and potential future data sources for work zone performance measures related to safety, mobility, customer satisfaction, and agency and contractor productivity and efficiency. The document also provides guidance on the development of performance measures through a five-step process (Ullman et al. 2013):

- Select categories of work zone performance to assess
- Select work zones for measurement
- Prioritize work zone conditions for measurement

- Identify data sources to calculate performance measures at specific work zones along with their benefits and limitations

- Select and calculate specific work zone performance measures

State DOTs can utilize various tools to calculate work zone performance measures. One such tool is the Work Zone Performance Metrics Analytical Tool (WZPERFOMAT) (Basulto-Elias et al. 2025). WZPERFOMAT calculates and reports work zone performance measures (both systematic and project-level) based upon user-provided work zone location data in Work Zone Data Exchange (WZDx) format and safety and mobility data. WZPERFOMAT is implemented as a web application that provides output in various formats, including tables, diagrams, and reports.

CHAPTER 3. STATE DOT PRACTICES FOR WORK ZONE PROCESS REVIEWS

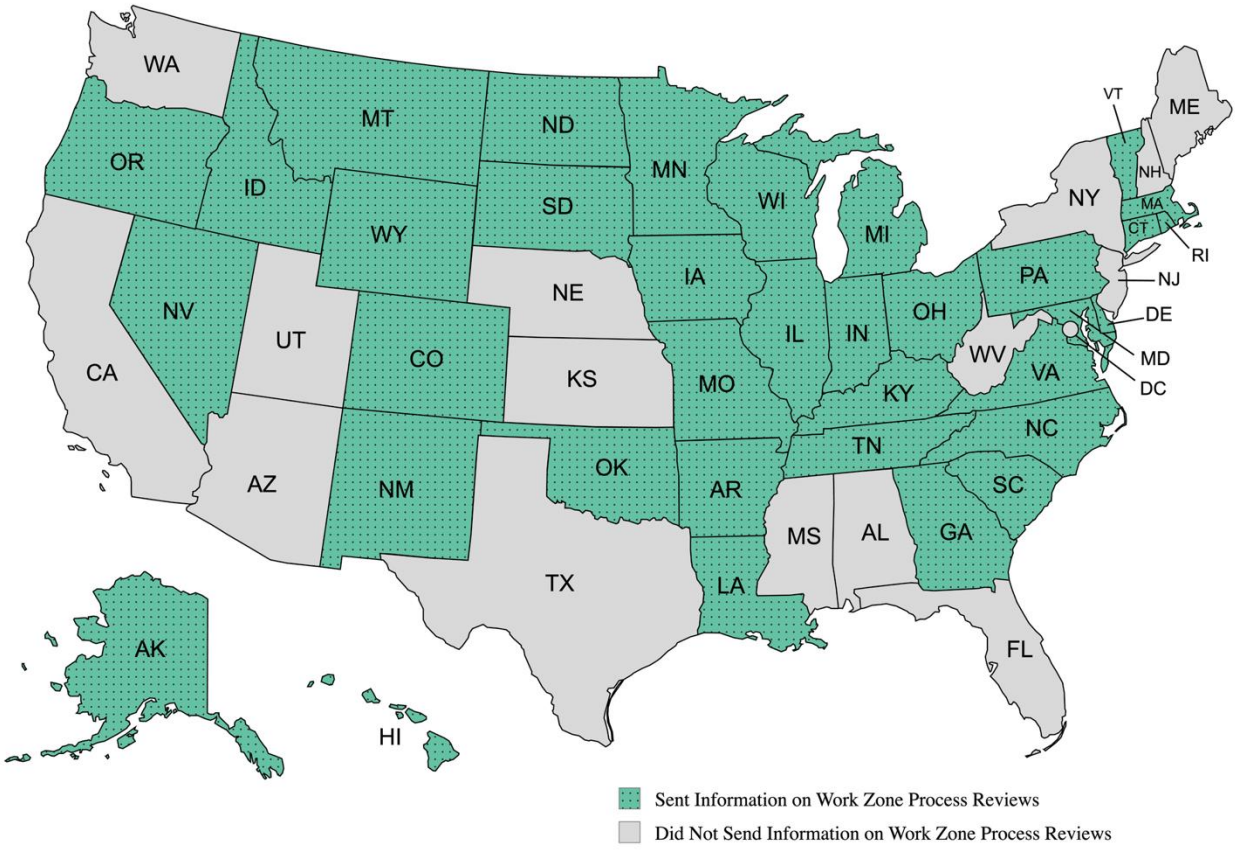
This chapter presents a review of existing State DOT practices for work zone process reviews. Moving forward, State DOTs will be transitioning to work zone programmatic reviews to comply with the updated requirements for the Work Zone Safety and Mobility Rule. However, some of the practices for work zone process reviews may be applicable and transferable to work zone programmatic reviews.

METHODOLOGY FOR SYNTHESIS OF EXISTING STATE DOT PRACTICES FOR WORK ZONE PROCESS REVIEWS

Existing State DOT practices for work zone process reviews were synthesized through a review of existing State DOT resources (e.g., guidance and work zone process review reports) and State DOT interviews.

Methodology for Review of Existing State DOT Resources

State DOT resources related to work zone process reviews, including guidance documents and previous work zone process review reports, were reviewed and synthesized. These resources were obtained through a literature search and correspondence with State DOTs. All State DOTs were contacted to see if they could provide information on their practices for work zone process reviews. As shown in Figure 3, 35 State DOTs supplied such information in the form of written descriptions, guidance documents, and/or previous reports.

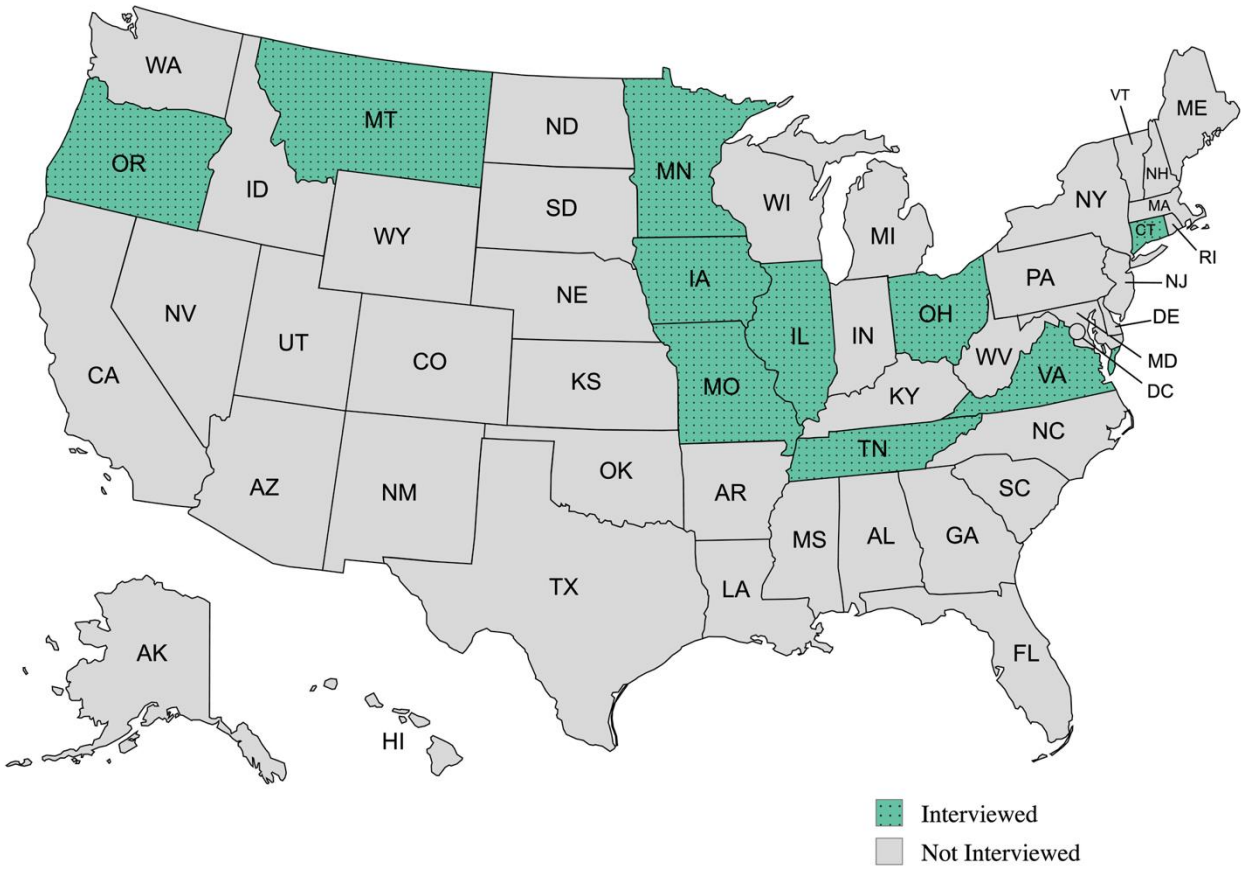


Source: Map created with Mapchart

Figure 3. Graphic. Map showing State DOTs that provided information on their practices for work zone process reviews.

Methodology for State DOT Interviews

To obtain additional information regarding State DOTs' practices for work zone process reviews and programmatic reviews, interviews were conducted with 10 State DOTs as shown in Figure 4. Interview questions covered various topics, such as approaches to work zone process reviews, upcoming plans for work zone programmatic reviews, performance measures, challenges, and training needs. After the individual interviews, a group meeting was held with the participating State DOTs to summarize interview results and obtain additional feedback.



Source: Map created with Mapchart

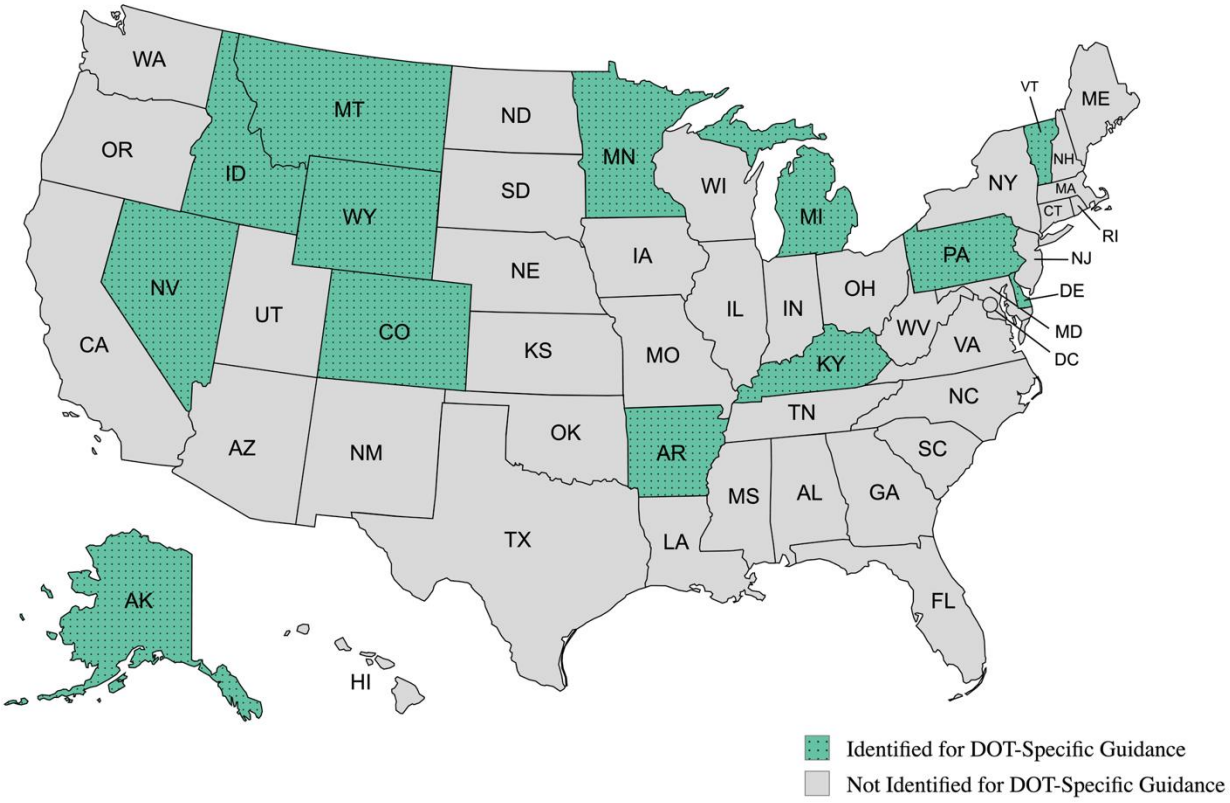
Figure 4. Graphic. Map showing State DOTs that participated in interviews.

RESULTS FROM REVIEW OF STATE DOT RESOURCES ON WORK ZONE PROCESS REVIEWS

This section presents the results from the review of State DOT resources for work zone process reviews, including State DOT guidance and previous work zone process review reports.

State DOT Guidance on Work Zone Process Reviews

Some State DOTs have developed guidance or policies for conducting work zone process reviews. These guidance or policy documents cover various topics, such as types of review (e.g., office, field), selection of projects, and review personnel. The literature review and State DOT identified 13 State DOTs with their own DOT-specific guidance or policies for work zone process reviews (see Figure 5).



Source: Map created with Mapchart

Figure 5. Graphic. Map showing State DOTs with identified DOT-specific guidance for work zone process reviews.

Some example practices from the DOT-specific guidance on work zone process reviews are as follows.

- Alaska DOT & Public Facilities conducts joint traffic control reviews for three to five projects (selected randomly) annually (Alaska DOT & Public Facilities 2022). Process reviews encompass assessments of enhancements to work zone safety and mobility management procedures, crash data, joint traffic control reviews, and policy, guidance, and training opportunities. Suggested staff for the review include the Construction Standards Engineer, State Traffic and Safety Engineer, Regional Traffic and Safety Engineers, Regional Work Zone Traffic Control Coordinators, and FHWA Traffic and Safety Operations Engineer. There is a focus on evaluating the effectiveness of improvements made since the previous review. After the review is performed, a summary of systemic findings and recommendations must be prepared.

- In Arkansas, process reviews are conducted biennially by a joint Arkansas DOT/FHWA committee (Arkansas DOT 2023). The Committee Chairman, Co-Chairman, and FHWA representative decide on the scope of the review. The reviews focus on safety of motorists and workers, mobility, construction efficiency, and public perception and satisfaction. Crash and performance data are reviewed for specific projects, and field reviews are held based on data collection needs.

- Colorado DOT conducts a Traffic Control Review (TCR) program to inspect work zones (Colorado DOT 2019). Members of TCR team include representatives from the Region Traffic Program, FHWA, and an Area Engineer. The TCRs are intended to evaluate effectiveness, identify potential improvement areas, and to spark discussion of traffic control issues. TCRs are conducted annually on a specified number of randomly selected projects from each Region and can include field review and/or office review. A field review is required for all engineering projects, and an office review is required for one engineering project per Region. Maintenance projects require a field review and assessment of available documentation from the Traffic Control Supervisor. After the TCRs are conducted, a statewide meeting is held to discuss any potential actionable items.

- Delaware DOT conducts biennial work zone process reviews which are conducted by multi-disciplinary teams (Delaware DOT 2007). A group of projects that are randomly selected (including at least one significant project) are reviewed for crash history, field observations during construction, and any differences with the TMP. Crash data analysis includes a summary of all work zone related crashes during previous two years and summary of crash data for the selected projects before and during work zone activities. Review results include recommended changes to existing work zone safety and mobility procedures and identification of training needs.

- The Idaho Transportation Department conducts process reviews biennially using a multi-disciplinary team (Idaho Transportation Department 2018). The reviews may encompass an assessment of work zone data, an evaluation of randomly selected projects, or both. The results are used to help enhance work zone processes and procedures, data, and training programs.

- The Kentucky Transportation Cabinet conducts an annual process review to evaluate the effectiveness of its work zone safety and mobility policy and procedures (Kentucky Transportation Cabinet n.d.). A Statewide Work Zone Traffic Review Committee appointed by the State Highway Engineer and comprised of representatives from various divisions (Construction, Traffic Operations, Maintenance, and Highway Design) oversees the reviews. Projects are randomly selected (at least one significant project and one other project per District) and reviewed in at least six Districts per year. Each year, a report with suggested changes to statewide traffic control and traffic management strategies is developed and sent to the State Highway Engineer and FHWA.

- Minnesota DOT's process reviews can potentially include an assessment of work zone data at the state level and/or results of field reviews (Minnesota DOT 2022). The results are used to help enhance work zone processes and procedures, data, and training programs. In addition to the process reviews, the Office of Traffic Engineering holds work zone feedback discussions periodically with each district.

- Nevada DOT's work zone process reviews are led by the Chief Engineer or their designee, and a biennial review meeting is conducted (Nevada DOT 2023). Examples of topics considered for discussion include work zone safety and mobility performance,

meeting customer expectations, effectiveness of work zone strategies, possible implementation of future strategies, and potential changes to policies or procedures.

- The scope of Pennsylvania DOT's work zone process reviews includes policies, procedures, and field reviews (Pennsylvania DOT 2026). The review team includes representatives from Central Office Work Zone Section, Construction Quality Review Section, and FHWA. A closeout meeting with the Assistance District Executive for Construction is held to discuss the results.

- Work zone process reviews for the Vermont Agency of Transportation include a review of the construction season from the Work Zone Safety Engineer and project-specific information provided by Regional Construction Engineers (Vermont Agency of Transportation 2021).

Example DOT Work Zone Process Review Reports

The following sections provide an overview of some of the methods, focus areas, and outcomes for previous DOT work zone process review reports.

Example Methods and Topics for DOT Work Zone Process Review Reports

State DOTs have utilized various approaches for work zone process reviews, such as field reviews, focusing on specific topics, and data-driven analyses. Some examples are presented as follows.

- Team members for Connecticut DOT's 2023 report included representatives from several Connecticut DOT Divisions (Construction, Traffic Engineering, Highway Operations, Maintenance Operations, Policy and Planning) and FHWA (Connecticut DOT 2023). The review covered the following five topics: program management, work zone field reviews, contract delivery, work zone technologies (e.g. speed safety camera (SSC) pilot, wrong way detection, pilot of smart sequential road flares), and work zone performance measures (e.g., law enforcement performance; tracking of incidents, motorist claims, and contract revisions; analysis of WZDx data; and pilot of work zone dashboard).

- Delaware DOT's 2022 report focused on its SSC program, including a review of its current practices and comparable programs in the region.[1]

- Georgia DOT's 2020 report included an assessment of pedestrian fatalities in work zones, including a review of police reports and project plans.[2]

[1] Delaware Department of Transportation. *Electronic Speed Safety Program: 2022 Work Zone Process Review*. Unpublished Report. Dover, Delaware.
[2] Georgia Department of Transportation. *Work Zone Process Review Georgia Department of Transportation 2020*. Unpublished Report. Atlanta, Georgia.

- Massachusetts DOT's 2023 report included field reviews from 11 construction projects to assess traffic control devices and traffic management methods.[3]

- Michigan DOT's 2021-2022 report presented an analysis of work zone crash data trends and results from reviews of nearly 300 work zones.[4] The report also included some discussion of several pilot devices for work zones (connected work zone devices, driveway assistance devices, and orange pavement markings), the Work Zone Safety Task Force, temporary pavement markings, and work zone training.

- North Carolina DOT's 2023 report included discussion of new practices (e.g., adding training requirements for work zone installers), improvements to current practices (e.g., use of intelligent technology for mobility measurements), upcoming improvements to current practices (e.g., planned development of TMP Design Manual), and areas for improvement (e.g., work zone fatal crashes, continued education efforts) (North Carolina DOT 2023).

- New Mexico DOT utilized a data-driven approach to evaluate work zone safety and mobility in its 2024 report.[5] The safety evaluation included analysis of crash rates, fatal and serious injury crashes, first harmful events, and speed involvement in crashes based on the contractor's Traffic Control Supervisor Journals and law enforcement crash reports. For work zone mobility, probe data from 27 work zones were analyzed to calculate aggregate performance metrics (e.g., average travel times, distances, speeds) for each work zone. An example chart for a mobility comparison of speed is shown in Figure 6.

- Ohio DOT's 2022 report was also based on a data-driven approach for work zone safety and mobility.[6] Safety analyses were conducted at the statewide level (to identify general trends) and at the project level (for a select number of projects). A graph showing construction cost awarded versus total work zone crashes is shown in Figure 7. Mobility analysis included a review of data for policy exceptions and probe data. The report also covered other topics, such as follow-up items from prior work zone process reviews and training.

- Oregon DOT conducted field reviews and utilized a customized form (see Figure 8) to score projects and provide feedback (Oregon DOT 2023). Various performance metrics (e.g., temporary signing, mobility, pedestrian/bicycle accessibility, temporary speed reduction) were scored for each project.

[3] Massachusetts Department of Transportation. *2023 Work Zone Process Review Report*. Unpublished Report. Boston, Massachusetts.
[4] Michigan Department of Transportation. *2021-2022 Work Zone Safety and Mobility Process Review*. Unpublished Report. Lansing, Michigan.
[5] New Mexico Department of Transportation. *Data-Driven Work Zone Process Review: New Mexico Department of Transportation*. Unpublished Report. Santa Fe, New Mexico.
[6] Ohio Department of Transportation. *Ohio's Data Driven Work Zone Process Review*. Unpublished Report. Columbus, Ohio.

- Virginia DOT's 2024 report included an analysis of various performance metrics (work zone crashes, exposure, Construction Quality Impact Program evaluations, work zone certifications, vulnerable road user analysis) and also focused on speed management in work zones.[7]

- Past reports for Wisconsin DOT have focused on topics such as flagging and markings.[8,9] Wisconsin DOT's 2022 report included a review of 185 contractor, county, and utility work zones and analysis of work zone crash data.[10]

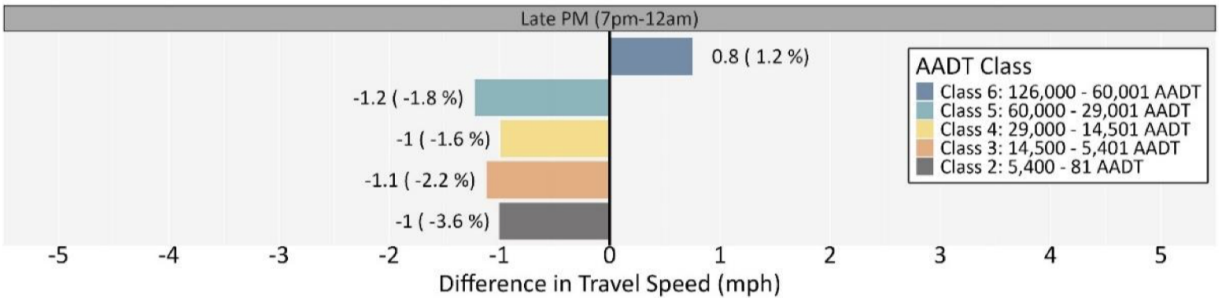


Figure 6. Graphic. Example chart of travel speed comparison for New Mexico DOT.

[7] Virginia Department of Transportation. *Work Zone Process Review.* Unpublished Report. Richmond, Virginia.
[8] Wisconsin Department of Transportation. *2018 Work Zone Process Review.* Unpublished Report. Madison, Wisconsin.
[9] Wisconsin Department of Transportation. *WisDOT-FHWA Work Zone Process Review 2021*. Unpublished Report. Madison, Wisconsin.
[10] Wisconsin Department of Transportation. *Work Zone Inspection Summary*. Unpublished Report. Madison, Wisconsin.

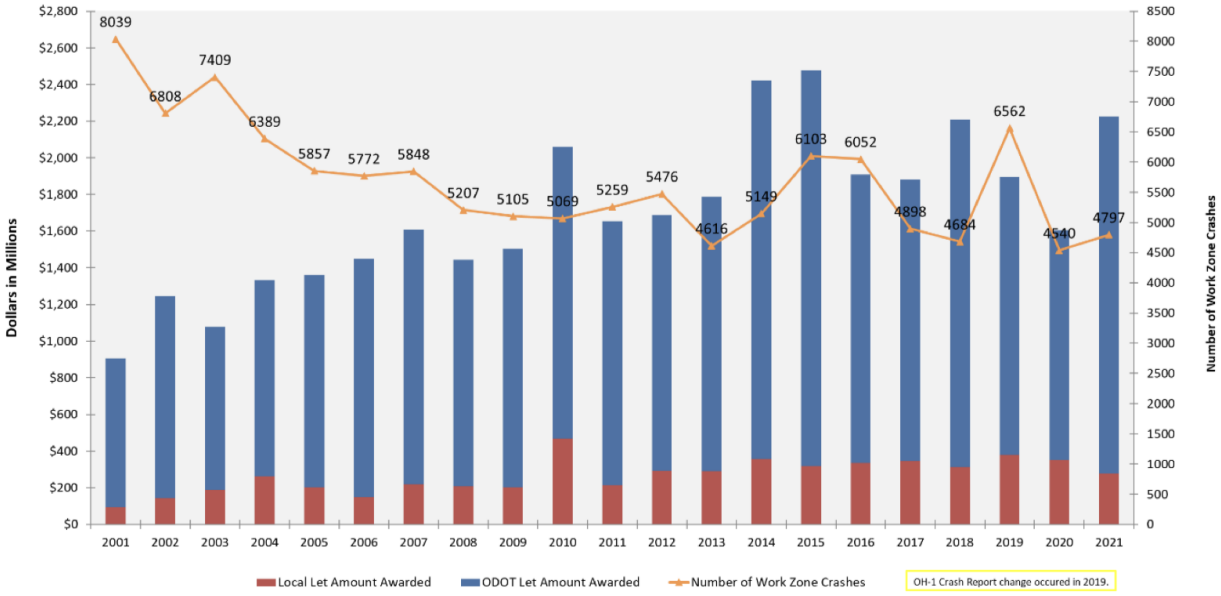
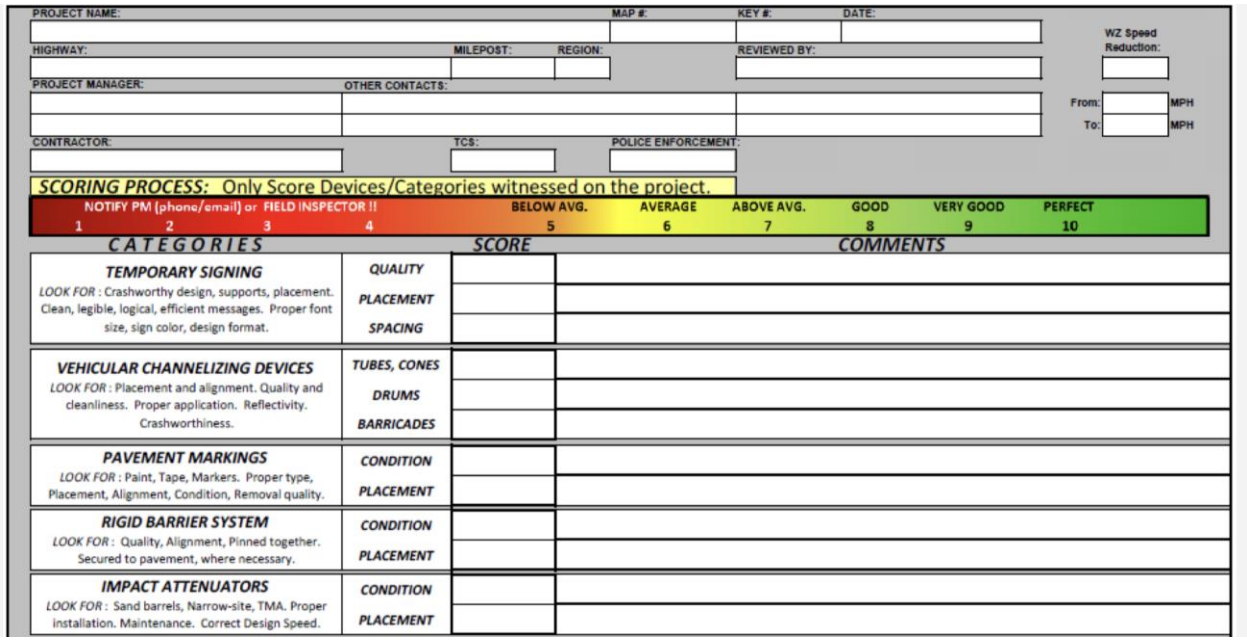


Figure 7. Graphic. Graph showing construction cost awarded versus work zone total crashes for Ohio DOT.


PROJECT NAME: | MAP #: | KEY #: | DATE:
HIGHWAY: | MILEPOST: | REGION: | REVIEWED BY: | WZ Speed Reduction:
PROJECT MANAGER: | OTHER CONTACTS: | From: MPH | To: MPH
CONTRACTOR: | TCS: | POLICE ENFORCEMENT:
SCORING PROCESS: Only Score Devices/Categories witnessed on the project.
NOTIFY PM (phone/email) or FIELD INSPECTOR !! 1 2 3 4 | BELOW AVG. 5 | AVERAGE 6 | ABOVE AVG. 7 | GOOD 8 | VERY GOOD 9 | PERFECT 10

CATEGORIES		SCORE	COMMENTS
TEMPORARY SIGNING LOOK FOR : Crashworthy design, supports, placement. Clean, legible, logical, efficient messages. Proper font size, sign color, design format.	QUALITY		
	PLACEMENT		
	SPACING		
VEHICULAR CHANNELIZING DEVICES LOOK FOR : Placement and alignment. Quality and cleanliness. Proper application. Reflectivity. Crashworthiness.	TUBES, CONES		
	DRUMS		
	BARRICADES		
PAVEMENT MARKINGS LOOK FOR : Paint, Tape, Markers. Proper type, Placement, Alignment, Condition, Removal quality.	CONDITION		
	PLACEMENT		
RIGID BARRIER SYSTEM LOOK FOR : Quality, Alignment, Pinned together. Secured to pavement, where necessary.	CONDITION		
	PLACEMENT		
IMPACT ATTENUATORS LOOK FOR : Sand barrels, Narrow-site, TMA. Proper installation. Maintenance. Correct Design Speed.	CONDITION		
	PLACEMENT		

Figure 8. Graphic. Excerpt from work zone reviews evaluation form for Oregon DOT (Oregon DOT 2023).

Example Outcomes for State DOT Work Zone Process Review Reports

State DOTs have developed various recommendations and action items related to standards, working groups, new technologies, and other aspects of work zone management in their work zone process reviews. Some examples are summarized as follows.

- Connecticut DOT identified various recommendations, such as having the Smart Work Zone Committee meet periodically to assess performance measures and fields for work zone dashboards and select projects that could benefit from a work zone dashboard (Connecticut DOT 2023).

- Indiana DOT recommended the creation of a structured forum for work-zone related issues with stakeholders from various groups within Indiana DOT.[11]

- Iowa DOT initiated a new Work Zone Management and Operations group that includes staff from various areas of work zone management (Sankar et al. 2021a). Core members of this group also contributed to the assessment process for Iowa DOT's Work Zone Capability Maturity Framework.

- Example recommendations from Montana DOT's 2022 report include updating specifications to require sunshades and retroreflective backplates on temporary portable traffic signals and updating specifications for end of queue warning systems based on practices of other States.[12]

- New Mexico's 2023 report included a table of action items (e.g., develop baseline for work zone mobility based on archived speed data, consider SSCs) and the responsible party for each action item.[13]

- Oregon DOT implemented action items related to flagging and pedestrian/bicyclist accessibility from its 2021 report (Oregon DOT 2023). Automated Flagger Assistance Devices (AFADs) were specified as the preferred option for flagging in a technical advisory, and a standard detail for AFAD use was developed. New standard details and online training were developed for pedestrian bicyclist/accessibility.

- South Dakota DOT developed recommended guidance for the length of duration for interstate lane closures and incorporated the guidance into its construction manual.[14]

[11] Indiana Department of Transportation. *Report on the 2023 Work Zone Traffic Control Process Review*. Unpublished Report. Indianapolis, Indiana.
[12] Montana Department of Transportation. *Transportation Management Plan Process Review.* Unpublished Report. Helena, Montana.
[13] New Mexico Department of Transportation. *Data-Driven Work Zone Process Review: New Mexico Department of Transportation*. Unpublished Report. Santa Fe, New Mexico.
[14] South Dakota Department of Transportation. *2021 Work Zone Process Review Final Report*. Unpublished Report. Pierre, South Dakota.

- Tennessee DOT provided a summary table of action items and implementation plan (including previous status, current status, and implementation) that covers various topics such as training, work zone crash data review process, speed countermeasures, and guidance for designers and field personnel.[15]

RESULTS FROM STATE DOT INTERVIEWS

The following sections summarize the results from the State DOT interviews, organized by topic.

Practices for Work Zone Process Reviews

The State DOTs that participated in the interviews have utilized various approaches for work zone process reviews, such as focusing on specific topics, conducting field reviews, scoring projects, reviewing TMPs, and conducting Work Zone Capability Maturity Framework workshops. A summary of the practices of these State DOTs is provided in Table 2.

[15] Tennessee Department of Transportation. *2019-2020 Work Zone Process Review.* Unpublished Report. Nashville, Tennessee.

Table 2. Summary of work zone process review practices for State DOTs that participated in interviews.

State	Notes
Connecticut	• Conducts field reviews (both formal and informal) for projects in various Districts. • Dashboard for work zone locations.
Illinois	• Reviews TMPs for projects in various Districts, conducts interviews, some field reviews. • Conducts work zone traffic control reviews for half of the State annually.
Iowa	• Conducts Work Zone Capability Maturity Framework workshop every other year. • Work Zone Council reports to management on work zone activities.
Minnesota	• Meets with Districts to talk through issues related to work zones. • Conducts some field reviews and office reviews.
Missouri	• Conducts drive through inspections of work zones throughout the State to identify concerns (e.g., barricades, flaggers, personal protective equipment). • Reviews crash data to identify trends in work zone crashes.
Montana	• Focuses on different topics (e.g., training). • Conducts some field reviews.
Ohio	• Transitioned to data-driven approach in 2020. • Conducts work zone safety and mobility analyses.
Oregon	• Focuses on field reviews. • Scores projects in the field for various metrics.
Tennessee	• Focuses on reviewing TMPs for compliance. • Conducts some field reviews.
Virginia	• Focuses on different topics (e.g., speed management). • Conducts plan reviews and field inspections.

Moving Towards Work Zone Programmatic Reviews

The participating State DOTs are in the early stages of transitioning to work zone programmatic reviews through development or refinement of performance measures for mobility and/or safety, policy updates, and internal coordination. There was general agreement that formally reported measures should be limited (e.g., one safety and one mobility metric) to facilitate ease of reporting, while allowing agencies to continue tracking additional measures internally. For mobility measures, many agencies rely on probe data platforms and are moving toward speed- or delay-based metrics due to data availability and ease of interpretation. Some State DOTs are working towards a team-based multi-disciplinary approach that includes other DOT groups due to the broader requirements of work zone programmatic reviews. Vulnerable road users and pedestrian accommodation in work zones were identified as growing areas of importance, particularly in light of updates to the Manual on Uniform Traffic Control Devices (FHWA 2023).

Performance Measures

The participating DOTs track various performance measures for mobility, safety, and exposure. Some examples are listed as follows.

- Mobility
    - Delays
    - Queues
    - Speeds
    - Work zone incidents
- Safety
    - Work zone crashes
    - Truck mounted attenuator (TMA) strikes
- Exposure
    - Annual Average Daily Traffic (AADT)
    - Sum of maintenance of traffic pay items
    - Work zone hour miles
    - Work zone length
    - Work zone duration

Some State DOTs provide data feeds or dashboards with work zone information. For example, Iowa DOT provides a WZDx feed with information on work zones under Iowa DOT's jurisdiction (Iowa DOT 2022). The feed is updated every minute. Virginia DOT provides a crash dashboard that shows crash locations on a map and can be filtered to show work zone crashes (Virginia DOT 2026). A map dashboard from Ohio DOT provides information on work zone locations, incidents, and travel delay (Ohio DOT 2026).

Challenges

State DOTs described various challenges to conducting work zone programmatic / process reviews related to data, processes, staffing, and other facets. Some of the challenges described by participating DOTs are summarized as follows.

- Data
    - Finding consistent and reliable datasets

    - Need to develop performance measures
    - Getting data during construction
    - Limited information on non-State or locally managed work zones
- Processes
    - Getting consistency in TMPs
    - Differences in philosophy / balancing priorities
    - Scheduling reviews
    - Affecting change in other DOT groups
    - Uncertainty of what will meet the requirements of the rule (and how to meet those requirements)
    - Implementing or following up on recommendations from prior reviews
- Staffing
    - Need for multi-disciplinary team and for coordination among different groups within DOTs (need to involve more personnel at DOT for work zone programmatic reviews)
    - Getting personnel together to do the review
    - Workload and employee turnover

Training Needs

Participating DOTs were asked about what type of information they would like to see included in guidance or training materials for work zone programmatic reviews. The responses to this question are summarized as follows.

- Performance measures and data
    - How to determine performance measures (e.g., case examples).
    - Ways to report annual data.
- Defining mobility metrics, especially how to treat delay related to incidents, remains an area requiring further guidance.
- Best practices and requirements
    - Information on best practices for developing thresholds (e.g., work zone crashes).

    - Best practices or examples from other States.
    - There is a need for practical, example-driven support, including hands-on methods for selecting and calculating performance measures, peer agency case studies, and on-demand or asynchronous resources to accommodate agencies at different implementation stages.
    - More details or clarity on requirements (e.g., distinguishing required versus recommended elements) for work zone programmatic reviews.
- Formats for training or guidance
    - Online training or videos would be helpful.
    - Technical assistance (e.g., consultant or researcher support) to help agencies establish performance measurement frameworks using existing data would be beneficial.

SUMMARY OF EXISTING STATE DOT PRACTICES FOR WORK ZONE PROCESS REVIEWS

State DOT practices for work zone process reviews can be summarized as follows.

- The literature search identified 13 State DOTs with DOT-specific guidance for work zone process reviews.
- State DOTs include representatives from various groups, divisions, and districts as well as FHWA representatives on the teams that conduct the reviews.
- Approaches to conducting work zone process reviews include field reviews, office reviews, focusing on specific topics, meeting with Districts, TMP reviews, scoring projects for performance metrics, and data-driven analyses for work zone safety and mobility.
- State DOTs track various performance measures for work zone mobility (e.g., delays, queues, speeds, work zone incidents), safety (e.g., work zone crashes, TMA strikes), and exposure (e.g., AADT, sum of maintenance of traffic pay items, work zone hour miles, work zone length, work zone duration).
- Example outcomes from work zone process reviews include creating forums or working groups, updating policies or specifications, and generating summaries of action items or recommendations.
- State DOTs are in the early stages of transitioning to work zone programmatic reviews through development or refinement of performance measures for mobility and/or safety, policy updates, and internal coordination. Some State DOTs are working towards a team-based multi-disciplinary approach that includes other DOT groups due to the broader requirements of work zone programmatic reviews.

- Example challenges noted during the State DOT interviews include finding consistent and reliable datasets, developing performance measures, uncertainty of what will meet the requirements of the new work zone safety and mobility rule (and how to meet those requirements), and the need for multi-disciplinary team and for coordination among different groups within DOTs for work zone programmatic reviews, and getting personnel together to conduct the reviews.

- Example training needs for work zone programmatic reviews described during the State DOT interviews include how to determine performance measures, best practices or examples from other States, more details or clarity on the requirements, and technical assistance (e.g., consultant or researcher support) to help agencies establish performance measure frameworks using existing data.

CHAPTER 4. GUIDELINES FOR WORK ZONE PROGRAMMATIC REVIEWS

This chapter provides guidance for the development of work zone programmatic reviews. This guidance was developed based on the review of existing resources (e.g., general guidance, State DOT guidelines, previous State DOT work zone process review reports) and State DOT interviews.

WORK ZONE PROGRAMMATIC REVIEW TEMPLATE

An example template document for the development of work zone programmatic reviews has been developed. A copy of this template is provided in appendix A. The intent of the template is to provide an example framework and process for the development of work zone programmatic reviews. State DOTs are not required to follow the structure, content, or organization of the template and are encouraged to customize their work zone programmatic reviews based on their own data availability, practices, review objectives, and work zone management goals. An example work zone programmatic review report is provided in appendix B.

The example template outlines the following sections for a work zone programmatic review:

- Executive Summary (optional)
- Introduction/Background
- Work Zone Programmatic Review Team Members
- Actions Taken Since the Previous Work Zone Programmatic Review
- Work Zone Safety and Mobility Performance
- Programmatic Assessment of Work Zone Processes and Procedures
- Summary of All Findings and Action Items
- Appendices (Optional)

STEPS IN CONDUCTING WORK ZONE PROGRAMMATIC REVIEWS

Based on the example template provided in appendix A, an example process for preparing a work zone programmatic review is shown in Figure 9. The process includes forming a review team, assessing actions since the previous review, evaluating performance, and conducting programmatic assessments. These steps are described in further detail in the following sections.

Source: FHWA

Figure 9. Graphic. Example process for developing a work zone programmatic review.

Assemble Review Team

This step involves putting together the team for the work zone programmatic review. The team could include, for example, representatives from various DOT groups or divisions (e.g., planning, safety, design, construction, maintenance, traffic engineering/operations, permitting, training, public information), FHWA Division Office, and Consultants.

Assess Actions Since Previous Review

This step includes conducting and documenting an assessment of results of the action items from the previous work zone process review or programmatic review, including completed and pending items. Examples of information for each action item that could be incorporated into this assessment include the issue being addressed, status, responsible entity, implementation notes, and any performance metrics developed in conjunction with the action item.

This step could also potentially include providing a summary of any other higher-level efforts (e.g., new safety management program, new mobility performance analysis system) related to work zone management.

Assess Safety and Mobility Performance

This step involves the assessment of work zone safety and mobility performance and can be subdivided into three facets: development of analysis methodology and project selection, analysis of safety, and analysis of mobility. These facets are described in the following sections.

Development of Analysis Methodology and Project Selection

In this step, the approach for the data-driven analysis is developed, and work zone projects are selected for the analysis. A representative sample of significant work zone projects during the 5-year period of the review should be chosen. Examples of factors to consider in the selection of work zone projects include land use (e.g., urban, rural), roadway type (e.g., freeway/expressway, arterial), type of work zone activity (e.g., reconstruction, maintenance, utility), work zone duration (short-term vs. long-term), and the extent of work zone impacts (e.g., significant vs. non-significant). Additional projects or categories (e.g., State work zones, local projects using federal funds) may also be included based on associated work zone impacts and trends.

Example approaches for selecting representative work zones are as follows:

- Random sampling
- Sampling based on geographic diversity from different districts or regions
- Sampling based on project factors (e.g., land use, roadway type, type of work zone activity, project cost, work zone duration, extent of work zone impacts)
- Input from State DOT personnel
- Screening based on data availability
- A combination of these approaches

The methodology for selecting representative work zone projects should be documented in the work zone programmatic review, and a list of work zone projects should be presented in the work zone programmatic review report. This list could be provided in tabular format. An example table of projects is provided in the work zone programmatic review template.

Analysis of Safety

This step involves a data-driven analysis of work zone safety based on safety performance measures. Examples of safety measures include total work zone crashes, crash rates, crashes by severity, worker incidents, pedestrian/bicyclist/motorcycle involvement, and surrogate safety measures (e.g., speeds, speed differentials, hard braking, near misses). A State may track additional safety performance measures internally in addition to the ones reported in the work zone programmatic review report. Potential data sources could include agency crash reports, work zone incident reports, law enforcement logs, connected vehicle (CV) data, and probe data. The safety analysis could encompass various aspects, such as crash rate trends, crashes by location within the work zone, analysis of crash types (e.g., head-on, rear-end, sideswipe, fixed object), and analysis of contributing factors (e.g., distracted driving, speeding, impaired driving, time-of-day, traffic volume, worker presence), and normalization of safety performance metrics using exposure metrics (e.g., crashes per work zone vehicle miles traveled/lane miles/lane closure hours). A summary of findings and recommendations from the safety analysis should also be generated.

Analysis of Mobility

This step includes a data-driven analysis of work zone mobility based on mobility performance measures. Examples of mobility measures that could be considered include travel time, speed, delay, queue length, stops, variance in delay or travel time, work zone vehicle hours traveled, and total work zone delay. A State may track additional mobility performance measures internally in addition to the ones reported in the work zone programmatic review report. Potential data sources could include traffic detectors, speed sensors, CV data, and probe data. The mobility analysis could encompass various aspects, such as trends in mobility performance measures, analysis based on factors (e.g., roadway type, work zone type, seasonal and temporal variations, worker presence, incidents, weather, and special events), and normalization of mobility performance metrics using exposure metrics (e.g., delay and queue length per work zone vehicle miles traveled/lane miles/lane closure hours). A summary of findings and recommendations from the mobility analysis should also be developed.

Review Additional Data and Trends

In addition to mobility data and performance data, data from other sources should be analyzed to help identify potential areas for improvement. Some example approaches are described below.

- Reviewing customer satisfaction data (e.g., surveys, customer feedback, social media responses) can help provide insight into the effectiveness of work zone strategies.

- Metrics for efficiency (e.g., on-time project completion, field inspection ratings, planned and actual costs, training statistics, and ratings for work zone management strategies) can be analyzed to help assess how effectively the State is implementing road projects to minimize work zone safety and mobility impacts.

- Review of qualitative data (e.g., field observations, stakeholder feedback, public feedback, post-project reviews) can help to assess areas that may not be able to be measured quantitatively.

Programmatic Assessment

In this step, the work zone programmatic review team should meet to review all of the findings from previous steps and to conduct a comprehensive review of all the work zone program areas (e.g. planning, preliminary engineering, design, traffic and impacts analysis, pre-construction, construction, post-construction, training) and to identify areas for further detailed analysis and focused reviews. Possible approaches for conducting this programmatic assessment could include structured workshops, facilitated discussions, field reviews, or scoring exercises involving review team members.

Additional analyses and focused reviews should be performed as needed. For example, an increase in average work zone delay on interstate projects may lead to a review and update of the State's permitted lane closure system charts for interstate highways.

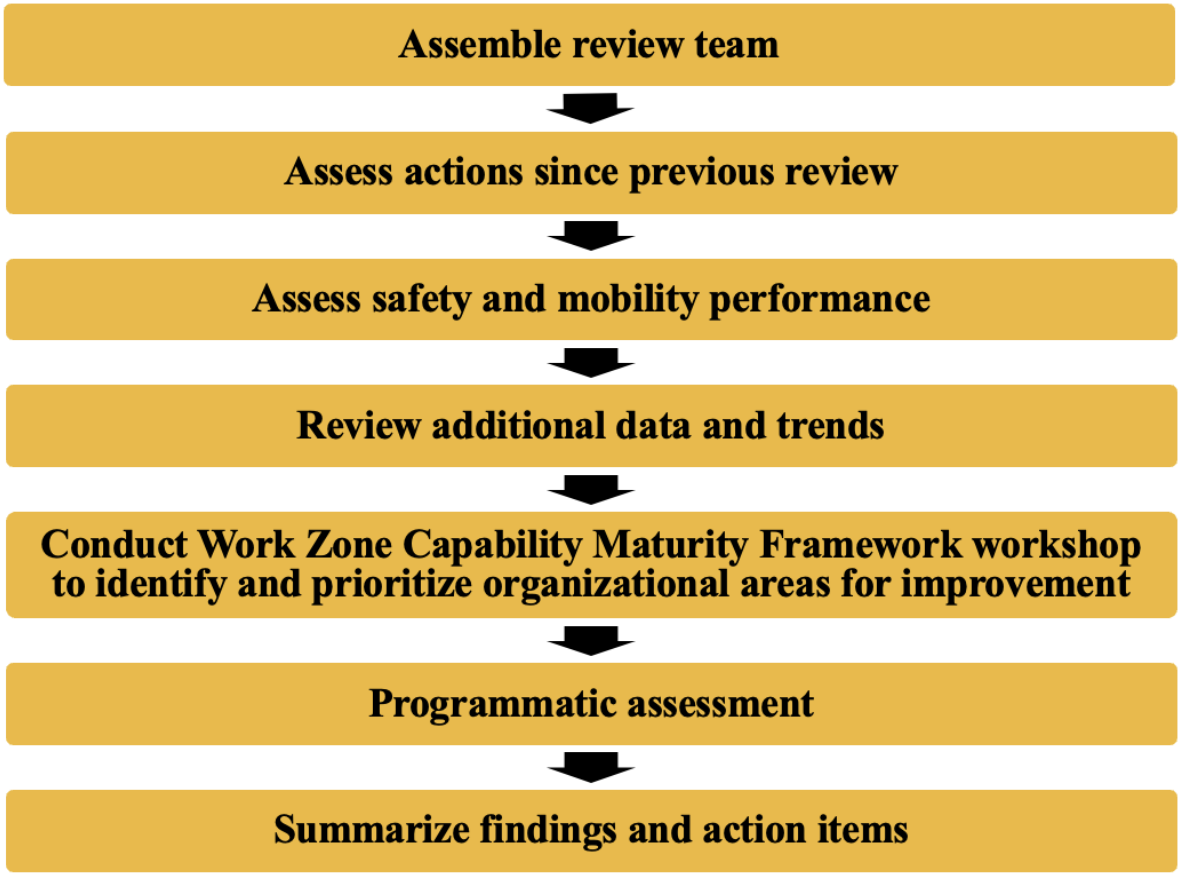
Summarize Findings and Action Items

The final step in developing a work zone programmatic review involves developing a final summary of all findings, recommendations, and action items based on the conducted analyses. Information presented in this section for action items could include findings, recommendations, priority, responsible entity, performance metrics, and due date.

The conclusions should specify areas in which the State DOT is performing well and areas that could use improvement. A list of recommendations (e.g., changes to DOT procedures or emphasis areas) should be developed to address the areas identified for improvement.

INCORPORATING WORK ZONE CAPABILITY MATURITY FRAMEWORK INTO WORK ZONE PROGRAMMATIC REVIEWS

One option for work zone programmatic reviews involves the use of the Work Zone Capability Maturity Framework. As described in Chapter 2, the Work Zone Capability Maturity Framework provides a framework for agencies to improve their work zone management program capabilities across six process areas: business processes, systems and technology, performance measurement, organization and workforce, culture, and collaboration (FHWA 2019). As part of the process for the Work Zone Capability Maturity Framework, a one-day workshop attended by staff from various disciplines and offices is conducted. Figure 10 shows an example of how the Work Zone Capability Maturity Framework can be integrated into the process for conducting work zone programmatic reviews. In this example framework, a Work Zone Capability Maturity Framework is conducted based on input from the assessment of actions since the previous work zone programmatic review, assessment of safety and mobility performance, and review of additional data and trends. The output from the Work Zone Capability Maturity Framework workshop helps to inform the programmatic assessment. Incorporating the Work Zone Capability Maturity Framework into work zone programmatic reviews can help an agency to focus their programmatic review efforts through the prioritization of improvement areas and organizational changes for work zone management.



Source: FHWA

Figure 10. Graphic. Example process for integrating Work Zone Capability Maturity Framework into work zone programmatic reviews.

OTHER POTENTIAL TOPICS FOR WORK ZONE PROGRAMMATIC REVIEWS

This section suggests some other topics that could potentially be incorporated into work zone programmatic reviews, such as rolling roadblocks, smart work zone technologies, and considerations for non-motorized users in work zones.

Rolling Roadblocks

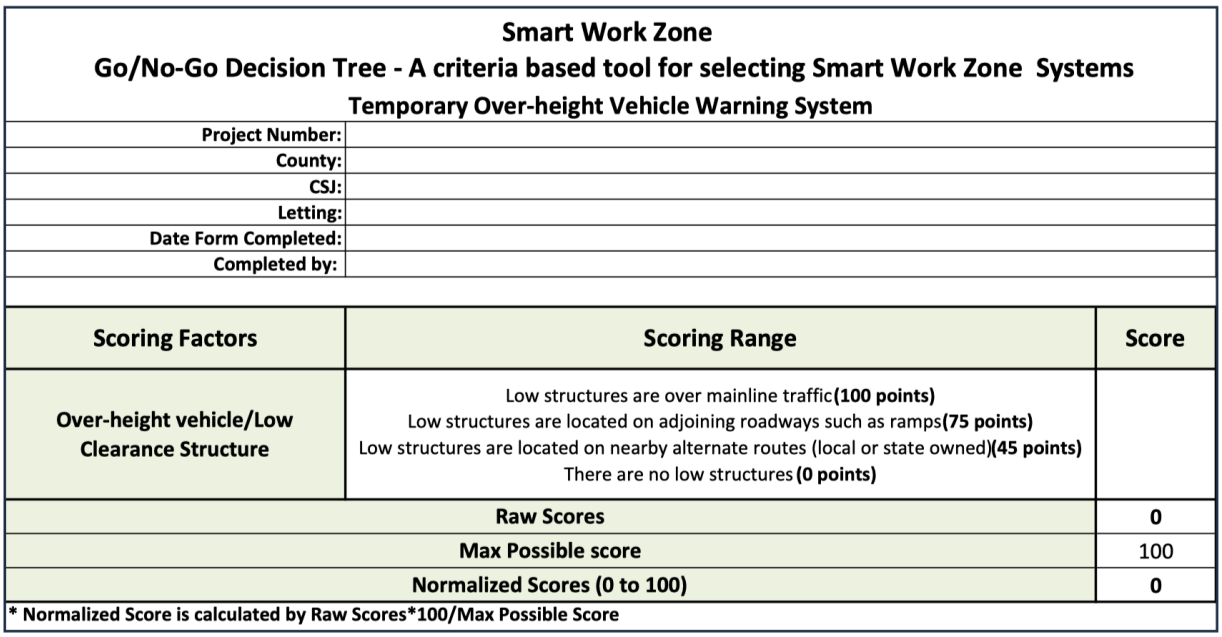
A rolling roadblock is a temporary traffic control (TTC) method that involves temporarily slowing or stopping traffic to allow for a break in traffic flow in advance of short-term downstream construction activities (e.g., overhead work) (FHWA 2018). As a result of an investigation into a 2016 crash that identified rolling roadblock policies as one of several contributing factors, the National Transportation Safety Board made several recommendations to FHWA regarding rolling roadblock policies. One of these recommendations was to encourage State DOTs to address rolling roadblocks in their next work zone programmatic review. In response to this recommendation, FHWA issued guidance on rolling roadblock operations (FHWA 2018). As part of FHWA's guidance, State DOTs are encouraged to review existing policies or adopt new policies for rolling roadblocks. These policies should incorporate processes

comparable to those utilized for other TTC operations (e.g., giving drivers advance warning of slowed or stopped traffic, monitoring the development and dissipation of traffic queues). Example State DOT policies on rolling roadblocks are described in the FHWA guidance (FHWA 2018). Guidance on rolling roadblocks is also available from the American Traffic Safety Services Association (ATSSA) (2013).

Smart Work Zone Technologies

A State DOT could review and update its policies and practices for using smart work zone technologies (e.g., traveler information systems, queue warning systems, dynamic lane merge, variable work zone speed limits) as part of its work zone programmatic review. This review could assess how a State DOT could further leverage smart work zone technologies as a tool to enhance work zone mobility and safety. For example, a State could decide to implement or expand the use of queue warning systems based on an observed increase in rear end crashes on freeways.

There are various resources available to facilitate a State DOT's implementation of smart work zone technologies. NCHRP Synthesis 587: Use of Smart Work Zone Technologies for Improving Highway Safety summarizes many of these resources and documents State DOT practices for implementing smart work zone technologies to improve work zone safety (Brown et al. 2022). These resources are available from FHWA, State DOTs, and other sources. For example, an implementation guide on work zone intelligent transportation systems covers the steps for implementing smart work zone technologies, including needs assessment, concept development and feasibility, detailed system planning and design, procurement, system deployment, and system operation, maintenance, and evaluation (Ullman et al. 2014). Some State DOTs, such as Connecticut DOT, New Hampshire DOT, and Texas DOT have developed their own guidance and/or tools to facilitate the implementation of smart work zone technologies (Arcadis 2024, New Hampshire DOT 2011, Texas DOT 2018). A screenshot from Texas DOT's Go/No-Go Decision Tree for smart work zones for a temporary over-height vehicle warning system is shown in Figure 11.



Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Over-height Vehicle Warning System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Over-height vehicle/Low Clearance Structure	Low structures are over mainline traffic **(100 points)** Low structures are located on adjoining roadways such as ramps **(75 points)** Low structures are located on nearby alternate routes (local or state owned) **(45 points)** There are no low structures **(0 points)**	
Raw Scores		**0**
Max Possible score		100
Normalized Scores (0 to 100)		**0**

*** Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Figure 11. Graphic. Screenshot from Texas DOT's Go/No-Go Decision Tree for smart work zone technologies (Texas DOT 2018).

Considerations for Non-Motorized Users in Work Zones

Another topic that could potentially be addressed in a State DOT's work zone programmatic review involves considerations for non-motorized users in work zones. States could review policies and procedures for accommodating pedestrians in work zones and identify ways to enhance pedestrian safety and mobility in work zones.

A FHWA guidance document titled Considerations for Non-Motorized Users in Work Zones covers various topics such as Public Right-of-Way Accessibility Guidelines, Americans with Disabilities Act (ADA) standards, design recommendations, speed management, and challenges faced by non-motorists (Decker and Falzone 2025). The document includes a prompt list to provide support for considerations for non-motorized users in the design, review, and maintenance of work zones. Examples of items on the prompt list include speed management strategies, temporary on-street parking, providing clear instructions for all users during construction, existing ADA concerns, and temporary lighting. The prompt list could provide a starting point for a discussion of considerations for non-motorized users in work zones during a State DOT's work zone programmatic review.

Some State DOTs have developed their own guidelines for considerations for non-motorized users in work zones. For example, North Carolina DOT provides guidance on the level of pedestrian accommodation in work zones based on pedestrian volume, adjacent land use, and other factors (North Carolina DOT 2018). District of Columbia DOT has published standards for covered and open walkways in work zones (District DOT n.d.).

Other Emerging Technologies

A State DOT could also look into the use of other emerging technologies, such as artificial intelligence and CV data (e.g., hard braking data) as part of its work zone programmatic review. This assessment could include the development of policies, guidance, or use cases for the application of these technologies to work zone management.

SUMMARY OF GUIDANCE FOR WORK ZONE PROGRAMMATIC REVIEWS

This chapter has presented an overview of a process that can be used by State DOTs when conducting work zone programmatic reviews along with potential topics that can be covered. State DOTs are encouraged to tailor their review processes to align with agency priorities, available data sources, and work zone management objectives.

CHAPTER 5. CONCLUSION AND RECOMMENDATIONS

Work zone programmatic reviews help State DOTs identify opportunities to improve their efforts to minimize work zone safety and mobility impacts and to enhance their overall approach to work zone management. The shift from work zone process reviews to work zone programmatic reviews involves a more systematic approach to assessing all aspects of work zone management and a data-driven analysis of work zone safety and mobility impacts.

Some recommendations and tips for conducting work zone programmatic reviews are provided as follows.

- Determine the procedures that will be used for work zone programmatic reviews in advance.
    - Identify a multi-disciplinary team to participate in the review. The team should provide a broad perspective on work zone mobility and safety. Examples of Divisions/Offices that could be included are Planning, Design, Maintenance, Construction, Traffic Operations, Traffic Safety, Public Information Office, and FHWA representative.
    - Select work zone safety and mobility performance measures and identify data sources for those performance measures. Example safety measures include work zone crashes and TMA strikes. Examples of mobility measures include delays, queues, speeds, and work zone incidents.
    - Select a representative sample of significant work zone projects during the 5-year period of the review. To the extent possible, try to obtain a diverse sample of work zone projects with respect to land use, roadway type, type of work zone activity, work zone duration, extent of work zone impacts, and other factors. Document the methodology used to select projects.
    - Identify other data sources (e.g., surveys, social media responses, field observations, training statistics, public feedback, post-project reviews) that will be used for analysis to help identify potential areas for improvement in work zone management practices.
- Ensure that the assessment includes both a data-driven assessment of work zone safety and mobility performance and a systematic evaluation of the State's work zone management processes and procedures.
- Consider including additional topics such as rolling roadblocks, smart work zone technologies, considerations for non-motorized users in work zones, and the use of other emerging technologies (e.g., artificial intelligence, CV data).
- Conduct a safety and mobility performance assessment of work zones annually.

- Generate a list of action items for improvement along with an estimated timeline and designation of the State divisions responsible for the implementation of the action items.

- Develop a system for tracking implementation of action items that are recommended in the work zone programmatic review report.

- Facilitate a continuous improvement approach to work zone programmatic reviews, using an assessment of the impacts of implemented action items from the previous work zone programmatic review to help inform the development of action items for the next review.

- Consider using the Work Zone Capability Maturity Framework to focus programmatic review efforts through the prioritization of improvement areas and organizational changes for work zone management.

APPENDIX A. WORK ZONE PROGRAMMATIC REVIEW TEMPLATE

WORK ZONE PROGRAMMATIC REVIEW TEMPLATE

A work zone programmatic review is a data-driven, systematic, and holistic analysis that uses quantitative and qualitative data from different sources to assess the safety and mobility performance of work zones under a State's jurisdiction in order to identify improvements to that agency's work zone processes and procedures.

Disclaimer

This Work Zone Programmatic Review template is provided solely as a reference document to illustrate one possible approach for organizing and presenting information in a work zone programmatic review report. It is not intended to prescribe a required format or level of detail. Agencies are not required to follow the structure, content, or organization presented in this work zone programmatic review Template and are under no obligation to adopt or replicate it. The examples provided are for illustrative purposes and are not intended to prescribe data requirements. Each agency is encouraged to tailor its work zone programmatic review report to reflect its own data availability, priorities, practices, and review objectives using the format and level of detail that best support its work zone management goals.

Table Of Contents

List of Figures

List of Tables

1. EXECUTIVE SUMMARY (Optional)

This section is a short summary of the review process, findings, conclusions, recommendations, and action items.

2. INTRODUCTION/BACKGROUND

This section is a short introduction summarizing the State's policy application/implementation of the Work Zone Programmatic Review requirement, review period covered, work zone safety and mobility performance measures used, key focus areas, review approach, and any other pertinent background information.

3. WORK ZONE PROGRAMMATIC REVIEW TEAM MEMBERS

This is a list of all stakeholders from the State divisions/offices that participated in the work zone programmatic review. This may include but is not limited to planning, safety, design, construction/implementation, maintenance, traffic engineering/operations, permitting, training, public information, FHWA Division Office, and consultants. An example format is shown in Table 1.

Table 1. Example format for list of work zone programmatic review team members.

No.	Name	Office / Division / Organization	Title / Designation	Email

4. ACTIONS TAKEN SINCE THE PREVIOUS WORK ZONE PROGRAMMATIC REVIEW

This section summarizes actions taken since the previous work zone programmatic review, including progress on previously identified action items and other initiatives undertaken to improve work zone safety and mobility.

4.1. Follow-Up from Action Items

This section contains a summary update and assessment of the results of the action items from the previous work zone programmatic review and any pending items that are still relevant to address. An example format for this information is shown in table 2.

Table 2. Example format for summary update and assessment of the results of action items from a previous work zone programmatic review.

Year	Targeted Issue	Action Item / Status	Responsible Office	Implementation Notes	Metric Selected	Metric Before	Metric After
2025	Safety: Work Zone Speeding	Increase enforcement in work zone sites with high speeding violations. Status: Completed	Traffic Operations	Coordinated with State and local law enforcement to implement the change. Implemented work zone speeding cameras in critical work zones/highway sections.	# of speeding violations/100,000 work zone hours	X_1	Y_1
					% of travelers above speed limit	X_2%	Y_2%

Year	Targeted Issue	Action Item / Status	Responsible Office	Implementation Notes	Metric Selected	Metric Before	Metric After
2024	Safety: Work Zone Intrusion Crashes	Increase consideration of Positive Protection for high-risk work zones that place workers close to traffic. Status: Completed.	Design	Released a Design supplement that requires all project engineers to analyze the requirement of positive protection for every work zone activity and assign a score. If the score meets a threshold, the project engineers need to include positive protection strategies (e.g., speed barriers, concrete barriers, impact attenuators, buffer lanes) in the work zone design.	% of work zone projects with positive protection specified during design	X_3%	Y_3%
					# work zone intrusion crashes over total work zone projects	X_4	Y_4

4.2. Other Efforts to Improve Work Zone Safety and Mobility

May provide a summary/mention of any other broader efforts (e.g., new safety management program, new mobility performance analysis system) that had work zone management implications.

5. WORK ZONE SAFETY AND MOBILITY PERFORMANCE

This section encompasses an overview of work zone safety and mobility performance trends and the data-driven assessment conducted as part of the work zone programmatic review.

5.1 Summary of Annual Work Zone Performance Trends

This section provides a high-level summary of the State's work zone safety and mobility performance trends over the reporting period (i.e., 5 years) using the data from the State's annual performance monitoring efforts. The annual performance monitoring efforts are intended to be used for year-to-year continuous improvement and to identify and address any work zone performance issues on an ongoing basis.

Available crash data, available safety surrogate data, available operational data, and the performance measures specified in the State's work zone policy are used in this annual performance monitoring. The data may be presented in text summary form, graphs, or tables representing statewide trends.

- Examples of crash data include fatalities, injuries, and crashes; examples of safety surrogate data include speed differentials, hard braking, and other data from connected and autonomous vehicles.

- Examples of available operational data include speeds, travel times, queue length, and duration.

- Examples of available exposure data include number of projects, number and length of lane closures, and vehicle miles traveled (VMT) through work zones.

Exposure Data

Work zone exposure data provide information about the scale and extent of the State's work zone program. When tracked consistently, exposure metrics provide critical information for setting benchmarks and context around work zone performance. Examples of exposure data and potential sources for exposure data are shown in table 3. See appendix A for examples of charts showing work zone exposure trends over time.

Table 3. Example exposure data and potential sources for exposure data.

Exposure Data	Potential Data Source(s)
Completed Work Zone Miles	Agency logs, contractor logs, databases, field detector / probe data
Planned Work Zone Miles	
Actual Work Zone Hours	
Planned Work Zone Hours	
Active Work Zone days	
Total Work Zone Days Available	
Work Zone Worker Hours	
Lane Closure Hours - Daytime	
Lane Closure Hours - Nighttime	
Work Zone Projects	
Work Zone Vehicle Miles Traveled	

Safety Data

Table 4 provides an example format for showing work zone safety performance trends.

Table 4. Example format for showing work zone safety performance trends.

Year	Total Work Zone Miles	VMT in Work Zones (Billion miles)	Total Work Zone Crashes	Injury Crashes	Fatal Crashes	Crash Rate per 100M VMT in Work Zone
Yr 1	Z_1	A_1	B_1	C_1	D_1	E_1
Yr 2	Z_2	A_2	B_2	C_2	D_2	E_2
Yr 3	Z_3	A_3	B_3	C_3	D_3	E_3
Yr 4	Z_4	A_4	B_4	C_4	D_4	E_4
Yr 5	Z_5	A_5	B_5	C_5	D_5	E_5

- *Total Work Zone Miles:* Annual cumulative length of all work zones.
- *VMT in Work Zones:* Estimated annual vehicle miles traveled through active work zones.
- *Total Work Zone Crashes:* Total number of reported crashes within active work zones.
- *Injury Crashes:* Total number of reported crashes involving at least one injury within work zones.

- *Fatal Crashes:* Total number of reported crashes involving at least one fatality within work zones.

- *Crash Rate (per 100M VMT):* Crash rate per 100 million vehicle miles traveled in work zones.

Mobility Data
Table 5 provides an example format for showing work zone mobility performance trends.

Table 5. Example format for showing work zone mobility performance trends.

Year	Total Work Zone-Miles	Lane-Mile Closures	Average Daily Work Zone Active	Average Work Zone Speed (mph)	Average Delay per Work Zone Mile (min)
Yr 1	Z_1	F_1	G_1	H_1	I_1
Yr 2	Z_2	F_2	G_2	H_2	I_2
Yr 3	Z_3	F_3	G_3	H_3	I_3
Yr 4	Z_4	F_4	G_4	H_4	I_4
Yr 5	Z_5	F_5	G_5	H_5	I_5

- *Total Work Zone-Miles:* Cumulative length of all active work zones throughout the year.

- *Lane-Mile Closures:* Total lane-miles affected by closures (more lanes = higher impact).

- *Average Daily Work Zones Active:* Average number of work zones active per day.

- *Average Work Zone Speed:* Average speed of vehicles as they pass through a designated work zone area.

- *Average Delay per Work Zone Mile:* Average added travel time per work zone mile.

5.2 Data-Driven Work Zone Safety and Mobility Performance Assessment

5.2.1 Projects Chosen for Data-Driven Assessment

Methodology used to Select Projects for Data-Driven Assessment
This is a summary of the methodology used to select projects for data-driven assessment. Representative projects should be selected based on factors such as land use (e.g., urban, rural), roadway type (e.g., freeway/expressway, arterial), work zone type (e.g., reconstruction, maintenance, utility), work zone duration (short-term vs. long-term), and the extent of work zone impacts (e.g., significant vs. non-significant). At a minimum, this is a representative sample of the State's significant work zones over the 5-year period being reviewed. States may also include additional projects or categories of projects based on the associated work zone impacts and trends.

Representative Projects and Associated Work Zone Exposure Data
This is a list or a summary of representative projects chosen for the assessment based on the above methodology, along with the associated work zone exposure data.

Table 6 shows an example format for the list of representative projects.

Table 6. Example format for list of representative projects.

No.	Name	Land Use	Roadway Type	Cost	Work Zone Type	Work Zone Miles	Work Zone Days	Work Zone Hrs	Lane Closure Hrs	VMT
1	Project1	Urban / Suburban	Freeway / Expressway	$X	Reconstruction	15	200	4,800	3,000	20M
2	Project2	Rural	Freeway / Expressway	$X	Repaving	40	80	1,920	1,500	8M
3	Project3	Urban / Suburban	Major Arterial	$X	Utilities / Maintenance	20	90	2,160	2,000	5M
4	Project4	…	…	…	…	…	…	…	…	…

5.2.2 Work Zone Safety Performance Assessment

Safety Metrics

This section contains a list and definition of the work zone safety metrics adopted in the State's Work Zone Safety & Mobility Policy along with any applicable thresholds. Examples of metrics include total work zone crashes, crash rates, crashes by crash type (fatality/injury/property damage only (PDO)), worker incidents, pedestrian/bicyclist/motorcycle involvement, surrogate safety data (e.g., hard braking, speed differentials, close car following).

Examples of safety data and potential sources for safety data are shown in table 7.

Table 7. Example safety data and potential sources for safety data.

Safety Metric	Potential Data Source(s)
Work Zone Crashes	Agency crash reports, work zone incident reports, law enforcement logs, connected vehicle (CV) data, probe data
Work Zone Fatalities	
Work Zone PDOs	
Work Zone Injuries	
Work Zone Worker Incidents	
Work Zone Citations	
Surrogate Safety Measures (e.g., speeds, speed differentials, hard braking, near misses)	

Safety Analysis

Safety analysis may include:

- Crash and crash rate trend analysis over the 5-year period using latest available crash data.
- Crashes by location within the work zone (e.g., before the first work zone sign, advance area, transition area, work area, termination area).
- Crash dynamics (e.g., head-on, rear-end, sideswipe, fixed object, turning).

- Analysis of contextual and potential contributing factors (e.g., distracted driving, speeding, impaired driving, time-of-day, traffic volume, worker presence).

- Normalization of the analysis/metrics against the exposure metrics (e.g., crashes per work zone VMT/lane miles/lane closure hours).

The appendix provides examples of safety analyses and associated charts/outputs.

Safety Analysis Findings and Recommendations
This is a summary of the analysis approach, key findings, high-level recommendations/actions for improvement, and further areas/topics for detailed analysis.

Generic examples of safety analysis findings and recommendations:

- Crash distribution analysis indicates that rear-end crashes constitute a high percentage of overall work zone crashes for the analysis period → Correlate the safety data findings with qualitative feedback and observations from field staff to conduct further analysis of work zone characteristics (e.g., design, layout, and temporary traffic control (TTC)/traffic operations strategies) to identify and mitigate the root cause of high rate of rear-end crashes.

- Crash analysis indicates that work zone intrusions are overrepresented in the data → Conduct additional data analysis of specific work zones and get additional feedback from field staff, construction/work zone inspectors, and workers to identify potential causes and/or improvements to work zone characteristics, positive protection use, and training.

- Data indicate high rate of commercial motor vehicle crashes → Conduct further investigation and analysis at the individual project level to identify potential work zone improvements.

5.2.3 Work Zone Mobility Performance Assessment

Mobility Metrics
A list and definition of the work zone mobility metrics adopted in the State's work zone Safety & Mobility Policy along with any applicable thresholds. Examples of metrics include delay, speed, travel time, queue length/duration, VMT, vehicle hours traveled (VHT), travel time reliability, and road user costs.

Examples of mobility data and potential sources for mobility data are shown in table 8.

Table 8. Example mobility data and potential sources for mobility data.

Mobility Metric	Potential Data Sources
Travel Time, Speed, Delay, Queue Length, Stops	Traffic count detector, speed sensors, probe data sources, CV data
Variance in Delay or Travel Time	
Work Zone VHT	
Total Work Zone Delay (vehicle-hours)	
Hours with queues greater than X (e.g., 0.75, 1, 1.5) miles for Y hours or more	

Mobility Analysis
Mobility analysis may include:

- Work zone mobility performance measure trend analysis over the 5-year period (e.g., comparing yearly values to the average for the 5-year period).

- Further analysis of mobility performance measures by roadway and work zone type, seasonal and temporal variations, and other contextual information and influencing factors such as worker presence/work activity in progress, incidents, weather, and special events.

- Normalization of the analysis/metrics against the exposure metrics (e.g., delay and queue length per work zone VMT/lane miles/lane closure hours).

Mobility Analysis Findings and Recommendations
Summary of the analysis approach, key findings, high-level recommendations/actions for improvement, and further areas/topics for detailed analysis.

Generic examples of mobility analysis findings and recommendations:

- Work zone mobility data trend analysis indicates a 4-percent increase in average work zone delay over the previous 2 years compared to the 5-year average → Conduct further analysis to identify specific project categories and/or individual projects that may be contributing to the work zone delay; identify additional project-specific influencing factors that may have contributed to the delay.

- Network-level probe data analysis shows that delays/queues persist on the work zone routes while there is additional capacity on associated alternate routes → Identify whether there is an opportunity to better leverage alternate routes for mobility management and to better communicate the availability of alternate routes to the traveling public.

- Work zone congestion trends indicate higher than allowable delays on specific days of the week → Conduct further analysis to identify additional factors (e.g., special events, commuting patterns) that may be contributing to the delay.

5.2.4 Additional Data and Trends Analysis
Customer Satisfaction
Customer satisfaction data can help understand the effectiveness of work zone management strategies including public information/outreach plans and traveler information. Customer satisfaction data may be captured through surveys, direct customer feedback, and other indirect methods including web/social media sentiment analysis. Examples of data points include customer complaints and customer perception data on ease of travel, safety, travel time reliability, and work zone information reliability.

Generic example(s) of customer satisfaction assessment:

- Overall customer/traveler surveys conducted by the agency indicate opportunities for improving communications about upcoming work zone projects and associated mitigation plans and alternate routes → Review agency public information efforts for timeliness, relevance, and completeness, as well as assess alternate route strategies.

Agency Efficiency
Agency efficiency covers a broad range of quantitative (and qualitative) data on how efficiently the State is implementing its road projects such that work zone safety and mobility impacts are minimized. Examples of metrics include on-time project completion by different project and contracting mechanism types, inspection and audit coverage/frequency, field inspection ratings, planned and actual costs, training statistics/trends, work zone management strategy ratings.

Generic example(s) of agency efficiency assessment:

- An assessment of the number and percentage of transportation management plan (TMP) audits conducted indicates that the percentage has been declining over the years → Review the criteria for conducting TMP audits and coverage requirements; reinforce appropriate requirements and training needs as needed.

- Review of work zone TTC strategies during field work zone safety audits indicates that certain specific strategies are consistently rated low → Review specifications and contractor compliance to identify potential causes and identify appropriate mitigation/remedial measures.

Qualitative Information
Qualitative data may serve as a good source for examining aspects that may not be measurable quantitatively. This includes work zone staff feedback, field observations/inspections, staff surveys, and vendor/contractor feedback. Qualitative data collection can be accomplished through surveys, questionnaires, personal interviews, researcher observation, field reviews, work zone and construction inspections, or similar methods.

Matching customer satisfaction, agency efficiency, and qualitative information to the work zone safety and mobility performance data can provide additional validation and potential insights on reasons/causal factors for performance issues. This information can then be used to identify and hone potential areas for improvement.

Generic example(s) of potential qualitative information related to work zones and the expected outcomes from assessment of such information to include in work zone programmatic reviews are listed below:

- **Field Observations:** Qualitative observations of work zone inspectors related to practices and traffic management at and around work zones to assess use of TTC devices, driver behavior, work crew practices, traffic operations, etc. that are not typically detected in quantitative data → Identification of issues and corrective actions.

- **Stakeholder Feedback:** Input from project staff, law enforcement, contractors, or agency personnel gathered through interviews, debriefs, or structured surveys to

understand implementation gaps and communication barriers → Identification of systemic, coordination, or procedural issues and recommendations for improved interagency coordination.

- **Public Feedback:** Input received from road users or community members that includes complaints, comments, or social media posts from that are useful for evaluating public perception and address traveler concerns → Insights into user perception and satisfaction and improved public messaging and mitigation strategies.

- **Post-Project Reviews:** Internal reviews after project completion to assess what worked, what did not, and how work zone planning and operations could improve in the future → Documentation of lessons learned and development of guidance documents, checklists, and updates to existing practices.

- **Narrative Logs or Diaries:** Project team logs documenting day-to-day issues, delays, or incidents during the road work including qualitative insights on near misses and unsafe conditions → Creation of a chronological record for future reference or investigation, identification of recurring issues or successful practices, and updates to TMPs or safety procedures based on detailed real-world observations.

- **Work Zone Training Evaluations:** Assess the effectiveness of training provided to personnel involved in planning, design, implementation, and inspection of work zones to address knowledge gaps, comprehension levels, and areas needing improvement → Validation that staff understand and can apply work zone policies, procedures, and safety protocols; improvement of performance and decision making in the field; updates to training programs based on feedback or results; and documentation of training effectiveness to support audits, certifications, or future funding.

6. PROGRAMMATIC ASSESSMENT OF WORK ZONE PROCESSES AND PROCEDURES

After conducting the data-driven assessment in the previous steps, the work zone programmatic review team should meet to collectively and holistically review all the work zone program areas (e.g., planning, preliminary engineering, design, traffic and impacts analysis, pre-construction, construction, post-construction, training) and then identify relevant areas for additional detailed analysis and focused reviews.

Conduct additional detailed analyses and focused reviews as needed. For example:

- Work zone intrusions identified as a problem area through safety data analysis and field reviews → Review positive protection guidelines and application/implementation, worker training, work zone exposure control/mitigation strategies, smart work zone solutions.

- Relatively high worker fatalities in a specific worker population (e.g., flaggers) → Review flagger training procedures, records, implementation compliance, and use of automated flagger assistance devices (AFADs).

- Queue lengths exceeding thresholds on certain short-term maintenance projects → Review work zone impact assessment processes and associated TMP strategies for short-term work zones.

- Mobility data trends indicate an increase in average work zone delay on interstate projects over the years → Review and update permitted lane closure system charts for interstate projects.

The results of the initial data-driven assessments and program reviews, combined with additional detailed analyses and focused-review of program elements, will lead to the final summary of all findings and the associated action items for improvement.

7. SUMMARY OF ALL FINDINGS AND ACTION ITEMS

This section summarizes all the findings, recommendations, and action items resulting from the work zone programmatic review.

An example format for summarizing findings and action items is shown in table 9.

Table 9. Example format for summarizing findings and action items.

No.	Finding	Recommendations	Action Item	Priority (Critical / High / Medium / Low) and Rationale	Responsible Office / Division / Person	Metrics (if any) / Expected Outcomes / Evaluation Methods	Due Date / Status
1.	4% increase in work zone delay	Optimize work zone hours, adjust lane closure schedules, and enhance traveler information to reduce delays	Include language in work zone management policy that enables coordinated work zone scheduling to minimize delays	Priority: Medium. Rationale: Reduce delays, support economic activity, enhance network efficiency, and decrease driver frustration. Low-cost action item.	Traffic Engineering / Operations	Year-over-year reduction in work zone delay by 2%	Year 1 of next review cycle
2.	12% increase in work zone worker crashes	Improve worker safety by increasing use of positive protection, using high-visibility PPE in high-risk zones, and providing refresher training on intrusion response	Increase deployment of positive protection devices at work zone sites with high speed limits	Priority: High Rationale: Prevent loss of life and injury, enhance project performance, ensure regulatory compliance, build public trust, and reduce the risk of litigation. Requires 4% budget increase but past deployments have shown significant improvements to	Traffic Engineering / Construction	Year-over-year reduction in work zone worker crash percentage	Year 1 of next review cycle

No.	Finding	Recommendations	Action Item	Priority (Critical / High / Medium / Low) and Rationale	Responsible Office / Division / Person	Metrics (if any) / Expected Outcomes / Evaluation Methods	Due Date / Status
				traveler/worker safety.			
3.	20% of travelers drive 15% above work zone speed limit	Implement targeted speed enforcement and increase use of speed feedback signs to encourage compliance with work zone speed limits	Increase work zone law enforcement	Priority: Medium Rationale: Enhance the safety of workers and motorists, reduce crash risks, and support overall work zone performance goals. Requires $200K additional budget which may not cover all priority work zones.	Planning / Design / Traffic Engineering	Reduction in percentage of driver speeding	Year 3 of next review cycle

The conclusions should identify areas and topics where the agency is performing well, as well as identifying areas to be improved. Areas where the agency is performing well could be described in the text and/or a table. For the latter, the agency should develop a specific list of recommendations for changes to agency procedures, emphasis areas, etc., that are believed to be necessary to address those improvement needs.

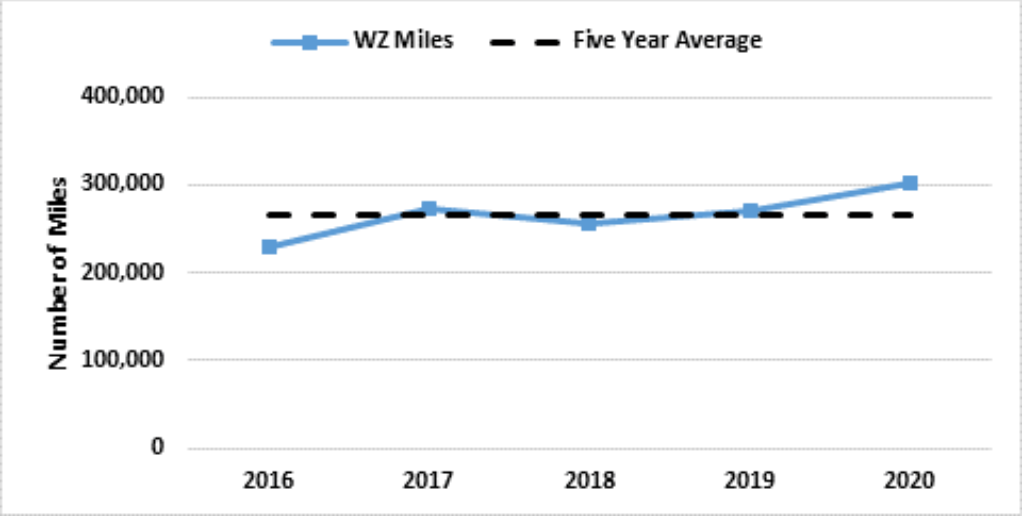
8. APPENDICES (Optional)

If desired, an agency may choose to include supporting materials used or referred to in the process review report. Items that have been included by some agencies include:

- Copies of policies, procedures, guidelines.
- List of questions used in the review (if questionnaires or interviews were used).
- Checklists, if deemed important for the implementation of the action plan.
- Detailed data analyses results used in the review.

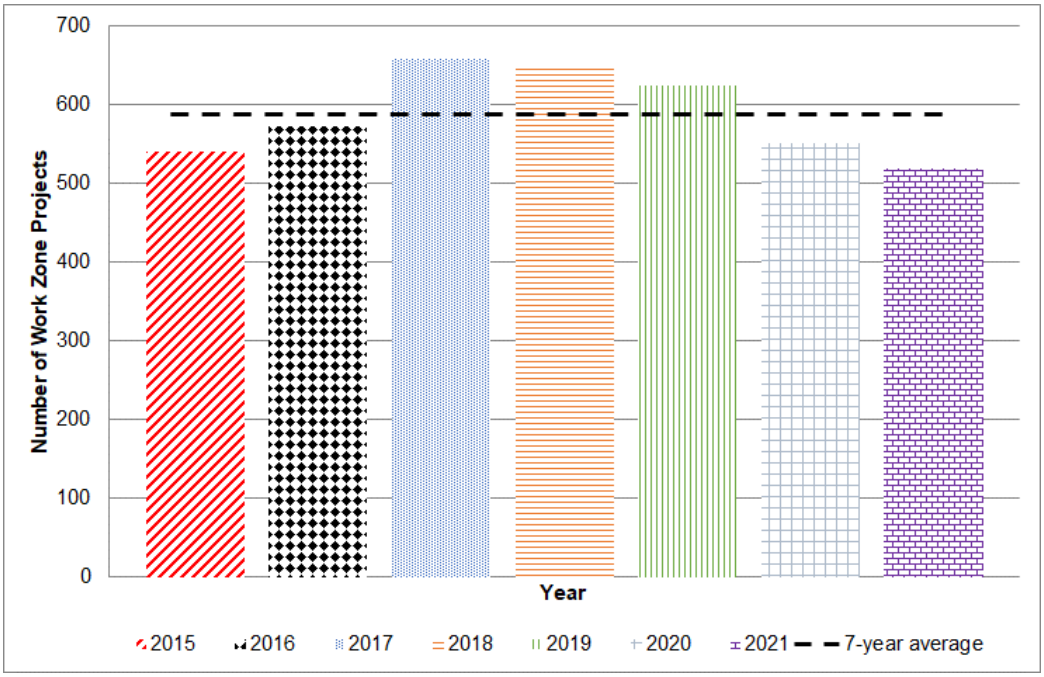
APPENDIX A.1 – EXAMPLE PERFORMANCE ANALYSIS GRAPHS AND CHARTS

A.1.1 Examples of Work Zone Exposure Data Charts



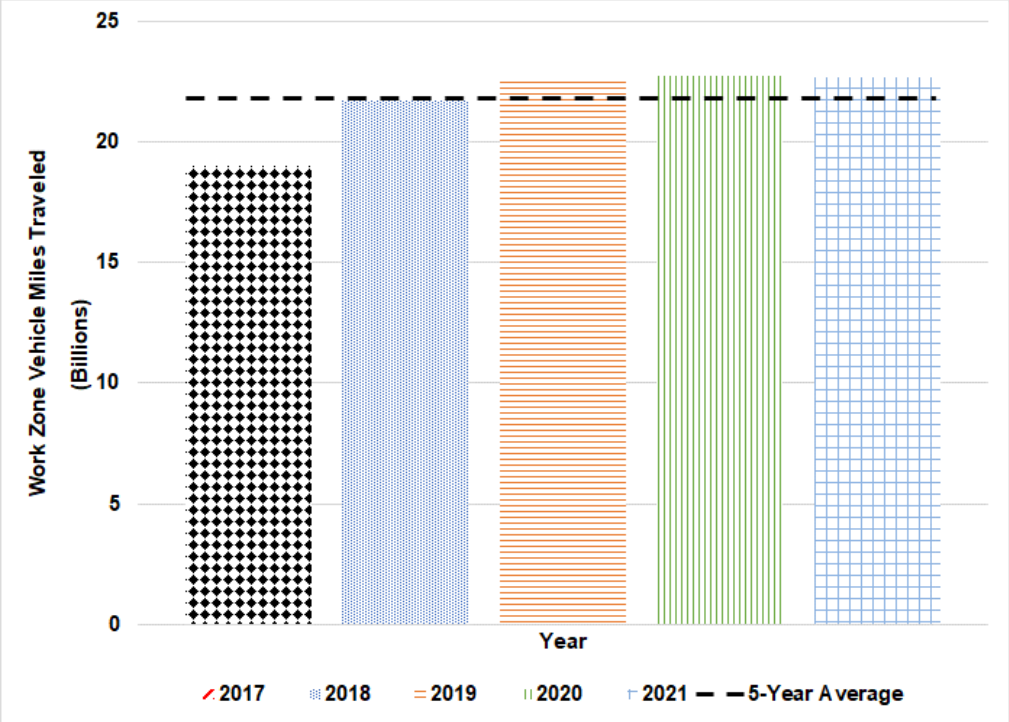
Source: FHWA

Figure 1. Graphic. Number of work zone miles.



Source: FHWA

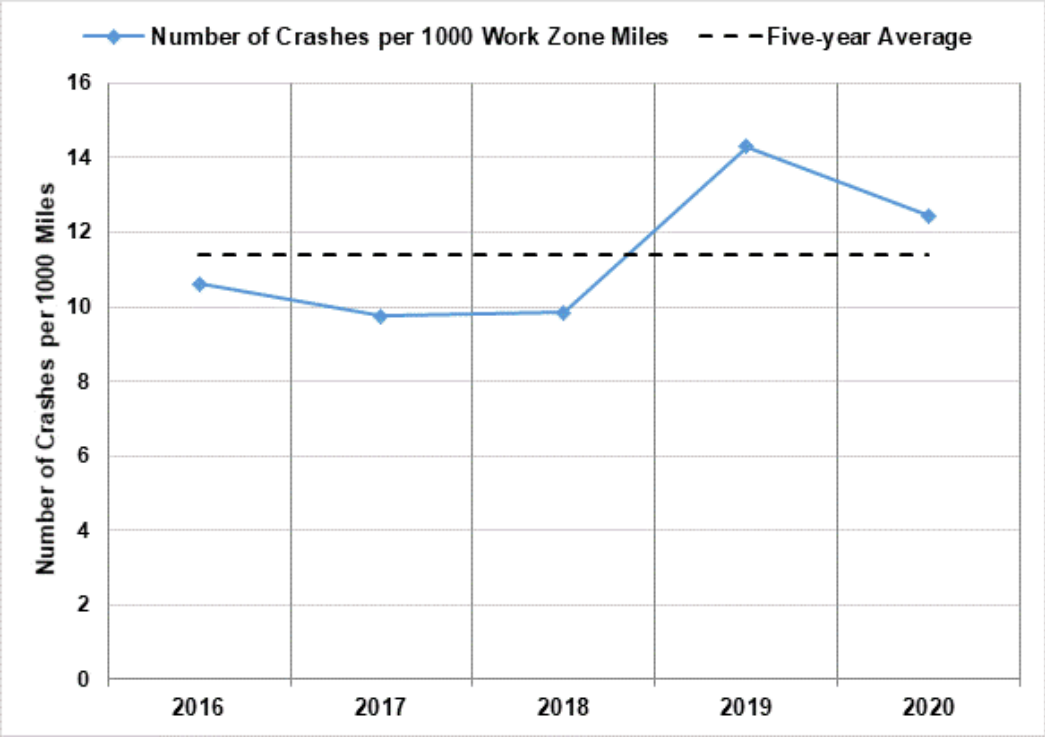
Figure 2. Graphic. Number of work zone projects.



Source: FHWA

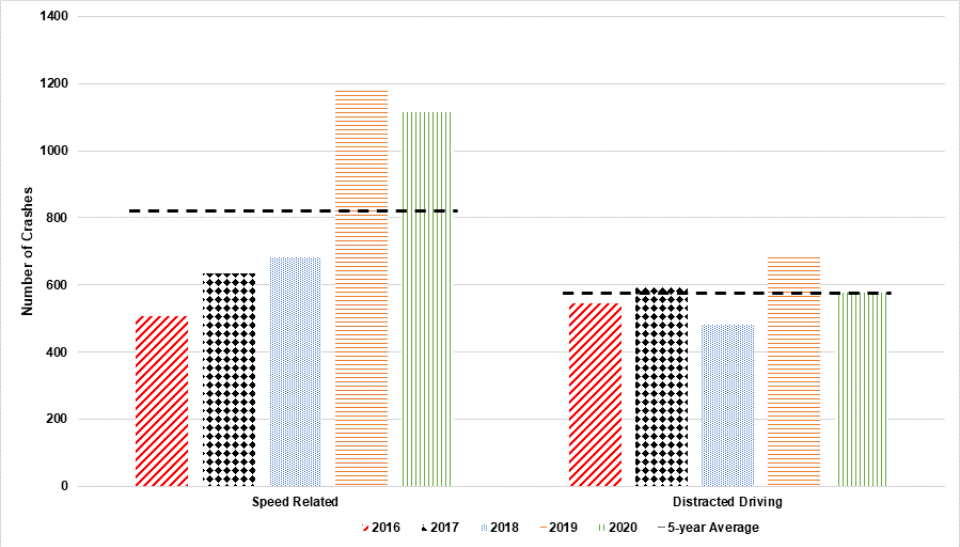
Figure 3. Graphic. Work zone VMT.

A.1.2 Examples of Work Zone Safety Data Charts



Source: FHWA

Figure 4. Graphic. Number of work zone crashes per thousand work zone miles.



Source: FHWA

Figure 5. Graphic. Number of work zone crashes caused by speeding and distracted driving.

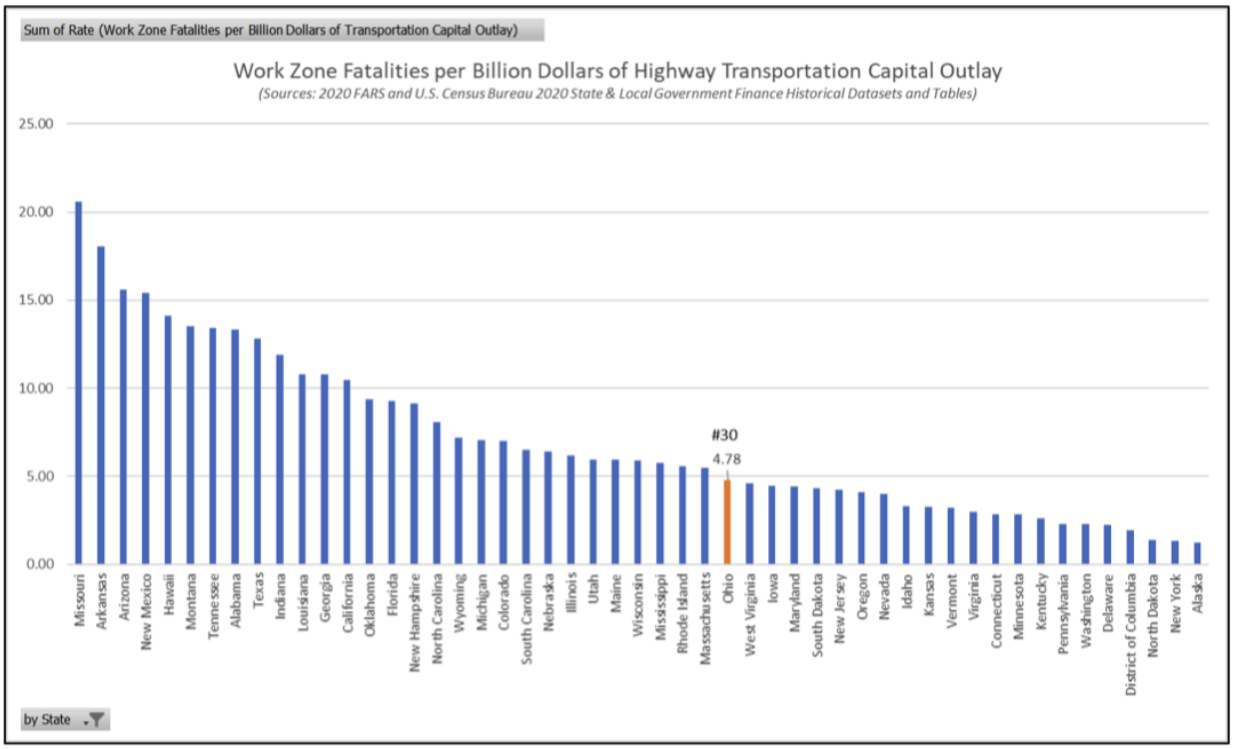
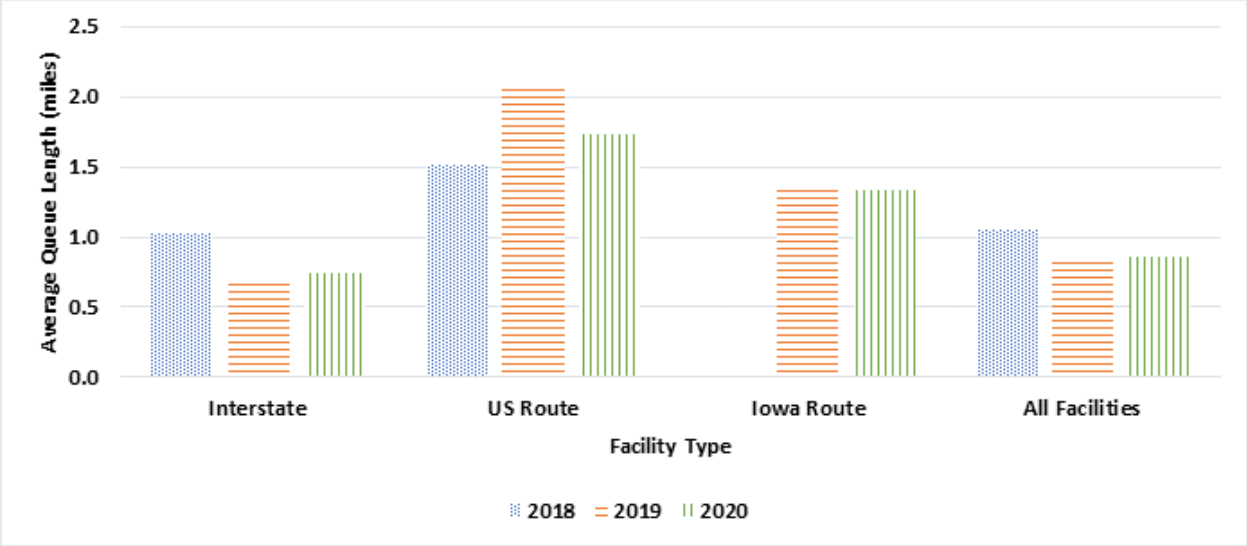


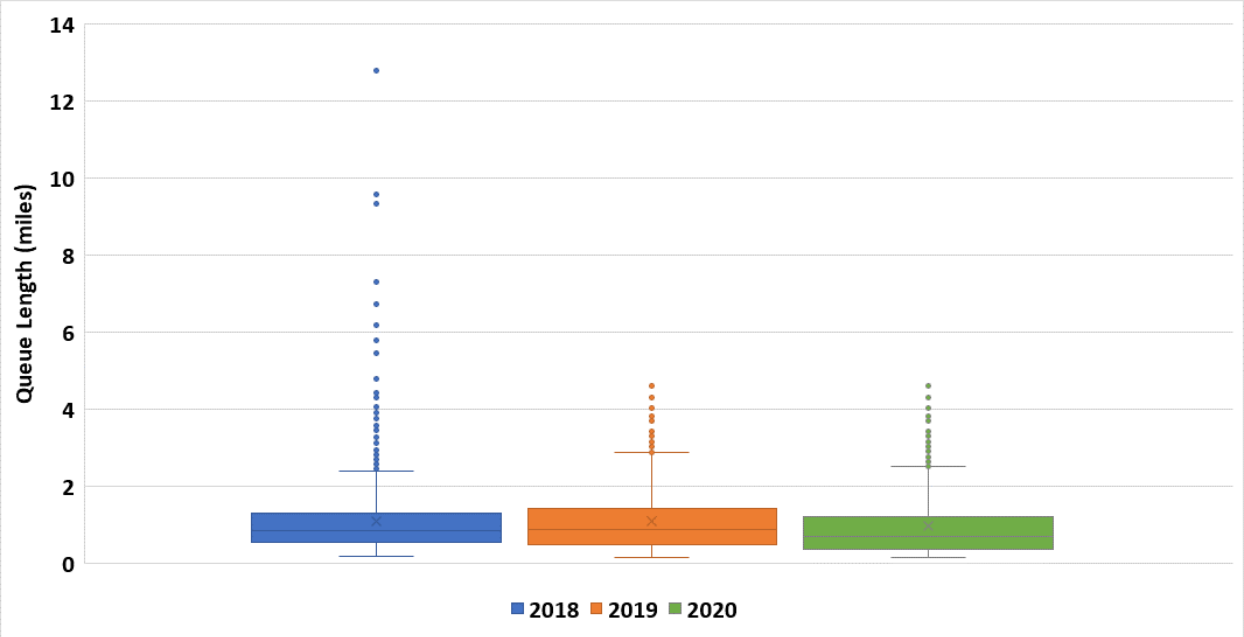
Figure 6. Graphic. Work zone fatalities per billion dollars of transportation capital outlay.

A.1.3 Examples of Work Zone Mobility Data Charts



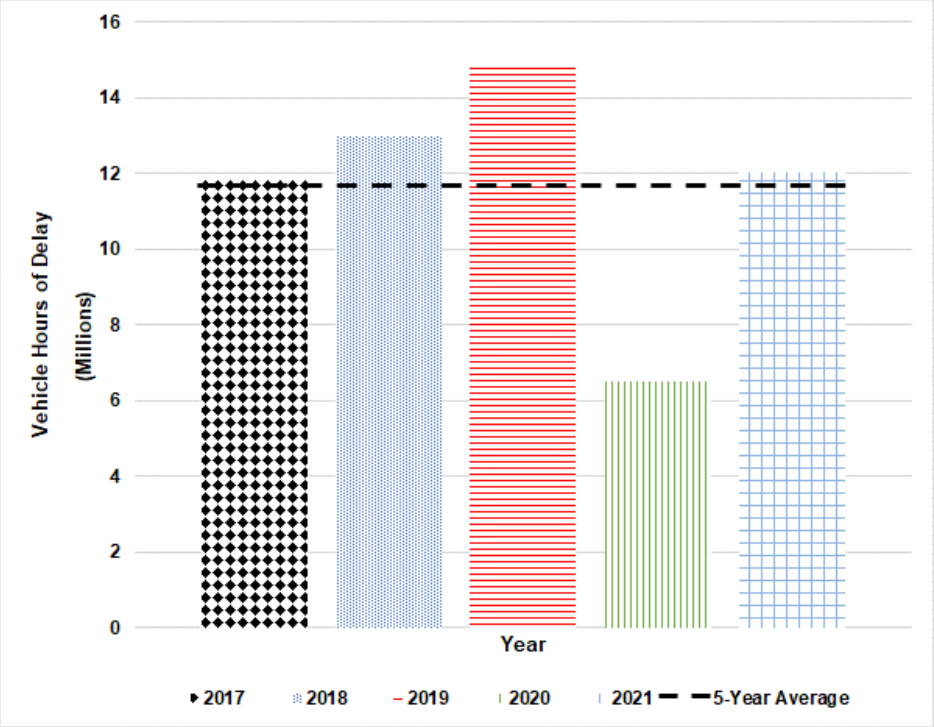
Source: FHWA

Figure 7. Graphic. Average work zone queue length at significant projects.



Source: FHWA

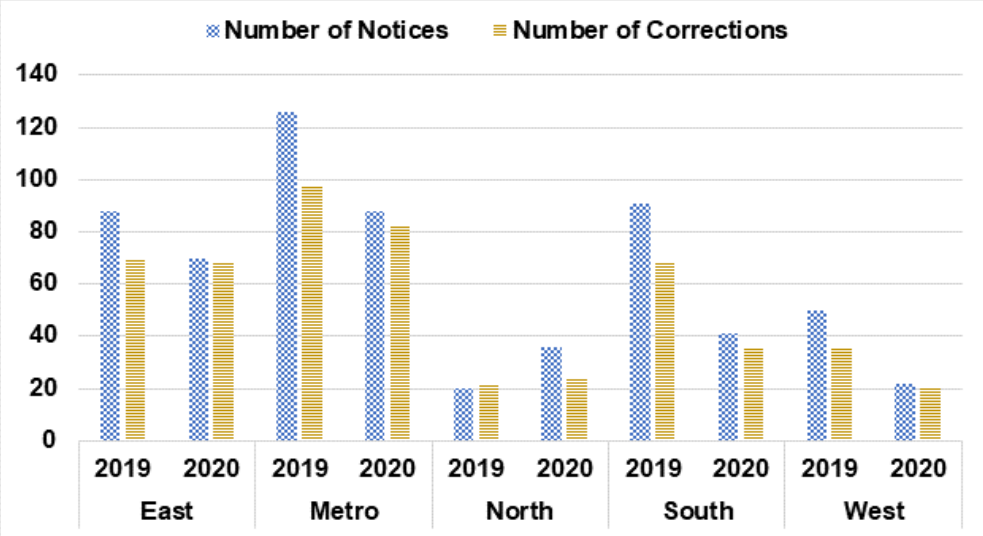
Figure 8. Graphic. Queue length distribution at significant projects.



Source: FHWA

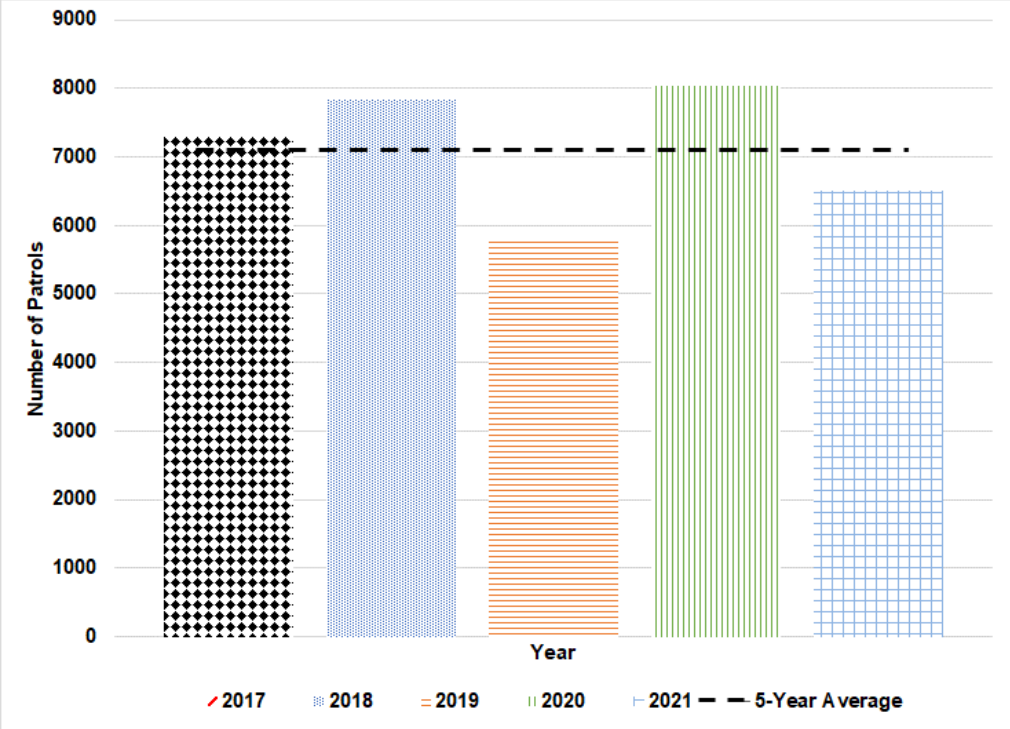
Figure 9. Graphic. Vehicle hours of delay.

A.1.4 Examples of Agency Efficiency Data Charts



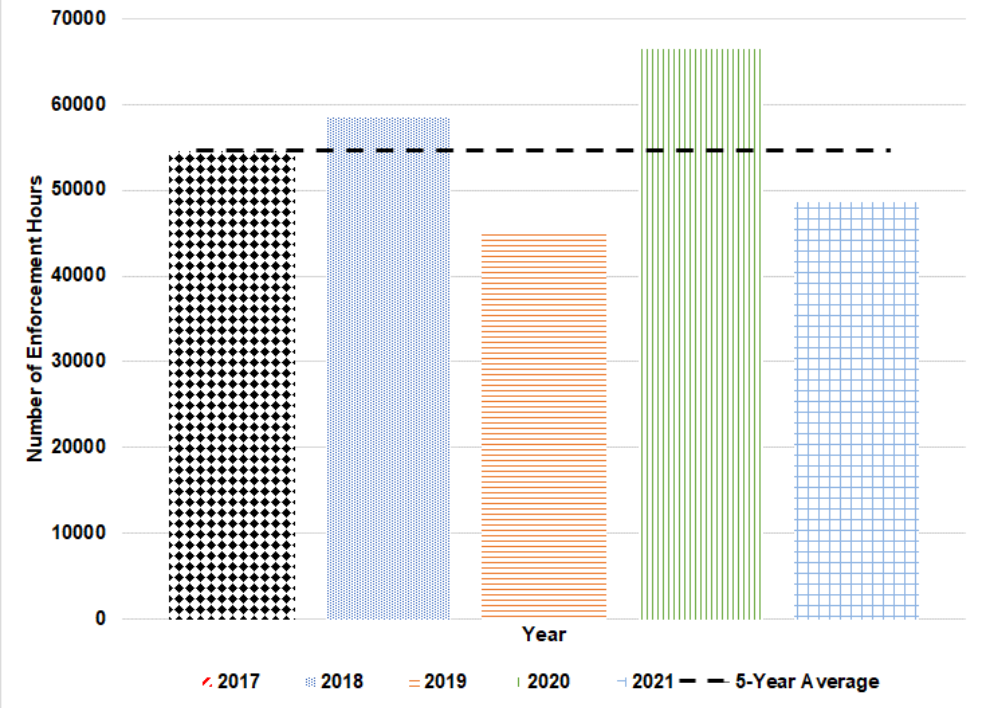
Source: FHWA

Figure 10. Graphic. Number of notices from work zone field inspections and resulting corrections.



Source: FHWA

Figure 11. Graphic. Number of patrols in work zones.



Source: FHWA

Figure 12. Graphic. Number of enforcement hours in work zones.

Table 10. Work zone traffic control strategies receiving an Exceptional or Acceptable rating for more than X% of field reviews.

Work Zone Traffic Control Strategy	Category	Interstate		U.S. and State Route		County Road		City Road	
		2018	2019	2018	2019	2018	2019	2018	2019
Lane Closure	Ballasting	✓	✓	✓	✓	✓	✓	✓	✓
	Cleanliness	✓	✓	✓	✓	✓	✓	✓	✓
	Crashworthiness	✓	✓	✓	✓	✓	✓	✓	✓
	Sheeting		✓	✓	✓			✓	✓
	Positive Closure	✓							
	Location/Spacing	✓							
	General Condition		✓	✓			✓		
	Retroreflectivity			✓	✓	✓			

Table 11. Work zone traffic control strategies receiving an Exceptional or Acceptable rating for more than X% of field reviews.

Work Zone Traffic Control Strategy	Category	Interstate		U.S. and State Route		County Road		City Road	
		2018	2019	2018	2019	2018	2019	2018	2019
Lane Closure	Location/Spacing		✓	✓	✓	✓	✓	✓	✓
	Positive Closure		✓	✓		✓	✓	✓	✓
	Proper Signage	✓	✓	✓	✓	✓	✓	✓	✓
	Retroreflectivity	✓							
	Sheeting	✓				✓	✓		
	General Condition			✓				✓	✓

Table 12. Annual TMP compliance audit by month of the year.

Audit Status	February	March	May	June	August	October	December	Total
Completed	19	23	21	16	17	9	25	130
Not Completed	1	0	0	0	0	0	0	1
Completion Percent	95	100	100	100	100	100	100	99

Table 13. Annual TMP compliance audit by project type.

Audit Status	Resurfacing	Bridge	Paving	Grading	Signals	Other
Completed	76	27	29	30	14	2
Not Completed	0	0	0	0	1	0
Completion Percent	95	100	100	100	100	100

APPENDIX B. WORK ZONE PROGRAMMATIC REVIEW EXAMPLE

WORK ZONE PROGRAMMATIC REVIEW
Any State DOT
March 2030

Disclaimer

This Work Zone Programmatic Review example is provided solely as a reference document to illustrate one possible approach for organizing and presenting information in a work zone programmatic review report. It is not intended to prescribe a required format or level of detail. Agencies are not required to follow the structure, content, or organization presented in this work zone programmatic review example and are under no obligation to adopt or replicate it. The examples provided are for illustrative purposes and are not intended to prescribe data requirements. The data described in this example are fictitious data for the future (2025 to 2029) generated for the purpose of illustrating the process of conducting a work zone programmatic review. Each agency is encouraged to tailor its work zone programmatic review report to reflect its own data availability, priorities, practices, and review objectives using the format and level of detail that best support its work zone management goals.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. EXECUTIVE SUMMARY

Any State Department of Transportation (AS DOT) conducted a work zone programmatic review for the time period from 2025 to 2029. The review was conducted by a multidisciplinary team including reviewers from various DOT Divisions and Districts and FHWA. The review encompasses analysis of work zone safety and mobility performance measures and other data sources such as customer surveys, training exam scores, and ratings from field reviews. Analyses were conducted both at the statewide and project levels. The project level analysis was based on 12 representative projects selected from around the State. The review process also included meetings with District Personnel to discuss work zone related concerns.

Regarding safety performance, the number of crashes increased from 2025 to 2029 statewide, while the crash rate decreased due to an increase in vehicle miles traveled (VMT). Rear-end crashes are a particular concern and represent 45% of all work zone crashes from 2025 to 2029. Rear-end crashes are also contributing to the 70% increase in crashes involving a truck-mounted attenuator (TMA). While the percentage of speed-related crashes decreased over the review period and AS DOT's pilot speed safety camera (SSC) program has been very successful, speeding in work zones continues to be very prevalent. Crashes involving pedestrians are also a significant concern, while there has been improvement in work zone intrusion crashes. Since the release of a design supplement with updated guidance for positive protection in work zones, work zone intrusion crashes have decreased by 43%.

Regarding mobility performance, the average delay per significant project increased from 2.3 minutes in 2025 to 3.3 minutes in 2029. For the project-level analysis, the average delay per mile ranged from 0.5 minutes to 13.2 minutes. Some concerns noted in the project-level analysis include underutilization of detour routes in some instances and slow response times from towing companies.

Analysis of public survey results show that customers are generally satisfied with AS DOT work zones. Customers generally feel safe driving through work zones and feel like they are able to easily navigate through work zones while driving. However, less than half of survey respondents indicated that they receive adequate notice of work zones or adequate information regarding alternate routes in work zones, and a lower percentage of customers feel safe walking or bicycling through work zones and believe they can easily navigate through work zones when walking or bicycling.

AS DOT continues to conduct a robust training program with a wide range of class offerings. Employees have performed well in these training classes, with average final exam scores well above the required 80% threshold for passing. There has been some decline in the performance in the Flagger Training class, and flagger operations were rated low in the field inspections.

Overall, AS DOT continues to make progress in enhancing work zone safety and mobility. Examples of action items identified for the next review period include expanding the use of queue warning systems, increasing social media engagement for work zone projects to disseminate information on work zone projects and detour routes, launching a public outreach campaign to decrease distracted driving, updating policies and standards for pedestrian and

bicyclist accommodations in work zones, working to expand the SSC program, considering a Towing Recovery Incentive Program, and enhancing training classes.

2. INTRODUCTION/BACKGROUND

This report details Any State Department of Transportation (AS DOT)'s work zone programmatic review in compliance with the Work Zone Safety and Mobility Rule (23 CFR Part 630 Subpart J). The review covers the period from 2025 to 2029.

The review was conducted by a multidisciplinary team from AS DOT and FHWA. The review encompasses analysis of work zone safety performance measures (crashes by severity and impact type, crash rates, number of crashes involving a truck-mounted attenuator (TMA)) and mobility measures (average speeds and delay). Other data sources analyzed include customer surveys and training exam scores. In addition, field reviews were conducted for 12 work zones, which were rated for various attributes. The review process also included meetings with District Personnel to discuss work zone related concerns. A key focus of this review is enhancing work zone safety for all users.

This report includes an overview of the work zone programmatic review team, review of actions taken since the previous review, work zone safety and mobility analyses, analyses of other data sources, an overall programmatic assessment, and action items for enhancements to AS DOT's work zone management practices.

3. WORK ZONE PROGRAMMATIC REVIEW TEAM MEMBERS

The work zone programmatic review team includes representatives from various AS DOT Divisions and Districts and FHWA. The review team is shown in table 1.

Table 1. Work zone programmatic review team.

No.	Name	Office / Division / Organization	Title / Designation	Email
1	Howard Pearce	Traffic Operations	State Work Zone Engineer	Howard.Pearce@anystate.gov
2	Ray Luken	Traffic Safety	Highway Safety Engineer	Ray.Luken@anystate.gov
3	Kimberly Williams	Planning	Program Manager	Kimberly.Williams@anystate.gov
4	Connie Garrett	Design	Highway Engineer	Connie.Garrett@anystate.gov
5	Michael Guajardo	Construction	State Construction Engineer	Michael.Guajardo@anystate.gov
6	Patricia Slater	District 1 Maintenance	Maintenance Supervisor	Patricia.Slater@anystate.gov
7	Ralph Chandler	Public Information	Public Relations Specialist	Ralph.Chandler@anystate.gov
8	Vanina Iglesias	Workforce Development	Employee Development Specialist	Vanina.Iglesias@anystate.gov
9	Beverly Hanson	District 3 Permitting	Permit Compliance Specialist	Beverly.Hanson@anystate.gov
10	Harold Simon	Division Office	Safety Engineer	Harold.Simon@dot.gov

4. ACTIONS TAKEN SINCE THE PREVIOUS WORK ZONE PROGRAMMATIC REVIEW

This section summarizes actions taken to enhance AS DOT's practices since the last review, including follow-up items from the 2025 work zone programmatic review (which covered 2020 through 2024) and other actions.

4.1. Follow-Up from Action Items

Table 2 presents a summary of the status of the action items from AS DOT's 2025 work zone programmatic review. As shown in the table, the increased speed enforcement in work zones and implementation of a speed safety camera (SSC) pilot are associated with increased speed compliance in work zones. In addition, the use of positive protection in work zones has increased from 25% of significant projects to 35% of significant projects, and work zone intrusion crashes have decreased by 30% since the implementation of AS DOT's updated policy on positive protection.

Table 2. Status of action items from 2025 work zone programmatic review.

Year	Targeted Issue	Action Item / Status	Responsible Office	Implementation Notes	Metric Selected	Metric Before	Metric After
2024	Safety: Work Zone Speeding	Increase enforcement in work zone sites with high speeding violations. Status: Completed	Traffic Operations	Coordinated with State and local law enforcement to implement the change. Implemented SSC pilot in critical work zones/highway sections.	Difference between average speed and work zone speed limit (for significant projects) (mph) (from probe data)	5.7	4.6
2023	Safety: Work Zone Intrusion Crashes	Increase consideration of Positive Protection for high-risk work zones that place workers close to traffic. Status: Completed.	Design	Released a Design supplement that requires all project engineers to analyze the requirement of positive protection for every work zone activity and assign a score. If the score meets a threshold, the project engineers need to include positive protection strategies (e.g., speed barriers, concrete barriers, impact attenuators, buffer lanes) in the work zone design.	# Work zone intrusion crashes over total work zone projects (from crash reports)	0.53	0.37

4.2. Other Efforts to Improve Work Zone Safety and Mobility

Since the completion of the previous review, AS DOT has undertaken various efforts in the areas of policy and standards, outreach, organizational structure, and technology. These initiatives are described as follows.

- Policy and Standards
    - AS DOT developed a new specification to require backplates for temporary portable signals and updated its specifications for sequential flashing warning lights, end of queue warning systems, and lighting in work zones.
    - AS DOT continues to make updates to its chapter on work zones in the AS DOT Design Manual.
    - AS DOT updated its guidance for determining the level of TMP required.
    - AS DOT developed standards for pedestrian maintenance of traffic in work zones and published standard drawings for temporary traffic control in roundabouts.
    - AS DOT updated its policy to limit the length and duration of lane closures for interstates and high-speed divided highways.
- Outreach
    - AS DOT launched a new website for public input on work zones in 2021. The website allows the public to provide feedback (including comments and a rating on a scale of 1 to 10) on their experiences in AS DOT work zones. Feedback from the website has been compiled and is discussed in a later section of the report.
- Organizational Structure
    - AS DOT formed a work zone traffic control review board that includes personnel from Central Office and each District.
    - AS DOT launched initiatives to enhance communication and outreach with law enforcement and enhance partnerships with the state contracting association.
- Technology
    - AS DOT joined a pooled fund that is looking at the use of emerging data sources (e.g., hard braking data) to enhance work zone safety and mobility.
    - AS DOT sponsored research studies to assess the feasibility of a smart vest alert system and to evaluate the zipper merge system.
    - AS DOT expanded the use of smart arrow boards and now requires their use on all interstates and high-speed divided highways.

5. WORK ZONE SAFETY AND MOBILITY PERFORMANCE

This section presents the assessment of AS DOT's work zone safety and mobility performance statewide, including a high-level summary of annual work zone performance trends, project-level analysis of a representative sample of work zones, and analysis of other data and trends.

5.1 Overview of Performance Measures

AS DOT tracks various performance measures, including primary measures (required for the rule) and secondary measures (supplementary measures collected by AS DOT), for both the statewide and project level analyses. These performance measures are described in the following sections.

5.1.1 Performance Measures for Statewide Analysis

A summary of the performance measures used by AS DOT for the statewide analysis is provided in table 3. These performance measures are briefly described in the following sections.

Table 3. Summary of performance measures for statewide analysis.

Type of Performance Measure	Performance Measure Description	Primary / Secondary
Exposure	Total number of significant work zone projects	Primary
Exposure	Work zone vehicle miles traveled (VMT)	Primary
Safety	Number of work zone crashes by impact type and severity	Primary
Safety	Speed-related work zone crashes	Secondary
Safety	Crashes involving TMAs	Secondary
Mobility	Average delay (significant projects)	Primary
Mobility	Difference between average work zone speed and average speed without the work zone	Primary

Exposure Performance Measures for Statewide Analysis

Work zone exposure metrics tracked by AS DOT include total number of significant work zone projects and work zone vehicle miles traveled (VMT).

Safety Performance Measures for Statewide Analysis

The analysis of statewide safety data includes overall work zone crash statistics, work zone crashes by impact type and severity, speed-related work zone crashes, and crashes involving TMAs.

Work zone crashes are tracked from the State Patrol crash database. The uniform crash reports in the crash database contain various types of information for each crash, such as date, time, severity, manner of impact, first harmful event, and speed involvement.

Speed-related work zone crashes and crashes involving TMAs are used by AS DOT as secondary performance measures. Data on crashes involving TMAs are obtained from law enforcement crash reports and AS DOT incident reports.

Mobility Performance Measures for Statewide Analysis
The primary metrics for statewide mobility analysis are average delay and the difference between average work zone speed and average speed without the work zone. Both of these measures are tracked statewide for significant projects. The delay and speed statistics are obtained from probe data. The probe data consists of average segment travel times in five-minute increments.

5.1.2 Performance Measures for Project Level Analysis

A summary of the performance measures used by AS DOT for the project level analysis is provided in table 4. These performance measures are briefly described in the following sections.

Table 4. Summary of performance measures for project level analysis.

Type of Performance Measure	Performance Measure Description	Primary / Secondary
Safety	Number of work zone crashes by severity and type of impact	Primary
Safety	Speed compliance	Secondary
Mobility	Average delay	Primary
Mobility	Average delay per mile	Primary
Mobile	Difference between average work zone speed and average speed without the work zone	Primary

Safety Performance Measures for Project Level Analysis
The analysis of project level safety data includes the number of work zone crashes by severity and type of impact as a primary measure and speed compliance as a secondary measure. Speed data were obtained from probe data. In addition, work zone speed limits were obtained from the construction records for the projects that were reviewed.

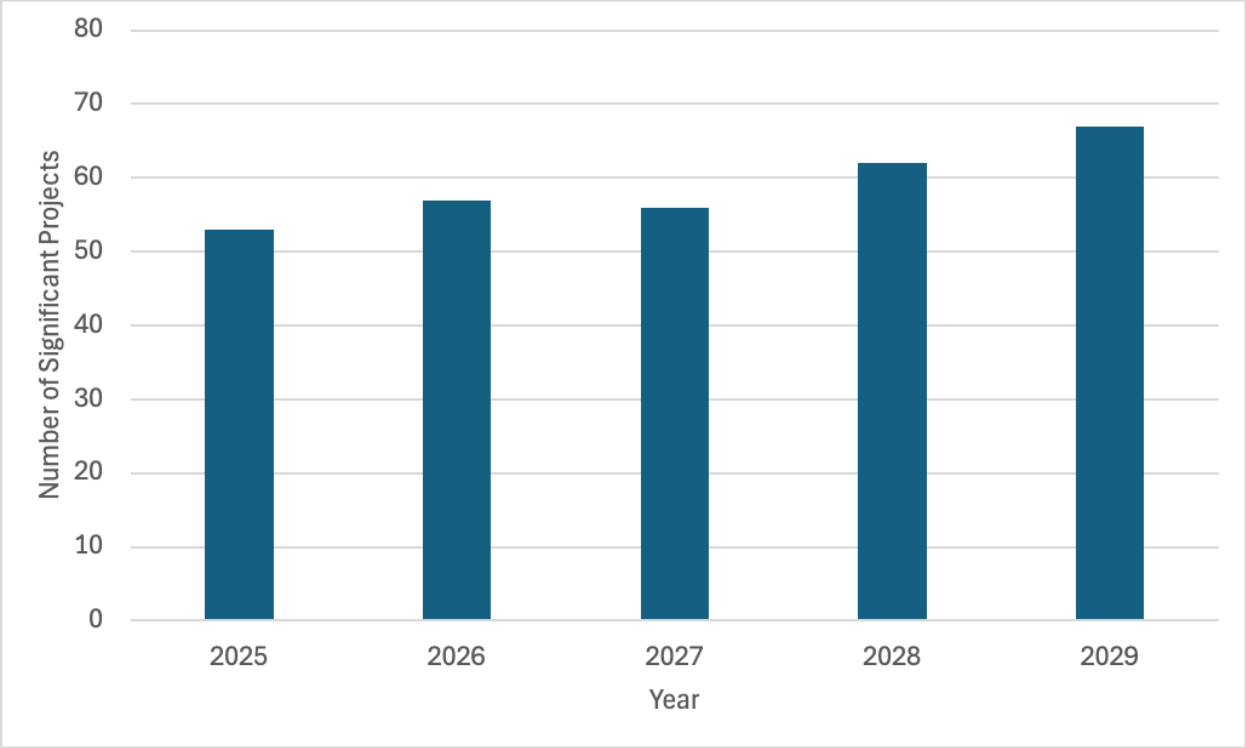
Mobility Performance Measures for Project Level Analysis
Mobility metrics for the project-level analysis include average delay, average delay per mile, and the difference between the average work zone speed and the average speed without the work zone. These metrics were calculated based on probe data.

5.2 Summary of Annual Work Zone Performance Trends

This section provides a high-level summary of the State's work zone safety and mobility performance trends over the reporting period (i.e., 2025 to 2029) using the data from AS DOT's annual performance monitoring efforts. The following sections present the metrics and high-level results for work zone exposure, safety, and mobility.

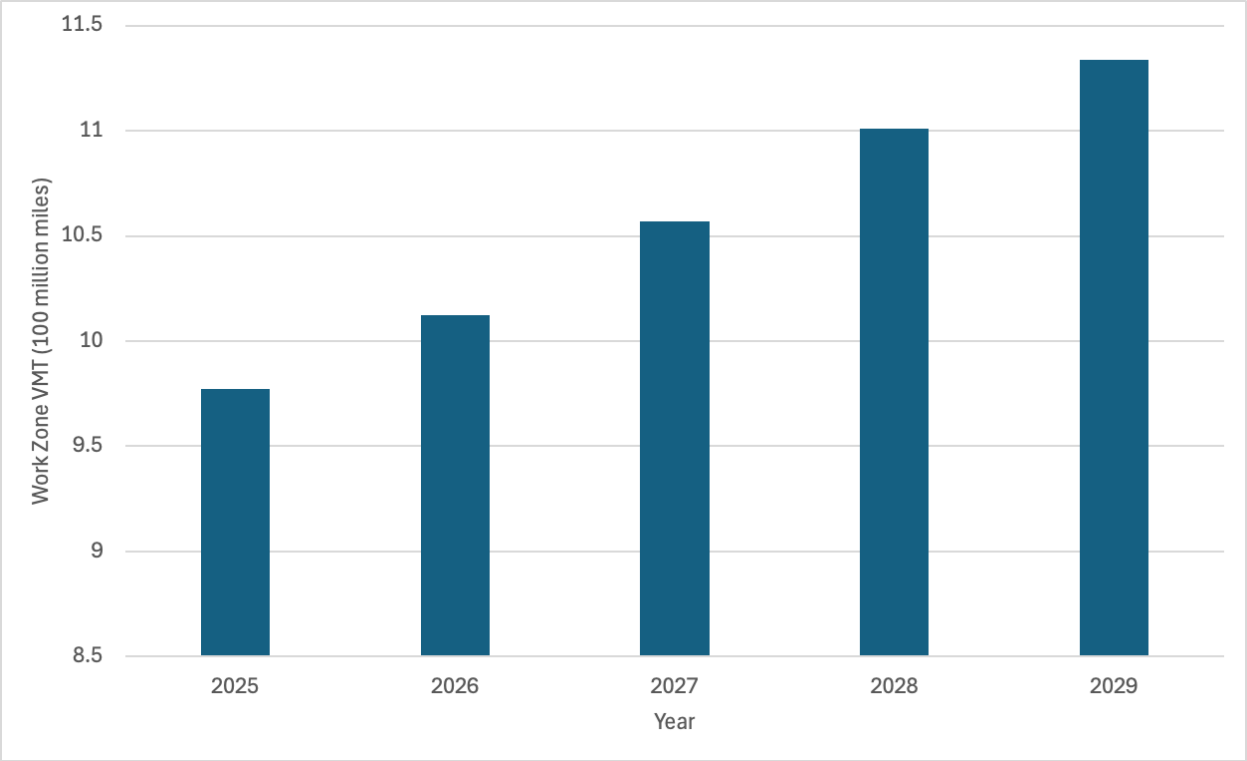
Exposure Data

Work zone exposure metrics tracked by AS DOT include total number of significant work zone projects and work zone VMT. Figure 1 shows the total number of significant work zone projects per year, while figure 2 shows the work zone VMT per year. The results show general increases in both the number of significant work zone projects and work zone VMT, indicating an overall increased level of work zone activity throughout the State.



Source: FHWA

Figure 1. Graphic. Number of significant projects per year.



Source: FHWA

Figure 2. Graphic. Work zone VMT by year.

Safety Data

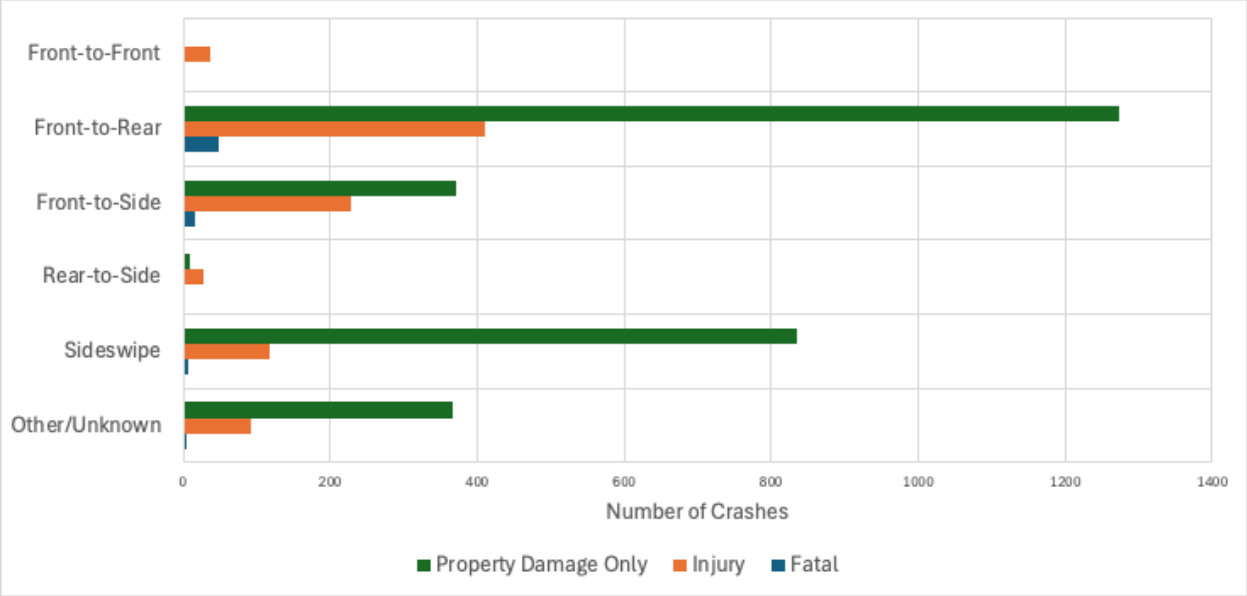
The analysis of statewide safety data includes overall work zone crash statistics, work zone crashes by impact type and severity, speed-related work zone crashes, and crashes involving TMAs.

A summary of overall work zone crash statistics is shown in table 5. The results indicate that the total number of work zone crashes has generally increased, but the crash rate per 100 million VMT in work zones has generally decreased.

Table 5. Overall work zone crash statistics for 2025 to 2029.

Year	Total Number of Significant Projects	VMT in Work Zones (100 million miles)	Total Work Zone Crashes	Work Zone Injury Crashes	Work Zone Fatal Crashes	Crash Rate per 100 million VMT in Work Zones
2025	53	9.8	756	150	14	77.4
2026	57	10.1	790	192	12	78.0
2027	56	10.6	712	174	16	67.4
2028	62	11.0	778	201	19	70.7
2029	67	11.3	813	195	18	71.7
Totals	**295**	**52.8**	**3849**	**912**	**79**	**72.9**

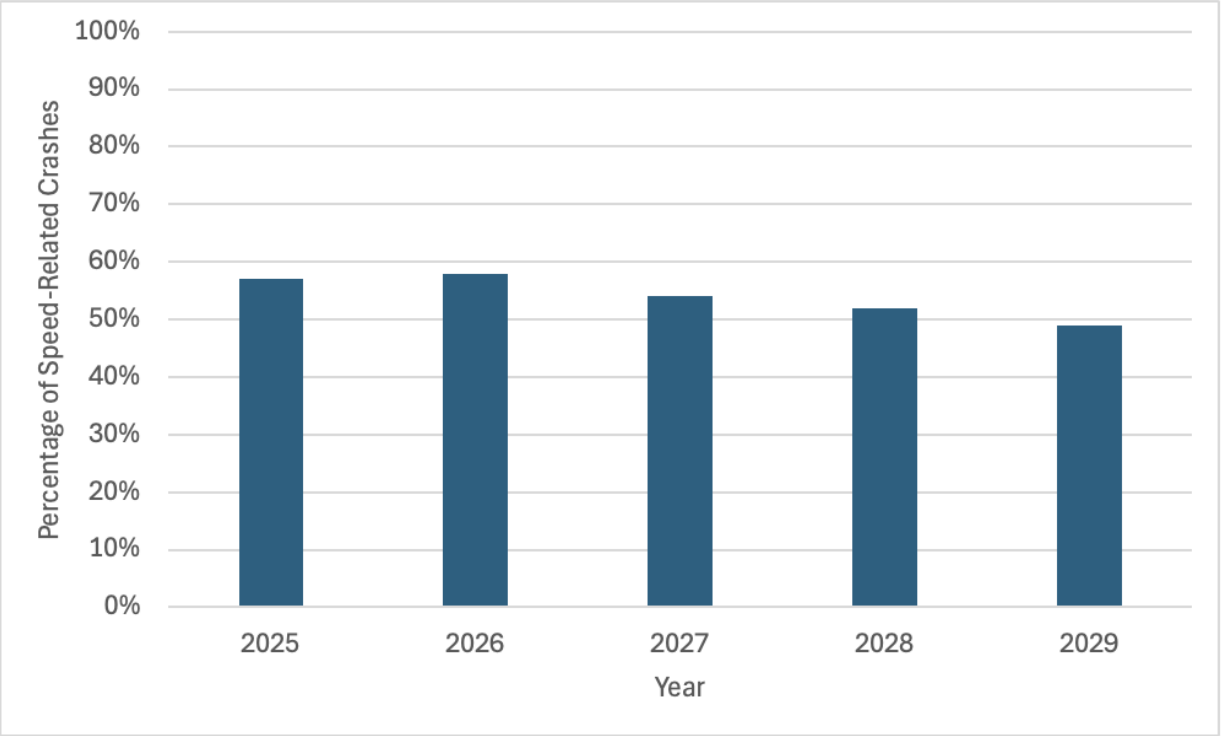
Figure 3 shows a breakdown of work zone crashes by crash severity and type of impact. These results show that front-to-rear crashes are the predominant type of impact for work zone impact (45% of all crashes), followed by sideswipe crashes.



Source: FHWA

Figure 3. Graphic. Work zone crashes by severity and type of impact (statewide analysis).

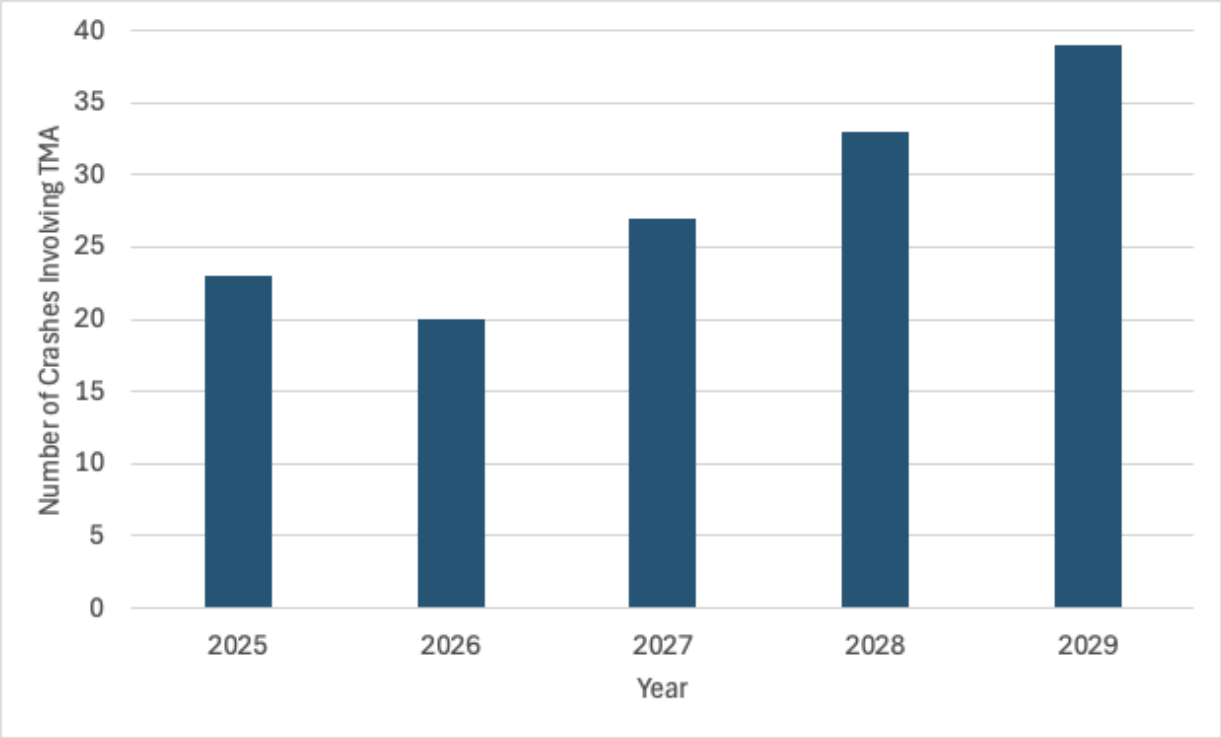
An analysis of speed-related work zone crashes was also conducted. Figure 4 shows the percentage of speed-related crashes by year. Overall, the results show that the percentage of speed-related crashes has generally decreased during the five-year review period.



Source: FHWA

Figure 4. Graphic. Percentage of speed-related crashes by year (statewide analysis).

An analysis of crashes involving a TMA was also conducted. This analysis included a review of law enforcement crash reports and AS DOT incident reports. Figure 5 shows the number of crashes involving a TMA by year. The results show a significant increase in these crashes, with an overall increase of 70% from 2025 to 2029. Based on the crash reports, 85% of these crashes were rear-end crashes in which a vehicle rear-ended the TMA. Approximately 60% of these incidents involved speeding, and distracted driving was noted as a factor in 65% of these incidents.



Source: FHWA

Figure 5. Graphic. Number of crashes involving a TMA by year statewide.

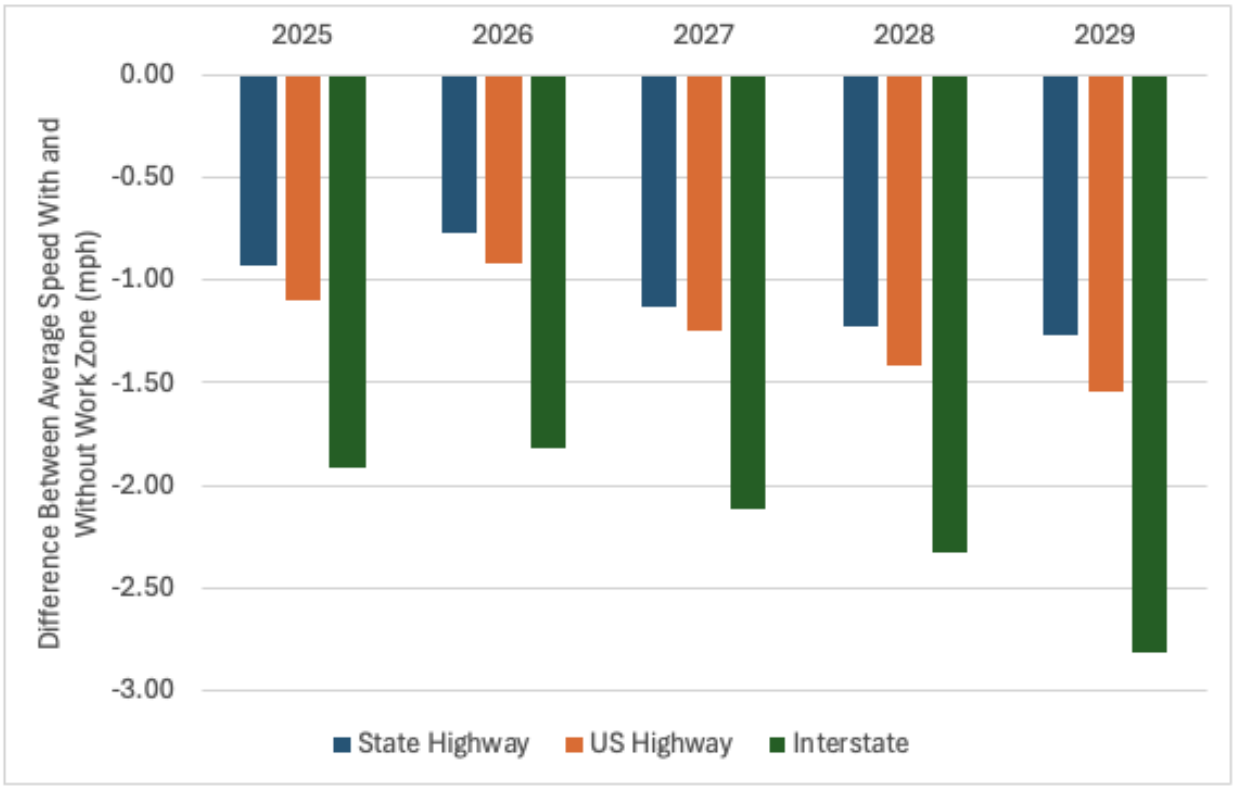
Mobility Data

The primary metrics for statewide mobility analysis are average delay and the difference between average work zone speed and average speed without the work zone. The total number of significant projects and average delay per significant project are summarized in table 6. Overall, these results show a 43% increase in average delays during the five-year reporting period.

Table 6. Average work zone speed and average delay for significant projects.

Year	Total Number of Significant Projects	Average Delay per Significant Project (min)
2025	53	2.3
2026	57	2.1
2027	56	2.7
2028	62	3.1
2029	67	3.3

Figure 6 shows the difference between average work zone speed and average speed without the work zone by year and by roadway type (Interstate, US highway, State highway). Overall, these results indicate speed reductions with work zones in place. The magnitude of the speed reduction is greater for Interstates than for US Highways and State Highways. The magnitude of the speed reduction has also increased over the five-year period, indicating speeds in work zones have decreased over time.



Source: FHWA

Figure 6. Graphic. Difference between average work zone speed and average speed without the work zone by year and by roadway type (statewide analysis).

5.3 Data-Driven Work Zone Safety and Mobility Performance Assessment

In addition to the statewide analysis, a data-driven work zone safety and mobility performance assessment was performed for a sample of significant work zone projects from around the State. A supplementary analysis of short-term work zones was also conducted. The following sections describe the methods for selecting these projects and the analysis results.

5.3.1 Projects Chosen for Data-Driven Assessment

Methodology Used to Select Projects for Data-Driven Assessment

For the project-level data-driven assessment, 12 significant projects were selected from around the State. Three significant projects were selected from each of AS DOT's four Districts. These projects were selected for diversity in factors such as land use, functional class, work zone type, VMT, and work zone duration.

Representative Projects and Associated Work Zone Exposure Data

A summary of the selected projects is provided in table 7. The average length of these work zones is 2.19 miles, and the average work zone duration is 136 days.

Table 7. Summary of significant projects selected for data-driven project-level analysis.

No.	Route	District	County	Begin Log Mile	End Log Mile	Land Use	Roadway Type	Cost (M)	Work Zone Type	Length (Miles)	Work Zone Days	VMT
1	I-7	1	Jefferson	12.47	13.20	Urban / Suburban	Freeway / Expressway	$2.5	Reconstruction	0.73	184	20M
2	SR 42	1	Franklin	89.32	93.50	Rural	Freeway / Expressway	$4.2	Repaving	4.18	221	3M
3	US 89	1	Madison	145.78	148.37	Urban / Suburban	Major Arterial	$5.1	Reconstruction	2.59	239	5M
4	SR 15	2	Clay	3.91	6.95	Rural	Two-lane Highway	$0.8	Concrete Patching	3.04	96	1.5M
5	SR 63	2	Lincoln	67.54	68.76	Rural	Multi-lane highway	$1.6	Repaving	1.22	152	7M
6	I-28	2	Montgomery	120.06	124.97	Urban / Suburban	Freeway / Expressway	$3.2	Reconstruction	4.91	111	23M
7	US 94	3	Jackson	54.83	54.98	Rural	Two-lane Highway	$0.3	Utilities / Maintenance	0.15	8	0.8M
8	SR 51	3	Adams	99.27	102.14	Urban / Suburban	Major Arterial	$1.8	Repaving	2.87	58	9M
9	I-28	3	Washington	0.58	0.94	Rural	Freeway / Expressway	$2.1	Bridge Replacement	0.36	173	12M
10	I-7	4	Monroe	138.44	140.12	Rural	Freeway / Expressway	$3.7	Added Travel Lanes	1.68	244	15M
11	SR 10	4	Harrison	76.19	80.52	Urban / Suburban	Major Arterial	$0.7	Pothole Repair	4.33	31	2.5M
12	SR 58	4	Benton	24.7	25.64	Rural	Two-lane Highway	$1.1	Bridge Rehabilitation	0.22	109	1.3M
Avg.	-	-	-	-	-	-	-	$2.3	-	2.19	136	8.3M

5.3.2 Work Zone Safety Performance Assessment

Safety Metrics

Safety metrics reviewed for the project-level analysis include work zone crashes by severity and impact type, crash rates (per million VMT), and speed compliance. Crash data were obtained from the State Patrol crash database. Speed data were obtained from probe data. In addition, work zone speed limits were obtained from the construction records for the projects that were reviewed. Feedback was also obtained from the Site Engineer for each project regarding safety performance.

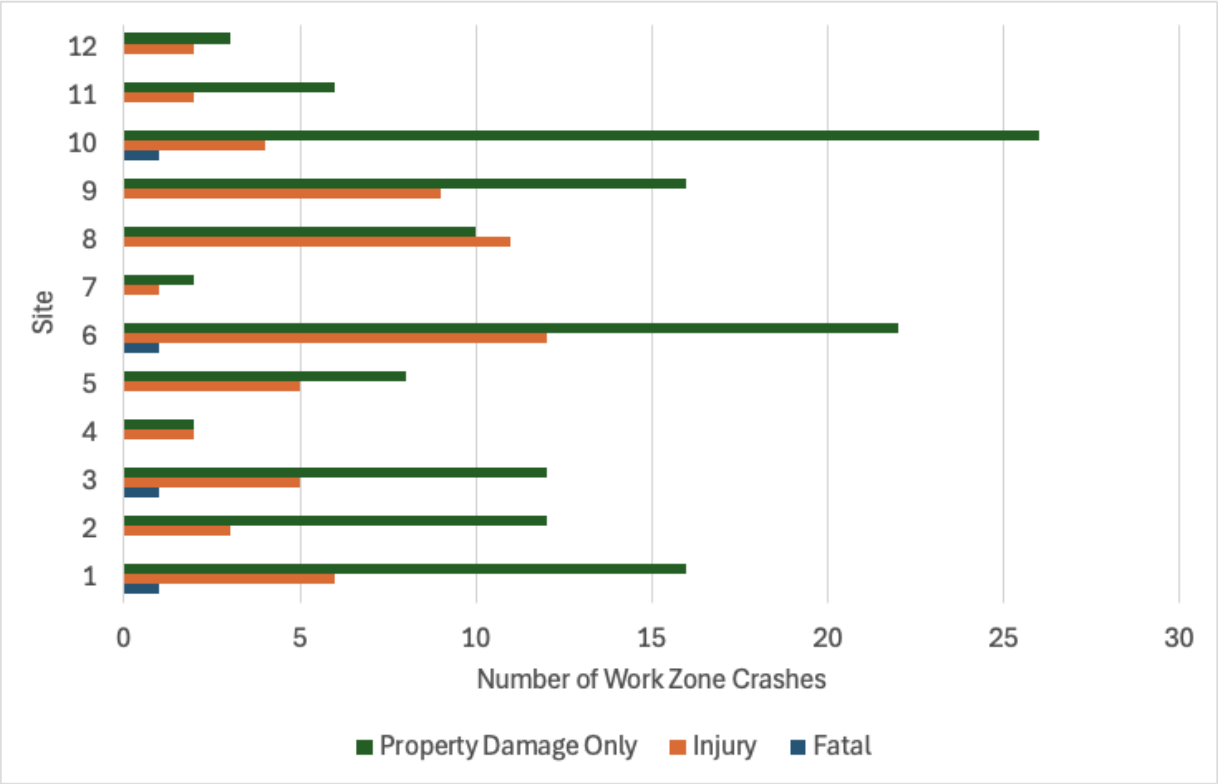
Safety Analysis

A summary of crash data for the 12 projects is provided in table 8. These results show that 31% of the total crashes in these work zones were injury crashes, and 2% of the total crashes were fatal crashes. The crash rate per million VMT ranges from 1.2 (Site 1, reconstruction on I-7 in Jefferson County) to 5.0 (Site 2, repaving on SR 42 in Franklin County). Approximately 63% of the crashes on SR 42 were front-to-rear impact crashes, and 57% of these crashes noted excessive speed as a contributing circumstance. Feedback from the Site Engineer for Site 2 indicated that there were several rear-end crashes during the morning peak hour, and sunlight glare may have been a factor in some of these crashes.

Figure 7 shows a breakdown of work zone crashes by severity and project site. The percentage of fatal and injury crashes by site ranges from 16% (Site 10, added travel lanes on I-7 in Monroe County) to 52% (Site 8, repaving on SR 51 in Adams County). Approximately 70% of the fatal and injury crashes on SR 51 were front-to-rear impact crashes, and 50% of these crashes noted driver inattention as a contributing circumstance. Approximately 30% of the fatal and injury crashes on SR 51 involved pedestrians during nighttime. Feedback from the Site Engineer for the SR 51 project indicated that three of the pedestrian injury crashes involved pedestrians crossing between intersections.

Table 8. Summary of crash data for project-level analysis.

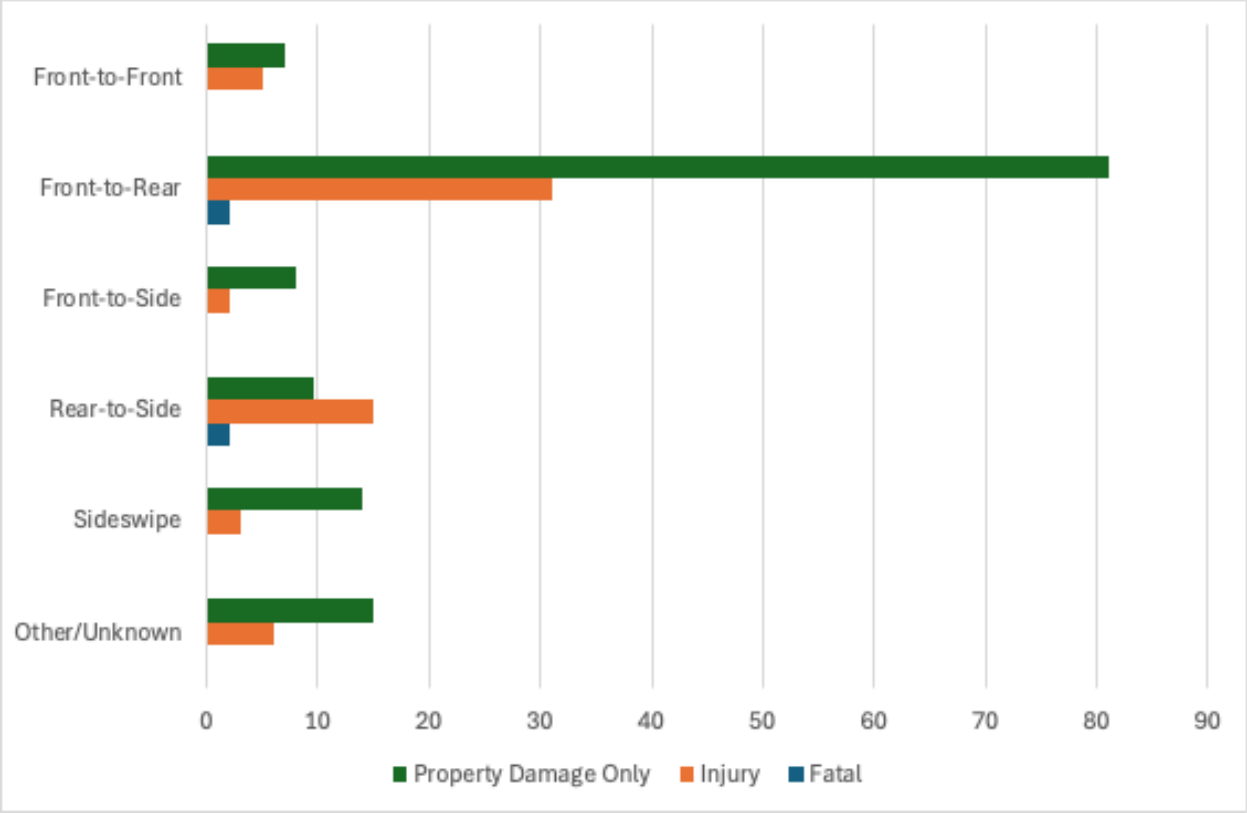
Site	VMT in Work Zones (million miles)	Total Work Zone Crashes	Work Zone Fatal Crashes	Work Zone Injury Crashes	Work Zone Property Damage Only (PDO) Crashes	Crash Rate per million VMT in Work Zones
1	20.0	23	1	6	16	1.2
2	3.0	15	0	3	12	5.0
3	5.0	18	1	5	12	3.6
4	1.5	4	0	2	2	2.7
5	7.0	13	0	5	8	1.9
6	23.0	35	1	12	22	1.5
7	0.8	3	0	1	2	3.8
8	9.0	21	0	11	10	2.3
9	12.0	25	0	9	16	2.1
10	15.0	31	1	4	26	2.1
11	2.5	8	0	2	6	3.2
12	1.3	5	0	2	3	3.8
Totals	**100.1**	**201**	**4**	**62**	**135**	**2.0**



Source: FHWA

Figure 7. Graphic. Work zone crashes by severity and project site (project-level analysis).

Figure 8 shows a breakdown of work zone crashes by severity and type of impact for the project-level analysis. Similar to the results from the statewide analysis, the results show that front-to-rear crashes are the predominant type of impact for work zone impact, followed by sideswipe crashes. Front-to-rear crashes represented 57% of the total crashes in these 12 work zones. Work zone crash statistics by project and impact type are provided in appendix A.



Source: FHWA

Figure 8. Graphic. Work zone crashes by severity and type of impact (project-level analysis).

Table 9 shows the results for speed compliance for the project-level analysis, including the average work zone speed, work zone speed limit, and the difference between the average work zone speed and the work zone speed limit. The average work zone speed was determined from the probe data (based on segment travel times in five-minute increments). Overall, these results indicate a low level of speed compliance in these 12 work zones. The difference between the average work zone speed and work zone speed limit ranges from 2.1 mph (Site 10, added travel lanes on I-10) to 8.4 mph (Site 1, reconstruction on I-7 in Jefferson County). Sites 6 and 10 were pilot work zones for AS DOT's work zone SSC program and showed relatively better speed compliance compared to most of the other work zones, indicating that the SSC program may be helping to reduce speeds in work zones. Sites 6 and 10 also had lower crash rates compared to many of the other work zones, and Site 10 had the lowest percentage (16%) of fatal and injury crashes of all of the sites. The Site Engineers for Sites 6 and 10 also perceived improved speed compliance with the SSCs implemented.

Table 9. Speed compliance (project-level analysis).

Project Number	Average Work Zone Speed (mph)	Work Zone Speed Limit (mph)	Speed Difference (mph)
1	63.4	55	8.4
2	66.2	60	6.2
3	44.2	40	4.2
4	55.7	50	5.7
5	62.1	55	7.1
6	53.4	50	3.4
7	54.2	50	4.2
8	44.2	40	4.2
9	65.4	60	5.4
10	62.1	60	2.1
11	43.2	40	3.2
12	57.1	50	7.1

Safety Analysis Findings and Recommendations
The results from the safety analysis at the project level are summarized as follows.

- Front-to-rear crashes are the most predominant impact type. These results are consistent with the statewide analysis.
- Speed compliance is a significant concern, with the average work zone speed exceeding the work zone speed limit at all 12 sites.
- The SSCs installed at the pilot sites (Sites 6 and 10) seemed to help reduce speeds in those two work zones. In addition, Site 6 had the lowest percentage of fatal and injury crashes among the 12 sites.
- Pedestrian crashes during nighttime are also a significant concern, especially for Site 8.

5.3.3 Work Zone Mobility Performance Assessment

Mobility Metrics
Mobility metrics for the project-level analysis include average delay, average delay per mile, and the difference between the average work zone speed and the average speed without the work zone. In addition, feedback was obtained from the Site Engineer for each project regarding mobility performance.

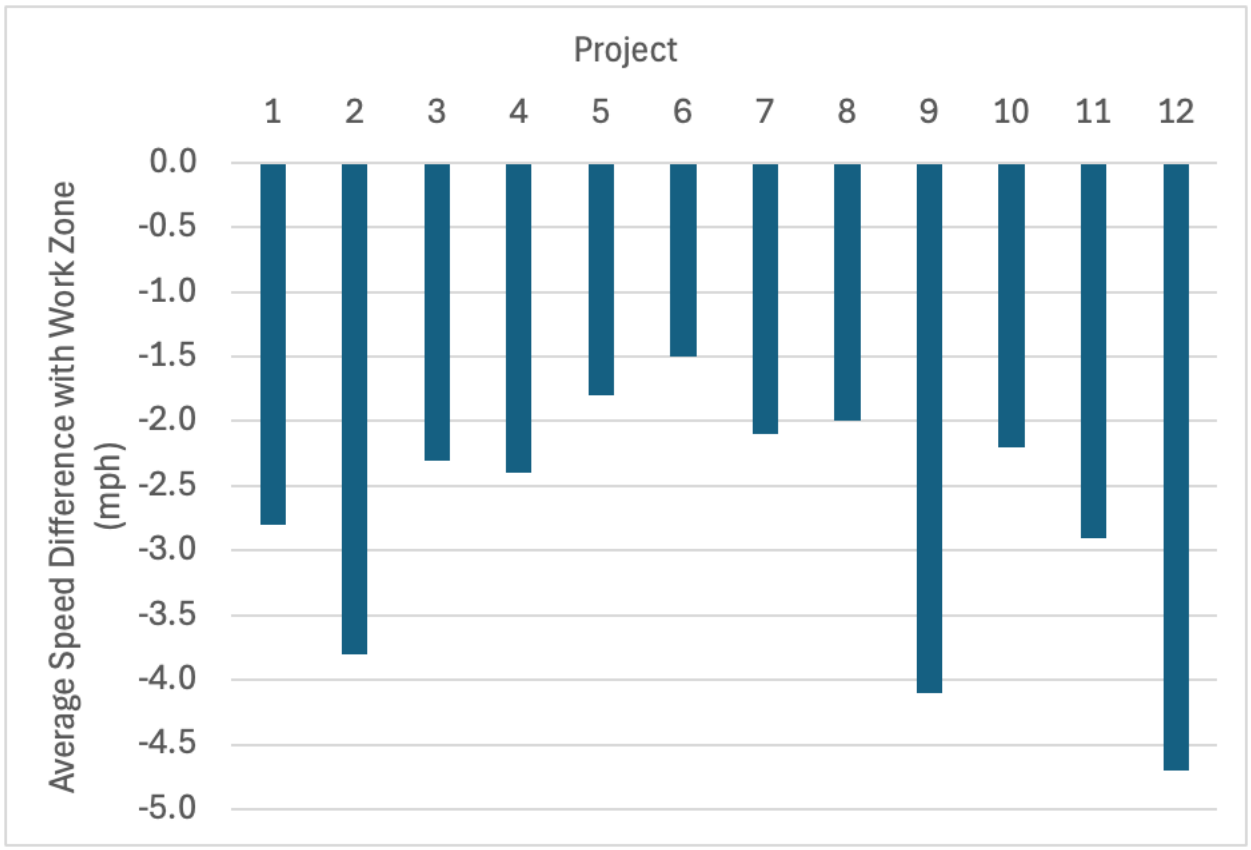
Mobility Analysis

Table 10 shows the results for average work zone speed, average delay, and average delay per mile. The average delay per mile ranges from 0.5 minutes (Site 10, Added Travel Lanes on I-7 in Monroe County) to 13.2 minutes (Site 12, bridge rehabilitation on SR 58 in Benton County). Site 10 was an added travel lanes project with no lane closures. Site 10 did not have any lane closures, and there was an extensive media campaign to help make the public aware of the project and promote alternate routes. Site 12 required flaggers and lane closures on a two-lane highway. The Site Engineer for Site 12 indicated that there were heavy backups during the morning peak and a high percentage of trucks. In addition, the detour route may have been underutilized. Site 9 (bridge replacement on I-28 in Washington County) had the second highest delay per mile (8.3 minutes). The Site Engineer for Site 9 indicated that there were heavy backups in the afternoon peak. In addition, there were some incidents in which towing companies were slow to respond and clear incidents.

Table 10. Summary of average work zone speed and average delay for project-level mobility analysis.

Project Number	Average Work Zone Speed (mph)	Average Delay (min)	Average Delay Per Mile (min)
1	63.4	2.1	2.9
2	66.2	8.0	1.9
3	44.2	3.1	1.2
4	55.7	2.8	0.9
5	62.1	1.4	1.1
6	53.4	2.3	0.5
7	54.2	0.3	2.0
8	44.2	2.2	0.8
9	65.4	3.0	8.3
10	62.1	0.9	0.5
11	43.2	3.6	0.8
12	57.1	2.9	13.2

Figure 9 shows the difference between average work zone speed and average speed without the work zone by project. These results show similar trends to the average delay results, with Sites 9 and 12 having the greatest speed reduction with the work zone in place. Results by project and time of day (daytime or nighttime) are provided in appendix A.



Source: FHWA

Figure 9. Graphic. Difference between average work zone speed and average speed without the work zone by project.

Mobility Analysis Findings and Recommendations

The results from the mobility analysis at the project level are summarized as follows.

- There was a wide range of mobility impacts, with an average delay per mile between 0.5 minutes and 13.2 minutes.
- The projects with the highest delay involved a two-lane highway with a lane closure (bridge rehabilitation) with flaggers and a freeway work zone (bridge replacement) with a 2 to 1 lane closure. Both projects saw some heavy backups during peak hours. Some of the factors potentially leading to the higher delays in these work zones include a high percentage of trucks, underutilization of detours, and slow response time from towing companies for some incidents.
- Extensive public outreach was effective in raising project awareness and providing information on alternate routes.

5.3.4 Supplementary Analysis of Short-Term Work Zones

A supplementary analysis of short-term work zones (duration less than three days) was also conducted. The following sections provide an overview of the work zones used for this analysis and analysis results.

Overview of Work Zones Used for Supplementary Analysis of Short-Term Work Zones

For the supplementary data-driven assessment of short-term work zones, four short-term work zones (one from each of AS DOT's four Districts) were selected from around the State. These projects were selected for diversity in factors such as land use, functional class, work zone type, VMT, and work zone duration. A summary of the selected projects is provided in table 11. The average length of these work zones is 0.26 miles, and the average work zone duration is 12.3 hours.

Table 11. Summary of work zones selected for project-level short-term work zone analysis.

No.	Route	District	County	Begin Log Mile	End Log Mile	Land Use	Roadway Type	Work Zone Type	Length (Miles)	Work Zone Hours	Annual Avg. Daily Traffic
1S	I-7	1	Jefferson	6.53	6.90	Urban / Suburban	Freeway / Expressway	Striping	0.37	15	22k
2S	SR 63	2	Lincoln	64.89	65.05	Rural	Multi-lane highway	Guardrail repair	0.16	8	7k
3S	I-28	3	Washington	1.12	1.27	Rural	Freeway / Expressway	Utilities / Maintenance	0.15	12	10k
4S	SR 58	4	Benton	6.54	6.89	Rural	Two-lane Highway	Striping	0.35	14	3k
Avg.	-	-	-	-	-	-	-	-	0.26	12.3	10.5k

Safety Analysis of Short-Term Work Zones

Due to the short-term nature of these work zones, the safety analysis was based on speed compliance. The results for speed compliance are shown in table 12. Overall, these results indicate low levels of speed compliance for short-term work zones, with higher speed differences than similar routes in the speed compliance analysis of significant projects.

Table 12. Speed compliance (analysis of short-term work zones).

Project Number	Average Work Zone Speed (mph)	Work Zone Speed Limit (mph)	Speed Difference (mph)
1S	65.9	55	10.9
2S	64.9	60	4.9
3S	67.2	60	7.2
4S	58.5	50	8.5

Mobility Analysis of Short-Term Work Zones

The mobility analysis of short-term work zones was based on average delay. The results for average delay are shown in table 13. Overall, these results indicate low levels of average delay. This result could be due to the short durations and lengths of these work zones, with lower average delays than comparable routes in the average delay analysis for significant projects.

Table 13. Summary of average work zone speed and average delay for analysis of short-term work zones.

Project Number	Average Work Zone Speed (mph)	Average Delay (min)
1S	65.9	0.6
2S	64.9	0.3
3S	67.2	0.9
4S	58.5	0.5

5.3.5 Additional Data and Trends Analysis

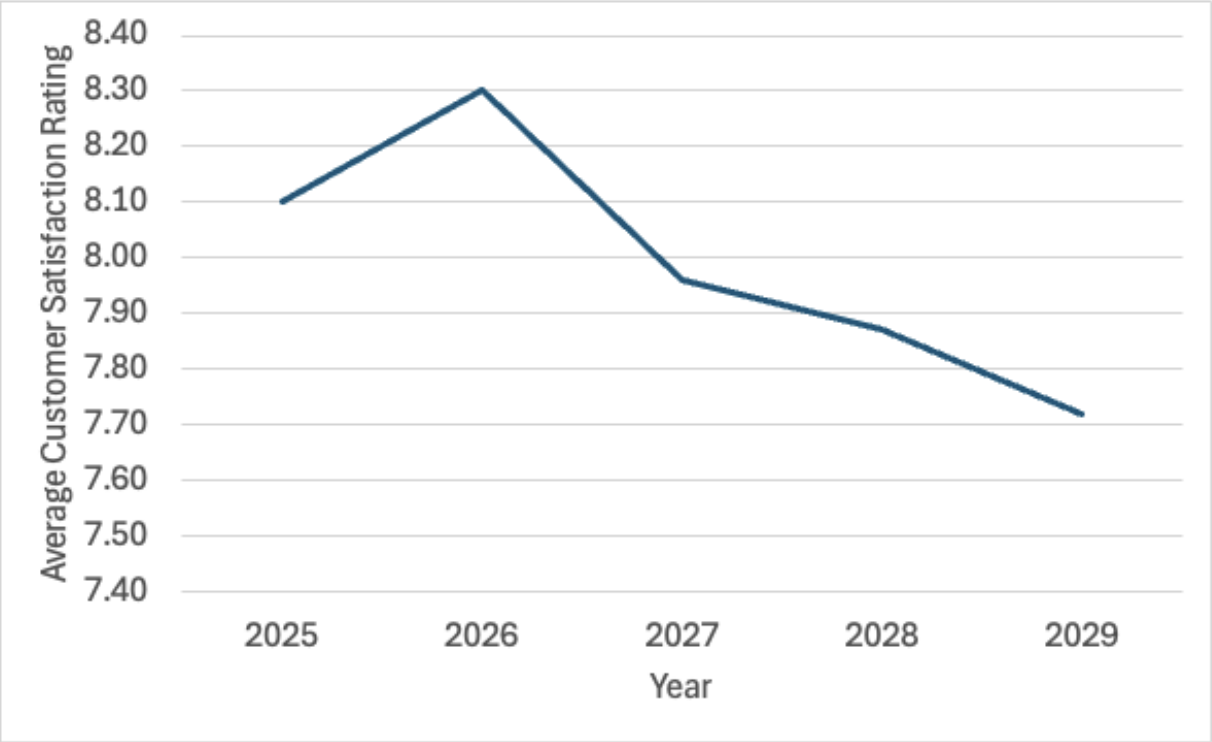
This section presents results from additional data analyses, including customer satisfaction, change orders, field review ratings, and training.

Customer Satisfaction

AS DOT launched a new website for public input on work zones in 2021. The website allows the public to provide feedback (including responses to statements, comments, and a rating on a scale of 1 to 10) on their experiences in AS DOT work zones. The survey results for the statement responses are shown in table 14, and the overall average satisfaction rating (1 = Low, 10 = High) by year is shown in figure 10. Overall, these results show that customers are generally satisfied with AS DOT work zones, although there has been a slight decline in the average customer work zone satisfaction rating between 2025 and 2029. Customers generally feel safe driving through work zones and feel like they are able to easily navigate through work zones while driving. However, a lower percentage of customers feel safe walking or bicycling through work zones and believe they can easily navigate through work zones when walking or bicycling. In addition, less than half of survey respondents indicated that they receive adequate notice of work zones or adequate information regarding alternate routes in work zones.

Table 14. Summary of responses for public feedback survey on AS DOT work zones.

Statement	Percent Yes
I receive adequate advance notice of work zones	43%
I receive adequate information regarding alternate routes for work zones	47%
I experience significant delays when driving through work zones	55%
I am able to easily navigate through work zones while driving	69%
I am able to easily navigate through work zones while walking or riding my bicycle	46%
I feel safe driving through work zones	75%
I feel safe walking or bicycling through work zones	37%



Source: FHWA

Figure 10. Graphic. Average customer work zone satisfaction rating (1 = Low, 10 = High) from public feedback survey.

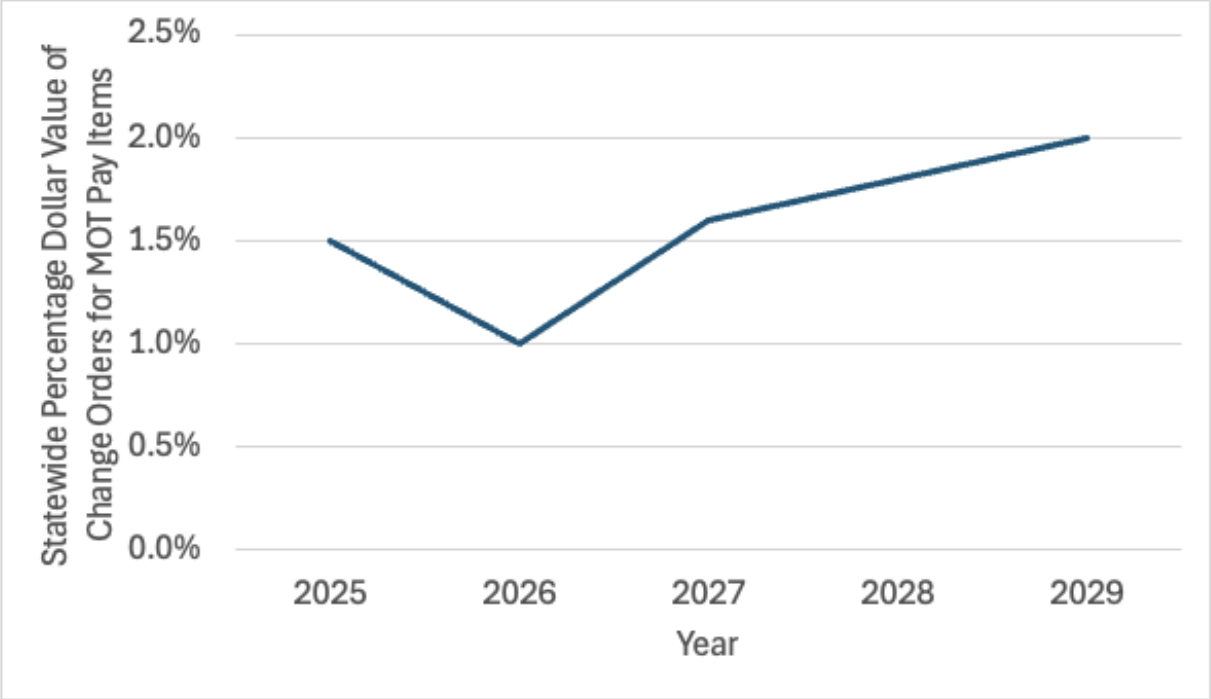
Key feedback from the open comments provided by participants is summarized as follows.

- Customers appreciated the clear signage and markings for work zones.
- Several customers feel that others are driving through work zones too fast.
- Customers would like to see more information (e.g., social media posts, message signs) on work zones and the availability of alternate routes.
- Some customers indicated some confusion with signage and where to go when walking through work zones.
- Customers generally liked the orange pavement markings that were implemented as a pilot for a work zone on US 95.
- Customers noted backups and significant delays for some work zones.

Agency Efficiency

For this review period, agency efficiency was assessed through two data sources: change orders and field inspection ratings. For change orders, the statewide percentage dollar value of change orders for maintenance of traffic (MOT) pay items based on the total cost of contracts was

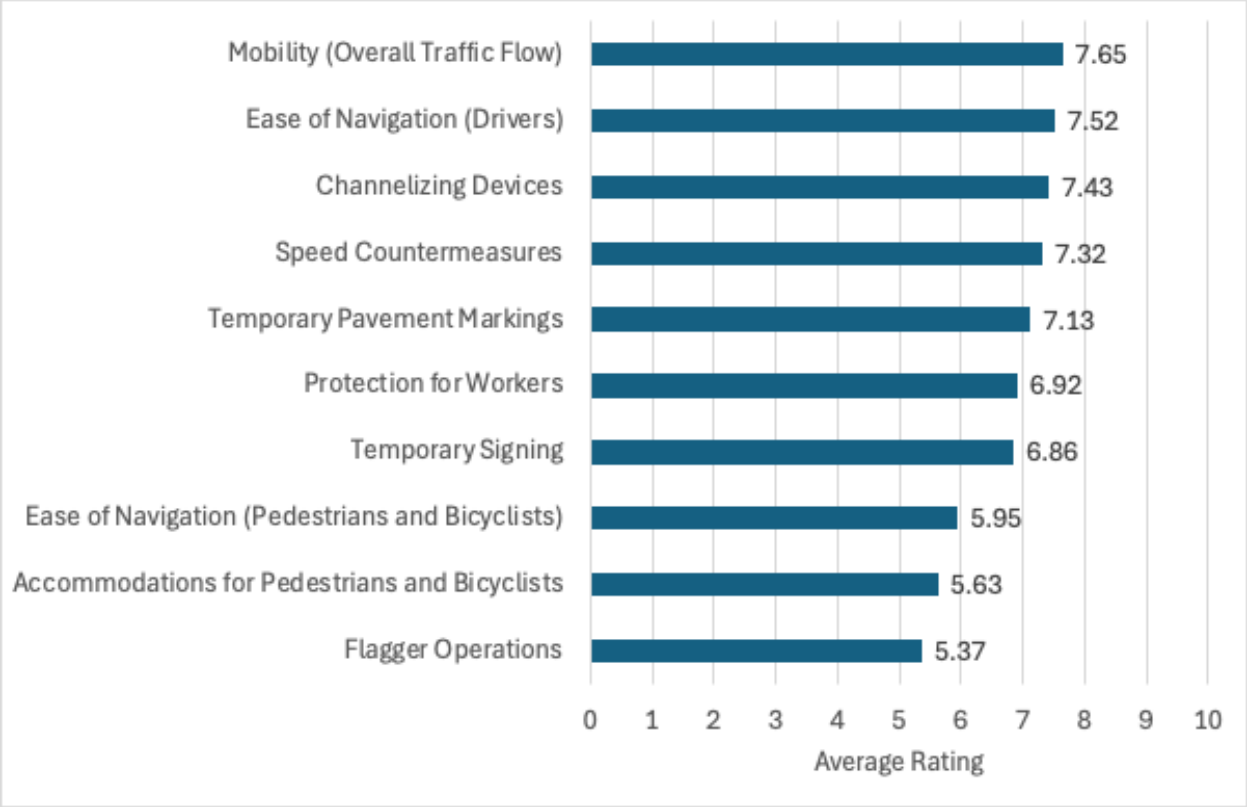
calculated for each year. These results are shown in figure 11. The results show a 33% overall increase in the percentage of change orders for MOT pay items. A review of data indicated that temporary barrier and equipment for smart work zones were the items with the most change orders for MOT pay items.



Source: FHWA

Figure 11. Graphic. Statewide percentage dollar value of change orders for maintenance of traffic (MOT) pay items (based on total contract cost) by year.

Field reviews were conducted for the 12 work zones that were studied for the project-level mobility and safety analysis. Members of the review team rated these work zones for ten attributes, and the average rating (1 = Low, 10 = High) was calculated for each attribute. The results for the field inspection ratings by attribute are shown in figure 12. Overall, the results show that the work zones were rated the highest for mobility and ease of navigation for drivers. Ease of navigation for pedestrians and bicyclists and accommodations for pedestrians and bicyclists received the lowest ratings. Reviewer comments noted some unclear signage and paths for pedestrians and bicyclists and need for improvement in flagger operations (e.g., flagger placement, procedures).

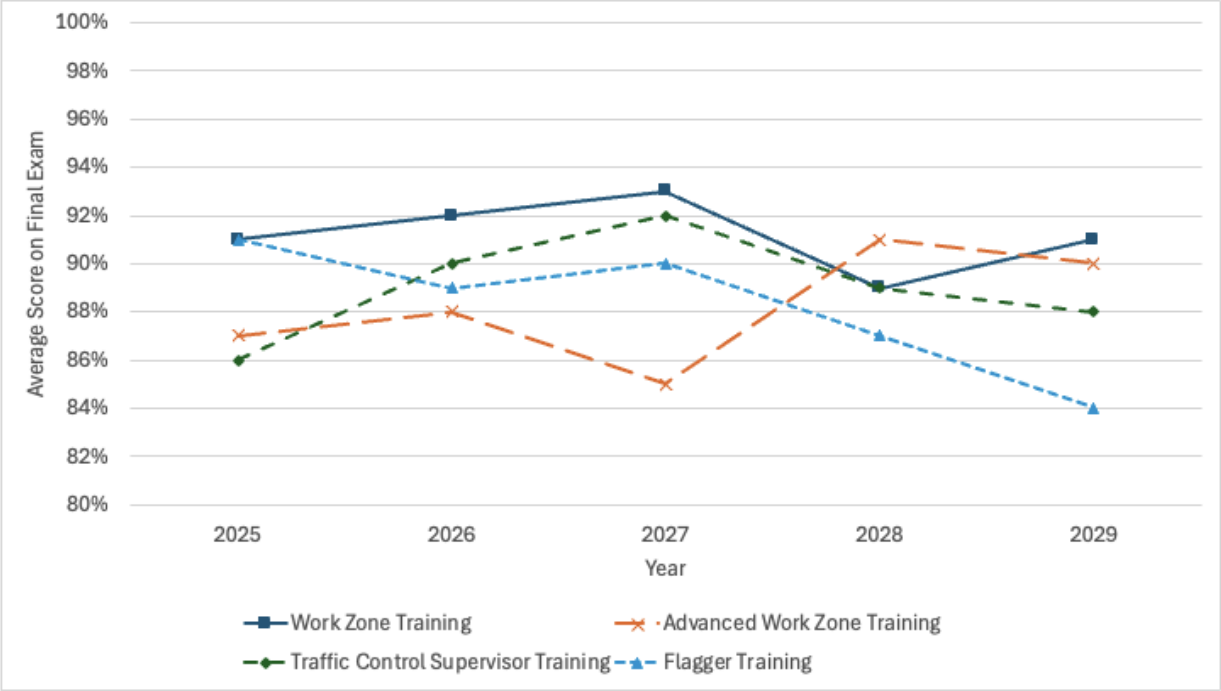


Source: FHWA

Figure 12. Graphic. Average field inspection ratings by attribute.

Training

AS DOT offers various work-zone related training classes each year. Training class participants are required to take a final exam, with a minimum score of 80% required to pass the class. Figure 13 shows the average final exam score by year for the following classes: Work Zone Training, Advanced Work Zone Training, Traffic Control Supervisor Training, and Flagger Training. These results indicate that the average score has been well above passing for all of these classes. The average final exam scores for most classes have been consistent from 2025 to 2029 with the exception of the Flagger Training, which has experienced a slight overall decline (8%) in the average score.



Source: FHWA

Figure 13. Graphic. Average final exam score by training class and year.

Qualitative Information

Additional qualitative information for this review was obtained through District meetings and a review of training evaluations.

Annual meetings were conducted with each District to discuss work zone practices, areas that are working well for personnel, and areas that may need improvement.

Key feedback from these meetings is summarized as follows.

- While speeding in work zones continues to be prevalent, the SSC pilot seems to be successful in helping to improve compliance with the work zone speed limit.
- There have been challenges in law enforcement availability to provide speed enforcement in work zones.
- While traffic has moved well through most work zones, there were some issues with queuing and rear-end crashes for some work zones, especially during peak hours.
- For several projects, temporary barrier that was not specified in the plans was added during construction.
- Contractors have expressed a potential need for improvement in the quality of temporary traffic control plans prepared by designers. There were a few projects for which contractors made adjustments to the phasing. Contractors also indicated that some temporary traffic control plans required more detail for accommodation of pedestrians.

- Public feedback has identified a potential need for more advance warning of work zones.

5.4 Summary of Work Zone Safety and Mobility Performance

Key findings from the analysis of work zone safety and mobility performance are summarized below.

- Safety performance measures tracked include number of work zone crashes by impact type and severity, speed-related work zone crashes, crashes involving TMAs, and speed compliance

- Mobility measures tracked include average delay, average delay per mile, and difference between average work zone speed and average speed without the work zone.

- Results from the statewide safety analysis indicate that the total number of work zone crashes has generally increased, but the crash rate per 100 million VMT in work zones has generally decreased.

- Results from the statewide mobility analysis show a 43% increase in average delays during the five-year reporting period.

- For the project-level safety analysis, the crash rate per million VMT ranges from 1.2 to 5.0. Front-to-rear crashes are the predominant type of impact for work zone impact, followed by sideswipe crashes.

- Speed compliance is a significant concern, with the average work zone speed exceeding the work zone speed limit at all 12 sites. SSCs installed at the pilot sites seemed to help reduce speeds. Pedestrian crashes during nighttime are also a significant concern.

- For the project-level mobility analysis, there was a wide range of mobility impacts, with an average delay per mile between 0.5 minutes and 13.2 minutes. The projects with the highest delay involved a two-lane highway with a lane closure (bridge rehabilitation) with flaggers and a freeway work zone (bridge replacement) with a 2 to 1 lane closure. Some of the factors potentially leading to the higher delays in these work zones include a high percentage of trucks, underutilization of detours, and slow response time from towing companies for some incidents.

- Speed compliance and average delay were lower for short-term work zones than for significant projects.

- While public survey results show that customers are generally satisfied with AS DOT work zones, there are some concerns regarding safety and ease of navigation while walking or bicycling through work zones and receiving adequate notice of work zones and alternate routes.

- Results from field ratings show that the work zones were rated the highest for mobility and ease of navigation for drivers and lowest for ease of navigation for pedestrians and bicyclists and accommodations for pedestrians and bicyclists.

- Average final exam scores for most training classes have been consistent from 2025 to 2029 with the exception of the Flagger Training, which has experienced a slight overall decline (8%) in the average score.

6. PROGRAMMATIC ASSESSMENT OF WORK ZONE PROCESSES AND PROCEDURES

The review team met twice in separate one-day workshops to discuss various aspects of AS DOT's work zone processes and procedures, such as safety and mobility performance, training, and public outreach. Various opportunities were identified for AS DOT to enhance its work zone management practices.

6.1 Programmatic Assessment of Safety Performance

Regarding safety performance, the number of crashes increased from 2025 to 2029, while the crash rate decreased due to an increase in VMT. Rear-end crashes are a particular concern and represent 45% of all work zone crashes from 2025 to 2029. Rear-end crashes are also contributing to the 70% increase in crashes involving a TMA, with 85% of these crashes involving a vehicle rear ending a TMA. The prevalence of distracted driving could be a factor in the high number of rear-end crashes. Possible strategies to try and reduce the number of rear-end crashes include expanded use of end of queue warning systems, public outreach campaigns for distracted driving, and increased law enforcement to help enforce AS's hands-free law.

Crashes involving pedestrians are also a significant concern. For example, the SR 51 repaving project in Adams County experienced several crashes involving pedestrians crossing between intersections during nighttime. This result may point to a need for additional guidance for pedestrian accommodations and lighting in work zones.

While the percentage of speed-related crashes decreased from 57% in 2025 to 49% in 2029, speeding in work zones continues to be very prevalent. The average work zone speed exceeded the work zone speed limit for all 12 work zones in the project-level analysis, with differences ranging from 2.1 mph to 8.4 mph. Speed compliance for short-term work zones was generally lower than speed compliance for work zones in significant projects. While speeding in work zones is widespread, AS DOT's SSC pilot program has performed well in helping to reduce vehicle speeds in work zones. For significant projects, the difference between average work zone speed and the work zone speed limit decreased from 5.7 mph to 4.6 mph after implementation of the program. In addition, two of the 12 sites in the project-level analysis were part of the SSC program and showed better speed compliance than most of the other sites. Legislative approval will be required to expand AS DOT's SSC program.

Since the release of a design supplement with updated guidance for positive protection in work zones, work zone intrusion crashes have decreased by 43%. However, there has been a significant amount of change orders for temporary barrier, indicating some designers may not be including temporary barrier in temporary traffic control plans. Additional training for designers may help to improve awareness of the updated positive protection guidelines.

6.2 Programmatic Assessment of Mobility Performance

Regarding mobility performance, the average delay per significant project increased from 2.3 minutes in 2025 to 3.3 minutes in 2029. For the project-level analysis, the average delay per mile ranged from 0.5 minutes to 13.2 minutes. For Site 10, an extensive media campaign to help make the public aware of the project and promote alternate routes was successful in reducing vehicle delays. Detours may have been underutilized for some of the other projects due to lack of awareness of alternate routes. Other factors contributing to delays for some of the projects include slow response to some incidents from towing companies and heavy backups (especially for Sites 9 and 12). Average delays for short-term work zones were generally lower than average delays for work zones on significant projects.

Strategies to help enhance AS DOT's practices for mobility could include additional outreach (e.g., increased social media engagement) to help make the public aware of projects and alternate routes, increased use of changeable message signs (CMS) to provide information on detour routes, updating the State's lane policy to include more lane closure restrictions on I-28, coordinating work zone scheduling to minimize delays, and exploration of a Towing Recovery Incentive Program.

6.3 Programmatic Assessment of Other Work Zone Practices

Analysis of public survey results shows show that customers are generally satisfied with AS DOT work zones, although there has been a slight decline in the average customer work zone satisfaction rating between 2025 and 2029. Customers generally feel safe driving through work zones and feel like they are able to easily navigate through work zones while driving. Customers also generally liked the orange pavement markings that were implemented as a pilot for a work zone on US 95. AS DOT may want to consider expanding the use of orange pavement markings to other significant projects.

However, less than half of survey respondents indicated that they receive adequate notice of work zones or adequate information regarding alternate routes in work zones. As mentioned previously, enhanced outreach and increased of CMS may help to increase public awareness of projects and alternate routes. In addition, a lower percentage of customers feel safe walking or bicycling through work zones and believe they can easily navigate through work zones when walking or bicycling. Furthermore, ease of navigation and accommodations for pedestrians and bicyclists were rated low in the field reviews. The public survey and field results, along with the previously noted concerns regarding pedestrian crashes, indicate a potential need for additional guidance for pedestrian accommodations and lighting in work zones.

AS DOT continues to conduct a robust training program with a wide range of classes offered, such as Work Zone Training, Advanced Work Zone Training, Traffic Control Supervisor Training, and Flagger Training. Employees have performed well in these training classes, with average final exam scores well above the required 80% threshold for passing. There has been some decline in the performance in the Flagger Training class, and flagger operations were rated low in the field inspections. These results indicating that the Flagger Training class may need to be refreshed. One option would be to incorporate some interactive Virtual Reality content into the class. In addition, District feedback regarding the quality of traffic control plans indicate that some content in the Traffic Control Design course may need to be updated. In addition, AS DOT

could consider requiring the Traffic Control Design course for all engineers (in-house and consultants).

7. SUMMARY OF ALL FINDINGS AND ACTION ITEMS

Overall, AS DOT continues to make progress in enhancing work zone safety and mobility. The overall crash rate has decreased during the review period. While average delays have increased slightly, implementation of additional strategies can help to reverse this trend. Customers are generally satisfied with AS DOT work zones, as they feel safe driving through work zones and feel like they are able to easily navigate through work zones while driving. Pilot initiatives such as SSCs and orange pavement markings have helped to reduce vehicle speeds and facilitate ease of navigation through work zones.

The review identified some specific strategies for AS DOT to further enhance its efforts for work zone safety and mobility. A summary of recommendations and action items from this work zone programmatic review is provided in table 15.

Table 15. Summary of recommendations and action items.

No.	Finding	Recommendations	Action Item	Priority (Critical / High / Medium / Low) and Rationale	Responsible Office / Division	Metrics	Due Date
1	Rear-end crashes were 45% of all work zone crashes and 70% of TMA crashes	Increase driver awareness of upcoming queues	Update work zone management policy to expand use of queue warning system	Priority: High Rationale: Reduce queues, reduce rear-end crashes, and improve worker safety.	Traffic Operations, Design	Percentage of rear-end crashes	2030
2	Rear-end crashes were 45% of all work zone crashes and 70% of TMA crashes	Increase awareness of distracted driving	Launch public outreach campaign for distracted driving	Priority: High Rationale: Reduce distracted driving, reduce rear-end crashes, and improve worker safety.	Public Information	Percentage of rear-end crashes	2031
3	Rear-end crashes were 45% of all work zone crashes and 70% of TMA crashes	Reduce distracted driving	Coordinate with law enforcement to increase enforcement of hands-free law	Priority: Medium Rationale: Reduce distracted driving, reduce rear-end crashes, and improve worker safety.	Public Information	Percentage of rear-end crashes	2031

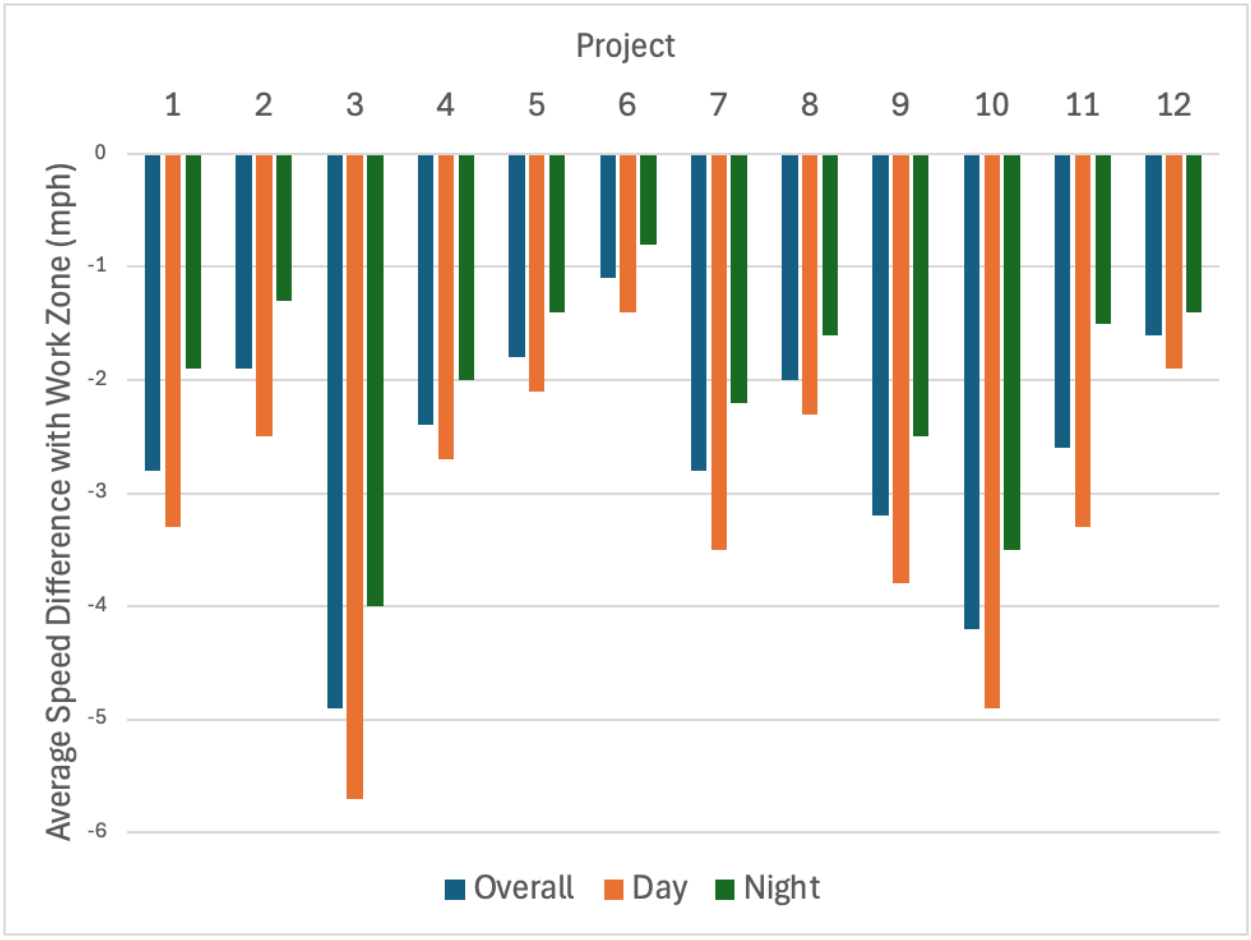
No.	Finding	Recommendations	Action Item	Priority (Critical / High / Medium / Low) and Rationale	Responsible Office / Division	Metrics	Due Date
4	High occurrence of pedestrian crashes for some work zones, public concerns about walking or bicycling through work zone, low field review scores for ease of navigation and accommodations for pedestrians bicyclists	Enhance pedestrian accommodations in work zones	Update work zone management policy and standards with additional information on practices to accommodate pedestrians and bicyclists in work zones	Priority: High Rationale: Improve pedestrian safety and increase public confidence in walking or bicycling in work zones.	Design	Percentage of crashes involving pedestrian, public survey results, field review scores	2031
5	Low level of speed compliance in work zones	Reduce speeding in work zones	Work with legislature to obtain approval to expand SSC use	Priority: High Rationale: Pilot program has been successful, need to improve speed compliance.	Traffic Operations, Public Information	Speed compliance	2030
6	43% increase in average work zone delay	Optimize work hours, adjust lane closure schedules, and enhance traveler information to reduce delays	Include language in work zone management policy that enables coordinated work zone scheduling to minimize delays, increase use of CMS with alternate route information	Priority: Medium Rationale: Reduce delays, support economic activity, enhance network efficiency, and decrease driver frustration. Low-cost action item.	Traffic Operations	Reduction in work zone delay	2031
7	Low survey scores for receiving advance notice of work zones and adequate information regarding alternate routes for work zones, 43% increase in average work zone delay	Increase public outreach efforts	Increase social media engagement for work zone projects	Priority: High Rationale: Reduce delays, support economic activity, enhance network efficiency, and decrease driver frustration. Low-cost action item.	Public Relations	Reduction in work zone delay	2030

No.	Finding	Recommendations	Action Item	Priority (Critical / High / Medium / Low) and Rationale	Responsible Office / Division	Metrics	Due Date
8	43% increase in average work zone delay	Update lane closure policy	Include more lane closure restrictions on I-28	Priority: Medium Rationale: Reduce delays and enhance operational performance on I-28. Low-cost action item.	Design	Reduction in work zone delay	2031
9	43% increase in average work zone delay	Reduce incident response time from towing companies	Consider use of Towing Recovery Incentive Program	Priority: Medium Rationale: Reduce delays through improved incident response.	Traffic Operations	Decrease in incident response time	2032
10	Positive public perception of orange pavement marking pilot on US 95	Expand use of orange pavement markings	Increase use of orange pavement markings for significant projects	Priority: Medium Rationale: Pilot project has been very successful.	Design	Public survey results, percentage of run-off road crashes in work zones	2032
11	High prevalence of change orders for temporary barrier	Encourage designers to consider positive protection when developing temporary traffic control plans	Enhance materials on positive protection in Traffic Control Design Course	Priority: Medium Rationale: Improve designer awareness of temporary barrier, reduce cost and delays due to change orders.	Workforce Development	Amount of change orders for temporary barrier	2031
12	33% increase in change orders, contractors perceive decrease in quality of temporary traffic control plans	Increase quality of temporary traffic control plans prepared by designers	Enhance content in Traffic Control Design course, require course for all designers	Priority: Medium Rationale: Improve quality of temporary traffic control plans, reduce cost and delays due to change orders.	Workforce Development	Amount of change orders. contractor feedback on quality of temporary traffic control plans	2032
13	8% decline in average final exam score for Flagger Training course, low average score for flagging in field reviews	Enhance training for flaggers	Incorporate virtual reality into Flagger Training course	Priority: Medium Rationale: Use of virtual reality will allow for use of more diverse scenarios and increase student interest.	Workforce Development	Average final exam score for Flagger Training course, average score for flagging from field reviews	2031

APPENDIX B.1 – Supplemental Data

Table 16. Work zone crash statistics by project and impact type (project-level analysis).

Site	Front-to-Front	Front-to-Rear	Front-to-Side	Rear-to-Side	Sideswipe	Other/Unknown	Total
1	1	13	1	3	2	3	**23**
2	2	9	0	1	1	2	**15**
3	1	11	0	3	1	2	**18**
4	0	2	0	1	0	1	**4**
5	1	8	1	0	1	2	**13**
6	2	22	2	4	3	2	**35**
7	0	2	0	0	1	0	**3**
8	1	14	2	2	1	1	**21**
9	1	10	2	5	4	3	**25**
10	2	15	2	7	3	2	**31**
11	1	5	0	0	0	2	**8**
12	0	3	0	1	0	1	**5**
Total	**12**	**114**	**10**	**27**	**17**	**21**	**201**



Source: FHWA

Figure 14. Graphic. Average speed difference with the work zone by project and day or night (project-level analysis).

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